Radio Guide

Radio Technology for Engineers and Managers

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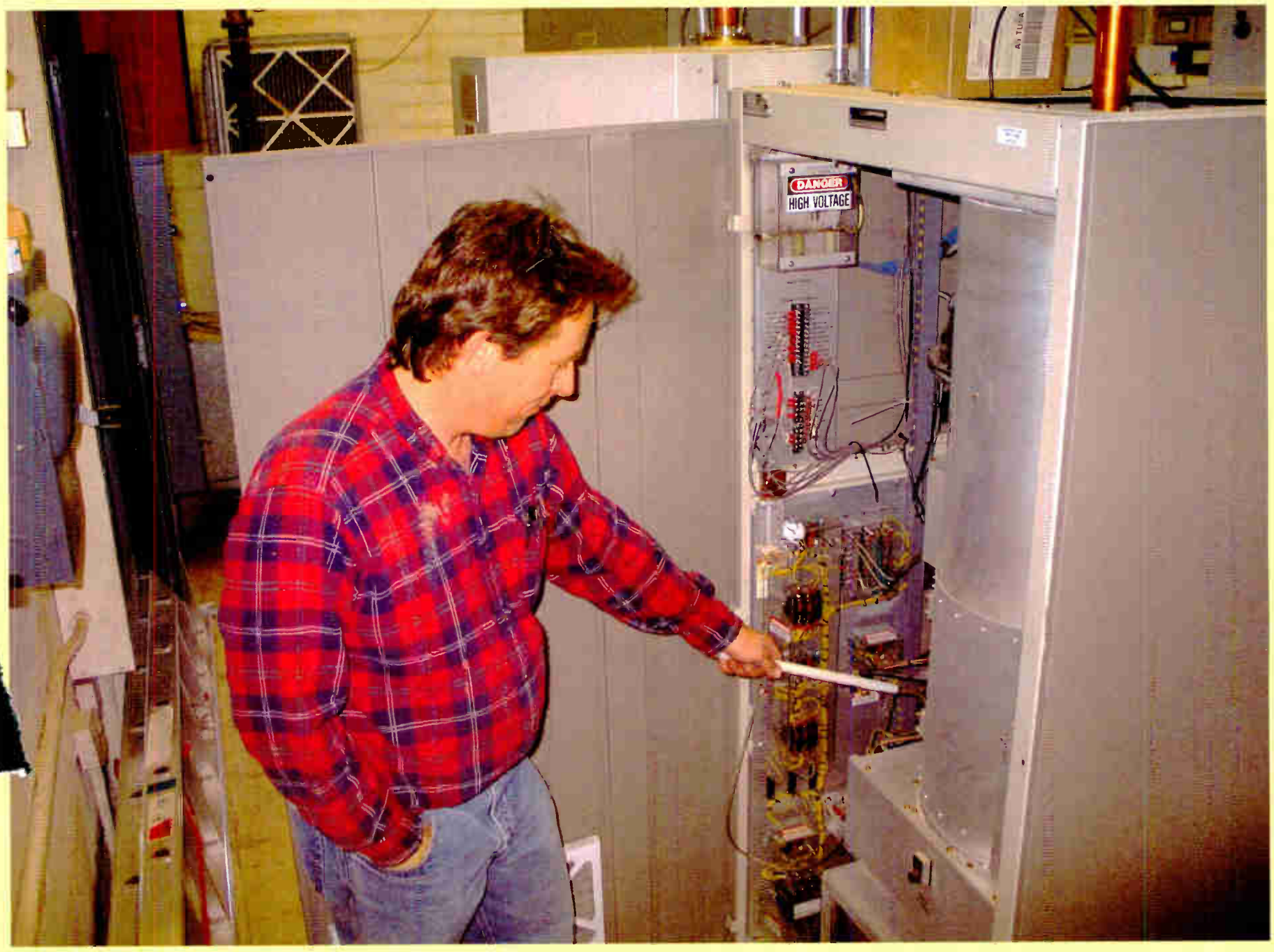
February 2004

Volume 12 Issue 2

Engineering Safety is No Accident



Maintenance – Plan to Be Safe

Our page four cover story will concentrate on the safety and personal security aspects of an engineer's repair and maintenance activities.

With consolidation placing an increased workload upon engineers, we'll show you how to stay safe, even if you are a one person show.

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Volume 12 Issue 2
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Maintenance – Plan to Be Safe

Page 4 – Whenever an engineer arrives on site for work, whether at a transmitter site or a studio, it is essential he survey the situation and be very aware of which circuits and equipment are energized.

More Than Just Lightning – Part 2

Page 14 – Lightning strikes are considered to be major causes of equipment failure in many broadcast facilities. But, what about damage caused by sources other than a direct lightning strike – in other words, electromagnetic pulses (EMP)?

Audio Processing – Part 13

Page 20 – Engineers often find themselves at odds with the Program Director when it comes to choosing the sound of the radio station. However, to "pull off" the perfect sound for a particular format, both must determine the station's goals.

Maintaining Reliable Power Systems

Page 22 – In this last installment, we will consider a back up power for a major market consolidated studio. The criteria will be based on several installations with which author, Dana Puopolo has been involved over the years.

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Email: editor@radio-guide.com

Alert! – NAB Show Approaching

Can it be less than ten weeks away, already?

Faster than you can say, "Do we have reservations," here comes your annual opportunity to see the state of the industry in person – the Spring NAB Show in Las Vegas. While more regional shows and even "road shows" have emerged in the past several years, the NAB Show is still *the* place to go if you have only one choice.

Of course, there are also the engineering sessions, from the Ennes Workshop to papers presented on IBOC and other new technologies, to discussions of how to get along with the FCC and solve technical problems.

Yet, the single strongest reason for going to the NAB Show is the opportunity to *network*. Some poor managers will instinctively react and say "Hey! He's going to network? That only means he's looking for a new job. I'm not sending him to Las Vegas – period!" Nevertheless, smart managers realize networking is actually of great value to the company; the opportunity to meet the manufacturers and their technical support people. It may be hard to quantify the value of these contacts, but any engineer who has been to the NAB show will agree it is significant in time and money.

For **SBE members** there is an additional reason to plan ahead: By filling out the early registration form at www.sbe.org, SBE members can save from $100 to $400 off the full registration cost.

And – please – do not forget to set aside Tuesday at Noon for our 12th Annual Lunch Gathering. This is a chance to network with folks we "meet" on email lists, and put faces to their names. As usual, we have a few special surprises up our sleeves, so you do not want to miss it. We hope to see you there!

Maintenance – Plan to Be Safe

by Barry Mishkind

[TUCSON, Arizona - February 2004] Several years ago, one of the Big Three car manufacturers came up with the slogan: "Safety is Job One." This simple, yet profound, statement somehow seems to be ignored so often during times of stress or when things get busy. However, the implications are very serious, and deserve due consideration.

You probably can name many dangerous occupations: construction workers and laborers often get hurt on the job, chemical workers (including beauty salon operators) have respiratory or skin problems, meat cutters and alligator handlers seem to lose a lot of little appendages, and the list goes on. In broadcasting, we immediately think of the dangers faced by tower climbers (see page 6). And then there are safety issues concerning engineers in general.

VOLTS AND DEADBOLTS

While final amplifier voltages on solid-state transmitters are significantly lower than tube models, current is still high – enough that manufacturers continue to add "Danger!" stickers to the transmitters. Add to that the potential personal security concerns of exiting a transmitter room door at 2 AM, and you have some real workplace issues that deserve proper consideration. If you are a manager, the word "liability" should be flashing in your head right now.

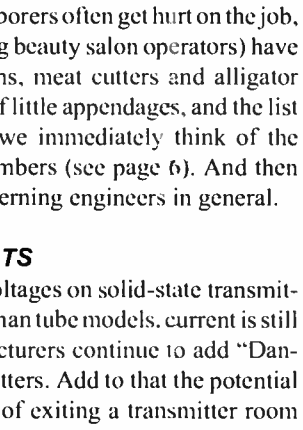
Perhaps one of the most troublesome issues arising out of consolidation is the increased workload placed upon engineers. While some companies and markets are exceptions, in some places broadcast engineers now are a vanishing breed. Yet, at the same time, a fair number of managers – most of them never having been to a transmitter site – have a highly inaccurate view of what an engineer is and what he does. They consider an engineer merely an expense – an expense to be reduced or avoided whenever possible.

Without dwelling upon the number of light bulbs changed, toilets fixed, lawns mowed, or home stereos repaired, in this discussion we will concentrate on the safety and personal security aspects of an engineer's activities. (OK, one short diversion: How many GMs does it take to change a light bulb? None, that is what they keep engineers around for! If that is the attitude in your facility, please raise your hand now.) To be fair, we also need to ask: Have these GMs ever been educated as to what their technical department is all about?

DON'T TOUCH THAT!

Many places around a transmission facility can be dangerous – from the transmitter itself to the tower environment. And additional hazards lurk at the studio as well. One of the reasons OSHA mandates "lockout tags" on breakers and disconnect boxes is how easy it is for someone to happen upon an open box, without knowing someone is working in a room far away. A quick flick of a switch, and someone could get zapped.

True, it is not uncommon for an engineer to be alone at the transmitter site, so it might seem as though a lockout tag would not be of much use there. On the other hand, it is easy to get busy and become so engrossed in the task at hand that you forget whether the breaker is on or off. And when alone it can be especially dangerous, because it only takes a tiny memory slip and one could literally turn to toast.



Sample Lockout Tag

Here is another potentially lethal situation, combining *two* errors: A disk jockey suddenly notices the transmitter is off the air, and pushes the remote control "on" button. Meanwhile, the engineer is working inside the transmitter, having forgotten to disengage the remote control. It does not even sound funny, does it?

INITIAL SURVEY

Whenever an engineer arrives on site for work, whether at a transmitter site or a studio, it is essential he survey the situation and be very aware of which circuits and equipment are energized. Also the condition of the site itself deserves attention, because in addition to technical problems, there are hazards from a variety of two, four, and multiple-legged creatures. So include those concerns, too.

Why not start at the entrance? What do you see? Is the gate in good repair, as well as the fence? While the engineer may be in a hurry to solve an off-air situation, a broken gate or cut in the fence can alert him to intruders who may well have had a hand in causing the problem. A great many stations *do not* take the time to secure the service disconnect boxes outside the building. More than one station has gone "silent" because a local kid played "let's pull the handle."

While you are checking outside, include the towers and bases, as well as the buildings. In most cases, graffiti is not a good sign – for several reasons. It indicates there were unwanted visitors; and if not cleaned up it will attract more defacing. You might have to repaint two or three times, but once the local kids figure the building is not abandoned (they never see you, right?), they will usually move elsewhere.

Locks, chains, gate hinges. All these things go into proper site security. And as you approach the main door, see if there are indications of crowbar application. This could be an early warning sign of impending invasion, and merit installing a more secure entryway.

INSIDE

Inside the building, the first thing that comes to mind is the condition of the entryway. Is there sufficient light and a walkway clear and free of clutter that could cause tripping and injury? A quick check of the surroundings should verify that no intruders have been inside the building.

Getting down to the issue at hand, whether your visit is for routine maintenance or an emergency visit to get the system back up, the key word is caution. With caution you will avoid many potential causes of injury. Even if you plan to work with the power off, disable the remote control – an unexpected "command" can come when you least expect it.

Clearly the best protocol is to have two persons on site at all times. In some markets, the union contracts forbid an engineer to work alone on high voltage. And some companies make this their policy as well. A second person can be instrumental in saving a life in case of accident, whether by performing CPR, calling 911, or simply being ready to kill the power switch. A second person also can be "in charge" of remembering if the tower is hot or not, and determining "go" and "no-go" for climbers.

Whether or not your chore is routine maintenance, it is important to know *exactly* which disconnect feeds which equipment. Mark or label each box clearly. And, unless you are testing the transmitter's operation, turn it *off* before opening the transmitter.

However, this does *not* eliminate all danger. Inside your transmitter are all manner of large capacitors. They can hold enormous charges. And sometimes the interlocks do not work properly; they may be broken, defeated, or lead to an "open" drain resistor. Worse, you might just find a disconnect switch was mis-labeled or broken. (John Stortz' tech tip of mounting neon bulbs across power leads is a good way to have visual confirmation of power status. A bulb could be mounted on the disconnect, and one *in* the transmitter.)

All of this leads us to grounding sticks, and the many lives they have saved. In short, *always use the grounding stick!* Engineers who have had a screwdriver or wrench turn into in an ad hoc grounding stick will tell you how impressive the "flash" can be! Those of you who observed and noted the safe practice shown on the cover of this issue may now take a gold star out of petty cash. That is right. Keep one hand *in a pocket.*

It might seem awkward or inconvenient, but until you have ensured all power sources are discharged, having a hand in a pocket will prevent many an inadvertent "circuit" from being formed through your body. Once everything is discharged, then you can use both hands. But, be sure you have carefully made the way safe.

The safe use of various tools and chemicals are definite topics for another article. The same applies to the necessary maintenance on air condition systems, generators, etc., that are found at many sites. Meanwhile, we will assume your maintenance visit is successful.

SAFE PRACTICES CONTINUE

Even after you have serviced the transmitter (or other gear), there are some important things to do before getting back in the car and heading home.

First and foremost is to document what you did. Maintenance logs are no longer required as in years past. However, the same issue applies as with studio logs: If you have an issue during an inspection, well kept logs will demonstrate that you do not typically run without regard to your licensed values. It will also provide a paper trail for replaced parts, and what parts of your transmission system need the most work.

Restoring power disconnects and remote control to their proper operating positions should be done by now, and as you prepare to leave, ensure the air conditioning/heating and lights are set for "unattended mode." As you secure the building, take care of your personal security. Again, two people on site are much better than one, in case some two legged animals are waiting for you to exit into the dark.

Better yet, have a camera set up to show you what is outside, before you exit. Even if your gate is closed, the "smell of activity" attracts some less than savory sorts. Management that does not acknowledge the need for sufficient plans to insure the safety of the individual is asking for a major liability lawsuit.

As you drive away, you might use your cell phone to call the studio or remote control and ensure it is working normally. Some stations even "remote" the light over the door for positive indication things are working (and it sure keeps you from having to get out of the car in the dark!).

We end by summarizing some of the things that should be on your site safety checklist; certainly, you can think of several more:

SITE SAFETY CHECKLIST

1. Site appearance: Are the fences and buildings all secure, with no indication of vandalism?
2. Building integrity: Are the doors secure, properly lit inside (and outside after dark), and walkways clear?
3. Disable the remote control system.
4. Disconnect the power to any equipment you plan to service. Use lockout tags "to be sure."
5. Use the grounding stick!
6. Keep a hand in a pocket until you are sure the gear is completely safe.
7. Handle tools and chemicals safely.
8. Note down all relevant details of your work in the maintenance log.
9. Make sure power and remote control are restored to "normal" operation.
10. Check on any untoward activity outside.
11. Lock up carefully.

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Tower Topics

Suspension Trauma – A Little Known Factor

A Major Climbing Danger

by J. Paul Jensen

[MANISTEE, Michigan - February 2004] There is a name for everything. Have you experienced ever dizziness when standing, after squatting on the balls of your feet? Yes, that has a name! It is called "orthostatic syncope." It is actually quite common. The effect can be also be caused by standing without moving for long periods of time, such as a soldier at attention. Another technical term is "orthostatic intolerance," but we will use a more easily remembered term – suspension trauma.

We have all heard tower climbers grumble about wearing "those darned harnesses – they get in the way!" Well, the harness that is intended to save you can also kill you! Indeed, it may cause fatal suspension trauma.

More attention has been paid to this matter than might have been expected, but that attention has been from the medical community rather than the safety equipment manufacturers. It is reported that the manufacturers attempt to fulfill the requirements of OSHA and other regulating bodies rather than consider the safety of all aspects of a fall event.

WHAT IT IS

Suspension trauma occurs because blood pools in the legs – which, being large in volume, can hold a great deal of blood. The body is built in such a way that the leg muscles squeeze the leg veins, which have one-way valves. When there is repeated muscle flexing in the legs, the pumping action keeps returning blood to the upper body.

However, if the heart does not have enough blood to pump because blood has pooled in the legs, the heart speeds up in an attempt to compensate. If there remains an insufficient flow, the heart then will slow way down and the victim will pass out, quite possibly permanently.

"Dead or Alive?"

In the example of the soldier at attention, normally he or she falls over and blood flows back to the heart. On the other hand, for a climber in a harness, especially those designed to keep the wearer upright, passing out has no effect on body position. Worse, the straps of the harness constrict the legs, exacerbating the problem. Without rapid action, death can follow rather quickly.

FALL PROTECTION

There are four stages of fall protection. Increasing safety in one stage may decrease safety in another. Consider the situation before the fall. The climber is properly trussed in a compliant harness and has the safety lanyards attached well above his position. The anchor points are out of the way, but also out of reach. He can swing around the tower with ease, but now it is time to move up.

He climbs on up to where the attachments are within reach, but slips and falls quite a number of feet. If the lanyards had been shorter, they would have been in the way and would have required more frequent adjustment, but the fall would have been shorter and less dangerous. As it is, the climber has suffered the shock of abrupt deceleration. Even with "shock absorber" lanyards, he may have hit his head on the tower. He will be anywhere from being annoyed with himself to knocked out and bleeding.

The attachment position of the lanyards onto the harness affects safety of the arrest differently than the safety of the subsequent suspension. Consider attachment high on the harness near the shoulders. The wearer will remain upright and stress will be mostly vertical on his vertebrae, but his legs will be hanging and he will be susceptible to suspension trauma.

If the points are in front, they will have been in the way. If they were high on his back, his face may be smashed against the tower. Attachment points near the wearer's center of gravity, safer after the fall, will result in sharp bending during the arrest.

A most critical stage of the fall event has been reached – suspension. If the climber is suspended upright and is conscious, he must immediately take steps to avoid suspension trauma. This is called self-rescue and, as is obvious, lanyard attachment point placement will have been the determining factor. He must not allow blood to pool in his legs. Simply standing on the tower, if possible, will work many times.

Danger averted by standing on tower rung.

If a leg is broken or other injury prevents standing, the legs must be raised relative to the heart. If the climber is unconscious he is in mortal danger.

AVOIDING RESCUE PROBLEMS

The rescue stage is also critical. Paramedics will be aware of the fact that returning blood flow to the heart abruptly can cause it to fail. This is called "post rescue death." Therefore, it is recommended that the victim be returned to a horizontal position over a period of 30 to 40 minutes. When the ground is reached after lowering the victim down, do not lay him down immediately. Start with a kneeling position, and slowly progress to sitting and then to lying over that half hour or so period of time. It is much safer.

Do not lay down immediately.

Slowly progress to sitting ...

... and then to lying position.

Our profession is dangerous. Just as with transmitter work, you should never climb alone. The other person may not be climbing with you, or even assisting, but she or he will be watching you for your safety. Because hanging free should never exceed five minutes, the safety person must be made aware that even though you are hanging in your harness you may not be well or even alive. If no motion is detected over several minutes, he should make verbal contact with the climber. Any difficulty should be addressed immediately.

By practicing safe climbing procedures, you or your tower crews can avoid potential fatalities through Suspension Trauma, and get the job accomplished safely.

J. Paul Jensen works for the X-Star Network in Manistee, MI. He enjoys tower climbing so much that he would like to live in a converted tree house on a tower. Contact him via editor@radio-guide.com

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FCC Focus

FCC Compliance Issues

Part 1 – Tower Structure Registration

by Terry Baun, CPBE, CBNT

[WESTFIELD, Indiana - February 2004] When the Communications Act of 1934 established the Federal Communications Commission, the mission of that agency was very clear-cut and very limited: to insure that radio signals of all types were regulated in such a way as to not interfere with one another or other communications services.

Since then, the Commission has seen its mission expand dramatically into areas unthought-of in the first half of the 20th century. Two of the most important to broadcasters are the pivotal role the Commission now takes in protecting public safety through EAS, and in protecting safety in flight through administration of antenna tower registration, marking, and public access protection.

If your station is visited by an FCC inspector (or one of the inspectors from your State Broadcaster Association's Alternative Inspection Program), you can be sure tower issues will be one of the most significant areas of interest. And since tower problems are often quite costly to correct, you will want to be sure there will be no surprises during the inspection.

In this review of tower issues, we will consider three areas: Registration, Marking/Lighting, and Public Access Protection. This issue will discuss the registration process and how it is administered

TOWER REGISTRATION AND THE ASR

For an industry that boasts tens of thousands of structures, the tower industry was singularly unregulated for many years. Although the Federal Aviation Administration requires owners to mark and light most tower structures, there was no standard tower registration system in place until the 1990's. Then, under the leadership of the late Robert D. Greenberg, the FCC undertook the massive task of locating and cataloging all tower structures of significant height in the Continental US and possessions.

This effort, known as ASR (Antenna Structure Registration), today provides the database by which each and every tower can be identified by geographic coordinates, height, and ownership, with its specific identification number clearly posted near the tower base so as to be readily observable. This ASR number is used in all filings related to the structure.

Why are towers required to be registered? Think of an analogy to automobile registration, where license plates are issued on a statewide basis to identify vehicles using public roads. Similarly, towers are registered so as to identify them to both regulatory authorities and the general public. If a tower owner fails to properly maintain the required marking and lighting requirements, or if the tower presents a danger to aviation or the general public in some other way, the ASR system allows quick and positive identification of the structure and the ownership responsible for its maintenance. It is little wonder the FCC places great emphasis on correct registration and proper identification of the towers.

LOOKING AT THE 854R FORM

In the sample ASR form 854R provided, note how the ASR number and ownership are prominently displayed at the top of the form, along with the precise geographic coordinates and the structure height above ground level.

The FCC generally assigns painting and lighting requirements at registration, according to the FAA's "determination" for a structure (also known as the FAA Study). The FAA Study references FAA Advisory Circular AC 70/7460-1, "Obstruction Marking and Lighting." This Advisory Circular and AC 150/53-5345-43, "Specification for Obstruction Lighting Equipment," are presently incorporated by reference in the FCC Rules. *Regardless of the general specifications listed in the FCC Rules, however, the owner must maintain painting and lighting in accordance with the specifications assigned to the structure at registration.*

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION
ANTENNA STRUCTURE REGISTRATION

Owner: Clear Channel Broadcasting, Inc.

KTZR - 60316 - TUCSON, AZ
Clear Channel Broadcasting, Inc.
2625 S. Memorial Drive, Suite A
Tulsa, OK 74129

Registration Number: 1233197

Issue Date: 03-26-2002

Location of Antenna Structure: 1775 South Cherry Avenue, Tucson, AZ

Ground Elevation (AMSL): 748.6 meters

Overall Height Above Ground (AGL): 81.8 meters

Latitude: 32-12-4.2N | Longitude: 110-56-50.3W | NAD83

Overall Height Above Mean Sea Level (AMSL): 830.2 meters

Painting and Lighting Requirements:
FAA Chapters 3, 4, 5, 12
Paint and Light in Accordance with FAA Circular Number 70/7460-1K

Special Conditions:

This registration is effective upon completion of the described antenna structure and notification to the Commission. YOU MUST NOTIFY THE COMMISSION WITHIN 24 HOURS OF COMPLETION OF CONSTRUCTION OR CANCELLATION OF YOUR PROJECT. Use FCC Form 854. To file electronically, connect to the antenna structure registration system by pointing your web browser to http://www.fcc.gov/cgb/antenna. Electronic filing is recommended. You may also file manually by submitting a paper copy of FCC Form 854. Use purpose code "NT" for notification of completion of construction. Use purpose code "CA" to cancel your registration.

The Antenna Structure Registration is not an authorization to construct radio facilities or transmit radio signals. It is necessary that all radio equipment on this structure be covered by a valid FCC license or construction permit.

You must immediately provide a copy of this Registration to all tenant licensees and permittees sited on the structure described on this Registration (although not required, you may want to use Certified Mail to obtain proof of receipt), and display your Registration Number at the site. See reverse for important information about the Commission's Antenna Structure Registration rules.

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FCC 854R
July 1999

Sample ASR Form 854R

On some ASRs you may see these specifications referring to numbered paragraphs of FCC Form 715, which is the summary of the Part 17 Tower Marking and Lighting Rules, formerly attached to most station licenses. In either case, it is critical to insure the tower lighting specified on the ASR is in complete agreement with what you have on the tower itself.

If they are not in agreement, an FCC inspector will likely cite you on this issue, and you will need to correct either the tower lighting or the ASR. The FCC has elected to remove the tower marking and lighting specifications from the Station License and simply refers to the appropriate ASR file, so the accuracy of that information is of critical importance during an inspection.

Note: Before you attempt to obtain a copy of AC 70/7460-1, "Obstruction Marking and Lighting," check your Registration (Form 854-R) for the specific version that is required for your antenna structure. (In the example above, the "K" version is specified). In turn, AC 70/7460-1 refers to a specific version of AC 150/53-5345-43, "Specification for Obstruction Lighting Equipment."

Each station should maintain the original or a clear photocopy of form 854-R for *each tower* to provide to any FCC inspector. Copies of this form must also be provided to every tenant who leases space on a tower from you, and conversely, you should be provided a copy by any tower owner from whom you lease space.

VERIFY THE DATA

In addition to verifying the lighting and marking of your towers, an inspector may also elect to verify the geographic coordinates and tower height as listed on the document. If your ASR registration did not incorporate *verified* coordinates for your tower location, it is possible the discrepancy will be discovered and a citation issued. Similarly, if the actual tower height does not agree with the ASR figures, a citation will probably be issued.

In either case, the errors will have to be corrected. Errors have been known to occur in the filing and keyboarding of these documents, so the conscientious engineer will verify the accuracy of all information on the ASR document. As was mentioned previously, future station licenses will not contain this information, so your ASR will become the only official government document specifying all the requirements for the registered tower.

POSTING THE ASR NUMBER

The other major requirement of the registration process is the posting of the registration number at the tower itself. The intent of the rule was to make certain the number can be observed by government personnel or the general public; however, as written:

17.4(g) Except as described in paragraph (h) of this section, the Antenna Structure Registration Number must be displayed in a conspicuous place so that it is readily visible near the base of the antenna structure. Materials used to display the Antenna Structure Registration Number must be weather-resistant and of sufficient size to be easily seen at the base of the antenna structure.

ASR sign at tower base. ASR on ATU box.

While the Rule does not specifically require an additional sign at the closest point of public access, it would be prudent to do so, especially if the tower base cannot be seen from the nearest road or driveway. FCC officials indicate a requirement for such additional posting is likely to be incorporated into future rules. Posting additional signs at the road does make it much easier for FCC officials to check on tower ownership and signage, and of course anything that makes the FCC's job easier is a desirable practice for broadcasters!

View of ASR on fence and tower.

What might be considered "Full Disclosure" at a tower site.

Some stations have asked about the wording of the sign. Strictly speaking, the Rule requires only that the ASR registration number be clearly visible, although most stations incorporate a short prefix, such as "FCC Tower ID #." Note that the ASR signage requirement is completely separate from any RF radiation warning signs that may also be required.

(Continued on Page 10)

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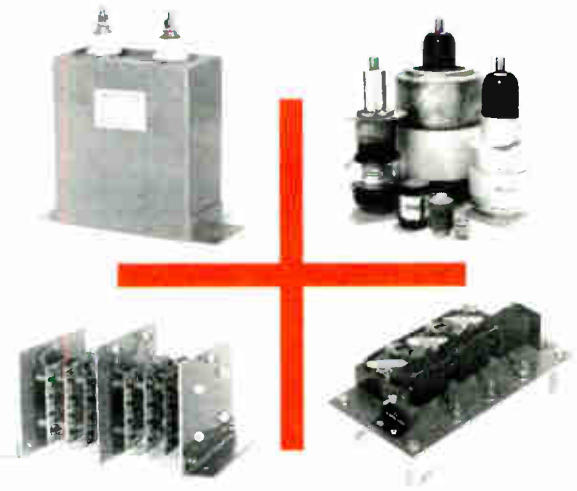

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FCC Focus

Continued From Page 8

An additional area of concern about ASR signage is its permanence. Signs fastened to chain link fences by cable ties have a very high mortality rate, due to weathering and vandalism. AM directional stations are particularly vulnerable to loss of signage at outlying towers. If possible, post or paint the number on the tower or a permanent structure inside the locked fence and adjacent to the tower – the tuning house or transmiter building, for example.

OTHER ASR ISSUES

You should also be aware the tower ownership listed on the ASR does not automatically transfer to a new owner when a station is sold. It is the responsibility of the company transferring ownership of a tower to a new owner to update the FCC's ASR records upon consummation of the sale. If your company name is not specified as the owner of record on the ASR of a tower you own, you should ask the previous owner to get the database corrected and a revised ASR will then be issued with your company name as owner.

Some licensees choose to register towers that do not require lighting or painting. Please note: If you have a registered tower (ASR# assigned) then you must post that number regardless of whether or not the ASR requires painting and lighting of that tower.

In summary, the Antenna Structure Registration system provides a consistent and complete database containing all necessary information concerning location, marking, and lighting of antenna structures. Each station should verify the accuracy of its ASR with both the station license and the actual physical attributes of the tower as erected, since in the future the ASR will be the only document of record containing the specifications for the tower structure.

ASR signs mounted on chain link fences can be easily vandalized.

Next time, in Part 2 of this series, we will discuss tower lighting and marking.

Terry Baun is the Principal of Criterion Broadcast Services, Westfield, IN, and serves as an ABIP inspector for Broadcast Associations in several states, including Wisconsin, Indiana, Ohio, and Michigan. Contact him at tbaun@criterion-broadcast.com

Tech Tips

Protecting the Inside of Your Coax/Antenna

By Bob Groome

[SACRAMENTO, California - February 2004] Stations with antennas located in a lightning prone area or with antennas driven by transmitters that can sustain an arc for more than few seconds may find nitrogen is not the best way to safely keep the antenna interior dry. In fact, using nitrogen can lead to antenna or coax failure!

Manville "Whitey" Bro (Courtesy: DuPont Co.)

Sam Garfield, CEO of Technical Broadcast Consultants (and SBE VP) directed me to Dr. Manville "Whitey" Bro, a senior chemical design engineer at E.I. DuPont.

In a conversation with Bro, whose research made the copolymer Teflon® FEP (fluorinated ethylene propylene) from the precursor PTFE, he explained the problem with using the product with nitrogen.

CHEMICAL BACKGROUND

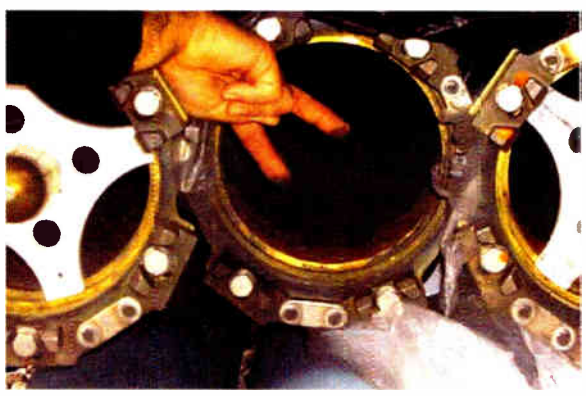
It turns out that when PTFE is heated to 500° C or so, hundreds of thousands molecules of Teflon react; CF_2 becomes double bonded CF_2. If nitrogen is used to pressurize the coax/antenna system, this double bonded CF_2 then will become CF_3 (a gas) and C (carbon), visible as soot. The chemical equation is:

$CF_2 + CF_2 + N$ + high heat = $HF + CF_2O$ (carbonate Fluoride) + C (*carbon*)

Clearly, no one wants carbon inside their coax or antenna. The results are, to put it mildly, potentially catastrophic.

A better way is to use dry air: $CF_2 + CF_2 + O_2$ + high heat = $HF + CF_2O + CO_2$ (a less damaging gas)

During an arc, the heated air expands quickly and possibly will open the pop-off value. This will allow more air to move through the system. Actually, this is good, as it will provide more oxygen molecules to bond with the CF_2 and make more CO_2. When the oxygen is depleted, C is the by-product.



Carbon Deposits (Courtesy: Sam Garfield)

So, depending on the duration of the flash over or arc, some carbon will still form in the presence of dry air, but not nearly as much as in the presence of nitrogen. In addition, the by-product of the arc itself may produce carbon.

It appears you cannot stop the production of carbon completely, but this recommended step will reduce the amount of its production in your antenna system, should it experience a sustained arc.

ANTENNA PRESSURIZATION

Antenna manufacturers like Jampro recommend that if nitrogen is used to test pressurization and/or used to purge moisture from an antenna, it should be replaced by dry air when the procedure is completed.

Here is a relatively easy way to replace nitrogen in a closed coax/antenna system: First, adjust the dehydrator to over 15 psi. This will cause the pop-off valve(s) in the antenna to purge the excess air. Then, the dehydrator will kick back in, adding more dry air as it attempts to maintain the 15 psi, blowing air through the entire system. You should maintain this mode of operation until all of the nitrogen is out of the system, and then reduce the dehydrator pressure to about 3 psi.

A reminder, though: If the pop-off valve has been removed, you will have to open and reseal this manually. Additionally, Garfield mentioned real caution should be taken when using the air dehydrators of today's design. The reason is poor input air filtration; additional filtration of the output dry air is highly suggested.

The bottom line: For long and reliable service from your antenna, it is best to use dry air for maintaining pressure in the system.

Teflon is registered trade mark of the DuPont Corporation.

Bob Groome is the Domestic Sales Manager for Jampro Antenna and RF Systems in Sacramento, CA. Contact him at BobG@jampro.com

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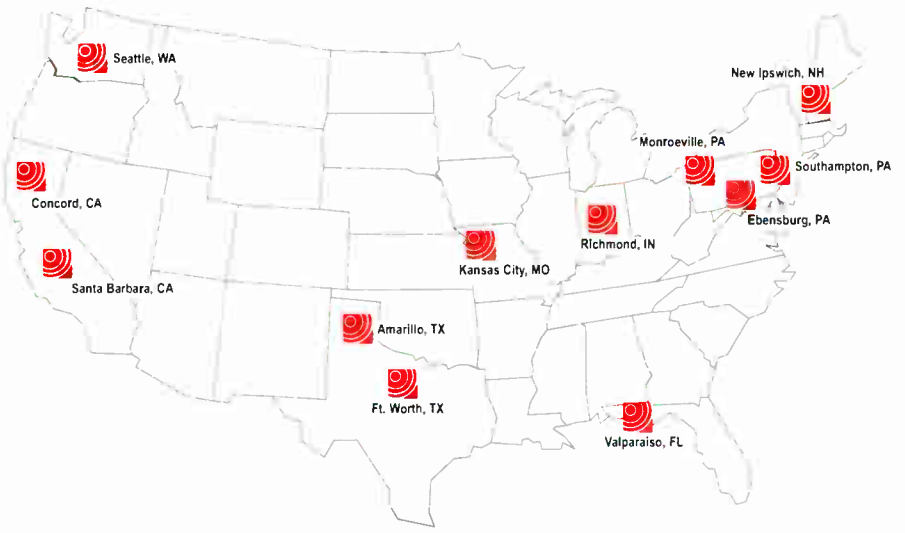

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Securing WiFi Networks, Wireless Keyboards and Mice

by Tren P. Barnett

Every time we use a computer – especially on the Internet – our privacy is at risk. Is it possible to have true security on a computer with Internet access?

[TUCSON, Arizona - February 2004] We all have heard horror stories such as "the police arrested a guy who was driving a van around the neighborhood looking for wireless access he could hack into and gain personal information." Unfortunately, there are many who delight in making up such silly stories. Why do I say this?

Consider how long it takes to identify and link up to an unsecured WiFi network when you *want* to do it? Now, take your laptop for a walk and see just how far you can roam while accessing your WiFi network. Ask yourself just how slowly a van would have to move – and just how obvious that would be. Intruders would have to park virtually in front of your home, and *then* hope to find and access your computer. Remember: Hackers and thieves prefer not being obvious, that is what keeps them out of jail.

WIRELESS SECURITY

Does this mean WiFi presents no security risk? No! Secure your WiFi access point as per the owner's manual, and look for other means of attack. There are far more efficient ways to access your computer. Internet users have more to worry about than a wireless network – because hackers can often gain access through the Internet, glean information, and you would not even be aware of it.

On an email list recently, someone made the less than informed statement that wireless mice and keyboards pose a security risk; I believe "that van" was taking advantage of this. If you can tell me how to get my wireless keyboard and mouse to talk to my computer from that distance, I would appreciate it. As the box says "range: six feet," I will be a hard sell.

REAL INTERNET PROBLEMS

Everyone hates Spam – those unwanted e-mail messages. And those cute little programs sent by a friend. They are supposed to humor us, yet actually enable popup ads, change our home page, or share a virus. Then there are cookies.

Internet cookies can be as bad as real cookies to diabetics. Did you ever wonder why the ads appearing on your favorite search engine correspond to your last search? Spam, applets, cookies – each may be designed to track our Internet usage – glean personal information and more. Some may benefit us; most just benefit those who know how to exploit them.

PREVENTING SECURITY PROBLEMS

Do not believe everything you read.

Find out for yourself, is it real or is it a hoax? Do not believe the following message:

IMPORTANT, URGENT – YOUR PERSONAL SECURITY IS AT RISK IF YOU USE WIFI! PASS THIS ON TO ANYONE YOU HAVE AN E-MAIL ADDRESS FOR.

Recently the Seattle city police arrested a van full of teenagers cruising residential areas. The van was full of radio equipment and antennas used to exploit wireless devices on home computers. Personal information was gleaned ... (etc.)

OK, perhaps this one is blatantly obvious, but you probably have seen similar items. Before passing any message onward, take a moment and find out the truth from some of the many anti-hoax Internet webpages like:

www.symantec.com/avcenter/hoax.html
www.trendmicro.com/vinfo/hoaxes/hoax.asp
hoaxbusters.ciac.org/

Consider the hidden risk.

There are hidden risks to Internet users. It may seem ironic – since I just told you not to believe everything you read – but I will now tell you to read *everything* before an install.

When did you last read a license agreement? For most, the answer is never. However, even if you did read them, you likely would still miss the risk. License agreements are boring on purpose, but they contain vital information; read and evaluate each carefully. Some may leave you with very cold feet. Although many nice utilities and programs require just a click on an "I Agree" button for installation, *start by reading those license agreements.*

Here is why: While claiming to protect your privacy, many applications actually glean information from your computer, sending it to the software designer. And some respected venders openly state their "right" to sell or distribute contact information – yet sometimes their "right" goes well beyond that. Never install and use programs without reading exactly what they will and will not do.

Know with whom you are dealing.

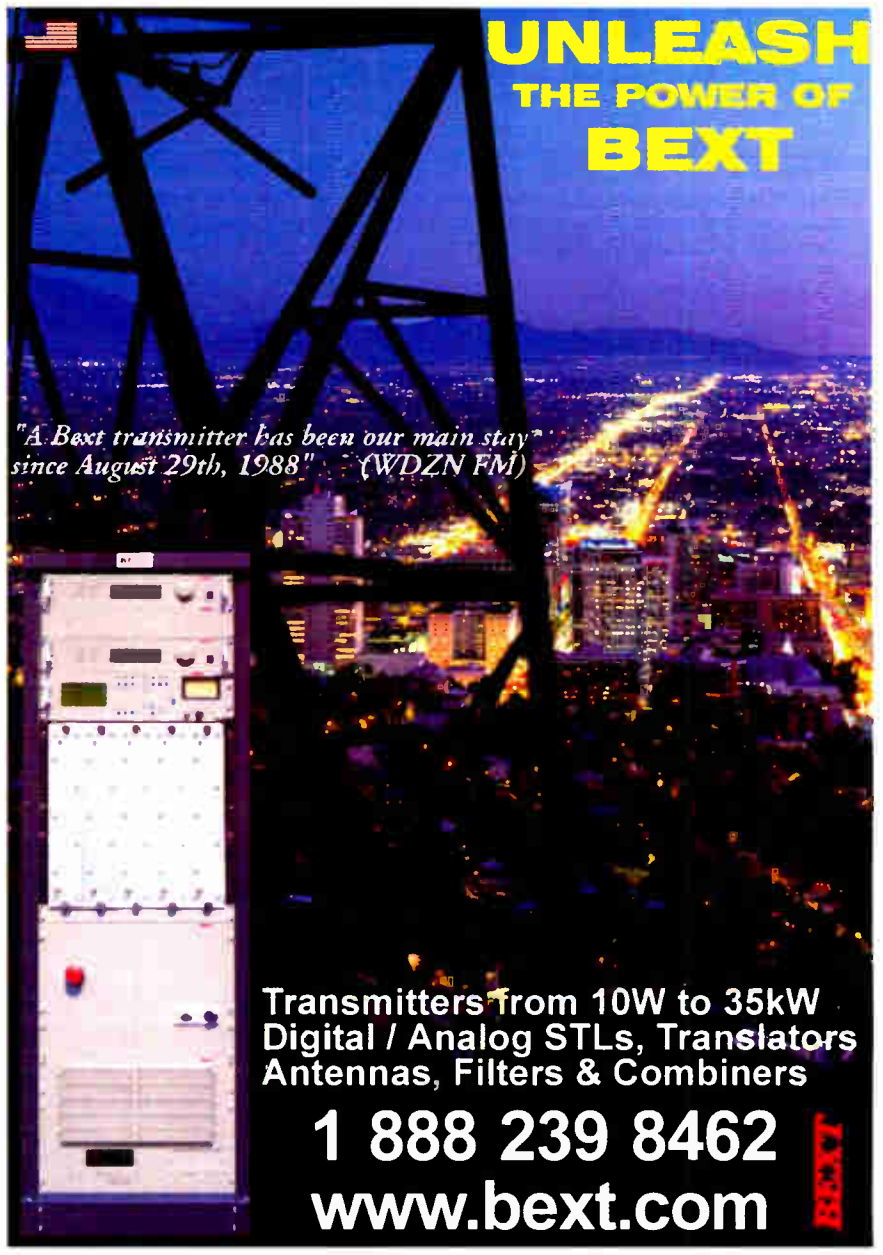
Learn about any company from which you plan to buy. Many good companies do business on the Internet. However if you are starting a new relationship, use the phone and make sure the contact information is legitimate. And yes, if it sounds too good to be true, it probably is.

Use reliable protection software.

Act wisely with what you store on any computer connected to the Internet. Take the time to use reliable virus protection and firewall software, and do not expect them to protect everything.

Following these steps will make more of a difference in your system safety than worrying about vans in the neighborhood.

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



More Than Just Lightning

Protecting Your Plant – Part 2

by Larry Bloomfield

[FLORENCE, Oregon - February 2004] Lightning strikes are considered to be major causes of equipment failure in many broadcast facilities. But, what about damage caused by sources other than a direct lightning strike – in other words, electromagnetic pulses (EMP)?

Recent research has shown that the primary problem associated with lightning current flow over a conductor is not heat. The energy is on the conductor for such a short period of time that heat does not stress the conductor overmuch. The real problem is the electromechanical force of the current flow attempting to straighten a conductor causing physical damage to that conductor.

This is the reason air terminals are constructed of a solid elevation conductor. If an air terminal were to be constructed of multiple wires twisted into a helix, the physical forces associated with lightning current flow along the helix would tend to straighten those wires, possibly compromising the structure of the helix.

Air Terminals

MODERN GEAR, NEW PROBLEMS

The resiliency of today's technology (microprocessors, etc.) to fields and pulses is much different than back in the old days of vacuum tubes and mechanical relays. The move to digital systems and faster components (or transients) of which lightning is the most dramatic, have and will continue to become more of a factor in component reliability and longevity.

Add to this the increase in environmental and man-made transients attacking your equipment, 24-hours a day, and the damage will range from catastrophic failure to minor damage, which eventually accumulates to the point of unreliable or random operation or ultimate failure. There probably are no broadcast facilities today without at least one computer, not to mention all those computer (microprocessor) driven automation systems and other devices.

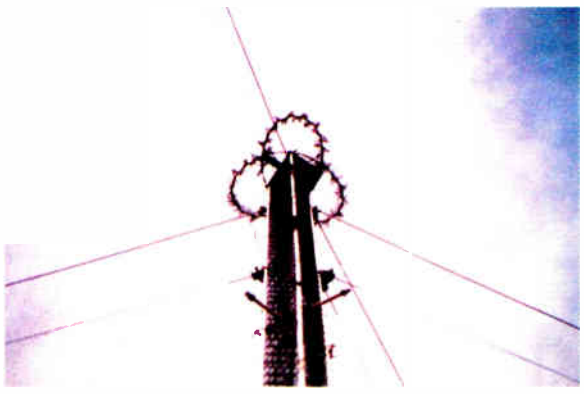
As our devices operate faster, the problems will become worse. It is not possible to make electricity travel faster. So, in order to make a device operate faster, the distance that the electricity travels must be reduced. As the distances and clearances are reduced, arc-over voltages become lower, exacerbating vulnerability to damage from transients.

SYSTEM DESIGN CONSIDERATIONS

When you or your engineers develop a system, your primary goal is to make it work to further your specific goals. Although the environment in which it will operate is normally addressed, it is usually limited to air conditioning and wire-routing. It is important to optimize the environment to enhance the reliability and longevity of your equipment beyond that.

The folks who deal with lightning abatement approach the situation differently. They are not specifically concerned with what your equipment does; they are specifically concerned with the rest of the environment in which it operates both inside and outside the plant.

Electrical storms and lightning are a year-round phenomenon. The ingredients necessary for the formation of a thunderstorm, irrespective of the time of year, are: moisture, an unstable temperature lapse rate and lifting action. Although electrical storms and lightning are more likely to be present during the traditional thunderstorm season, some of nature's most awesome phenomena are lightning in a snowstorm and lightning during a volcano's eruption.



Lightning prevention system on top of tower.

Lightning rods have been perceived to provide protection from the damage caused by lightning for over 200 years. However, it is important to remember that the purpose of a lightning rod system is to prevent physical damage and to keep the protected structure from burning down, not to protect any equipment inside. Lightning would strike the lightning rod and be conveyed by the conductor system to ground, and the barn would not catch fire. Lightning rod systems are therefore covered by National Fire Protection Association standards.

However, now we have structures with lightning rod systems housing microprocessor-based equipment. Lightning still strikes the lightning rod is conveyed to ground, and the structure still does not burn down, but we cannot say much for what happens to the gear inside – none of the computers work after the strike. That is because, although lightning rod systems are relatively effective at conducting the discharge current and the associated heat away from and around the protected structure to ground, there are other types of damage from a lightning strike: secondary effect damage, damage caused by currents induced by the electromagnetic field effect, and damage caused by changes in ground potential across a site.

While the lightning rod prevents most physical damage, it cannot mitigate these other types of damages.

BEYOND THE LIGHTNING ROD

There are ways of circumventing these kinds of problems: Reduce the potential for any lightning strikes. However, the old Latin saying, "caveat emptor" – let the buyer beware, is very important when it comes to these kinds of approaches and products.

The most successful method of discharging this difference in Coulomb potential is to drain it off. There are three well know ways: (1) the blunt object, (2) the pointed object and (3) multiple fine points or electrodes that resemble a feather duster or chimney sweep brush. This latter approach is called the point radius approach.

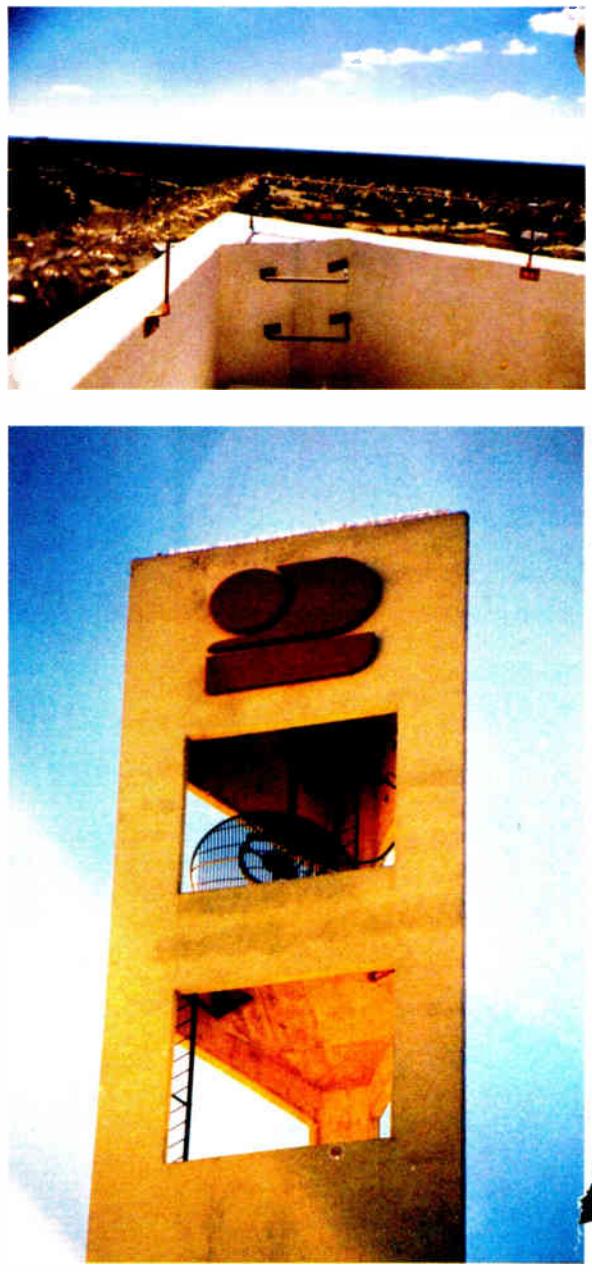
1. When the discharge takes place with the blunt object, it is normally quite violent due to the rather large buildup of Coulombs on the surface. This is not acceptable in and around a broadcast environment. It simply directs the lightning to strike a given point.

2. When the discharge takes place with the pointed object, such as a lightning rod, it is normally less violent than the blunt object. Not as many Coulombs can build up on the surface. This is still not usually acceptable in and around a broadcast environment.

3. When the discharge takes place with the multiple fine points (electrodes) resembling a feather duster or chimney sweep brush, a large number of Coulombs cannot built. The potential for an arc is abated while the electrons can steam on or off from a multiplicity of points in their effort to reach electrical equilibrium.

IMPLEMENTATION

Point radius is the property that makes these products work. Electric field intensity is an inverse square relationship to point radius (see white paper on structural lightning protection at www.lightningmaster.com) For example, LightningMaster uses a point size of .008".



Rooftop Installations

The only points which count are those which do useful work. Potential is a function of elevation. It is desired that all the small points break down into a corona around them. This is why the products should be designed so that all of the points, being arranged in a hemisphere, are essentially all at the same elevation and, hence, potential. They all break down into corona at the same time, and therefore, all work together.

Another consideration is point density. Because of inter-point interference, points will not be optimally effective if placed too close to other points. LightningMaster uses the hemisphere approach, which allows the points, being of the same polarity, to repel one another and space themselves optimally. Incidentally, inter-interference is more pronounced with larger radius electrodes.

We first encountered this method of lightning protection that we will be discussing here when we were

(Continued on Page 18)

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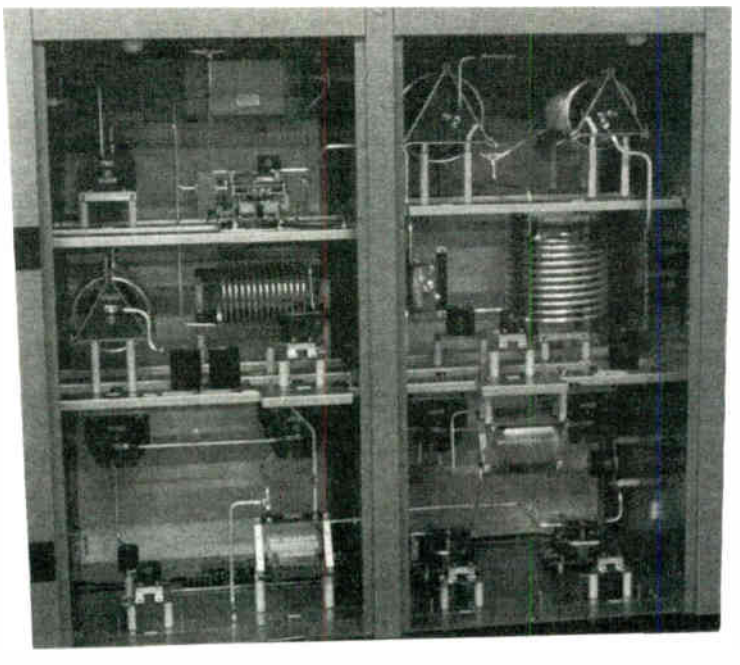

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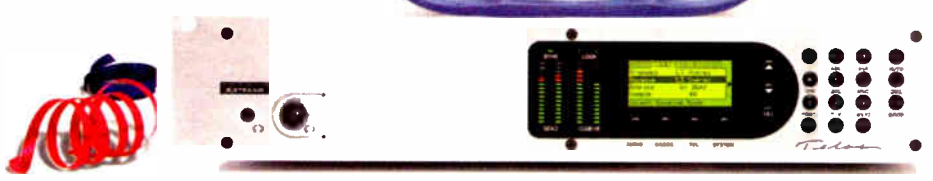

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"Xport's audio quality is outstanding. The *aacPlus* algorithm provides great fidelity... Every hit, the metal sticks hitting each other, conversations from the field, all were reproduced with great clarity over the POTS line."

Michael Black, GM, WEOS, Geneva, New York

"I was wary of using a compressed link, but the Zephyr Xstream's AAC algorithm is incredible. The on-air audio is the best we've ever had ."

James Turvaville, Chief Engineer, WAY-FM Media Group

"We were out in the mud [at the Bonnaroo Music Festival] and the phone line had been run over by a thousand cars. But the Zephyr Xport worked great!"

Jake Glanz, Engineer, Sirius Satellite Radio

"Zephyr Xstream is in a class of its own, the only codec really worth having for main broadcast ISDN."

Graham McHutchon, Senior Sound Supervisor, BBC News

but you get the present).

with ISDN in 1993, we had no idea that their offspring would grow
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More Than Just Lightning

Protecting Your Plant – Part 2

Continued From Page 14

doing the Taste of NAB Road Show last year while in Florida. Florida is quite possibly the lightning capitol of the world. We did see some rather strange appendages on cellular towers, street light-poles, etc, but we really did not give it a second thought.

It was not until we got to WJWB-TV, Jacksonville, FL that we saw the tops of nearly everything at their facility (buildings, towers, Doppler-radar, satellite dishes, etc.) gave rise to porcupines on metal steroids. When questioned, the Chief Engineer told us that he no longer had to put aside large parts of his budget to replace items damaged by lightning hits or near lightning hits.

Lightning Protection on Dishes

Lightning Protection on Dishes: A Closer Look

THE AIR TERMINAL

When LightningMaster, who invented the streamer-delaying air terminal, was issued a patent, manufacturers who wanted to copy these products had to come up with a design they could claim was the same without infringing on the patent. This accounts for the differences in appearance, but these other products are rip-offs and therefore perform differently. It is the difference in performance that is critical to the user. The LightningMaster products are UL Listed as air terminals under UL 96 for the purpose of lightning protection.

As we said earlier, "caveat emptor" – let the buyer beware. The bottle brush products are brushes, manufactured by a brush manufacturer for the purpose of being a brush. The companies offering the bottle brushes in a lightning protection application are marketing companies, not lightning protection component manufacturers. Whose product liability insurance covers these products in the lightning protection application? You might want to check.

LightningMaster uses UL 96A and NFPA 780 as its design standard and as such requires that all of its products be grounded. If these devices are not grounded, you have a very serious and dangerous situation on your hands. It should be noted that if a non-UL approved bottle brush assembly is attached to the top of a UL Listed air terminal; it may void the UL Listing on that air terminal.

In conclusion, lightning protection is not just a lightning rod or other similar device; it is a three-pronged approach: Bonding and Grounding, Transient Voltage Surge Suppression and Structural Lightning Protection. Look at lightning protection as a system whereby you can solve your equipment reliability problems by creating a safe environment in which it may function. Here is a checklist to consider:

1. Have a qualified company perform a survey and analyze your existing environment.
2. Get a written report of findings and recommendations.
3. Design a protection system that includes written specification.
4. Can the supplier manufacture and supply all required parts and equipment?
5. Can the chosen supplier provide a turnkey system installation or supervise the installation by others?
6. Can the chosen supplier provide continuing customer upgrade and warranty support?

Larry Bloomfield has been doing radio and TV long enough to become the Sagacious Pixel of the Order of the Iron Test Pattern. Check his web site at: www.tech-notes.tv. Larry can be reached at larry@tech-notes.tv

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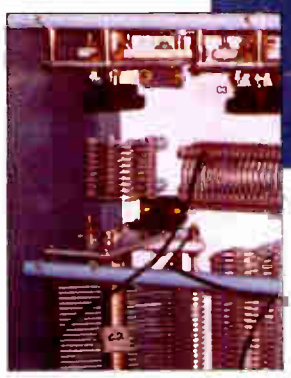

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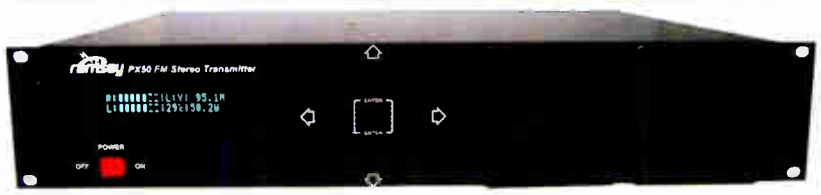

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Audio Processing From the Ground Up

Part 13 – How to Get the Sound You Want

by Cornelius Gould

[CLEVELAND, Ohio - February 2004] Engineers often find themselves at odds with the Program Director when it comes to choosing the sound of the radio station. However, to "pull off" the perfect sound for a particular format, both must sit down and together determine the station's goals.

START WITH THE BASICS

Success comes from a basic truth: The Engineer must understand where the Program Director is coming from, and the Program Director has to understand how processing adjustments can affect the audience (positive and negative). When each realizes that both parties have the station's best interest in mind, they can work together effectively, maximizing the sound from the station's processor, and creatively overcoming any limitations.

The best way to start is by getting a good handle on the format. Who listens? How do the listeners use the radio station? How does programming want the listeners to use the radio station? All are equally important, and will, to some degree, dictate how the audio processor is used.

Probably one of the biggest mistakes I hear comes from cluster operations that do not use the above criteria for setting the audio processing. Typically, the processing is cranked up and EQ'ed at one station, and that preset gets carried across to the other stations in the cluster, with only minor variations. That is a *big* mistake.

Keep in mind that the vast majority of radio listeners are not audiophiles, so the decisions you make may have a definite, although subconscious, effect on the listener. It is easy to observe. Just start by observing how the people you know react to radio.

PAYING ATTENTION

For example, starting as a kid I observed my mom occasionally reacting to the radio, and today I notice my wife's idle comments to the radio as we drive around. Most of the time, they would just say "Ugh. Enough of that radio noise," and either turn it off or put on a tape or CD. I latched onto the term "*noise*," and began to realize how many times I hear it used by people.

After hanging around me for a while now, my wife generally knows what I am talking about when I complain about specifics of bad processing that irritates me; now I find her readily pointing out exactly why she gets irritated with specific radio stations, using her own terms. Ruling out stations she just finds "just horrible" (programming wise) we are left with just two or three to which she is willing to listen. Even most of them get ruled out for long term listening because "It's too muddy," or "This station sounds like I'm listening to AM," etc.

Since she is now more aware than most people of the specifics behind what bugs her about radio stations and their on-air audio presentations, she has almost zero patience for poor audio. She will tolerate a station with poor programming more easily than one that sounds bad on air.

An example: One station in town plays most of our favorite music, but sounds pretty bad. She would not even listen to them until after the on-air sound was improved. Now she listens all the time; her only complaints now just involve certain programming decisions, but that does not bother her enough to punch away. She listens a lot nowadays. My mom has also started to notice specific things about the audio of certain stations that bother her. Her biggest pet peeve is "thumping bass." It irritates her as she drives around or does housework; if a station thumps too much, she switches it off.

I have picked these two people in my life because, after hanging around a crazy insane audio processing nut like me, enough of "me" rubbed off on them to enlighten them about why they cannot tolerate (or "get into") certain stations targeting their particular demographics.

Before I get too deep, I *will* acknowledge that not everyone tunes out for these reasons. A lot of people do not hear the "processing" – and others have different issues, such as repetition, commercial load, or their affinity for CD's, Sirius, or XM. Processing cannot do much for those people.

But, for most, audio processing and advertising via other mediums are major factors to help keep existing listeners or bring in more ears. And the next phase of this series is meant to help you put the audio processing pieces together to make decisions that will help your station audio "shine."

THE "SIGNATURE SOUND"

Going back to the supermarket aisle analogy in our last visit, the "radio product" is just one amongst many others competing for the eyes, ears, and hearts of people visiting to find entertainment to their liking.

Suppose the stations in your market are represented by product on the "toothpaste isle" in a store. If your company manufactures more than one kind of toothpaste (radio format) you would want each to stand out on its own to different demographics. Thus each product needs its own brand, logo, and marketing appropriate for the intended group. Tailoring the audio processing appropriately for each format enhances the individual marketing strategy for each of the properties. Sounds great, right? How do we get there?

We return to the first of our "basic" questions; the format of your radio station usually will dictate the type of processing you will do. *Know your audience.* This is important because we know wrong processing decisions make a radio station hard to listen to for long periods of time. Women listeners generally are very sensitive to audio distortion. Men generally like their radio to sound like it has "power" (gonads).

Fine tuning a radio station to sound unique on the air is called creating a "signature sound." Since today's audio processing features multiband compression, leveling and limiting, these processors can instantly re-equalize audio cuts on the fly. This means all audio sources can be made to sound consistent. You decide the degree (or type) of on-air consistency by adjusting the processing controls. Knowing how to use the controls on the processor to do this correctly is the main trick.

EXAMPLES

The Soft AC format is a good example. Soft AC is usually marketed to women, who tend to be very sensitive to midrange distortion. A poorly processed AC station will definitely become an irritant that could cause them to flip to another station – or even worse, just turn to some other medium.

Remember those times you heard someone in your family (or maybe even *you*) flip off the radio as a relief from "the radio noise" so they can concentrate on what they need to do at that moment? That is the first clue to the unconscious fatigue incorrect audio processing can cause.

The programming department of a Soft AC station typically wants potential radio listeners to use the station as the audio soundtrack to their daily lives whether at work, or running around doing daily errands. This also makes Soft AC stations prime candidates for use in offices as background music to keep things moving on without distractions to normal office functions. Long term listening is important here. Audio processing fatigue should be avoided at all costs.

Most rock formats are geared to men. Generally speaking, most male listeners like the radio to be "powerful sounding," so some tasteful loudness and solid bass goes a long way here. Since Rock n' Roll is all about raw power and creative use of what would normally be considered noise, quaint little things like subtle midrange distortion are not going to be noticed by most guys. Aggressive processing can be quite effective.

In fact, a little distortion makes rock music sound a bit louder, which actually works in favor of the format. And, depending on the exact flavor of rock, a fair amount of bass thumping can be most desirable.

BUILDING THE SOUND

With the space left in the article, let us get started with setting the amount of overall compression on the air. Nothing is more irritating to a listener than the need to continually re-adjust the volume of the radio when listening to their favorite station. Fortunately, the consistency of level across multiple programming elements is usually easily defined by the early stages in the audio processing system.

Typically, the first stage is some kind of wideband AGC. You will also notice that there is typically a meter indication of some kind that gives a representation of wideband (AGC) gain reduction.

This metering scale is typically shown in decibels (dB). The meter indication will change with program audio, indicating how much the audio processor is turning the audio *down* to maintain a constant level. The louder the program audio from the broadcast console, the more the audio processor will turn down its input level, and the more dBs the AGC meter will register.

Wideband AGC meter on an Optimod 8100.

To set this correctly, you need to reflect on the questions asked earlier in this article. Specifically, how the listeners will use your radio station in their daily activities. If a significant amount of time is spent listening in the car, or as background music in an office, then you will probably want more gain reduction. The idea here is as program audio levels drop, the processor will turn up its input levels, maintaining a constant level. This is important for people who listen with a lot of competing sounds – such as in an office, or in a car.

But wait ... there is more! There are a number of other controls affecting your overall sound!

ATTACK AND RELEASE

Attack is how fast the processor will turn down the program audio when things get too loud. Release is how quickly the processor will turn the program audio back up after the loud segment has passed. Picture a man with his hand on the pot. How fast should he respond to changes?

Setting the attack time too fast in this stage can "suck the life" out of percussive instruments. Setting it too slow can result in audio that sounds LOUD then slowly gets *quiet* – a real irritation to a listener. Setting the release time too fast will cause audible pumping, most noticeable in the midrange audio area (such as vocals piano, keyboard and/or guitars – or all of the above).

This is typically heard as the midrange audio getting LOUDER, then quieter, then LOUDER again to the beat of a bass percussion instrument. It is very fatiguing. Setting the release too slow causes the audio processor to take "forever" to recover (turn back up) from loud sounds. Start by setting both attack and release knobs midway, and adjust from there. Listen carefully to what happens to the midrange audio in reaction to bass notes in the program audio.

That is where we will wrap things up for now. Next time we will continue on the adjustments of the first stages of an audio processor, touching on gating functions. We will reveal some of the unique features used on popular audio processors, and how to use them effectively. Until then, happy tinkering!

Cornelius Gould has spent plenty of time playing with audio processors and enjoys sharing his knowledge. Corny is the technical adviser and weekend announcer for WAPS 91.3 FM, Akron Ohio. You can reach him at: cg@radiocleveland.com

Maintaining Reliable Power Systems

Planning Power for Your Station

by Dana Puopolo

With this article, we conclude Dana's series on power systems.

[SANTA MONICA, California - February 2004] In this last installment, we will consider a back up power for a major market consolidated studio. I had hoped to tour one currently being built in this area, but that was not possible, so our criteria will be based on several installations with which I have been involved over the years.

The build-out we will postulate is in a major market. The group involved is Congested Channels, LLC. They own the maximum compliment of radio stations, five FMs and three AMs. All five FM stations are music based; one of the AMs is talk, one is all news, and one programs adult standards music (big bands) and sports. Right now their studios are spread out all over Gotham City.

Management wants to consolidate all of these stations in one building in order to better use the economies of scale that a larger location offers. They have decided to lease two floors of the Batman building in beautiful downtown Burbank; the Gotham Business Development Authority got them a good deal on this prime office space. (They even had a cave available for parking the station vehicles.)

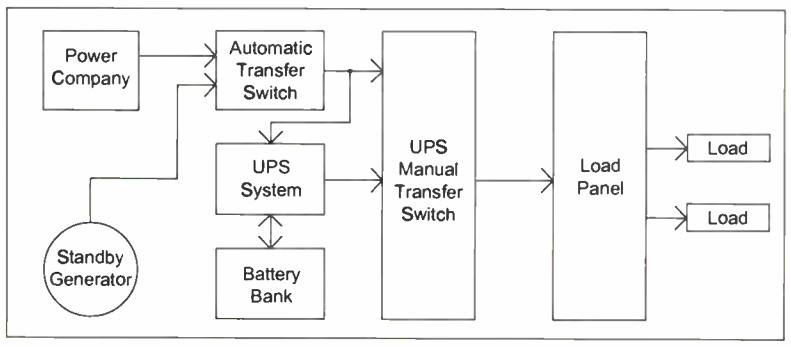
SCOPE OF CONSTRUCTION

Each radio station will have two studios – a main and a back-up that will normally be used to produce its commercials. Additionally, there will be a small broadcast booth for each station built off the main newsroom. This will be used for news and traffic and will be connected back to each station's studios by a two way CCTV connection and intercom. Finally, two stations have studios built for their morning show stars and there are also two creative studios, both loaded with the newest whiz bang production equipment.

To save on the construction costs, only the core broadcast area will have back-up power; the rest of the station will have emergency lighting only. (Some crucial computers will employ UPS units to allow their graceful shut down; these will not be addressed here.) This means that emergency power will be used to run all studios, the news area, computer and telephone area, and rack equipment area.

Since this market is a major revenue producer for Congested, they have decided to power all studios, the news area, and all broadcast equipment areas from on-line UPS systems normally connected to utility power, but also able to be switched onto generator power.

This way, they will be unaffected by any loss in power whatsoever. This area is vulnerable to tsunamis and the news station had heavy listenership during the last one 10 years ago. Indeed, their slogan is "The Tsunami station." (Note: Although not part of the studio complex, it is worth noting that each transmitter site is also backed up by diesel emergency generators.)



Stand-by power system using a generator and large-scale UPS.

INITIAL ASSUMPTIONS

To simplify matters, some initial assumptions were used. Why? Because in a project of this magnitude, you simply have to start somewhere. We will assume the power needs to be as follows: Each large studio will be supplied with four 20 amp power feeds. The smaller studios (news) with two, the news area itself with eight 20 amp circuits, the computer/phone area with ten, and the rack area with sixteen 20 amp circuits. All these areas will also be air conditioned; the A/C units will be able to run off generator power as well.

This makes the maximum current draw as follows:

20 large studios x 4 circuits per studio x 20 amps per circuit: 1600 amps

News area (includes small studios): 320 amps

Computer/phone: 200 amps

Rack area: 320 amps

Total: 2440 amperes

To put things in perspective this is enough power to run about 80 homes.

Converting this to watts (amps x 125), 305 kW (power to be supplied via UPS)

Add 20 percent for UPS losses: 60 kW

Air conditioning load: 250 kW

Total estimated load: 615 kW

As you can see, we have an initial estimated power consumption well over half a million watts. This is a huge amount of power; providing it would be very expensive. Therefore, when dealing with power draws this large, some tweaks have to be made to our initial assumptions.

FIGURING THE RIGHT SIZES

First, when factoring this draw, we assumed that each 20 amp circuit would be drawing maximum power (20 amps) all the time. This is likely not the case. The general rule of thumb is that the draw on the average circuit is below 50% of its rated amperage. However, to be conservative, we shall use 62% draw on each one (about 13 amperes).

This means that a more accurate UPS load will be 190 KW. Factor in an additional 20% and the realistic current draw on the generator will be 228 KW plus A/C load.

This represents a big difference because we can now use a 500 kW emergency generator. It turns out that generator prices tend to go up rapidly once we get over 500 kW capacity. (A 500 kW generator costs somewhere in the $125,000 price range including transfer panel.)

Most large A/C units operate on 480 volts, three phase, meaning that dry transformers will likely be needed to step down the voltage to the 240 volts normally used by UPS units. What makes the most sense both economically and service wise is to have 15 single phase 18 KVA UPS units, five for each phase leg. The units I have selected will power the equipment for about 90 minutes at full draw, more at reduced output. This way, if the generator fails there is time to get it quickly repaired before the stations go off the air.

These APC units cost approximately $8,500 each or a total of $127,500. Doing things this way is smart because you have the load spread out over many units, so the failure of one is not catastrophic. It is even possible to stagger the loads over the various stations so a single UPS failure will take down the main studio for one station while leaving its back up studio powered (by another UPS). It also makes sense to employ mirrored redundant audio servers each run off a different UPS unit to keep the hits playing at all times.

It is likely the generator either will be roof mounted and run on natural gas, or pad mounted and run on diesel. This station has decided to pad mount their unit in the building parking lot and employ a diesel genset because natural gas supplies have been interrupted in the past. The UPS units will usually be located on an electrical floor or in the basement. As I have said before, it is a good idea to plan for back up power when you are doing any kind of build-out, even if you do not plan to make the equipment investment now. It is much easier to run any kind of wire before the wall covering goes on than fishing wires through afterwards.

This is also why I highly recommend that anyone doing a build out run at least one fiber run to each location, and also at least two runs of the best quality networking cable available as well (Category 6 as of this writing). Anyone who has had to upgrade a location from 10 base T to 100 base T knows exactly what I mean.

COUNTING THE TAB

Let us now run the final cost-out on this system:

500 KW generator & transfer panel:	$125,000
Diesel tank:	$15,000
15 Online UPS @ $8500.00	$127,500
6 Dry transformers@ $800.00	$4,800
Installation, wiring, permitting (approx)	$25,000
Grand total:	**$340,500**

This works out to about 11 percent of the 3 million dollar project. This installation will insure that Congested's studios are 100% backed up power wise. Additionally, as the equipment is always being powered by online UPS units, surges, sags, brownouts, and all other power anomalies will not reach any equipment. This means the studio equipment will run cooler and require less maintenance.

SYSTEM MAINTENANCE

Speaking of maintenance, let us talk a bit about maintaining the power system we just built. While most every engineer realizes the generator must be tested and maintained, UPS units also need to be maintained and tested per their manufacturer's advice. Most online UPS units are tested regularly to cycle their batteries. This way they do not sulfate, and last longer. (This is one of the main failures of all UPS units.)

By regularly testing the UPSs on load until the batteries are substantially discharged, the batteries are allowed their proper charge/discharge cycle. The average UPS battery will last about 3-5 years if maintained properly. Battery replacement costs need to be considered in advance so surprises do not happen; a UPS that fails when needed serves no one well.

Besides being tested, run online, etc., the generator's engine needs regular professional maintenance. Fluids need to be replaced, batteries serviced and replaced, adjustments made. Again, a generator that fails when it is needed serves no one, yet we have all heard stories of just that happening, or worse, experienced it personally. Having these units regularly serviced per factory recommendations also protects the warranties on this expensive equipment.

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

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Radio War Stories

Earthquake!

by Bill Bordeaux

[SAN LUIS OPBISPO, California - February 2004] On Monday, December 22, 2003, I was taking prospective buyers on a tour of transmitter sites in the San Luis Obispo area. We had just arrived back in the downtown area of San Luis Obispo, and parked near an accountants' office where a member of the party needed to deliver some paperwork. After the stop-off we were to continue our tour to other transmitter sites in the area.

Sitting there with windows down, I was thumbing though an electronics catalog, enjoying the warmth of the mid-winter sun streaming though the windshield. And, then at 11:16 AM my truck began to rock rather briskly from side to side. I looked behind the truck expecting to find someone playing a joke on me, standing on the corner of the rear bumper and jumping up and down. I was bewildered to find no one there, yet my truck continued to rock and shake. Several seconds elapsed before I realized that terra firma was shaking!

A REAL EARTHQUAKE

About that time I began to hear screams from an apartment building across the street from where I was parked. Large plate glass windows in the apartments began to buckle and make that peculiar glass banging sound, as if someone were attempting to wake someone within the apartment by banging on the glass with their fists. Holding firmly to the driver's seat of the truck as it continued to rock and sway, I looked ahead and down the street. Streetlights, poles, and traffic lights were swaying back and forth. The street seemed to undulate like a person lying in bed trying to find a more comfortable spot.

My mouth went dry and I could feel my heart rate starting to pick up as the "fight or flight" instinct began to crank in. As the swaying motion in the truck changed to more of a hopping up and down feel, I began to wonder when it would stop and how much worse it would get. For an instant, I could imagine the earth cracking open and swallowing up the town, not unlike the "B" movies I enjoyed as a teen.

After about 20 seconds the rocking subsided and as quickly as it started, it was over. For several minutes there was complete quiet, as if the community was collectively catching its breath. The normal city noises of busses, and cars had ceased. Even the chirping of the birds in the trees lining the street had stopped. A small finch had perched itself on the top of the parking meter on the sidewalk next to my truck and stared directly at me, as if I had something to do with the strange event.

CHECKING ON THINGS

Like most folks, my first thought was of my children, and their safety. Realizing that in moments the cell phone system was going to be crippled by thousands of calls like I was about to make, I immediately called my wife. Shame on me! After learning all was well with my family, I tuned in all of the local radio stations, and much to my surprise found all were on the air. Of course, everyone was playing either satellite music, news or voice tracked local programming. Not a word yet about the quake.

Slowly, live announcers found their way to studios and began to broadcast news of the quake. Within five or ten minutes of the quake, our local AM news outlet had someone from the USGS on the phone giving the location as San Simone, and size of the quake as 6.5. It was really quite amazing to get such accurate information so quickly.

Shortly after the interview with USGS, the station began to field calls from listeners around the county. Slowly a pattern emerged of damage and power outages that followed the quake. It was apparent the northern portion of San Luis Obispo County had suffered the most damage, and power outages were widespread in that area. Southward, a large population in the Santa Maria area of northern Santa Barbara County also had wide spread power outages. In the middle, the city of San Luis Obispo had escaped relatively unharmed and with power on in most areas.

ASSESSING PROBLEMS

The AM news outlet in Paso Robles, CA, KPRL, was off the air, but a call to the transmitter site quickly got it back up. The generator had started and was working fine, but for some reason the transmitter had not turned itself back on. A remote control command solved that, and within 15 minutes of the quake, KPRL was back on the air providing information and comfort to the population in the hardest hit areas. Their studios and transmitter site remained on with emergency power for about six hours. The studios were lightly damaged, with just a few computer monitors falling to the floor and ceiling tiles and light fixtures fallen. The traditional phone system remained functioning through it all with the cell system all but useless for the first three or four hours following the quake.

I discovered that while the enormous volume of calls crippled the cellular service, the text messaging on my pager worked fine. Through this, I was able to communicate with my fellow engineers in the area and made sure that all trouble spots were being covered. I then headed the 30 miles north to the Paso Robles area to stop in at KPRL and see if they needed any help. I was pleasantly surprised to find that they were running very well, and with the exception of a strange list in the floor of the sales office, the 1940's art deco studios had survived well.

Several other clients in the Paso Robles area were not faring so well. KLUN, a Spanish language FM station located on a hilltop about five miles west of Paso Robles was off the air and there was a rumor the "Acorn Building" had collapsed in downtown Paso Robles. Sadly, the report was true. The front wall of the building gave way. The roof then slid off the walls pulling the roof from an adjoining building with it, killing two.

The building was a part of a city block of historic buildings surrounding a park in the center of the downtown area. We spent the past summer building a new studio facility for Maverick Media (a local agency and national syndicator) on the second floor of the building attached to the Acorn Building. If the Acorn Building had collapsed, I could not imagine what had happened to the beautiful new studios in that historic structure; and what of the people inside at the time?

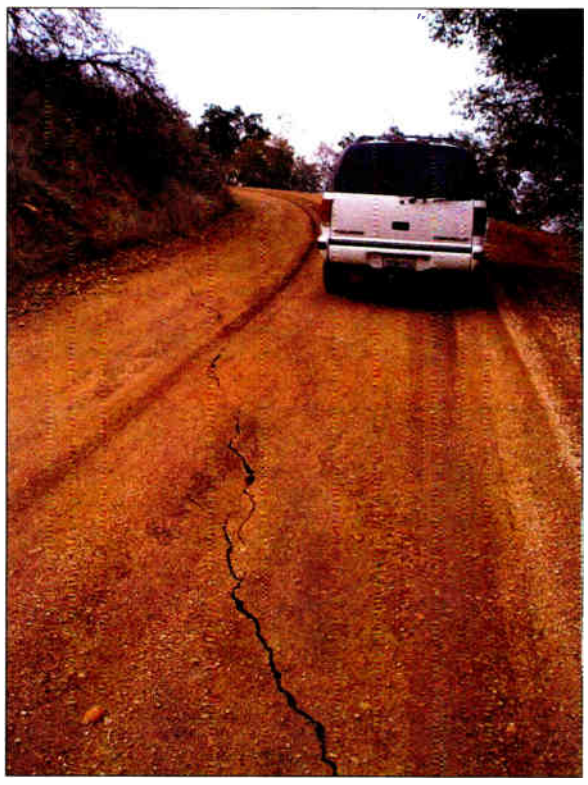
The "Acorn Building" Paso Robles, CA where two persons died during the quake.

The local police had blocked off the downtown area and there was no way anyone could get in unless you were driving something with lights and sirens. Amazingly, the San Luis Obispo NBC affiliate, KSBY-TV had a camera crew on the scene within the hour and were doing live microwave shots back to their relay on Cuesta Peak some 30 miles away. The news crew beat many of the emergency personnel to the scene.

When the roof slid off there was nothing left to keep the walls of the adjoining building apart. The result was they collapsed into themselves.

ON UP THE HILL

I proceeded up the winding road to the KLUN transmitter site, pausing when I discovered a large crack running through the road about midway up the mountain. Before driving over it I got out and walked along as much of it as I could see to be sure that it did not present a safety issue for travel up the road. The crack ran across the road and then up the hill beyond. The rest of the hill seemed intact, and it appeared that it did not present a significant risk to cross.



Crack on the road to the KLUN transmitter site, Paso Robles, CA, caused by a 6.5 quake. This photo taken about 1 Hr after quake on 12/22/03.

Upon arrival at the transmitter site I was surprised to hear a fan running inside the building. When I entered the building the lights would not come on, so I went back outside and got my flashlight. I checked all the circuit breakers and found that they were OK but there were still no lights in the building.

Several fans were running but the main FM transmitter was completely off. Measuring the voltage coming into the main electrical panel confirmed my suspicions: Two of the three phases were working, but the third one only had 15 VAC on it.

I called the power company and they assured me a crew was on the way. They really did have a crew on the way, but there were so many outages it took almost 36 hours for power to be restored. The site had no back up power so it was off the air the entire time.

The equipment in the building suffered little damage. In fact once power was restored the 25-year-old transmitter came back up to full power with no problem. The most unusual thing at the site was the equipment that had fallen out of the equipment rack. The old steel rack had rocked back and forth and it appears more than a few rack screws were sheared off; the equipment then hung from the remaining screws in the rack.

(Continued on Page 25)

War Stories

Continued From Page 24

This transmitter location was about 10 miles from the epicenter of the 6.5 San Simon quake.

Lots of items such as the fire extinguishers and the coax pressurization pump had been knocked off the wall. A shelf full of old station logs also fell, sending hundreds of old logs across the transmitter room floor.

GETTING THE WORD OUT

All of the stations that had power remained on the air through the earthquake. The few that lost power and had generators also stayed on. Those stations unlucky enough (or who failed to plan) to lose power and had no generators were off for eight hours or more.

The local stations did a wonderful job of providing a place for the community to come together and hear a friendly or familiar voice. It was radio doing what it does so well: connecting people through the immediacy of the medium. Most stations aired phoned-in reports from local emergency officials telling what areas of the county were hard hit, and what types of work was being done to inspect buildings, roadways and bridges to insure the public's safety.

The bulk of the programming time was spent just putting callers on the air to relate their stories to other listeners. It was like the entire county was sitting around on the porch of the General Store swapping stories.

For almost twelve hours after the quake, the Paso Robles station, KPRL kept the microphones open, the phone calls coming and interviewed a parade of people that came through the studios. There were many offers of help for people that might need it: help with elderly, shut-ins or help finding boarding for displaced pets and livestock.

Up and down the Central Coast, other stations too kicked into high gear and spent many hours giving a personal connection and reassurance to worried and sometimes frightened residents.

EAS CONCERNS

An earthquake is a strange occurrence in many ways. It is very much unlike other natural disasters in that there is absolutely no warning that it is going to happen. You may have suspicions that conditions are ripe for a tornado, or see a hurricane coming from several hundred miles away, or maybe all that rain we are having could cause a flood or two. But an earthquake is always a surprise.

Rack equipment that had fallen out when rack screws sheared during the quake.

Because of this there is no chance to warn people in advance. Our local Office of Emergency Services (OES) considers an earthquake to be a "self reporting event," and rightly so. The local EAS system was not activated in the aftermath of the earthquake. Fortunately, there was no event resulting from the earthquake that required action by the public. There has been quite uproar from some in the local broadcast community over the "failure" of the EAS. As the Chairperson for the Local Area Emergency Communications Committee (LAECC), I have found this to be a good opportunity to clarify the purpose of EAS in our community.

If the earthquake had caused a passing train to derail and leak chlorine gas, a dam to fail, or our local nuclear power plant to split open, the story would be much different. The OES is standing by 24/7 with their finger on the button(s), ready to trigger all those EAS interrupt boxes and send out warnings to the masses. In our county (because of the nuclear power plant) the local OES has an EAS encoder/decoder and a private radio link to all of the local broadcast stations. They are our main point of entry for local EAS matters.

As you can imagine, there were PR guys from the nuclear power plant reporting in to the local media many times an hour to assure local residents that the plant was continuing to operate normally. There was great concern about gas leaks (there were a few), bridges out (none) damaged roadways (one), unsafe drinking water (none) and aftershocks (there were lots).

LESSONS LEARNED

Some important lessons were demonstrated that day. Stations need to have a communications plan in place that does not include the cell phone or telephone system. It is also important to meet with station personnel and pre-plan emergency response. Decide who will take care of what functions: who is going to the transmitter sites, and who is going to the studios? A clear plan ahead of time will reduce worries and allow everyone to concentrate on their job, rather than wondering "where is everyone?"

Radio and TV stations with back up power generators will be on the air. Stations with no back up power will be silent.

And, oh yes: Be very sure to keep a full tank of gas and some cash on hand. Nothing works quite like cash during an emergency!

Bill Bordeaux, CBRE, is a contract engineer based in San Luis Obispo, California. He can be reached at email address: bill@stationengineer.com

Equipment Reports From Radio Guide Readers

Field Report

The Comrex Matrix

A Report by Michael Halleck

[St. Paul, Minnesota - February 2004] The holiday season in Minnesota marks the start of the Christmas shopping season and our "Stuff the Bus" promotion. This is a promotion/charitable event KSTP-FM has sponsored for the past seven years. The objective is to stuff a large charter bus with donated Christmas toys and in turn donate them to the Salvation Army. Oh – and did I mention the programming people wanted to carry live cut-ins from each event, along with a PA playing the station signal in the parking lot next to the bus?

SITE TO STUDIO CHALLENGE

The first "Stuff the Bus" events were Marti'ed back to the station. The vagaries of a Marti signal being what they are, as well as the encroaching RF congestion, made the use of the Marti very unreliable at best. The mix products of course adhered to one of Murphy's laws and were the most prevalent when we most needed the frequencies.

Imagine explaining to your program director the occasional mix product (never were there enough recognizable words to pinpoint the culprit, and never a call sign) was a random occurrence and yes, we know it is there and no, we do not know how to prevent it because it is on all of our Marti frequencies (there is a cavity on the receiver) and yes, it occurs at random intervals. Needless to say, we needed a different way to do things.

An ISDN or POTS line remote was out of the question due to the costs of seven different lines and the fact that in some cases the bus was far out in the parking lot, presenting a new set of problems. Doing the cut-ins via cell phone was only considered as an emergency measure – the quality was just not good enough for us. Therefore it was with great interest that we watched the development of the Comrex Matrix with a GSM module.

THE COMREX MATRIX

Several weeks prior to the remotes we arranged with our good friend Dave Kerstin of Broadcaster's General Store for a trial of the Comrex Matrix and an accompanying Blue Box for the studio end. GSM (originally Group Speciale Mobile, the original standards body, but later known as Global System for Mobile communications) is a cellular communications system in the 1900 MHz band (the standard is PCS 1900, as accepted by ANSI) in the States. The original idea, developed in Europe in 1991, was to allow customers to travel freely among markets, and still be able to use their phones. This "second generation" of cellular technology is just now gaining popularity in the USA.

In order to get GSM service, we contacted a GSM cellular provider in our area, T-Mobile. We requested GSM service with CSD (circuit switched data, a temporary circuit of a constant bandwidth). As you may expect with new technology, it took a few explanations of our objectives and the equipment we were using. ("It's not a telephone, it just holds your Smart Card, and I'm using one codec to call another.")

TELCO FOLLIES

In fact, I really doubt the myriad of people with whom I spoke ever understood exactly what we were doing. They had a hard time understanding all I wanted was SIM (Subscriber Identity Module) to plug into the Matrix GSM module.

After speaking to what seemed to be several hundred people ("Please hold, your call is important to us ..." – If it was so important why was I holding? – And, "This call may be recorded for training or quality control purposes."), I asked for, and was quite happy with myself for getting, what seemed to be a very reasonable unlimited data rate. That is ... until the bill came.

I was under the impression that our connections were data only, hence the data rate pricing. It turned out the connections were considered by T-Mobile as calls, just like voice. In order to get a data rate, T-Mobile explained, the connections needed to be made via the internet through an ISP, a system Comrex does not support. A word to the wise, find a service plan with as many minutes you can afford. Charges add up at twenty cents a minute, for a long remote, it can be quite spendy!

In the defense of T-Mobile, once I got to the proper person (believe it or not a technician in the switched data department), and because of the misunderstanding on both sides, a reasonable billing compromise was reached in spite of my stupidity. If you are just going to demo the unit and do not plan on purchasing, or you would like to demo the unit and buy it, but it takes a while for the PO to wind its way through your corporate financial bureaucracy, be aware most providers will give you a thirty day trial. After that, you are on the hook for a the term of the agreement, whether you use it or not and to drop the service early will cost you a "nuisance" fee.

We received the unit, along with the Blue Box unit for the studio end, installed the SIM card (a very simple process, it plugs into a slot on the back of the phone module) and immediately went to each location to check the systems operation. At each location, we had signal strength of at least the minimum 20. (The Matrix display will show you signal strength and at least a twenty is required, although lower numbers will allow a connection, but reliability will be suspect.) With those results, we decided to put the matrix to the test, at a real remote.

TESTING THE PRODUCT

The first remote was on a typical Minnesota winter's day, cold and dreary. The 65-foot bus arrived on schedule and we proceeded to set everything up. We were concerned with the noise of the small Honda generator, but the noise of the idling bus (heat for the talent – remember it is a Minnesota Winter) masked just about everything except the powered Mackie PA speakers.

The generator ably ran the pair of Mackie's, a tuner, a small headphone amp and the Matrix. By the way, the Matrix can be powered by a 12 volt cigarette lighter, but in these health conscious days, try finding one in charter bus.

All the necessary cables were run out of the bus via a small window to the Mackie's and an extension cord to the generator. Seeking to get the best RF reception for the Matrix, I stood up on a step ladder to place the magnetic mount Matrix antenna on the top of the bus, only to watch it slide right off and dangle along side the bus. Idiot! The bus body was aluminum! The transmit antenna ended up on top of a plastic Mackie about eight feet in the air outside the bus, not much of a ground plane but this is a remote!

CONNECTING TO THE STUDIO

Now the acid test: connecting to the station. From a cold start the matrix takes a couple minutes to come up, find the GSM circuit and make a connection. This is not the fault of the Comrex box, but more the cellular network. Suffice to say, the Matrix connected with the Blue Box and because the system is full duplex, we were talking to the on air person, just like any other remote. (The Blue Box has to have the GSM algorithm to talk to the GSM module equipped matrix. If yours does not, Comrex will update it for you.) We plugged two stick mics into the Matrix, ran the headphone output to a small headphone amp, and the on-site talent was happy – they were on the air.

The audio quality is what many of you familiar with a Vector would expect. The GSM connect rate, which is limited by the provider, is only 9600 baud, so the audio is similar to a Vector at 9600. There were a few artifacts; we noticed female voices seemed less affected than male. One solution for this was the use of a music bed under the remote feed, which helped mask the undesired artifacts to a degree.

Looking back at our experience in testing the Matrix, we would definitely use the GSM Matrix for cut-ins and limited remotes on FM, and would have no problem on our AM. We hope the 14.4 data rate will be supported soon, which hopefully will extend the frequency response. At any rate, if cellular service is available where phone lines are not, I would highly recommend the Comrex Matrix.

Michael Halleck is the Chief Engineer at KSTP-FM (KS95) in Minneapolis, MN. His email address is: Mhalleck@hbi.com

EAS Q&A

Answers to Your EAS Questions

by Clay Freinwald with Barry Mishkind

[SEATTLE, Washington - February 2004] As more and more stations consolidate and automate larger parts of the broadcast day, even the LP stations find themselves without warm bodies at times. This month we start our discussion with how to handle some EAS issues at automated stations.

Barry - Kirk Chestnut, of Entercom in Kansas City, wrote in with a question on automated stations. One of his stations just automated the overnight shifts. However, the station is the LP-1, and usually *originates* the RMTs. Do you have any suggestions for him? Traps? Tricks?

Clay - Let us approach this from a couple of directions. First, consider the purpose of EAS testing, especially the RMT: to test the entire system from the *source* of a typical EAS message. It is unlikely any broadcast station will be the actual source of public warning messages; normally, these come from some government entity such as Emergency Management, NWS etc. That is why RMTs should come from these same governmental entities where the *real EAS* warnings originate, and not from a location "between" that source and the public.

When you stop and consider it, this often is a major problem with EAS plans – having critical roles handled by broadcast stations that can abruptly change format at the drop of a Program Director, or GM. The broadcast station's role with EAS should be to communicate to the public – *period*.

So, my advice is to revamp your area's EAS system. By arranging the RMT to be generated by a governmental entity, your station's equipment would simply automatically pass on the RMT, regardless of whether it is manned or automated.

On the other hand, perhaps re-doing your EAS Plan is not an option. Depending on the EAS Box you have in service, you may be able to externally trigger the unit to transmit an RMT. However, the problem is going to come with the transmission of the voice portion of the message. Pre-recording an RMT message into the box would not work because the EAS boxes permit only one recording, and should another event come along, it would bump the RMT out. I suggest you contact the maker of your EAS Box to see if they have an alternative. Good luck, and let us know what solutions develop.

Barry - Nels Wilson (KBGN) received a repeat of an RMT from just a few days earlier. The repeat test was automatically re-transmitted right in the middle of a paid 26 minute program. Nels feels the present arbitrary system produces lousy radio, makes explicit compliance difficult for daytime stations, and is not necessary to maintain and prove a viable emergency system. He says, "The system should be our friend, not our enemy!"

Clay - Nels has good reason to be unhappy. There should be only *one* RMT reception per month. And EAS should not be our enemy. My rather stock and often repeated challenge applies here: Get involved with your LECC and SECC. Perhaps calling them can help determine what happened and what is being done to avoid a repeat. Then again, perhaps the double test was on purpose, and they know why. For the most part EAS is not "*their*" system but rather "*ours*." It is as good as we work to make it, or as bad as we allow it to be.

As for the matter of automatic re-transmission, the new Rules require the RMT be re-broadcast (forwarded) within "one-hour." You might want to check to see how your EAS Box is programmed. You did not state whether or not your station is automated, but either way, the RMT could have run *after* the paid program. The timing of the forwarding is up to you and is not the fault of those who sent it.

AMBER QUESTIONS

Barry - Craig Albright (WBCL) reports that, in his state, laws protect stations from civil liability if they relay incorrect AMBER Alert information, so long as the message is relayed verbatim as received from the state police. (If the police make a mistake, the station cannot be sued.) However they have two licenses in Ohio, where there is no such protective law. This makes them reluctant to carry AMBER messages there. Any suggestions?

Clay - State laws do vary on this issue. Legal exposure is something to be treated with great respect. This underscores my contention that broadcast stations *should not* be generating or originating EAS messages. A simple mistake could create what lawyers call "exposure" to unwanted legal action. I would suggest you contact your State Association of Broadcasters and/or legal department for their advice.

At the same time, my personal feeling is a broadcaster needs to look at what is called "the greater good." Is not saving the life of a child worth the exposure? I would continue to participate with the AMBER program while you obtain answers to the legal questions, but let the government entities deal with this issue by having *them* generate the messages while broadcasters stick to passing it on.

Barry - In using AMBER, should alerts go across state lines to prevent an abductor from heading to a state line to outrun an AMBER Alert?

Clay - AMBER is maturing. In most states the state police are involved with AMBER. These state agencies have the ability to track bad-guys across state lines; they do this all the time. Typically these agencies figure an abductor can travel about 60 miles from the site of an abduction. When a 60 mile circle around the site crosses a state line, they notify the state police in the next state so they can, if they choose, initiate an AMBER Alert for that area.

Barry - We keep hearing concerns that AMBER is going to be overused and thus become less useful, sort like the kid that cried wolf?

Clay - Yes, this is a concern. This is why the folks behind AMBER, working with law enforcement are coming up with guidelines to keep the bar high enough so AMBER will be useful, and yet will not get over-used and become less effective. Still, remember that AMBER is a tool of law enforcement. It is not a "broadcast thing."

WHOM TO MONITOR?

Barry - What do you suggest for stations that have been told to monitor AM stations they cannot reliably hear?

Clay - A place to start is to employ a Field Intensity Meter (FIM) at the receiving location. A FIM has great sensitivity as well as a directional antenna. This process will determine whether or not reception is possible. You even could use a FIM for a monitor receiver, however that is a bit expensive.

Often a better radio, one with better sensitivity or selectivity is the ticket. A good place to start is a car radio. A good AM car radio with a 12 volt supply is likely to function much better than the receivers supplied with typical EAS equipment (and at less cost). Another choice is consumer grade high performance AM radios. Check with CC Crain (www.ccrane.com), they have some products designed for tough AM reception conditions. Another unit is the GE Super Radio.

Be careful about the antenna, though. If the radio requires a high-impedance antenna, a long run of low impedance coax to a roof top antenna might not work well. Also, a directional antenna may really help (due to its ability to null out an interfering station). Consider a loop antenna; they can be purchased from broadcast equipment vendors. If the price is a bit steep, consider making your own – check the ARRL Antenna Handbook.

If these steps do not resolve the problem, contact the SECC and request a change in monitoring assignment. Unless it is a 50 kW power house, AM stations often reduce power or use a different antenna pattern at night severely compromising the ability to be heard by others downstream. Unless there is something unique about that AM station, such as being a PEP, for example, you might be able to monitor an FM with a more reliable signal at your location.

It may be those that "assigned" you these stations do not fully understand the dynamics. So, do a little research and in talking to the SECC, pass on some alternatives for their consideration. Nevertheless, *do not* start monitoring another station without going through your SECC. Usually, the FCC has a copy of the monitoring assignments, and in an inspection may want to see that you are in compliance.

EAS AND HAMS

Barry - How much involvement by Ham Radio is there in EAS? Is it permitted?

Clay - Like most things with EAS, Ham Radio involvement is spotty, although Amateur Radio has a long history of assistance with emergencies of all types.

Here in Washington State we have a permanent Amateur Radio representative on our SECC, representing ARES and RACES. Our State Plan does not set out specific responsibilities for the Hams, however we encourage them to participate and "jump in" when they feel they could be of help. I encourage the helping of local areas with their EAS Plans communications needs, especially in small communities with very limited resources.

A number of Amateur Repeater Systems have installed NWR receivers and equipment that enables them to also "broadcast" public warnings. As NWR more fully becomes an "all hazards" warning system, these amateur repeaters will become more useful. The goal of EAS should be to utilize every communications system possible in alerting the public, not limiting itself to AM, FM, TV, Cable and NWR.

Perhaps this is a good opportunity to note how Amateur Radio and NWS have been working together in the Sky-Warn system for many years. I feel Ham participation in EAS is a natural progression of this. A noted leader in EAS matters wrote – " I find it interesting (rather – disturbing) that a group of communications specialists who have arguably more transmitters and dedication to public service that broadcasters were completely ignored/left out"

LOOKING AHEAD

Barry - I understand some work is being done on a more advanced system than EAS. What is this, and where can we get more information?

Clay - One of the exciting concepts being developed is what is called the CAP or Common Alerting Protocol. This is an effort to coordinate our public warning systems in such a way that the "control panel" has fewer knobs and switches, and where equipment all works together. I know sounds a bit far fetched in this world, but it is worth a look.

Here are some Web-Sites to get you started (Thanks to Richard Rudman):

http://incident.com/cap/docs/aps/dvanced_EAS_Concept.pdf
and
http://www.incident.com/cap/interop/

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

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Letters From Our Readers

Mr. Don Kimberlin:

Thanks for a great story about the Ft. Lauderdale AT&T office on the day President Kennedy was assassinated. [**Radio Guide November – 2003**] As I grew up in the 60's, and am now clinging to what's left of a broadcasting career, I really enjoy reading historical articles such as yours.

A suggestion for a future article: Several years ago, when I was the chairman of our local SBE chapter, we took a field trip to the Voice of America facility outside of Greenville, NC. It was just a fabulous step back in time. They ran a pair of old 500 kW Continental transmitters in parallel for the Radio Marti signal.

The consoles for this and another feed were from the late 30's/early 40's! The story goes that they were originally built for shipment to Germany but when Poland was invaded, the shipment was embargoed by the US. Years later, when the US was trying to get Radio Free Europe on the air quickly, someone remembered the two consoles that were in storage and they were pressed into service.

At one time, the Greenville facility could put a radio signal anywhere on the face of the earth. The facility used to consist of three sites but one has been abandoned and another has been automated from the main site. I just happened to have a copy of a 1963 Broadcast Engineering with a photo of their main antenna farm on the cover. I was thrilled to be able to stand in their observation tower 35 years later, and still see the same antenna farm.

Charlie Farr – Virginia Beach, VA

Dear Editor:

We all love **Radio Guide** here at KOHL! It seems that every issue contains valuable information that we use at the station. Again, thank you for a great publication!

Robert Dochterman – Director of Operations
KOHL Radio - Ohlone College, Fremont, CA

Dear Editor:

Just received my latest issue of the **Radio Guide**. After looking over some earlier issues, I want to let you know you're doing a great job. It's great reading and well put together. From the looks of the ad pages, it appears you're attracting a good list of clients.

I like the variety of articles you have, and if there is anything I can write for you concerning management/engineering, do let me know.

Keep up the good work. You've got a great start!

Lowell Homburger
Abernat, Roxben, & Boggs
Broadcasting Division, Charlotte, NC

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$25.00 Reward

For bonafide tech-tips added to the ***Radio Guide*** publication.

Radio Guide Ads: Feb-2004

Advertiser - Page	Website
AM Ground Systems - 23	www.amgroundsystems.com
Armstrong Transmitters - 21	www.armstrongtx.com
Audemat-Aztec - 23	www.audemat-aztec.com
Balsys - 23	www.balsys.com
BEXT - 13	www.bext.com
Broadcast Connection - 13	www.broadcastconnection.com
Broadcast Devices - 15	www.broadcast-devices.com
Broadcast Software Intl. - 3	www.bsiusa.com
Broadcast Tools - 21	www.broadcasttools.com
Broadcast Warehouse - 13	www.broadcastwarehouse.com
Conex Electro Systems - 11	www.conex-electro.com
Comrex - 12	www.comrex.com
D&H Antennas - 9	www.dhsatellite.com
Decade Transmitters - 23	www.decade.ca
Econco Tubes - 9 & 28	www.econco.com
Electronic Mfg., CKE- 15	www.rectifiers.com
Energy Onix - 2	www.energy-onix.com
ERI - 5	www.eriinc.com
Harris - 32	www.broadcast.harris.com
Henry Engineering - 2	www.henryeng.com
Inovonics - 5	www.inovon.com
JK Audio - 7	www.jkaudio.com
Kahn Communications - 21	none
Lightner Electronics - 7	www.lightnerelectronics.com
Lightning Master - 18	www.lightningmaster.com
Micro Communications - 19	www.mcibroadcast.com
Moseley - 7	www.moseleysb.com
NAB - 31	www.nab.org/conventions
Not Ltd. - 19	www.nottltd.com
OMB America - 21	www.omb.com
Orban - 32	www.orban.com
Peter Dahl - 9	www.pwdahl.com
Phasetek - 15	www.phasetekinc.com
Ramsey - 19	www.ramseyelectronics.com
RF Specialties - 11	www.rfspec.com
SCMS Inc. - 25	www.scmsinc.com
Sine Systems - 19	www.sinesystems.com
Telos - 16/17	www.telos-systems.com
TFT - 9	www.tftinc.com
Tieline - 5	www.tieline.com
Transcom - 11	www.fmamtv.com

Date Book

Radio Conference Guide

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

Great Lakes Broadcast Conf. – March 7-9
Lansing, Michigan
www.michmab.com/conferences/glbcmain.html

IBS College Radio Conf. – Mar 12-14 – New York
www.ibsradio.org

Collegiate Broadcasters – Mar 18-20 – New York
www.collegebroadcasters.org/convention.shtml

Oklahoma Association of Broadcasters (OAB)
April 2-3 – Oklahoma City, OK
www.oabok.org

Black College Radio – April 16-17 – Atlanta, GA
www.blackcollegeradio.com

NAB Spring 2004 – April 17-22 – Las Vegas, NV
www.nab.org

Hamvention® 2004 – May 14-16 – Dayton, Ohio
www.hamvention.org

NAB Radio Show – October 6-8 – San Deigo, CA
www.nab.org

WAMC, Albany Chief Engineer Looses Three Members of Family in Fire

Jim Scholefield, CE at WAMC in Albany, NY, lost his home and three members of his family in a fire Sunday night, January 25th.

James Scholefield and Korrena Salerno, and their two children were inside at the time with Salerno's mother and younger sister. The couple's daughter, Salerno's mother and younger sister were killed.

Scholefield has been in broadcasting for over thirty years, having started as an intern at WKIP back around 1970.

A fund to assist the family has been established at HSBC Bank. For information, visit the Web site **www.wamc.org**, or make donations by sending them directly to: The Scholefield Family Relief Fund, Care of HSBC Bank, 899 Western Avenue, Albany, NY 12203

Industry Updates

RF Power Exchange Aquires West Highland Semiconductor

RF Power Exchange announces the acquisition of West Highland Semiconductor of Argyll, United Kingdom. West Highland Semiconductor is the largest distributor of Acrian RF Power Semiconductors in the world.

RF Power Exchange, in addition to its large inventory, has a vast cross-reference of all the major manufacturers' part numbers.

RF Power Exchange is an international distributor of RF Power components that address the broadcast, industrial and military markets. With over 28 years of RF experience, the company adds value with its engineering background and cross-reference database. Website: **www.rfpowerx.com**

Telos/Omnia Software Updates

The start of the new year is a good time to make sure your Telos and Omnia software is up to date. If you haven't checked lately, there's an easy way to find out if your software is current. Go to:

www.telos-systems.com/support/software.htm

for a complete list of Telos and Omnia products and their most current software versions.

Orban Road Show Dates

Orban/CRL has announced the dates and cities for the Orban/CRL Mobile Broadcast Laboratory (MBL) USA Tour's 2004 first quarter visits.

Broadcasters will have the opportunity to obtain demonstrations of Orban and CRL broadcast equipment in their home town as the Orban/CRL Mobile Broadcast Laboratory goes from city to city throughout 2004.

The MBL unit is a fully-equipped 33-foot mobile vehicle that has been converted to permit testing and demonstrations of Orban and CRL products, and to do comparisons with other products.

Spring 2004 tour dates, include:

February 16-18 Houston – February 20-23 New Orleans
February 25-27 Tallahassee – March 8-10 Tampa
March 12-15 Miami – March 17-19 Orlando

For more information, contact David Rusch at 602-438-0888 or by e-mail at drusch@orban.com. More information at the following websites: **www.crlsystems.com** and **www.orban.com**

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