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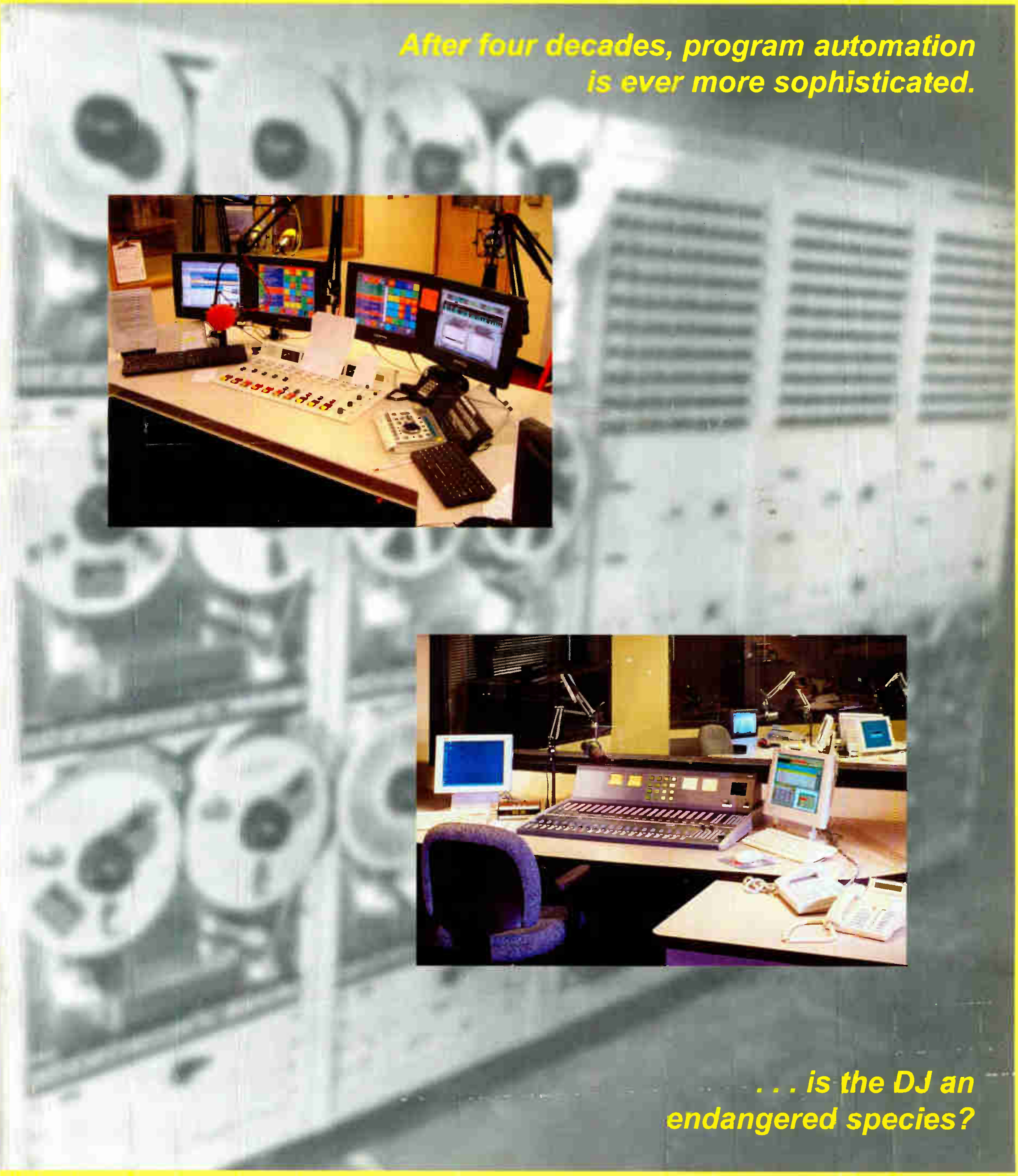
April 2003
Volume 11 Issue 4



After four decades, program automation is ever more sophisticated.

. . . is the DJ an endangered species?

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Radio Guide

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Publication Website: www.radio-guide.com
Radio History Website: www.oldradio.com
Used Gear Website: www.radio-classifieds.com

Advertising Information:
www.radio-guide.com/rates.pdf

Radio Guide, ISSN 1061-7027, is published monthly, 12 times a year, by Media Magazines Inc., PO Box 20975, Sedona, AZ 86341.

Columns & Articles

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April 2003

Got Together, Still Moving

What a month! Just as we were getting all "geared up" for the NAB show, this reality TV war breaks out. A number of folks have told us their companies pulled back on plans for them to make it to Las Vegas this year. Combined with the continuing industry consolidation, you don't have guess hard to know this wasn't the largest NAB show in history.

Nevertheless, the purpose of the NAB Convention was served. New products were displayed, current technology was showcased, relationships between station engineers and the manufacturers were either made or renewed.

Although engineers often work alone, we need each other. The opportunity to share experiences and learn from each other is one of our greatest strengths. It is the foundation of the SBE, for example. When difficult times arise, most engineers – even competitors – willingly roll up their sleeves and help solve the problem together. This can be a great "family."

Our goal at **Radio Guide** is to develop topics and procedures to help you. So feel welcome to express your opinion of what we are doing. A letter is good, so is email to editor@radio-guide.com, even a phone call. We're interested to know what you are thinking.

And last, but not least, I'd like to thank all of you who did come and make it to my 11th Annual Lunch Gathering. Those of us there had a good time, and special thanks go out to the co-sponsors of my event: **Prophet Systems, Shively Labs, Orban and Sierra Automated Systems**. The door prizes were fantastic this year ... you are invited to read all about it on the NAB page on www.oldradio.com for some pictures and descriptions of our get-together.

Better yet, make your plans now to be with us next year! [Ed.]

Radio Automation

by Paul Black

From Juke Boxes ... to Computers

[The concept of "automation" suggests a completely different idea today, from what it was years ago, when radio first began experimenting with self-operating systems. With imperatives going beyond just "filling hours," automation has taken on new tasks. Ed.]

[PLEASANT HILL, California - April 2003] The rise of microprocessor-controlled equipment has led to the availability of more and more "automatic" devices. We have all gotten used to computer controlled equipment taking care of the more mundane functions of life. Some of this may conjure up visions of the evil computer "HAL 9000" from Arthur C. Clarke's *"2001: A Space Odyssey."* Nonetheless, these kinds of systems are becoming more numerous every day.

In broadcasting, computers are now the heart behind the program automation system. Due to the ease with which software can be written to control the flow of program events and the rapid advances in hard-disk storage of the actual audio, some amazing things can be accomplished with these systems.

But it was not always that way.

Filling Up the Hours

When the so-called "Golden Era" of broadcasting came to an end in the early-to-mid 1950's, most entertainment programs (dramas, comedies, soap operas, and variety shows) migrated to television. At that point there were basically two choices; disk jockeys playing records or men reading the news.

While major markets did have popular radio personalities, the phenomenon of "radio stars" was still in the future. Many stations played what we today would classify as "elevator music." (In those days, it was called "good music" – to distinguish it from Pop, or the new Rock-and-Roll, then sweeping the country.)

Since everything could be put onto tape and played back on the air in the correct order, management quickly realized playing *101 Strings* records or Mantovani's orchestral works one after another, and inserting commercials and voice announcements, could easily be accomplished by merely finding a way to start and stop open-reel tape machines. Other formats, such as Classical were quickly adapted to tape replay. All these factors created a demand for some kind of AUTOMATION, as it ultimately came to be called.

However, there was one little problem.

Studio Location

It was always cheaper to have co-located studio and transmitter, to keep staffing costs down. Yet, even as disk jockeys replaced studios filled with artists, management saw a "staffing issue." The increasing use of vertical antennas and directional arrays usually required a transmitter site at a considerable distance outside of town. FCC rules required an operator to be on duty at the transmitter site, with First Class RadioTelephone licenses. And most people with this license were trained technicians, not willing to work for low wages.

Some managers were under the impression these operators were being "paid to just sit there." Of course many of them worked hard performing important maintenance, but that was how managers saw it (an issue persisting down until today). Although it might hurt "visibility" in the community, some studios found their way out to the transmitter site, so "combo" operators could handle both announcing and engineering tasks.

Other stations, wishing to keep their studios closer to the downtown areas, turned to technology for problem solving products.

Unmanned Sites

One of the first, if not *the* first person to begin this work was Paul Schafer. Schafer Electronics pursued development of automation systems and remote controls. As a direct result of Schafer's work, the FCC amended the Rules in 1957 to allow remote control of radio transmitters, and the Commission permitted many stations to use operators with a "Third Class" license with a "Broadcast Endorsement." It was now possible to have one person run the whole setup from the studio. Management was happy, and the license was pretty easy to get, so "Third-Endorsed" people typically accepted really low wages.

Operationally, it was considered better in "good music" formats to have a machine do the actual playback, instead of a human being. Programmers reasoned they would have better control of both the content and the "flow" of the format this way. Plus, while the automation kept the format running on the air, the operator was freed up to do other things, such as production work. This meant a separate production person need not to be hired to "dub spots."

Lastly, there were no on-air personalities to gather a listenership following, and thereby demand more money for their services. It seemed as if management had achieved something close to Nirvana: inexpensive workers doing multiple jobs, and all those spots just running and running and running! What a world!

It remained that way for many stations in many markets, right on up through the early 1980's. New formats such as Rock Oldies began using automation very heavily in the 1970's. Several major syndication companies provided tapes for this format.

Thumbwheels and Relays

The systems themselves were amazingly simple by today's standards. Without microprocessors (because they had yet to be invented), only a simple mechanical memory controlled the tape decks. The "memory" could be little thumbwheel switches turned to different numbers, small plastic "chips" about two inches square with holes in them, or even a tape cartridge with audio pulses recorded on it. As the machine ran, it accessed its next event by "reading" the next thumbwheel, square, or pulses off the cart – whatever was used.

Around 1955, Schafer equipped KGEE in Bakersfield, California with his first practical radio station automation system. I am not sure if this was what later became the famous Schafer 800 Series Automation, but if so, it probably used rows of thumbwheels as a memory source. Each thumbwheel had numbers on it (usually from 0 to 15), and each source had a number assigned to it.

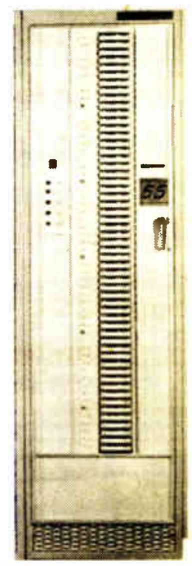
Notice the row of thumbwheels at the top.

One would "programmed" the system by turning the thumbwheels to the numbers of the sources corresponding to the order of events desired. If you wanted tape decks 2, 3, and 4 to play, followed by cart 9, a Time Announcement from Cart 12, and then tape deck 1, you would dial up 2-3-4-9-12-1 on the row of thumbwheels, and let 'er rip! Formats were usually structured to "start over" after thirty minutes, so you would set the machine to "reset" itself to the beginning at the half-hour and hour, and repeat the process again. And again. And again.

Of course the machine had to know when an event was over. At first this seemed quite a challenge: Silent Sense would leave too much dead air. Soon a simple method was devised to tell the machine to "step" to the next event: A 25 Hz tone was recorded onto the tape, and detected by a simple circuit. A relay then "stepped" the machine to the next on-air event. (Many automation controllers had a button "STEP NOW," which commanded the machine to go to the next event, regardless of what was on the air, or whether a step tone had been detected. The Schafer 800 labeled the button "PANIC" – nomenclature leaving little doubt as to what conditions needed to take place to require pushing it.

When tape cartridges came along, manufacturers devised ways to change carts automatically. Playback systems such as the "Gates 55," the "Carousel," or IGM's "Instacart," utilized the cue track of the cart as the obvious place to put a step tone. Usually a 150 Hz tone was used, as 25 Hz was too tough for some cart reproducers to handle.

To keep "upcuts" from happening, all systems worked on the principal that step tones would be one second in length. The next source to air would start at the beginning of the tone, and the source that did the stepping would stop at the end



of the tone. All elements, on cart or tape, had to have a one-second deadroll at their beginning. Properly done, this could make for a pretty tight-sounding station. Some were so good they rivaled live operators in their sound.

More Automation

Schafer was not the only automation system. I worked with several (and saw more), in my days as a working radio engineer. The ones I remember most vividly were the Sono-Mag system; the Gates SP-12 and its evil companion subsystem, the RA-5 Random Access Carousel Controller; the Harris System 90; Paul Schafer's 800 and 903 Series; and an IGM system.

IGM was a "hybrid" company. Its complete name was International Good Music, signifying the taped music service the company sold. IGM built and sold automation systems, but the software (music) was worth more than the hardware. IGM knew once a station had invested a lot of money in the machine, they were very likely to continue to purchase tapes. Several formats were available, mostly centered around different "tempos," which were supposed to attract different demos. IGM supplied a lot of programming for years.

Today's "automation" system is quite different from those old ones we had years ago. Most of these systems are rooted (and often still used) in what we once called "jock-assist" configurations. The computer system plays all the elements, and the live announcer jumps in when necessary. Of course, with the newest systems and remote control units, it is now possible to program a station for days without a live body, even locking the doors on the empty studio. Management's dream has indeed arrived!

Compared to that, the old stuff seems incredibly crude. But at the time, it was state-of-the-art. The next time you watch one of the new systems quietly running a format in some modern studio setting, think back to flashing lights, noisy Scully open-reel decks clunking on and off, and little white lights indicating which machine is playing, or will be playing next. And be thankful of the progress that we have made.

Paul Black is a many talented consultant based in Pleasant Hill, CA. You can email him at paul@mediatechcon.com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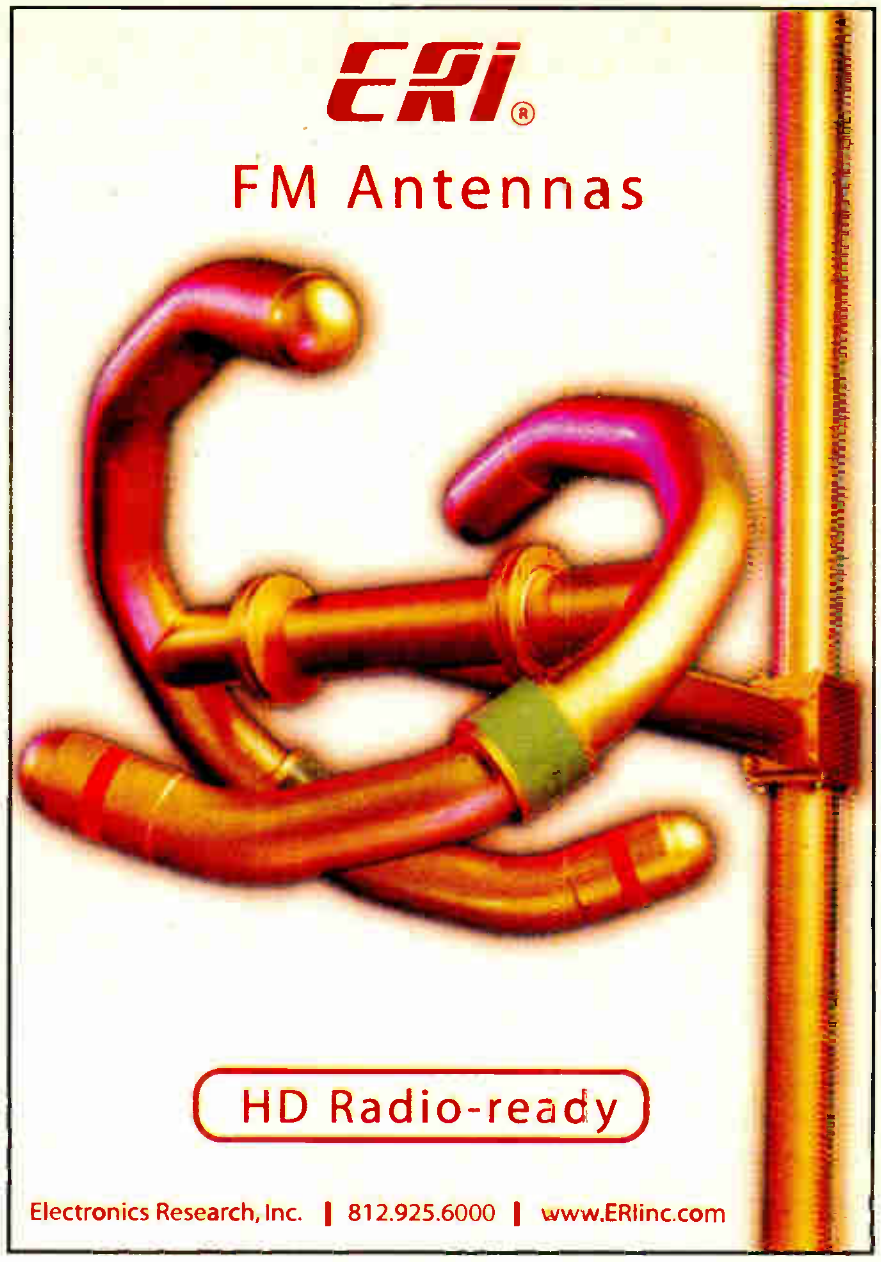
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Radio Towers

by Richard Haskey, CPBE

Everything You Wanted to Know About Towers, But Were Afraid to Ask

[MESA, Arizona - April 2003] There you are, happy as Chief Engineer of five radio stations. Then the GM declares a cost saving endeavor: The two AM stations will share a new site – and you have been declared the supervisor for the new project. Likely, nothing was said about an increase in your pay for this additional "hat." Maybe, that is part of the cost savings.

At any rate, you have been in the business for 13 years and have done it all – almost. You are good at what you do, but new transmitter site construction has never been one of your disciplines. The part that worries you most is those towers! One of your AMs is non-directional, but the other is a two-tower directional.

Let not your heart be troubled – it is not so bad! All of the major tower manufacturers will be pleased to work with you on the project hoping, of course, that you will select their steel package. However, it does pay for you to have some idea as to what you need.

In selecting towers, one of the first things you will need is an accurate plot plan so you know exactly how much land you have to work with, including its shape. Guyed towers are the least expensive *if* you have the room. And you will need to know the "line of towers" for the two-tower directional, as it would be preferable to use the existing pattern rather than making changes.

While you will probably need a soils analysis done in order to get a building permit, you also should have some idea of the general land conditions where the towers will stand (solid rock, typical earth that is easily workable, land that flood easily or often, etc.), airport proximity, recorded wind conditions and whatever other information that will help you in dealing with suppliers.

Tower Choices

Today, there are three types of guyed towers available: Bolt-up, welded pipe/tube and solid-rod.

Several manufacturers make a bolt-up tower, with ROHN probably the principal supplier. These towers can be engineered for use up to 400 feet with reasonable wind loading.

As their name implies, they use bolts to connect everything, like a giant "Erector Set." The biggest advantage is shipping, since the cubage is so much less than for welded sections. As you might imagine, the largest market for these towers is for export use. They are seldom used domestically due to the additional labor for on-site assembly.

An ancillary advantage is that the bolt holes are slightly smaller than the bolts which are driven through them, providing an extremely straight and true structure. Little or no welding is done on this type of tower so the slight "pulling" due to the welding heat is eliminated.

Many manufacturers of guyed towers still produce towers with pipe or tubular legs. While these towers are useful in very dry areas, they tend to corrode and rust form the inside out and are certainly to be avoided along the coasts and in the humid mid-west. Even though the manufacturers tout galvanizing inside and out, the inside galvanizing leaves a lot to be desired.

Years ago, I was readying to paint such a tower along the California Coast. I was scraping rust and what have you, when I came across a particularly stubborn spot and was, as they say, getting with the program. All of a sudden, my scraping brush hung up and, upon further inspection, I determined it had caught on a hole all the way through the tower leg. Subsequently, the tower was dropped and, when it finally hit the ground, many spots were found where there was no longer steel – only paint!

Galvanizing has become better and more durable but I would never use a pipe or tube leg tower – galvanized or not – except maybe here in Arizona or in Nevada. Really, it is foolish to install towers and other hardware without galvanization. Be certain your manufacturer of choice galvanizes to ASTM Specification A-123 (about 2 ounces of zinc per square foot) or better. Proper galvanizing actually deposits a small amount of zinc to the clean, prepared steel. Unlike the various cold galvanizing compounds sold in various hardware and industrial supply stores, properly applied galvanizing doesn't "wear off" or "go bad" for a period of many years. I am not aware of any manufacturer supplying non-galvanized hardware today.

With both bolt-up and pipe/tubing leg towers less than optimum, what is the best choice? A little more expensive, but a whole lot more durable, are the so-called solid rod towers. Pioneered by Pi-Rod (and one or two others) many years ago, these towers use solid steel rod for the legs and for the horizontal and diagonal bracing.

Welded, and built in precision jigs, the solid rod towers will last for many, many years. Here in the West, Magnum Tower in Sacramento is one of the more popular brands. In the mid-west, Utility Tower in Oklahoma City manufactures a full line, while in the East, Pi-Rod, ERI (yes, the FM antenna guys!) and Central Tower (now a part of Dielectric Communications) are front runners. (There are dozens of guyed tower manufacturers and the above list is not meant to be exhaustive or to cull "bad" firms.)

What happens when there is not enough room for a guyed tower? This requires a self-supporting tower, in one form or another. As the name implies, the tower supports itself without using guy wires, brackets or any other paraphernalia. The lack of guy wires, etc. sounds really neat, so why not build all towers this way? Expense is the main reason.

A typical 240-foot guyed tower would cost, maybe, $30,000. A self-supporting version could cost as much as $100,000, plus lots of extra concrete, ground assembly time, etc. Of course, when the chips are down (and the plot is small) there may be no other way.

Most all the major manufacturers produce self-supporting towers but few (ROHN may be the exception) have "off-the-shelf" versions. Once you get beyond 100 feet they become "custom" towers.

Whether your towers will be self-supporting or guyed, an AM radiator will usually be insulated. Your tower manufacturer will usually provide a tapered base section drilled/punched to accommodate your base insulator of choice. These days, the Austin base insulator is probably most popular.

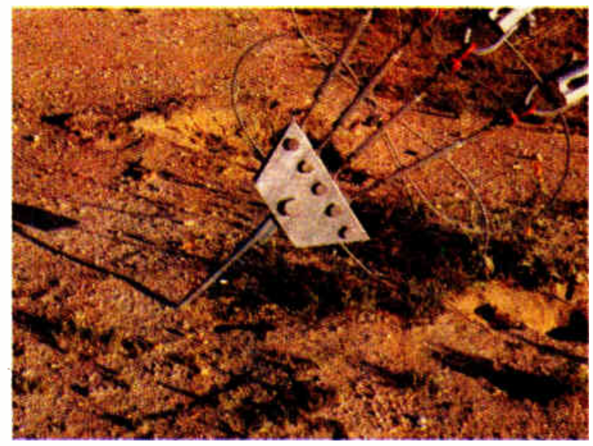
When selecting a base insulator, there are two specifications that are most important. First, the insulator must be able to withstand the weight of the tower. But realize the weight of the steel (dead weight) is only a fraction of the force the insulator must accommodate. The downward force of the tensioned guy wires must be added. A small increase due to wind forces also should be added. Most base insulators manufactured today have charts which take most of the work out of this process.

The voltage breakdown is the other important factor; usually this is only important when high power (usually equating to high voltage) is applied to your tower. As radio amateurs often discover, a trio of good glass beer bottles will perform nicely as a base insulator, easily support a small tower and handle a couple of kilowatts. It is probably best not to suggest this to your manager. In his cost-cutting frenzy he may suggest you do it!

Anchoring the Sticks

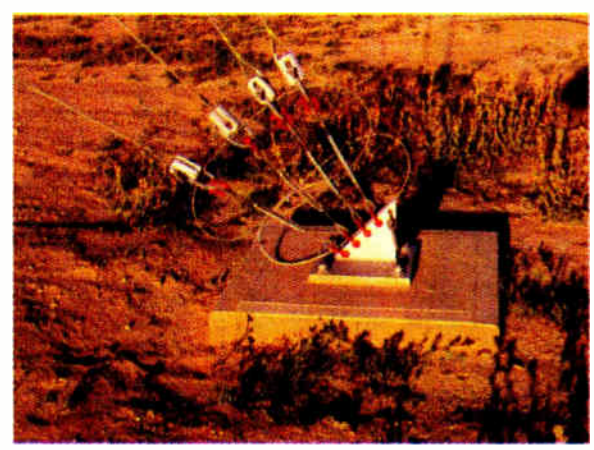
Guy wire anchorage is an important factor to consider. A guy wire failure, of course, means it is all over. Usually, when a guyed tower tips, it comes down like an accordion and all you have left is a pile of crumbled steel. Rarely, is any bit of it salvageable.

There are two workmanlike ways to anchor a set of tower guy wires. The first, and most common, is a "dead-man" type anchorage, which consists of a steel-reinforced concrete block with some form of steel weldment to which the tower guy wires are attached. The "dead man" concrete block is usually buried beneath six or more feet of earth, with the steel weldment (rod or channel, commonly) exiting the earth about one foot.



The weight of the concrete plus the weight of the earth provides a secure anchorage for the guy wires. The main disadvantage in this style of anchorage is potential damage to the weldment, usually of a chemical nature. It is not uncommon for the rod or weldment to disintegrate and the anchorage to fail.

The second, and in this writer's opinion, the better method to provide a secure anchorage is to drill a pier, add steel reinforcement and concrete and place a galvanized "anchor head" bolted to the top of the pier. This obviates any type of chemical reaction between the earth and the anchor.



The above situations assume that the earth where the tower base and anchors are to be located is of such a nature that common construction techniques and easily located machinery can do the job. There are situations where this does not occur. What then?

Some form of rock anchor must be set in place and holes drilled into rock and proper rock anchors installed and tested for pull-out. The techniques for accomplishing this are beyond the scope of this article, but let it be said, it is a costly and time-consuming measure. This writer installed 35 such anchors

Several years ago, after having been told that a site was "typical rolling farmland," some of the excavations required blasting. Fortunately, I still have ten fingers.

If you have read this far, it should be obvious that both you and the GM should look very carefully at your proposed site. The savings in cost may be eaten up by some costly construction techniques or expensive material expenditures. On the other hand, the new site may truly save money and be beneficial.

Richard Haskey has been around the world installing and maintaining broadcast facilities for over 40 years. When in his cage at the IGH, you can contact him at rhaskey@extremezone.com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Audio Processing From the Ground Up

by Cornelius Gould

Part 4 – The Limiter: A Final Processing Stage

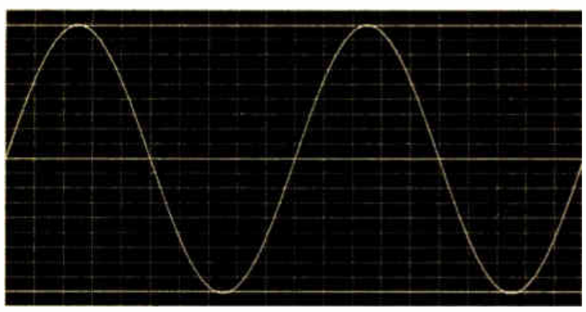
[As we look at the parts of an audio processor, this time Cornelius "limits" his consideration to the peaks of the audio signal. Ed.]

[CLEVELAND, Ohio - April 2003] Last time out, I introduced a concept, but did not explain what it was. That concept is the "limiter."

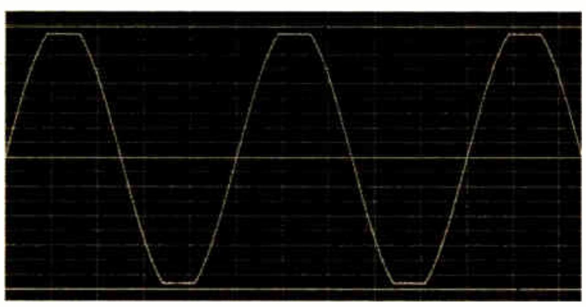
A limiter is the final processing stage, and its job is to put an absolute ceiling on the output level of your program audio. There are two types of limiting. They are "dynamic limiters," and "final (hard) limiters." First, we will look at the final limiter.

The final limiter can be thought of as an audio "brick wall," which sets an absolute "hard" ceiling no audio can exceed – no matter how hard you drive it. The final limiter's purpose is to ensure program audio will never exceed the FCC mandated modulation limit. It is very similar to a stereo system turned up so loud that it begins to distort; the distortion occurs because the system is only designed to dissipate a set amount of power into the speakers.

When the point of maximum output is reached, it will "flat top" or "hard limit" to that point, and distortion results. If you look at our diagram of a sine wave, you will see the flat topping phenomenon. This concept is used in peak modulation control in broadcasting audio of any kind.



A typical audio sine wave.



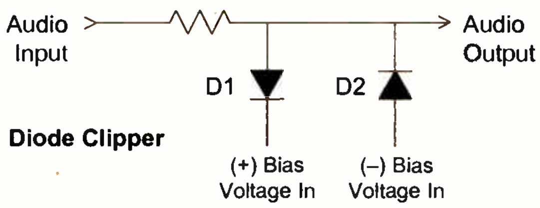
A typical audio sine wave limited by a "clipping Limiter" (the brick wall effect).

In the US, this limit for AM is -99% on negative peaks and +125% on positive peaks. For U.S. FM Stations, the limit of 100% modulation is represented by a +/- 75 kHz carrier deviation. Final limiters are also referred to as "clippers" as they it will "clip" any portion of an audio waveform exceeding the "overmodulation" point – sort of like a pair of audio scissors. In all analog processors, this "scissors funtion" ultimately boils down to a cople of diodes.

Intentional Clipping

In the diagrams above, you can see the audio signal comes in on the left and goes through a resistor. Next are two diodes (D1 and D2). Diodes can be used for lots of things in audio processors including "final limiters."

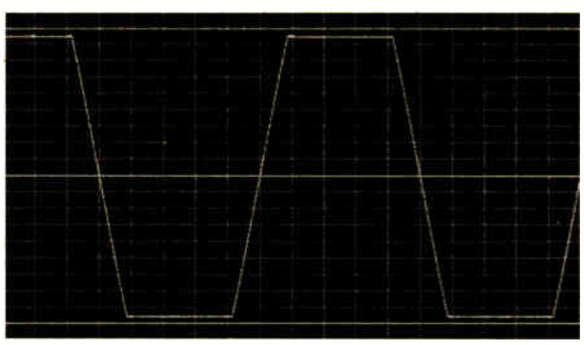
Here is how it works: A positive voltage bias is set on diode 1 (+1.5 V, for example), and a negative one on diode 2 (-1.5V). As long as the input voltage is less than 1.5 volts, no change happens, and the audio flows through the circuit as normal. As soon as the audio exceeds 1.5 volts, the diodes kick in, and limit the voltage swing to a maximum of 1.5 volts



Since it is a "brick wall limiter," the transition is pretty abrupt, and the signal "flat tops" as seen on the output side of our little diagram. For AM stations, raising the bias voltage value of diode 1, and keeping diode 2 at -1.5 volts causes positive modulation to increase.

The interesting thing about hard limiting is – under the right, controlled conditions – it is possible to drive it in such a way as to cause a listener to perceive it as being louder than it really is. If you have been following this series of articles, I am sure the light bulb in your head just went off!

Yes, a station can be made louder by "leaning" on the final limiter harder, but there is a price to pay: The louder you get, the more obvious it is that you are distorting your signal. This distortion begins to manifest itself as a "ripping" or "tearing" sound on piano notes, and is especially noticeable on female vocals. Another side effect is sibilant vocal energy can "fuzz out" when final limiters are working overtime. I like to refer to this sound as "Fuzzy Esses." Early processing systems employing simple limiters composed of just two diodes really suffered from these symptoms. But some clever solutions were just around the corner.



High levels of clipping creates more loudness, but also causes more distortion.

Obviously, the two diode final limiter has a very small range of useful operation as far as loudness goes, and some clever solutions were needed to make it more useful for broadcast. An early solution was to use a "dynamic limiter" ahead of the final limiter. (A dynamic limiter is electrically the same as the compressors we have discussed, but operates at a much higher compression ratio.)

Squeezing More Level Out

Compression ratio is expressed as [input level increase]:[output level increase]. So a compressor with a compression ratio of 15:1 is a compressor set up in such a way that for every 15 dB increase in input level, there is a 1dB increase in the output level. A limiter with ∞:1 compression ratio is one whose output could never increase beyond 1dB no matter how hard you drive it.

A compressor like this would be used as a dynamic limiter ahead of the two diode clipper. This high ratio dynamic limiter has the benefit of making the diode clipper operate more efficiently as it then only has to deal overshoots which "sneak by" the dynamic limiter.

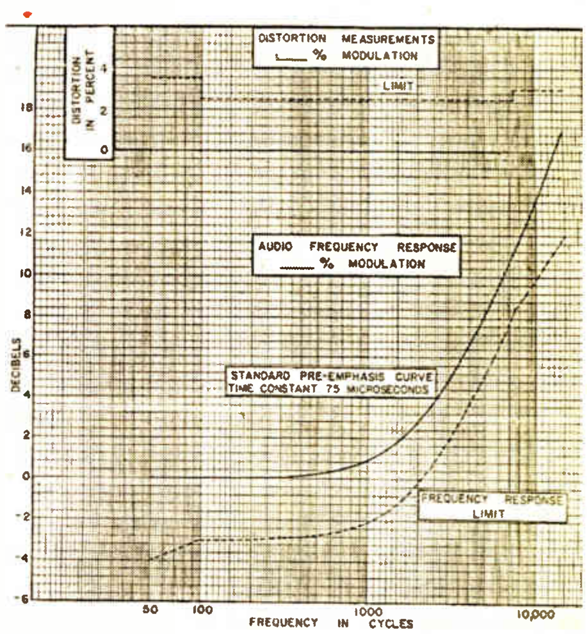
Of course, due to the constraints of the laws of physics, the limiter's attack time cannot be 0, so some loud signals will pass through. These peaks are usually quite brief, but can be large. You can think of the dynamic limiter as the "soft sponge" in front of the brick wall, providing a gentle transition between a normal waveform and a clipped one. This configuration reduces distortion since you are not hitting the diode "brick wall" nearly as often as before.

The first dynamic limiters were wideband with very fast attack and release times. Nowadays, they are multi-band, and have very sophisticated timing networks. Furthermore, with the advent of Digital Signal Processing (DSP), these dynamic limiters have the ability to totally do away with clipping all together. (We'll discuss DSP in an upcoming article.)

The Pre-Emphasis Hassle

Even with dual limiting, over-modulation peaks can occur on the higher frequencies as a function of pre-emphasis. What is pre-emphasis?

Pre-emphasis involves boosting the high frequency content of the program audio by a specified amount. (Receivers use a complementary de-emphasis system to reduce those high frequencies by the opposite amount before passing the recovered audio to the listener's speaker system.) FM radio stations in the U.S. employ a 75 uS pre-emphasis curve to the program audio before the program signal goes into the transmitter.



The 75 uS De-emphisis Curve

Pre-emphasis and de-emphasis form an effective noise reduction system for FM radio transmissions. This is because when your radio passes the (pre-emphasized) audio through the high frequency reducing system, it also reduces any "hiss" in the signal by a dramatic amount. Pretty clever!

While the dynamic limiter in front of the clipper decreased the perceived distortion, stations wanting to get louder had to balance a trade-off of two problems. Because of the pre-emphasis, the dynamic limiter "sponge" for the high frequencies is inefficient, and there is a tendency to "dull" the high end excessively. The choice was a loud, but dull mushy high end or a brighter high end, but with "fuzz" or "splatter" on high frequency content – those "fuzzy-esses." The solution to this problem sparked a revolution in audio processing.

(Continued on page 10)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Audio Processing

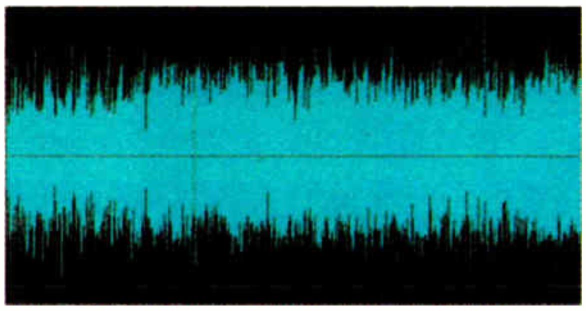
Continued from page 8.

Problem Solver

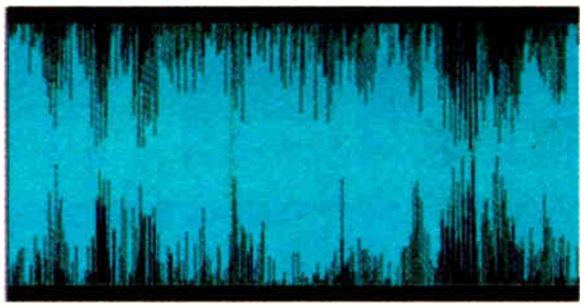
The biggest advance in the science of final limiting came in 1980 with the introduction of the Bob Orban's "Distortion Cancelling Clipper" in his Optimod 8100 audio processor. The idea behind it is essentially this: When a clipper is active, it creates audible distortion. No matter where in the range of audio frequencies clipping may occur, we humans will mostly perceive this distortion as unnatural audio content in the upper midrange audio region.

Orban came up with a pretty sophisticated scheme to 'isolate' this midrange distortion product, and add it back into the audio, out of phase, so that you cancel it out. The system was capable of unbelievable amounts of clipping power without all the nasty "fuzzy-esses" distortion all to common in processors before. Orban's XT2 chassis took this idea further for even more high frequency clipping power.

The end result was a high end sound very much like the program source – provided you did not go overboard. Of course, as with any other advanced processing application, it can be abused easily.



Output of a multiband dynamic limiter (with pre-emphasis) before being applied to a final clipper. Notice all the little "peaks" This will cause over-modulation if not treated by the final limiter.



Audio after the multi-band processor is fed into a final limiter to remove the little peaks, and boost average levels.

Another function of the final limiter is usually to perform the necessary low pass filtering for the intended transmission medium. In FM, the lowpass filters are generally set around 15 kHz, and for AM NRSC, this lowpass is set between 7 and 9.5 kHz (depending on what the AM broadcaster is trying to accomplish). There were many tricks learned with the (seemingly) simple lowpass filter that can make or break an audio processor.

But, that will have to wait for next time.

Cornelius Gould has had a life long interest in the insides of audio processors. He is the Senior Staff Engineer for Infinity Broadcasting in Cleveland, Ohio as well as Chief Engineer for WJCU 88.7 FM in Cleveland. Reach him at: cg@radiocleveland.com

FCC Spotlight

The Alternative FCC Inspection Program

by Ken Benner, NCE

[Many of you are familiar with the Alternative FCC Inspection Program, sponsored by most of the State Broadcasters' associations. Perhaps you did not know how the program came about, or all the benefits that accrue to participating stations. Ken Benner, an Alternate Inspector, helps us inspect the program. Ed.]

[TUCSON, Arizona - April 2003] The Alternate Inspection Program (AIP) is the product of legendary Minnesota broadcaster, Jim Wychor. While serving as Executive Director of the Minnesota Broadcaster's Assoc.in 1994, Wychor realized the difficulty facing stations in their attempts to keep compliant with the ever changing and constant interpretive variations of the FCC rules and regs.

Wychor invited managers, engineers, FCC representatives, and anyone else interested, to develop a program to simplify and, more importantly, *standardize* interpretation of the rules. The FCC checklists, past and present, were compared and reviewed with a focus to develop an educational tool simplifying their understanding.

Other broadcaster associations became involved in the planning, and in early 1995 the program was finally underway, offering stations an opportunity to be inspected and be "certified in good faith as basically compliant." It was felt essential to provide stations a non-threatening program with an opportunity to learn what is needed to be corrected and become certified. Only certified stations are reported to the FCC.

A prime benefit of the program is an agreement from the FCC to recognize such certifications and eliminate those stations from their *random* assignment of stations to be inspected. Another significant provision of the agreement between the broadcast associations and the FCC is that stations inspected and found non-compliant are *not* reported to the FCC.

Over the past eight years, the program has developed a large source of information from managers, engineers and consultants who are willing to share their experiences, war stories, unique problem solutions and – most importantly – their phone numbers to help other stations.

Such an information exchange is a boon to many stations. While inspectors can identify problems or can suggest simple corrective procedures from past experience, they are prohibited from performing corrective maintenance themselves, due to liability issues. However, being able to provide a phone number of someone who has resolved a similar problem turns a potential problem into a much more pleasant situation.

In recent years, I have had the enjoyable job of visiting stations all over the country. Some of the locations were easy to get to. Others ... well, let us just say there have been some amazing experiences. If you think getting to your transmitter site can be a challenge, how about a station up at the Arctic Circle? No, a car will not make it!

Ken Benner, on his inspection route,
eight miles above the Artic Circle at Ft. Yukon, AK.

A typical inspection begins with a complete review of the current applicable checklist, followed by a training session during which any and all questions get answered. If I am unable to answer a question, I will call someone who can. In some cases to get a formal legal opinion, I may contact the legal counsel for the broadcasters' association.

As a firm believer in the old adage, "If it ain't in black 'n white – it ain't so," I will write an explanation over my signature, explaining my concerns and what I believe may be a good faith solution to the problem. This may include my recollection of what we used to do back in the "good ol' days," or the name and phone number of someone with more expertise to address the problem.

As an example of the low-key way the program tries to handle issues, I recall one station which clearly was operating out of tolerance with its license. "But our lawyer said we could operate this way," explained the engineer. With a speakerphone in the presence of the manager and chief engineer, I called the lawyer who reported "Yes, they are legal per a verbal agreement I have with the FCC." Thus, I was able to certify the station as compliant. Be assured my letter to the station manager confirming that phone conversation is posted with the station license.

As you can imagine, there are a million stories in the AIP. Some of them, I can talk about! Going around to the various inspection sites leads us to some fascinating war stories to share: operating transmitters sitting in a pool of water; field intensity meters with corroded batteries; rusted and frozen directional antenna relays; trees growing up through rotting antenna tuning shacks; misplaced tower locations; stations operating with an expired license; a station "off" with an *unmodulated carrier on the air*; another station similarly "off," but actually on, its open mike feeding the transmitter with oscillating audio resulting in horrendous over-modulation distortion.

Finally, there was the bold-'n-brave Minnesota idiot who climbed a tower and thought a novel way to get back down would be to slide down a guy-wire bare-handed. They found his body the next morning – how pitiful – but there was one less idiot! I have more stories ...

From Bristol Bay, out on the Alaskan peninsula, from the East Coast to Southern Arizona, Jim Wychor's brainchild continues to grow. The program assists thousands of broadcasters in their regulatory compliance with professional good-faith efforts on the part of all concerned.

Ken Benner, a retired broadcast engineer, resides in Tucson, Arizona. He continues to perform Alternative FCC Inspection Certifications for hundreds of stations under several state broadcaster association sponsored programs. He can be reached at 520-579-6413.

Visit the Radio Guide website at: http://www.radio-guide.com

Living With AM-IBOC

by Thomas R. Ray, III, CSRE

A Primer on the AM-IBOC System

[NEW YORK CITY - April 2003] WOR turned on IBOC on October 11, 2002, the day after the FCC gave the go-ahead for IBOC operation. How did we arrive at this moment of becoming the first AM station in New York City to put an AM IBOC signal into the Number 1 market in the country? The tale is as follows.

The good people at iBiquity were looking for a good test station for AM IBOC. And WOR fit the bill. We have a monster signal. We have a complex antenna system with a common point that is less than perfect. We have an organization that had the guts to put IBOC on WOR and promote that fact publicly. And you have two engineers in the organization with a desire to play, and the oomph to tell it like it is. It has been a good pairing.

Our primary criteria with putting IBOC on WOR was that the IBOC signal would not cause problems with our signal. Kerry Richards, our Chief Engineer, had a few concerns regarding reducing the audio bandwidth of the analog "legacy" channel. Those were dispelled immediately when we tuned the Orban Optimod 9200 processor for a 5 kHz roll off, and we could not hear the difference on our car radios. When IBOC was turned on, we could not hear the IBOC sidebands on our radios, either.

Sure, there are a few people who have noticed our IBOC operation on the air. You can notice the reduced audio bandwidth if you are listening to WOR with a wide bandwidth radio. You can also hear the IBOC sidebands on a wide bandwidth radio. These radios are few and far between. The core of our listening audience has told us that they have heard no changes, and some have said that we sound better since going digital. Kerry and I figure that what they mean is that we sound louder.

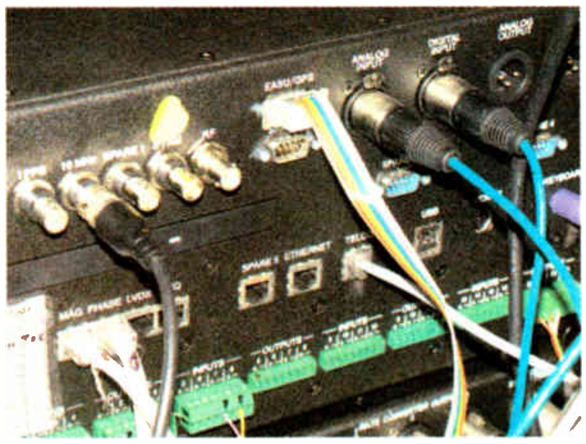
Remember, the majority of AM radios do not "hear" above 4-5 kHz. If you modulate the transmitter to 100%, the band from 5 kHz to 10 kHz is wasted modulation, audio that cannot be heard on an average radio. Limiting the bandwidth to 5 kHz, but still modulating the transmitter to 100%, should make the demodulated audio on a typical narrow band radio appear louder, since you are no longer transmitting "wasted modulation."

The IBOC Exciter

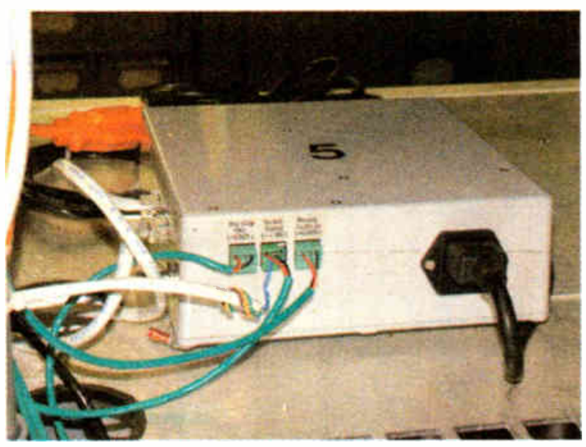
Our IBOC exciter is an iBiquity test exciter, a prototype, and it chose us, not the other way around. I will say that we are about to break ground on a completely new transmitter facility for WOR, and I have a Harris Dexstar IBOC exciter on order, along with 2-3DX50 transmitters. I will describe in general terms how the exciter connects to the transmitter, but the pictures you see will be of the test exciter.

WOR's iBiquity Exciter and Auxiliary Unit

The connections from the Dexstar are what you would expect to see on an exciter: BNC for the RF, and XLR for the audio. The test exciter connects over to the transmitter with shielded Cat-5 cable, and has an interface box that connects to the transmitter with BNC and terminal block.



The rear of the exciter takes in the AES audio signals from the analog and digital channel processors on XLR connectors. The two Cat-5 cables you see near the lower left are the RF and audio going to the transmitter.



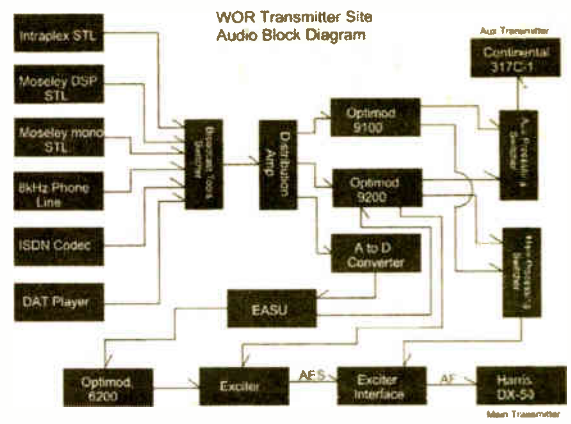
The iBiquity interface box lives on top of the DX-50 transmitter. It converts the RF signal from the Cat-5 cable to a BNC connection, and converts the audio signal to a Phoenix type terminal block. As an added feature, it controls a relay in the transmitter which will switch the transmitter to its internal oscillator should the IBOC exciter fail.

We have had very good luck with our Harris DX-50. The only time it has been off the air for the past 5 years was in February of this year, when a blocked drain on the roof of the transmitter building, coupled with high winds that blew water into the exhaust vent for the dummy load, caused water to drip into the transmitter and take out the voltage references on the DC regulator card. The DX is a good performing box, so we ordered 2 of the latest model for our new site. And since I trust Harris, and bought two of their transmitters, it seemed logical to order their IBOC exciter, as well.

And now to explode a myth. You do not need to have a completely digital path to your transmitter site from the studio! We kept our STLs intact, two of which are digital but with analog output, and used an analog-to-digital converter. The IBOC exciter requires an AES data stream for input, so an A/D was a must.

The audio path is a tad complex, but you need to remember that, once the audio comes out of the STL, you are feeding two paths: one for the analog channel, one for the digital channel.

The AES signal comes out of the A/D converter and goes into an auxiliary section of the exciter. This unit acts as a control unit for the exciter, as well as a distribution amplifier for the AES signal. The AES



This is the block diagram of the audio paths at the WOR transmitter facility. Note the two separate AES audio paths for the analog and digital channel processors.

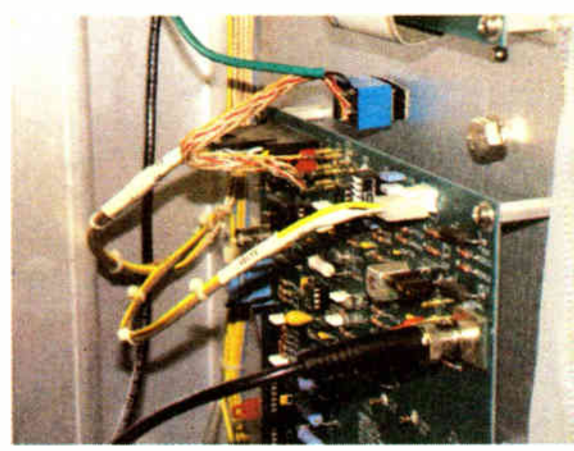
signal comes out of the AES DA and goes to your analog processor and your digital processor. For the analog channel, we use an Optimod 9200 with the AES I/O option. For the digital channel, we chose the Optimod 6200 DAB processor.

You may be able to get away with an FM processor with the pre-emphasis defeated, though you will want to give serious consideration to purchasing a DAB processor. The DAB processors are designed to work with the various DAB algorithms, and will simply sound better. From the processors, the AES signals go into the exciter.

Once in the exciter, the analog audio will be delayed by approximately 8.5 seconds. This is to match the 8.5 second delay on the digital channel, which is caused by error correction and the encoding time. On an HD equipped radio, the radio will blend back to the analog channel if the digital starts to fall apart, so it is fairly important that the digital and analog audio be time aligned.

Two signals are presented to your AM transmitter. The RF, or Phase, signal is a phase modulated signal with tertiary IBOC carriers from 0-5kHz, and rides under the analog channel audio. The audio, or magnitude, signal contains the 5kHz bandwidth limited audio from your analog processor, as well as the IBOC carriers from 5kHz to 15kHz.

The RF signal is input to the transmitter on its external RF input jack. The audio signal goes into the standard audio input on the transmitter. You will want to consider adding a relay to force the transmitter to operate on its internal oscillator should your IBOC exciter fail.



We installed this relay in the DX-50 to switch it from external to internal excitation if the IBOC exciter fails. You will notice the BNC connection on the card below the relay.

This is the external excitation input on the transmitter. Harris has available for the DX series a replacement oscillator board that incorporates the external/internal switching relay.

Next time, we will discuss what to expect from your transmitter when IBOC is turned on, as well as the performance your transmitter needs to exhibit to make IBOC work.

Tom Ray is the Corporate Director of Engineering for Buckley Broadcasting/WOR, New York City. You can reach him at tomray@wor710.com

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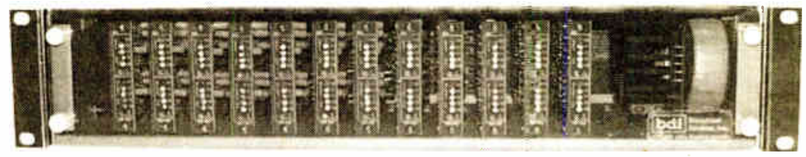

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Maintenance Log

What's a NOTAM?

by Jeff Johnson

[Dealing with the FAA when tower lights fail is normally not too difficult. On the other hand, does your staff currently know what to do and who to call when there is trouble with the tower lights? Ed.]

[CINCINNATI, Ohio - April 2003] "Hey, I think our tower lights are out, what should I do?" says your overnight jock when he calls you at 3:00 a.m. "Well, read the sign on the wall next to the remote control," you reply. "Oh ... OK, what's a NOTAM?" he asks. Good question; how many of your staff know how to properly "sponsor" a NOTAM (NOTice to AirMen)?

"Well, first of all, how do you know there is a problem?" you ask. He replies, "Well, the remote control says there is a tower light warning and the light at the top of the tower is not flashing." "OK," you say, "I'll take care of it, and will run you through the procedure next time I see you. Thanks for bringing it to my attention!"

Next, call the FAA FSS (Flight Service Station) serving your area. **800-992-7433** will automatically connect you to the appropriate FSS. When the attendant answers, ask for the "NOTAM desk."

"Hello, NOTAM desk," you hear. "Yes, I have a broadcast tower light outage to report," you reply. "What is the Antenna Structure Registration (ASR) number?" they will ask. (Have this and other tower data at hand when calling; it is also wise to post it at the station's control point with the licenses.) "The ASR number is ####### (your number)," you respond.

"What is the HAGL (Height Above Ground Level) and the HAMSL (Height Above Mean Sea Level) in feet?" you are asked. You respond with these numbers, and perhaps also with the latitude and longitude. Lat. and Long. are registered with the ASR and may not be requested.

The "sponsor" (you – the person making the report) will be asked for your name, title, and phone number. You will receive a NOTAM reference number. *Write this down accurately!* Before hanging up, ask the attendant "What are your initials?" You will be informed of them in phonetic form, for example "Charlie Victor" for "CV." It is imperative to enter in your station log all of the information exchanged. Be certain to include the NOTAM reference number, the exact date and time of the outage and the NOTAM origination call, the number called, the attendant's initials, your name, and the specific outage reported such as "Obstruction beacon outage on tower ASR #######."

The FSS will issue a NOTAM good for 15 days. You should repair the outage within this time limit, if possible, and cancel the NOTAM immediately upon completion of the repairs. On the days involved, place a detailed notation of the NOTAM origination and cancellation in the station log. 47 CFR, Part 17.49 specifies logging requirements, including the logging of marker light outages in the station log only.

You must renew the NOTAM if more than 15 days are required. Do not wait until the last minute. Failure to do either will result in an "auto cancellation." Broadcast towers are under joint regulation of the FAA and the FCC. The FAA will fax the appropriate FCC field office with the ASR of the tower in question. You do not want this to happen! Specifics of this process and the 15-day limit are at **http://www2.faa.gov/atpubs/NTM/not0502.html**.

Report *only* what is required. CFR TITLE 47 (Code of Federal Regulations, telecommunications), Part 17 (Construction, Marking, and Lighting of Antenna Structures), Subpart 48a (Notification of extinguishment or improper functioning of lights) requires "immediate report ... of extinguishment or improper functioning of any top steady burning, or any flashing obstruction light, regardless of its position on the antenna structure."

This even includes only *one* of two lamps in a beacon, even if the other is good. Subpart 48b states, "An extinguishment or improper functioning of a steady burning side intermediate light or lights shall be corrected *as soon as possible* (my italics), but notification ... is *NOT* required." Report even one beacon or top lamp out, *but do not report side markers*.

Lest you think this is a "whatever-whenever" thing, look at **http://www.fcc.gov/eb/broadcast/asml.html** for forfeitures (fines) for tower light carelessness. The FCC is enforcing tower light and EAS regulations strongly. Site magazine reports in their May 1, 2001, issue that of all FCC enforcement write-ups, 20% are related to antenna structure violations, half of which are for tower light infractions.

Do not forget – tenants on towers are responsible as second parties if the owner fails to comply with tower regulations. Lighting outages on towers not owned or operated by an observer should be reported by that observer to the FCC not the FAA. The address is to be found at **http://www1.faa.gov/arp/aso/airportopics/Airportopics0211.htm** and is: FCC, Enforcement Bureau, Technical & Public Safety Division, 445 12th Street, SW, Washington, DC 20554.

Now for the fun part! We get to fix the problem! Many in radio have never seen the transmitter, let alone seen the view from the top of the tower or a beacon 'up close and personal.' We are going to the top!

Bulb Replacement

Before the climb, be certain the problem is not an open circuit breaker or a controller failure at ground level. If your remote control indicates a lamp failure, but you seem to see everything flashing, you may be deceived by the lenses of the beacon fixture. They are commonly of the Fresnel variety meant to beam the light horizontally like a lighthouse, so you will not see both bulbs of an incandescent fixture differentiated clearly when viewed from near the base of the tower.

Go out a half-mile or so and look at the beacon with binoculars. You will then be able to judge if one of the two lamps is out. If the beacons are of the strobe or LED types, detailed knowledge of the particular units involved will be necessary. If the beacons are good old incandescents, the project is nothing more than a light bulb change – hundreds of feet in the sky!

Beacon lamps are 620 or 700 watt, 120 volt with a special bayonet base (push and twist). Marker lamps are 116 watt or 125 watt, 120 volt, medium screw base. The marker lamps are the same as used in incandescent highway stoplights. They are specially made for the purpose. Acquire the proper lamps from a reliable supplier. Be certain of correct voltages and wattages before climbing.

Jeff Johnson, ready to ascend.

Getting the lamps to the top without breakage can be a challenge. I've heard of one climber who uses a certain female undergarment to stow them on his personage. I place them in a doubled trash bag, in their cardboard sleeves, and hang the bag on a rear hook of my climbing harness. Safety issues will not be discussed here, other than to mention tower climbing should not be done by anyone except those trained, properly equipped, insured, and granted permission to climb. Acrophobia reenforces these cautions nicely.

Additionally, turn off your transmitter. If you are climbing alone, disconnect the remote control so no one can fire up the transmitter, not knowing you are on the tower!

Be certain to take two each of any tool or supply item you may need to make electrical repairs or minor tower repairs. I have a set in each of two belt pouches. Should I drop a tool, there is a second. Be certain no one stands near the base of a tower while you are climbing or working.

Of greatest interest are the beacon fixtures; they are commonly 30" tall, 16" in diameter, and are hinged in the middle. From the perspective of the climber, they are a pretty sight. They are rather like captured prey after a lengthy and difficult stalking!

The beacon fixture hinges opens in the middle, with a lamp bulb in each half. The top lamp hangs base up. The halves are held shut by a single wing nut that is loosened and slid out of a notch. It is captive so it will not fall to the ground. When you have the fixture open, inspect the rubber seal between the halves.

You can imagine the wind and rain encountered, so water tightness is imperative. You may find one or both bulbs broken by being splashed while hot, and the over-under mounting may cause the bottom bulb to be shattered by the breakage of the upper one. Be careful at this point not to cut your fingers! Think of the climb down!

Press and turn the lamp counter-clockwise to release it from its socket. Inspect the socket for burned contacts and connections. Check for frayed wires. Again, the outage may not be due to bulb burn-out. Place the old lamp in your lamp bag. Do not throw it down. I may be the one who steps on it later. If the lamp had shattered, watch out for live filament mounts.

An open beacon fixture. Note the bulbs are lit.

When climbing alone, I place a black bag over the photocell to activate the lighting system. You do not need to short the circuit, as you want to be assured of proper operation while you are still on the tower.

After cleaning out any broken glass and correcting wiring problems, press and twist the new lamps in place. Your reward is 1200 watts of glory winking at you! If it is a cold day, you can warm your hands before the climb down! Carefully close the two halves of the beacon fixture, snug it tight, and enjoy the view for a while!

I always go to the top first and work down. And be sure to replace *all of the lamps* while you are up there. Marker lamps are much smaller, about 8" tall and 5" in diameter. They are commonly held closed with a captive spring clip, and the lens is captive on a short cable. Look carefully before letting go of it. The bulb screws in just like a table lamp bulb. They often come loose from their base shells, so unscrew carefully.

While you are climbing, inspect each guy for tight connection, absence of fraying, and tight preforms (the "Chinese finger trap" like attachments on the ends of the guy cables).

Look for loose bolts and corrosion. Be certain transmission lines are affixed properly. You did bring UV resistant tie-wraps, did you not? Loose electrical conduit can cause problems, as the sections not bonded tightly to the tower can be a cause RF arcing and spurious radiation. Note the condition of the tower's paint and estimate how soon you might need a paint job. In this way, a relamping doubles as a tower inspection.

When you have finished, report and log the NOTEM cancellation immediately. Turn your transmitter back on, reconnect your remote control, unbag the photocell. Oh ... remember to wake up your jock!

Jeff Johnson is Network Engineer at WVXU and the X-Star Radio Network in Cincinnati. You can contact Jeff at jjohnson@goodnews.net

Technical Support Forum

How to Get the Best Results From Technical Support

Part 2 – by Paul Black

[PLEASANT HILL, California - April 2003] In Part One of this article we laid out some general points to consider when you have to call for Technical Support (or TS, as we have been abbreviating it). So, now let us continue the discussion from where we left off. Here are three more important things to remember when you call for Tech Support:

4. PATIENCE

Patience is not only a virtue; sometimes it is a necessity. It is true that some companies have periods of time when their TS people are not available, such as during the local lunch hour, or at night and on weekends. Since broadcasting is a business of immediacy, this can be frustrating.

What is the best way to get a callback when the place is closed and you have to leave a "general voice mail?" Again, be calm, state your problem, and explain you would like to be called as soon as possible when the company opens. Those companies without 24-hour customer service do check the general voice-mails first thing in the morning and send them off to the correct people.

Personally, I do not agree with having TS service unavailable during off-hours or days. It is silly for a company to have an ironclad rule where all employees will eat lunch between Noon and One p.m. local time. It is equally silly if there is no "employee-rotation" rule for nights and weekends. As to those companies like that … well, here is where you need to make your voice heard. Let them know you do not like it!

This leads me to a point which might sound unnecessary to say, but is applicable to staying on the air during emergencies.

5. BACK UP CRITICAL EQUIPMENT.

Pretty obvious, is it not? But we all know some owners just will not do it. They will not spend the money for backup gear, or to pay you to install it correctly – or both.

One of the best ways to view your plant is to use the concept of "revenue stream" equipment. What gear is in the "revenue stream?" It is anything necessary to keep you on the air and playing commercials; that is where the money is (unless you are a non-com, of course!).

Apply the "revenue stream" rule to your plant. Anything in the "revenue stream" should be backed up. Management should realize if they are not willing to do this, they must expect there will be times when they will be off the air due to lightning, floods, fire, plagues of locusts, etc. These things happen. They are beyond anyone's control. Urge your management to make the investment in backup systems. Finally, last but not least:

6. REMEMBER JUST WHO THE OTHER PERSON IS

You probably are talking to Private Sad Sack, not General George Patton. The TS people for most companies usually do not have much authority. If you are mad as the Devil at some piece of gear, or if you cannot understand why they will not send you a new one of whatever it is that is broken, do not "vent" on the TS person. It is very likely they are required to get permission from someone higher up to do anything.

If there is some design flaw you think should be corrected, do tell the TS person about it. At some companies, many product managers and designers pay little attention to suggestions from the TS people. (Sad, but true.) But the TS person will be glad to pass your comments, written or verbal, on to their superiors.

Executives, like designers, do not always believe their TS people, but they will listen to customers very carefully. Why? Because there is where the money is! Any company not listening to its customers is not going to be around very long. Good management knows this.

A brief word about e-mail: Most international technical help now is accomplished this way as the time zone difference usually demands it. Of course, this may create a slight language barrier, but that can usually be overcome. The real challenge is making sure all the symptoms are understood clearly.

Many times it is necessary for the TS person to e-mail back to the customer to gather all the needed information. If there is no hurry (not an emergency failure, for example) then this is a great way to get help. But if you are in deep stuff, and need help now, a phone call still is the best way. Check manufacturers' web sites for their e-mail assistance address. Most will have one.

Very likely, the technical support person to whom you are speaking was a working engineer at a radio or TV station sometime in the past. It is very possible they have been on top of a mountain at a transmitter building at Midnight with a sick something-or-other that has the station in trouble. I do not know if past experience as a working broadcast engineer makes a TS person any more qualified to help you with your problem than someone who has not been one. However, I can tell you it probably will make them have a lot more sympathy for you than someone who has not. If you want to benefit from such sympathy, and get the best help you can, remember the points we have discussed in this article. Working together, you and Technical Support will cure the problem and get your station out of trouble and back on line.

Paul Black is a long time broadcast engineer and technical support person. He operates Media Technical Consulting in Pleasant Hill, CA, and can be contacted at paul@mediatechcon.com

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Full Duplex

The Plan

by George Nicholas

[CEDAR RAPIDS, Iowa - April 2003] The manager just stopped by your office with some exciting news: "We're moving the stations. Finally getting the space we need! I look forward to hearing your plan at the next department head meeting." Then he turns and leaves. You sit behind your desk, stunned. When you think about it, he is right – we do need more room. But you never thought it would happen, and now all eyes are going to be on you. You start to break out in a cold sweat. All kinds of thoughts race through your mind. Am I dreaming? Is this a nightmare?

The good news is there is an answer. It is called a project plan; when successfully developed, you will have accomplished something most people cannot do: predict the future.

There is an old adage, "Failing to plan is planning to fail." Talk about predicting the future!

Planning occurs all around us every day. A safe pilot files a flight plan to communicate his travel itinerary. The mailman has a pre-planned route to distribute mail quickly. And the quarterback's planning session is called a huddle.

In our scenario above, I believe the manager actually did the engineer several favors in his short meeting. First, he did not mention any restrictions. To say there will not be any restrictions is unrealistic. Eventually, there will be a budget and a time line. Unfortunately, most likely both will be out of your total control. But they will require your input.

Second, he gave the engineer the benefit of the doubt by asking for a plan. Doing so is a sign of trust and responsibility. Third, he indicated this would be a shared experience in the next meeting. Remember, there is no "I" in the word "plan." It is a collaborative effort and participation by others is mandatory. And last, he did not make the idea a negative experience. A good manager will communicate in a positive manner with his staff, participate in the plan, then step back and watch it happen.

> It has been said, for every one minute you spend planning, you save 12 on the execution.

There are several key elements to a good plan.

RESEARCH: Realizing that sometimes a plan must be developed quickly, research may a bit thin. Yet, even a little research is a lot better than none at all, and the more resources you can devote to research, the more successful the plan will be. During the research part of the project, the goal(s) of the plan should be made in clear and concise terms. A total budget amount and target date are both key elements to a successful plan.

PRE-PLAN: This is where all of the research, ideas and requirements are presented. This is a meeting where open minds and cooler heads prevail! Hint: If possible, try to work with total amounts first, then narrow the project scope. For example, in a studio project, you may want a specific type of console that is more expensive than typical. So, first determine the total cost for the studio, and then try to work "backwards" toward the specific console.

Be prepared to justify your choices at the expense of another portion of the project. And be prepared to lose all or part of it, depending on the budget. Since the pre-plan should include all aspects of the project, a good overall picture of the entire project scope will allow you to pick and choose your "battles" carefully. There is a secondary benefit to going into a project a little on the "high" side – you have a little wiggle room to cut something later, if necessary.

Avoid what I call "the 2X trap." This occurs when specifying something costing roughly double what you need; for example, specifying a production room worth $50,000 when $25,000 will perform the same function. The "2X" function is indelible in a GM's mind.

The pre-plan should also include a rough timeline, in project phases. It is not a bad idea to target some areas to cut if the project goes over-budget. And a contingency budget is a must. On the engineering side of things, you might not have each wire numbered in your wiring plan (another hint!) but you will certainly have a block diagram and estimation of wire type and amount.

The PLAN: This is actually the summary of the pre-plan. All managers should sign off on the Plan. This is a great time to communicate the Plan with your staff. If it is a remodeling job, identify some of the vendors involved. Post a copy of the Plan in the lobby or in the break room, along with drawings, colors, fabrics, etc. In the Engineering plan, account for each wire in the building. Hint: Use an Excel© spreadsheet that includes wire number, description, location/destination, termination type and check boxes.

EXECUTION: The place is a mad house, vendors are running back and forth, there is lots of dust, and in general this is the worst part of the project. But you have predicted all of this, so it comes as no surprise. This part of the project is typically where problems develop with the budget and time line. Many facets are out of your control, but with a contingency plan in place we minimize the risk. Communication during this time is critical.

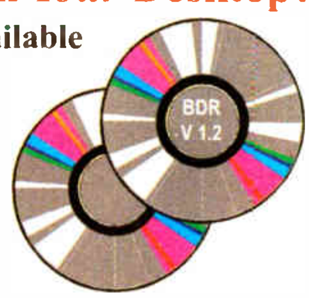
REVIEW: This is also the quality control part of the project. As we near the end of the project, communication should be more in terms of "clean up" issues.

By the way, the Plan is not just for projects. In our next segment, we will discuss time management plans.

George Nicholas has been in the broadcasting business since 1975, most recently as a Regional Engineering Manager with Clear Channel. He now operates George Nicholas Communications, specializing in technical and communication consulting throughout the US. You can contact him via Editor@radio-guide.com

Do You Have the BDR on *Your* Desktop?

Version 1.2 of the BDR Now Available



At last year's NAB, Version 1.0 of the Oldradio.com CD was released. **Broadcaster's Desktop Reference** (BDR) is now is available to everyone. 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-2002, 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, and some nice historical files.

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.

We are suggesting something in the range of $15-$20 (or more, if you really want to support the Oldradio Project).

We'll send you a copy of the CD (via postal service), and personally notify you when Version 2 is made available (The plan is to provide a free to registered users, or at most a minimal cost for shipping.)

Please send your check or money order to:

**Barry Mishkind, 2033 S. Augusta Place
Tucson, Arizona 85710.**

Please include your snailmail and email address.

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

Networking 101

by *Tren P. Barnett*

Part 3: Domain Name System (DNS)

[TUCSON, Arizona - April 2003] If you have been following our series of articles, we just completed setting up a server with Microsoft Windows 2000, and promoting it to be the domain controller in a new domain named radioguide.com. As noted in the previous article, to complete the process of setting up our server we need to install a Domain Name System (DNS). We also will need to set up what is called Dynamic Host Configuration Protocol (DHCP) so our workstations will be able to function completely on our server, without having to manually enter addresses for each one.

What Does DNS Do?

To start out, let us briefly cover what the purpose of a DNS server is in a TCP/IP network. Every network card in a computer has a unique identity something like 0095828b3f5. This is how the card itself is identified. This identifier or Media Access Control (MAC) address is guaranteed to be unique and never to be repeated. When the workstation starts the networking services, this unique address announces itself and requests a DHCP server to respond.

The address we are using or may have received from the DHCP server is in the format of 000.000.000.000. These sets of zeros represent 1 of 4 sets of 8 bit numbers, which when combined create a TCP/IP network address such as 192.168.0.25 *(we will use this address for our example)*. This network address uniquely identifies our workstation in our domain.

In an attempt to make life easier, we must complicate the situation; we will now give our computer a name: It will be named cpu1.radioguide.com. The name may seem overly complicated, but if we are referring to this computer on our local domain, we only need to remember the workstation's name cpu1, the rest of the name (or domain) will be appended by default.

Forward Lookups

DNS is a service running on our server which looks up the name cpu1.radioguide.com and converts it to 192.168.0.25. The DNS service keeps these computer names stored in a database and converts these names to an address in the local domain.

What if the workstation is used by Barry our editor? We want Barry to be able to share information on his computer with the rest of the editing team. But how can we simplify this? How do we remember he is cpu1.radioguide.com? DNS allows us to create an alias for cpu1.radioguide.com and name it Barry. That way our user can simply type \\Barry\Files and get to a shared location on the workstation cpu1.radioguide.com called Files.

When we type \\Barry\Files, we are making a request of the DNS server to resolve this into \\cpu1.radioguide.com\files, which is resolved into \\192.168.0.25\files.

Typing \\192.168.0.25\Files would get us to the same location, but \\Barry\Files is easier to remember in theory. What we just described is called a forward lookup.

Reverse Lookups

When setting up zones in DNS, such as our foreword lookup zone which we just described, we can also set up a reverse lookup zone. Reverse lookup zones are not required to function, but are useful. A reverse lookup zone allows us to do the opposite of what we just described; we can take an address and convert it to a DNS name. This is more useful on the administrative side then the user's side.

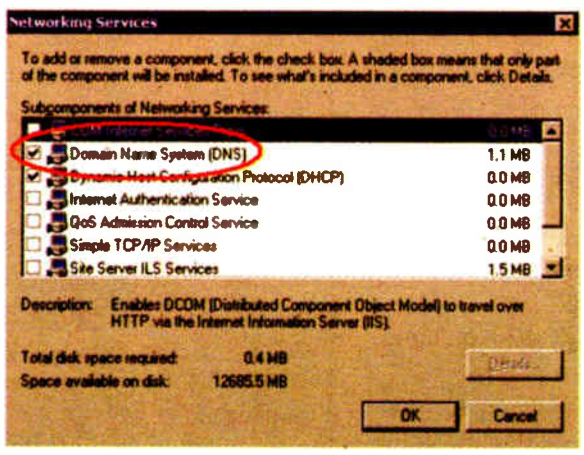
Imagine you are getting strange network requests that are tying up your network. Someone's workstation is going mad, and we must find out whose. It is most likely any logs we read will reflect the network address, but not the name. In a network using DHCP, the computer causing the problem leases an address, but is subject to change, so how can we identify the workstation?

If we have access to the DHCP database, we could look it up. With reverse lookups defined in our DNS database though, we can simply go to a command window and type nslookup 192.168.0.25 and press the enter key. Our answer is there: it is cpu.radioguide.com. Well, let us set up our DNS now.

Adding DNS

To install DNS, there are several ways to do so, we will go to the **Start** button, and select **Settings** then **Control Panel**. Next select choose **Add/ Remove Programs**.

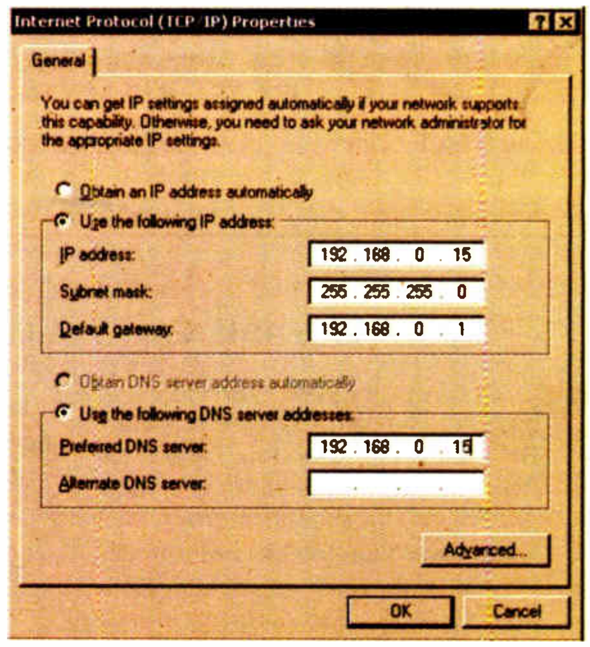
By default **Change or Remove Programs** is selected. We want to select **Add/Remove Windows Components**. This will open the **Windows Component Wizard**, scroll down through the list until we get to **Networking Services**, then select the **Details** button. The **Network Services** window will open, make sure **Domain Name System (DNS)** is checked. Right below it in the list is **Dynamic Host Control Protocol**, make sure it is checked too. Continue by selecting **OK**, which will return us to the previous window, continue from there through by selecting **Next**. DNS and DHCP will be installed on the local server.



Once the services have been installed, we must configure them. First we will configure DNS, and in the next article, we will set up DHCP. To set up DNS, we must go to **Start, Programs, Administrative Tools, DNS**. This opens the DNS configuration manager entitled DNS. To create a foreword lookup zone, click on the name of the DNS server in the left windowpane. In our illustration it is named Server1-DC.

Select the menu choice to create a new zone. We want to create an Active Directory Integrated domain. DNS plays a large role in Windows 2000 server active directory and its security ... select next. We will choose a forward lookup zone ... select next, and name it, in our case, radioguide.com.

Before we can go too far, we need to know the address of our server. Since it is a DNS server, it is recommended it be a static network address, and since we are going to set up DHCP, it must use a static address. To setup an address, right click on **My Network**, select **Properties**, this will open the **Network and Dialup Settings** window. Choose the network adapter, right click on the adapter, and choose **Properties**. When the properties window opens, select the TCP/IP protocol and choose the **Properties** button. This will open a dialog window allowing you select the appropriate address for your server.



For now we are going to set and address of 192.168.0.15 for our server, a subnet mask of 255.255.255.0 and the gateway should be the address of our router, which in our case is 192.168.0.1. Since this is a domain controller, and since this is the only DNS server, we must choose ourselves for the DNS server. There we will enter our own address:192.168.0.15.

For a domain controller to work correctly, DNS must be configured correctly. In this case it must refer to itself, but no records for our server exist, or if they do they are incorrect. The quickest way to add these records is to let the server do it itself. We can restart the server, or stop and restart the NetLogon service.

Once we have restarted the server or the service, it will create the needed records for itself in the DNS database of the forward lookup zone. It will also add 4 subfolders under the zone that will be used by active directory. A reverse lookup zone is created the same way, except instead of asking for the domain name, it will want the first sections of the TCP/IP address.

Tren Barnett is a System Administrator and Programmer in Tucson, Arizona. He welcomes your questions on solving network problems in your facility. Contact Tren at tpb@aires.org

Answers to the EAS   *by Clay Freinwald with Barry Mishkind*

EAS Q&A

[This month Barry and Clay return to the discussion of LP stations and the way EAS alerts are routed to the other area stations. While LP stations are important, we will see how the different Relay Networks can help get information distributed across the EAS even better. Ed]

[SEATTLE, Washington - April 2003]

Barry - Clay, in many areas, consolidation has brought both the LP-1 and LP-2 stations under one roof. This is not particularly good for EAS is it?

Clay - You are correct. When an area's LP facilities are broadcast stations and those stations are under one roof, the FCC's intent is compromised. First, consider why the FCC chose to have LP's the first place. Under EBS, each 'Operational Area' had a CPCS-1 with one or more back-up facilities. These Common Program Control Stations were the distribution point for all other electronic media within that operational area.

In contrast, the Commission's guideline for the creation of EAS was *"operating redundancy."* This meant each operational area was to have *two* fully functional and parallel distribution facilities from which other area facilities could receive EAS messages. Such redundancy ought to mean a duplicate of *everything*. A good EAS planner would try and avoid a situation where all the eggs are in one basket.

Barry - Especially when the "basket's" power fails, and both LP stations die at the same time!

Clay - Yes. However, there are many other issues to contend with beyond power failures, including structural failures, human failures, or evacuation situations. You might compare EAS redundancy to your station; you can have a back up transmitter and a back up generator, for example. But there are still many common devices, each of which can constitute what is called a 'single point of failure,' such as a tower, or the building roof. If we are to have a robust EAS system, anything common between the LP-1 and the LP-2 should be avoided.

Barry - But what if no other local facility will take on the LP1 or LP2 responsibility?

Clay - The major difference between LP stations and all the other broadcasters in an area is who they monitor. The LP's primary responsibility is to act as a source of EANs (national level EAS messages) for the local area, so the other electronic media outlets receive these required messages. In most cases where a station does not wish to be an LP, it usually turns out the State (SECC) or Local (LECC) Coordinating Committee has placed too many responsibilities on that facility. LP's should *not* be relay devices for State or Local governments, or the National Weather Service (NWS). This is a role for Relay Networks.

Barry - In an earlier conversation, you mentioned the use of local and state relay networks, as used in Washington State, to strengthen the EAS networks. Can you tell us how this works?

Clay - Let us start with the State Relay Network (SRN), a term I borrowed from the FCC. A typical network will have one or more input locations, perhaps including the state Emergency Operations Center (EOC), and will use various government owned communications systems to distribute EAS messages from the EOC throughout the state.

You mentioned Washington State. We have a 24/7 EOC with a fully functional EAS message generation capability. Messages generated there are distributed via a state-owned microwave system to a network of VHF transmitters located on mountaintops, providing over 90% coverage of the state. Using this system, the state can issue a statewide EAS message, or by utilizing only certain transmitters or FIPS/Area Codes direct the message to certain areas of the state.

The system has a couple of other roles – it functions as 1) a state-wide distribution system for National Level EAS Messages (EANs), 2) back up for any local area should the need occur, and 3) works with our Amber program to enlarge the reach of the Child Abduction Emergency (CAE) should the need arise.

Barry - Is the Washington method the only way to accomplish a SRN?

Clay - Certainly not. Many different approaches can be used to accomplish the goal. Ours started out many years ago with a conversation I had with a fellow from State Emergency Management. I asked him if the State Patrol had the means to talk to a patrol car anywhere in the state. The answer was yes, they did; so we built upon this capability. Today, many state governments have similar communications assets used by their various divisions. The job is to convince the state that having a public warning system is a good idea, and go from there. Recently, private industry has introduced solutions to this problem. One system marketed by ComLabs has been adopted by several states as their answer to their need for an SRN.

Barry - Are you saying State Relay Networks are the responsibility of the states?

Clay - Yes, I believe they are. Back in the old days of EBS, the FCC felt broadcasters should provide this function. (This was back prior to FM being able to stand on its own.) The FCC thought FM stations could be linked and thereby provide the means of distributing State Level messages to be broadcast in local areas by AM stations. Things have really changed since then, but unfortunately many still utilize ' EBS thinking' and assume EAS is still the responsibility of broadcasters.

Barry - What about local areas and Local Relay Networks?

Clay - The Local Relay Network (LRN) is very similar to the SRN except the size is much smaller. The role of the LRN is to distribute EAS messages from one or more local governmental entities within a Local EAS Area (formally called Operational Area) to the electronic media. Just as with the SRN, the distribution facility should be a government owned communication system that is simply time shared with EAS for the purpose of distributing EAS messages.

Barry - In some markets, is it not common to use Remote Pick Up (RPU) channels for this purpose?

Clay - In some cases that is true. However I feel it is the primary responsibility of local governments to come up with these facilities.

Barry - What kind of government systems work best?

Clay - In many cases, local governments already have communications assets, usually 2-way radio systems dedicated to emergency services. These are a natural for use as LRN. In other cases, I go looking for a public works radio system – you know, the kind used to dispatch dump-trucks or snowplows. These systems are a natural for timesharing with EAS. One warning: Do not even think about asking to use a Public Safety system (that is, Fire or Police).

Barry - So, if one of these systems (LRN or SRN) is put into place, governments then distribute EAS message content to the LP Stations who in turn send out the alerts?

Clay - *No Way!* I feel very strongly that broadcasters should never assume the role of initiating EAS messages, and for a number of good reasons. Show me a broadcaster who is hired on his or her ability to generate accurate EAS messages. In fact, we are in the entertainment business.

There are serious liability issues here. Can you imagine what kind of exposure is created if some minimum wage weekender gets something wrong? And what about the LP station that decides it is going to go un-attended tomorrow? That station has no obligation to any EAS committee. The bottom line is this: Any EAS plan which obligates broadcast stations to perform beyond what is stated in Part 11 is on a poor foundation.

Barry - All right, then. What are you suggesting is the best solution?

Clay - Just as with the National Weather Service and NOAA Weather Radio, *all* government entities should create the EAS message and distribute it, electronically, to the electronic media. Broadcasters, whether they are operating attended or otherwise, should be thought of as 'conduits' to the general public, and nothing more. Using this method, EAS messages coming from *any branch of government* are processed and handled by the media in the same way. Besides, this makes automatic unattended operation easier. Come to think of it, was not EAS created due to the pressure to have a warning system compatible with unattended operation?

Barry - Doesn't this take EAS control away from broadcasters?

Clay - Broadcasters should not be in control of EAS message creation in the first place! Just as you would not want the folks at the local emergency services office creating weather forecasts, you certainly do not want weekend DJs creating Civil Emergency Messages (CEM). The creation of EAS messages, whether they be TORs (tornado warnings), CEMs, or CAEs, should be totally left up to those trained to do so, having all the facts. In a properly configured EAS system, electronic systems automatically distribute these government created EAS messages to *all* the media at the same time. Broadcasters are links to the public and should never be reduced to being a message relay device for the benefit of other broadcasters.

Barry - Clay, we will continue with this discussion of LRNs and SRNs next time. However, I think we have some questions from our readers, do we not?

Clay - Yes, we sure do. Frank Pingree is awaiting a CP for an LPFM in Northern New Hampshire. Frank explains that he can only receive one FM station and no AM stations, and wonders what to do about monitoring.

Whom you monitor is the responsibility of your State (SECC) or Local (LECC) Coordinating Committee. You should contact them. If you do not know who they are, contact your state broadcasters association. As you can see from our discussions, system redundancy is the key. I urge you to get involved with your EAS Committees. From the sounds of things, you may be the first to provide EAS messages to your area and as such can provide a valuable service to your community. Go for it!

Barry - An engineer in the Chicago area who operates a consulting business recently noticed a set of guidelines produced by a school system in his area for students and parents. In this document, a section dealing with Tornado Warnings listed a number of radio stations whose call letters have long since changed. The "topper" was instructions to tune to Conelrad on 640 or 1240. What should be done when we encounter something like this?

Clay - Remember, *many folks employed in Broadcasting* do not understand EAS and how it works. We can hardly expect others to grasp it, especially when many emergency management offices are just as confused as your weekend DJ. We all have an obligation to help folks like these. Contact the schools in your area and make sure they understand EAS and how to inform and instruct students and parents. As to listing stations they should listen to: this is a carry over from Conelrad and EBS where specific stations had specific roles.

The goal of EAS is to have emergency information on all stations. With this goal, perhaps information could come from your LECC, who more fully understands which stations in are likely to broadcast information for your community. This situation underscores the more general problem, the need for more and better EAS education. We all need to keep working on it.

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. Please feel free to address your questions about EAS to Clay at k7cr@wolfenet.com

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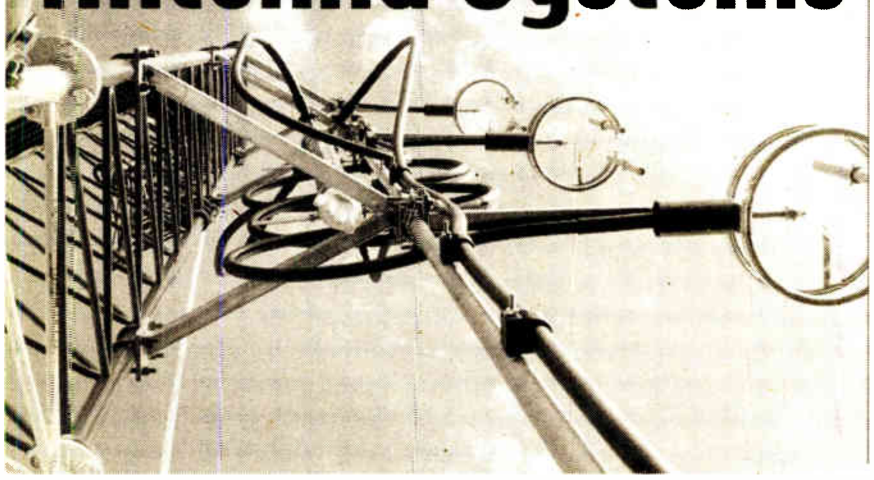

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Tips From the Field

Field Intensity Meter Repair

by Mark Persons, WØMH

[BRAINERD, Minnesota - April 2003] If you have a Nems-Clarke 120 or RCA WX-2 AM Field Intensity Meter, it may have a missing or broken cover spring. The meter uses two such springs to hold the front cover/antenna over the face of the meter or upright on top of the meter when it is in use. These spring assemblies are very nicely machined items with internal springs, however, they are no longer available because the meters have not been manufactured for many years.

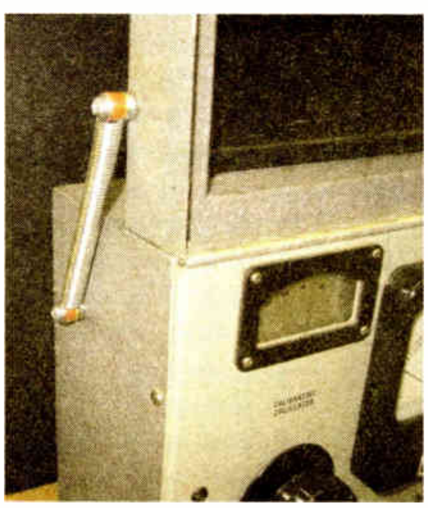
The meters are not reliable when one spring is missing. The springs are needed to provide necessary tension to keep the front cover/antenna in proper position when someone is trying to make a field intensity measurement. The cover has three electrical contacts which must make before the meter will work. Two of the contacts are for the antenna and the third one turns on the battery power when the cover is opened. Those contacts need to be cleaned on occasion to maintain performance.

In my case, the missing spring created a dilemma needing a solution. After some thought, a trip to a good local hardware store and $1.25 in change resulted in the purchase of a 3/8-inch OD expansion spring such as normally used to close a screen door on a home.

Back at the shop, I bent the last two turns, of the spring, over at a 90 degree angle. Then I cut the spring to length, and bent over the last two turns at the other end. After some experimentation and some more bending, I came up with a spring providing tension when the meter cover is open or closed, and yet does not have too much tension to keep the cover from moving between the two extremes.

To keep the spring in place over the threaded spacers in the meter and cover, I hacksawed two 3/8" OD copper tubing lengths to about 1/4 inch length each. Then, a flat washer, lock washer, and 6-32 x 3/8 machine screw, were installed on each spacer. Careful trimming of the copper tubing, on a bench grinder, resulted in the tubing providing just the right pressure to keep the spring straight so it would not rub on the meter cabinet when the cover is opened and closed.

Original Spring Assembly



Replacement Spring

As with anything, and especially when working with calibrated equipment, I make "before and after measurements" to make sure any change does not disrupt the calibration.

It is a gratifying experience for me to do this kind of repair and look at it with pride for a job well done at little cost. If both sides of the meter had one of these new springs, possibly you would not know it was not made that way at the factory.

The original leather handles, on these meters, are failing too. You can have a local shoemaker fabricate a new handle at little cost. Batteries are not a serious problem either. Any supply house that caters to antique restorers will have, or can get, the 67.5 volt Model 467 batteries. In the Midwest, I get batteries at a place called Batteries Plus. Their only business is supplying batteries for everything from hearing aids to trucks.

Before you do any serious measuring with one of these meters, I recommend you go to an area free of power lines and compare a field intensity reading with one taken in the same spot with a recently calibrated Potomac Instruments FIM-21 or FIM-41. Remember not to run both meters simultaneously as the calibrating oscillator in one meter can look like a signal to the other meter.

Mark Persons WØMH is Certified by the Society of Broadcast Engineers as a Professional Broadcast Engineer with over 30 years experience. He has written numerous articles for many publications over the years. His website is: http://www.mwpersons.com

Radio Guide Book Shelf

Wartime Broadcasting

As this is written, we are listening to and watching the coverage of a war as has never been seen before. As the various news organizations vie for the best pictures and most dramatic shots, some feel the war in Iraq has become a "reality TV" show.

The way wars have been covered certainly has changed over the years. Clearly, satellite transmission has been a major change. But the methods of covering wars, and the ways the media have approached them, have roots that go back decades.

Howard Blue, a High School Social Studies teacher on Long Island, NY for 32 years, combined his interests in world history and the Golden Age of Radio into a look at broadcasting during the Second World War. Words at War (2002, Scarecrow Press), grew from an anthology of the propaganda that was aired during WWII by four countries in Europe. Widening it out to include U.S. broadcasting of news and radio dramas during the time, allowed for an additional discussion how radio drama was used as propaganda on both sides of the Atlantic.

Enthusiasts of vintage radio broadcasts will remember how, long before the U.S. entered the war, radio drama was warning people about the Nazi threats to the world. Yet, after the war, as the same writers and actors continued producing similar politically oriented programming, many ended up as part of an industry Blacklist.

Among the interviewees in the book are Norman Corwin, Arthur Miller, Pete Seeger, Art Carney. The picture that is developed includes issues of censorship, scapegoating and the government's role in how much of what got on the air was produced.

For those who do not remember, or who do not know what radio did during World War II, this is an interesting look back at an industry and people thrown into the difficulties of doing their job during the crisis of wartime.

Further information on Words at War, can be **http://www.howardblue.com/**

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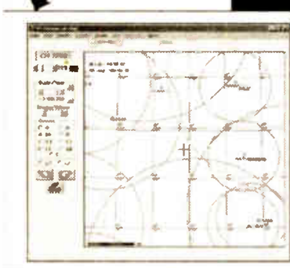

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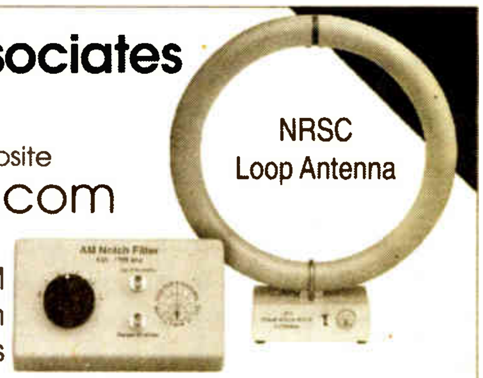

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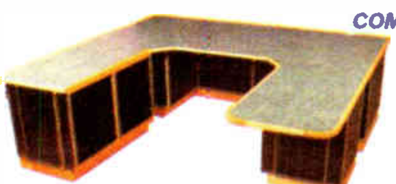

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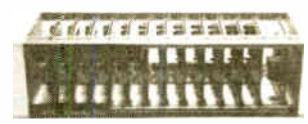

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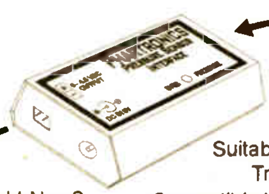

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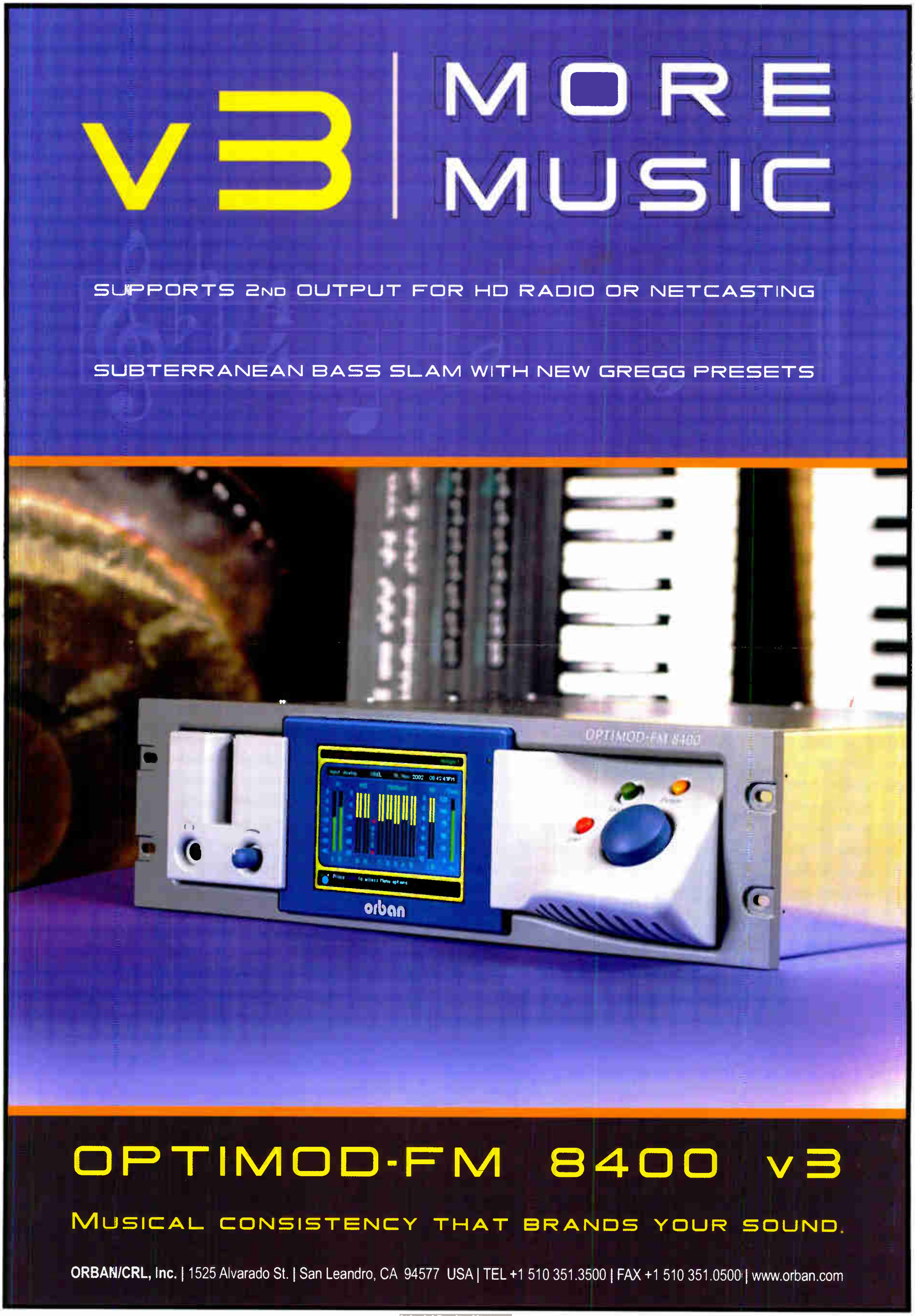
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