Radio Guide

Radio Technology for Engineers and Managers

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November 2004

Volume 12 Issue 11

Protecting Key Assets – Transmitter Site Security

Securing the Remote Transmitter Site

Page 4 – In recent months, there have been quite a few reports of break-ins at transmitter sites, with theft and vandalism causing a variety of major and minor problems in places from Portland to Houston to Orlando. Beginning with Phil Alexander's overview, **Radio Guide** plans several articles to help you spot potential problems, and solutions that have worked for others. If you have a story to tell, let us know!

Tower Topics

Page 8 – Our effort to develop a better understanding about the towers at our stations began with a tabulation of "tower facts" concerning the design and construction of towers. This month we will actually start the process of designing a tower for a typical Broadcast application, as a sort of case study to demonstrate several of those critical points.

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

Ray Topp *(Publisher)*
Email: radio@broadcast.net

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

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Radio Guide

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How Secure is Your Site?

There have quite a few reports of transmitter site break-ins and/or vandalism this year, more than recent years. More than a few appear to be "organized." Often it is the engineer who is pressed for, "What can we do to stop this?"

Yet, at the same time, it is often hard for the engineer to get sufficient money to do the job. It takes money to build a secure site, transmitter building, lights, fences, cameras, alarms, and everything. As with many other aspects of the technical mission, site security is often relegated to a "wish list" or some sort of "parts project" by the local engineer, as he grabs a relay here, and a magnetic door sensor there. Since the manager rarely visits the site, he sees no need for any sort of expenditure until it is too late.

"But there is no budget for any of that," is the all-too-common refrain. Considering transmitter sites all around the country, it is clear there is a wide range of what is "acceptable." Or, is it just that complacency is "acceptable" until there is a break-in?

Nevertheless, it is clear times have changed. Is it society? Is it violence in movies and on TV? Is it drugs? Is it something else? There are lots of opinions, but the bottom line is that each time an engineer goes out to a remote site, his personal security can be on the line. Arming the engineer is not the solution.

Radio station owners and operators need to view this issue as important as paying the light bill, city taxes or the lease on the manager's new car.

Perhaps some industry organizations will join us in promoting greater site and personal security for the engineering side of the stations.

Securing the Remote Transmitter Site

by Phil Alexander

In recent months, there have been quite a few reports of break-ins at transmitter sites, with theft and vandalism causing a variety of major and minor problems in places from Portland to Houston to Orlando. Beginning with Phil Alexander's overview, ***Radio Guide*** *plans several articles to help you spot potential problems, and solutions that have worked for others. If you have a story to tell, let us know!*

[INDIANAPOLIS, Indiana - November 2004] How much is your transmitting equipment worth? What would you do if it disappeared overnight? In fact, do you know for sure where is it right now? Out in that little building in the middle of nowhere, is it? Is anyone watching for the "delivery" truck making an unscheduled "pick-up" of all the equipment they can steal?

Oh, you say you have a good burglar alarm? But, how long will it be after it goes off before the Sheriff or other law enforcement arrives? What can you do to prevent remote transmitter site burglary?

SECURITY 101

Site security begins by assuming anyone who wants to use enough force *will* get inside your transmitter shelter. Making that difficult is one way of cutting losses. Additionally, an effective alarm must go off with very little provocation, yet it must not trigger falsely. Ideally, the alarm should go off at the first entry attempt, and at least before the crooked crew gets inside.

Overall, the idea is to delay their entry to give law enforcement time to get there before they can get inside. And if they do get in, it should take more than a portable drill and #2 Phillips bit to strip the equipment from your racks. Again, delay and more delay is the objective.

On the other hand, it almost seems like sometimes, we make it easy for the bad guys. Those of us who operate and maintain broadcast stations are generally law-abiding citizens, and that can be a handicap when we look at our remote sites. Burglars are inventive. They can figure out any hiding place you can devise for a key, like the one you may have hidden inside the switch box for the air-conditioner, or in the flasher box on the tower.

ALARMING REVIEW

Therefore, when taking a hard look at site security, be sure to look at the problem from a variety of "vantage points." What is obvious to a burglar may not be quite so apparent to you at first glance.

Consider: except for kids out to do nothing more than damage things, your intruder may well know more about your alarm than you do. Serious criminals are familiar with most of the common alarm systems furnished by commercial alarm companies and can bypass them.

For example, some burglar alarms depend on power fed over the phone lines from a central station. Often these are simple current loops that drop if the line is cut or shorted. Assume a burglar can bypass your alarm system so the loop sees no change, provided there is access to your phone lines – for example at a demark box or outside terminal on the transmitter building.

Other alarms depend on utility power. If they have a UPS/battery back-up, those may work when the power lines are cut, but, again, cutting power lines is difficult if there is no access to them. The lesson here is to bury all utility lines coming into the building to prevent easy outside access. If a generator is installed, defending the fuel supply, fuel lines and control system will help keep it operational.

This may mean a combination of burial and armoring, or placing the genset in its own alarmed enclosure. The electrical controls for the genset can generally be relocated inside the transmitter house with the AC transfer switch. The conduits between them should be buried so that none of the wiring can be attacked above ground.

Remote transmitter sites offer some "non-traditional" alarm possibilities that are more difficult to defeat because they are different. For example, is addition to the commercial alarms on the building, you could rig a cheap Doppler radar motion detector to a remote control or SCA data link giving a studio indication whenever there is significant movement inside the building.

If you are clever with IR diodes and detectors, there are possibilities outside the building that will alarm when there is an attack on your fenced compound without tripping falsely on birds, rabbits or snakes. If the studio is not staffed 24/7, a discrete two-tone audio signal can be broadcast as a low level beep at 30 second intervals that will alert you or a two-tone decoder attached to a receiver anywhere within the station's coverage area. The possibilities are limited only by imagination.

ASSESSING BUILDING ACCESS

Access to the building itself is critical. A perimeter fence around the property is generally no barrier to someone with criminal intent. A fenced compound around the transmitter building and any external equipment such as air-conditioners, generators, fuel tanks etc. will not stop a burglar, but it will slow him down. But more importantly, it can be alarmed to trigger a first alert before the attack begins on the building itself.

Signs noting "High Voltage" or "Interfering with a Broadcast Facility is a Federal Offense" may give bad guys second thoughts. But, unlike those folks who put fake "alarm company" decals on their houses, do not put too much value on the sign's effect. Remember, we are dealing with sites often isolated from "nosy neighbors."

The compound should be well lighted. If so, a burglar cannot be sure a random patrol car will not spot him. For the same reason, fenced compounds should be kept bare of tall weeds and shrubs. Visibility is a strong deterrent, especially in "bad" neighborhoods. If they cannot hide easily, interest in access in reduced.

Good sightlines reduce trespassers.

The next defense is the building itself. Steel doors with tamper resistant locks, internal hinges, or pry bar guards, all delay entry into the building, as do bars on windows. However, do not forget the building has a roof, and if that is not defended all the security on the other four sides can be bypassed as easily as climbing on the roof and pulling off a ventilator or cutting a hole in the roof.

A metal roof with bars over all openings and bars in the ceiling structure can frustrate overhead entry. All vents need bars that penetrate the duct and block the opening at the roof level. These should be tied into the roof support structure to eliminate easy removal.

Unless your building is very strongly constructed, alarming the entry door alone may be of little value. For example, a cinder-block structure can be penetrated with a few swings of a sledgehammer. A section of wall in a simple prefab can be opened with a drill and saw. Think about how difficult or how easily you could cut a new vent hole in your roof or building walls, then consider how much faster you could do it if you did not need to be neat and precise!

BETTER BARRIERS

When building a cinder-block structure, consider placing rebar and pouring concrete from top to bottom of half the core holes in the blocks. In a wooden structure rebar can be embedded in the walls before they are raised by drilling horizontally through the studs and inserting rebars at close intervals to prevent cutting a hole in the wall and crawling through it.

Another alternative is covering the interior walls of a shelter with expanded steel before putting up the wallboard. A saw that rips through plastic, foam or wood will encounter problems with expanded steel, and if you use metal above the ceiling it is also a very nice start on a Faraday cage for preventing RF penetration of the building.

If you are getting ready to build a new transmitter building, take time during the planning stage to consider the structure, and use your imagination. Think about different forced entry possibilities and put steel in the way. If a burglar is not prepared for steelwork or does not have the right tools for dealing with it, he may decide it is too much trouble and depart as soon as he finds it. This is especially true if your fence contains part of your alarm system.

And do not forget the coax cables. As seen by the experiences of stations in Oregon, and John White's tests (See **Radio Guide**, October 2004), making sure there are sufficient fire barriers could be crucial to reducing damage from vandalism.

HUMAN RESOURCES

A quick response by local law enforcement to an alarm is vital for reducing the time your building is under attack, and that cuts the probability of forced entry into the building itself. Getting to know the officers or deputies who will respond to your site accomplishes several things. You can explain exactly where your site is located and how best to get there, something very useful, especially if it is in an isolated area.

Also, if the cops know who you are, you are much less likely to spend time "under the gun" while working late, proving your right to be there in the middle of the night when they drive by on a random patrol.

It is good to remember that law enforcement officers are human and tend to respond more quickly and vigorously if they consider you one of the "good guys" – especially if you occasionaly turn up around shift change times with some doughnuts or some of those station giveaways like coffee cups, or hats and T-shirts to take home to their kids.

Of course, a good relationship with local law enforcement does not happen overnight. This varies from department to department, and from region to region. Participating in the local FOP as an associate member is a good idea, and in some areas an occasional visit to the local PD or Sheriff's station is helpful. If that is the case do not forget the doughnuts.

REDUCING LOSSES

What can you do if the worst happens and despite all your building "hardening" the burglary crew hits while local law enforcement is too far away to respond in time? The key is in understanding they will take anything they can carry away. The transmitter may be too big, but rack equipment is a prime target. However, if the rack equipment is difficult to get out of a heavy, well-anchored rack, the time factor may discourage them.

Many years ago, most racks had trim covers that concealed the equipment mounting screws. Basically, these are channels with one side longer than the other that bolt to the side of a rack and cover about one inch of front panel. The mounting bolts may be either at top and bottom of the cover, or on the sides. Their presence adds to the difficulty of removing equipment from the racks, especially if you use security fasteners for locking them to the rack.

(Continued on Page 6)

Indecency Processor

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

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

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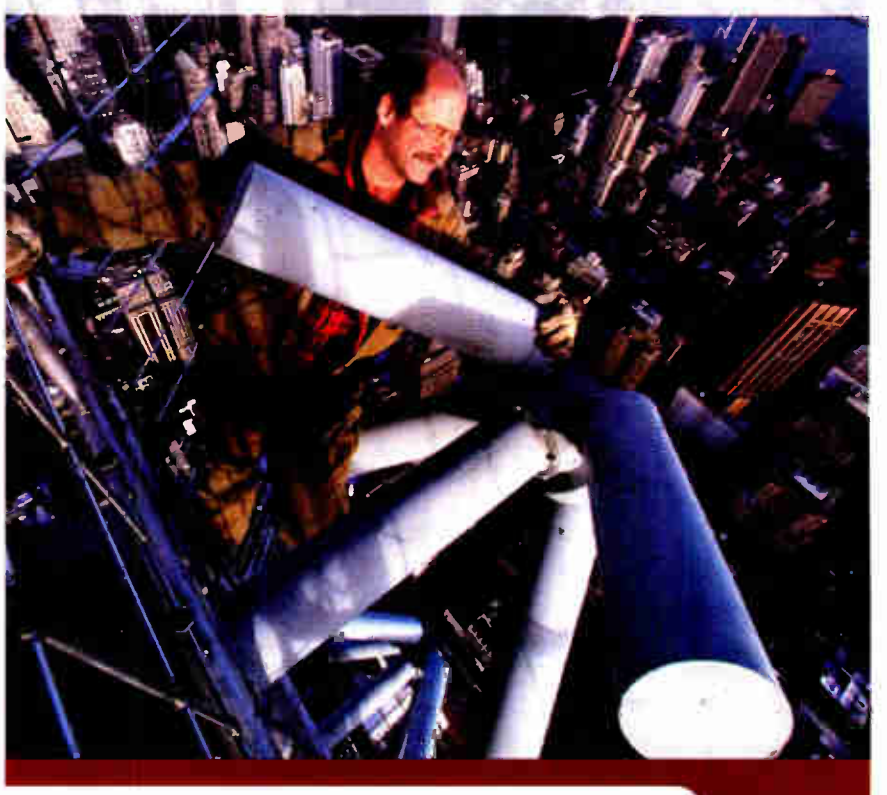

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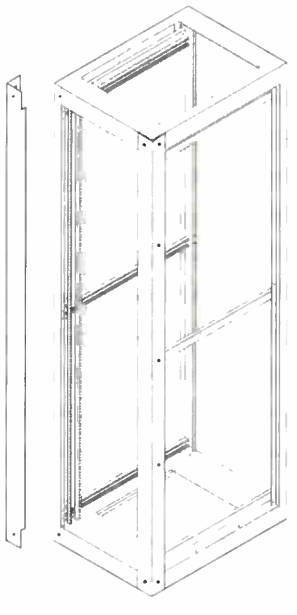
Securing the Remote Transmitter Site

Continued From Page 6

The exact dimensions of the channel will depend on the style of rack, but most large sheet metal shops can make them for you from 10 or 12 gauge flat stock heavy enough that it cannot easily be bent out of the way. Usually, the channel width will be about 2.5" to 3" and the sides about one inch for the inside and 2" to 2.5" for the outside.



The long side of the channel can be directly bolted to the sides of single racks, or standoff spacers can be used to mount them at the top and bottom of the rack frame.

If your equipment is securely mounted in the racks with as many screws as you can put in the panel using "security" headed screws, the time factor for removing it goes up another order of magnitude. While it is true you can get "tamper proof" screws from several of the major hardware supply houses, these also sell the tools for them. Common "security" headed screws such as pinhead Phillips and pinhead Torx are widely used and you can expect serious criminals will have bits for removing them.

Bryce Fastener's Keyed-Lok

However, there are several newer proprietary screw heads available such as those available from Bryce Fastener, Inc. that are individually registered to the user. While not cheap, and the heads of these screws can be ground off, the increased time factor is substantial. However, they are not difficult to remove for day-to-day maintenance provided you have the special keys for your screws and bolts.

Whatever method you use in making it harder to remove equipment, the point of creating these "delays" is frustrating a quick "in and out" by the burglars, giving law enforcement time to respond.

IF THERE IS AN BREAK-IN

If criminals do attempt an entry, and you get an alarm that says they are trying to get in – or are already in your building – call law enforcement as fast as possible. Let them know you have an alarm of a burglary in progress.

However, *do not* investigate the alarm yourself.

Make sure law enforcement arrives at the site before you do. Your local law enforcement friends like catching crooks in the act. It makes prosecution to get them off the street much easier when an officer can testify the felon was trying to steal your equipment and carry it away after breaking in through a door, a vent or a hole he cut into your building.

It may also be advisable to report the break-in to the FBI and the SBE, in case a pattern is involved.

In addition to personal safety, there are liability issues for you and for the station. If you become involved with the criminals in any way, it may complicate their prosecution. It does not matter if you are legally armed. Burglary is a crime against property and probably does not justify the use of deadly force; it is not worth getting yourself arrested.

Furthermore, some criminals may be on drugs, or otherwise decide they have nothing to lose, and could attack you unexpectedly with some serious weapons. The smartest thing to do is to observe from a distance and do not approach the site until law enforcement has it fully secured. When all is said and done, your personal safety and convicting the crooks are far more important than getting the station back on the air if it is knocked off in the process of an attempted burglary.

IF YOU HAVE BEEN "HIT"

There are two key things you can and should do which will help convict a criminal who removes equipment from your building. First, keep an accurate equipment log showing each piece of equipment and its serial number or other unique identification. It is helpful if you have information on file that conclusively proves station ownership of the equipment backing up this record. This information may help you recover your equipment if the crooks do get away with it.

Second, every piece of equipment at every site should be visibly *and* invisibly identified with the station's call letters or other unique identification. The invisible ID is more useful if it is located in a difficult place, such as the underside of a large PC board. Use a "Sharpie" or "Magic Marker" pen that writes in a UV fluorescent ink that is otherwise invisible.

If you cannot locate one of these pens, check with your local law enforcement. They usually have them for exactly this purpose, or can tell you where you can get one. That unique, hidden ID can be a significant help convicting the criminals because it proves the property is stolen, and conviction means they will be off the street, reducing your risk that they may return.

Of course, this is just a short list of the precautions and courses of action available to protect your remote sites.

Staying in touch with fellow engineers will alert you to any unusual problems in your area, as well as solutions that have worked for others. Be a good neighbor: as you pass other stations' sites, observe anything out of the ordinary.

The more we share tips and information, the more secure will be everyones' transmitter sites.

Phil Alexander, CSRE, is a Contract Engineer based in Indianapolis, IN. You can contact Phil at dynotherm@earthlink.net

Radio History

Another Short Trip Back to 1953

by Clay Freinwald, CPBE

An old magazine, a few minutes to relax, and here is another interesting look at radio history!

[SEATTLE, Washington - November 2004] First of all, thanks to all of you that have emailed me comments about our previous foray into the history of things technical. Due to the median age in this business I rather suspect that I am bringing back a lot of memories for many.

We are once again looking back some fifty plus years via Volume 50, Number 3 of *Radio & Television News*. We start on Page 13 with an ad for a Triplett Model 3441 Scope. I had almost forgotten that Triplett made scopes, but I do not think they did for long as there are not many out there. (Triplett was perhaps most well known for their model 630 VOM).

This beauty had a couple of unique features, a built in peak-to-peak voltmeter with eight ranges, a Vertical Amplifier with 4 MC (Yes, written "MC") bandwidth, and a Phone Jack on the front panel. According to the text it only cost $199.50, "so you can hear as you see."

On Pages 14 and 15 is a big two-page Channel Master ad, advertising their line of UHF Bow-Flectors and Stato-Matic masts. Is it interesting that TV antennas were largely "put out to pasture" by Cable TV and Satellite. Now as HDTV is rolling out, local stations find themselves disconnected from their viewers, and TV Antennas are making a comeback.

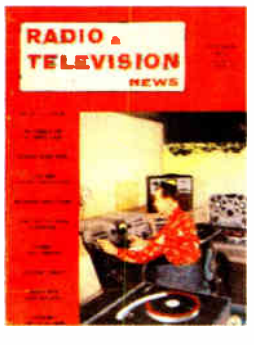
I recently helped a fellow Broadcast Engineer put up a Bow-Tie array so he could receive HD. Pretty cool, too. We have about a dozen HD stations here in the Seattle area. I do wonder when Aerial became Antenna?

Page 16 is a treasure of memory makers. On the left side of the page is an ad for Argos, the speaker cabinet-maker. I would be willing to bet that they made millions of them.

THE BIG STORY

The big story that caught my eye on page 16 is under "Spot Radio News" where the dawn of the "Color Age" is discussed.

It was forecast in the article that color will be launched before the year (1953) is out. "Mr. Sarnoff declared that his company and its broadcast unit, are prepared to invest as much as $15 million during color TV's introductory year to establish this new service on a solid foundation." It is interesting to read that the NTSC (for which today's analog color scheme is named) was being doubted.



The bottom of the page has a box of "new TV grants" since the freeze was lifted. In those days a TV station was not on the air 24/7. In fact, sometimes a channel was shared by two stations. For example, KOOL-TV and KOY-TV both shared the use of Channel 10 in Phoenix. KMBC-TV and WHB-TV shared Channel 9 in Kansas City. Back in those days VHF and UHF were more equal than in later days with about the same number grants for both bands being announced.

HIGH SENSITIVITY RECEIVERS

A Fisher "Series 50" products ad is next. The model 50-R tuner claimed an "extreme sensitivity of 1.5 mV for 20 dB quieting." To show a connection to the inventor of FM. the tuner specifications list an "Armstrong System."

This 50 watt power amplifier had less than 1% THD @ 50 watts (.08% at 10 watts) and response "within 1 dB from 5 to 100,000 cycles." Billed as "A man sized unit," the all triode design was priced at $159.50. A mint amplifier like this would fetch a pretty penny on eBay these days! (I just love reading how the "sound" of vacuum tubes continues to be popular.)

Actually, I remember when I brought home my first solid-state stereo amplifier and CD player. I connected it, and called the wife into the room for a listen test. Her first reaction was "How come it sounds so 'screechy'" – apparently her assessment of what I thought was superior transient and high frequency response. I later found out she had turned down the treble control to get things closer to the sound of the old tube rig!

YOU CAN BE SURE

The phrase jumps out at you from page 19: "You can be SURE if it's Westinghouse." Here the company is advertising their new UHF service kit designed to help Radio-TV service firms with the conversion to this new thing called UHF-TV. Remember Reliatron Tubes? Their tube division was in Elmira, NY.

Page 20 contains a full-page ad for Centralab, long time makers of the attenuators that most all of us have used over the years. They were selling a "New service tool: PCH-4 TV attenuator assures best reception in multi-station areas."

The little black box pictured had 4 attenuators inside, 10, 20, 30 and 40 dB. The service man would hook up the 300 ohm twin-lead between the antenna and set, turn the knob for the best picture, and then install the proper fixed pad to prevent set overloading. I figure this does not say much for the dynamic range or AGC actions of early TV sets.

As Walter would say, "And that's the way it was, in 1953." Stay tuned for our next journey into the past.

Clay Freinwald enjoys reflecting the history of broadcasting and how some things have changed over the years, while other things have not changed at all. Contact Clay at K7CR@wolfenet.com.

Tower Topics

We Deal in Steel – The Truth About Towers

Part 2 – Developing Tower Specifications

by Leonard Weenou, P.E.

[SEDONA, Arizona - November 2004] Our effort to develop a better understanding about the towers in our stations began with a tabulation of "tower facts" concerning the design and construction of towers. This time we will actually start the process of designing a tower for a typical Broadcast application as a sort of case study to demonstrate several of those critical points.

A LEARNING PROJECT

Our setting is the legendary Mt. Alexander, where we are planning to construct a facility for our new FM Construction Permit (CP). According to the Application for CP, to achieve proper height above average terrain (HAAT) for infamous W-QRM (FM) our center of radiation (COR) needs to be 420 feet above ground level (AGL).

Meanwhile, another study has indicated that the STL receive antenna needs to be at an optimal AGL of 420 ft (coincidence) to provide proper Fresnel zone clearance and make the STL 99.99% reliable.

As we had mentioned, all tower design is a function of the *loads and location.* Since the loads come first in line, let us begin by accumulating and annotating the projected loads on our study structure.

GATHERING SPECIFICATIONS

With that height up here on the bluff, we only need an effective radiated power (ERP) of something like 40 kW for a full class C, which we can achieve easily with a 25 kW transmitter and a four bay antenna (a circular pattern with a gain of 2). The four bay antenna will minimize aperture problems in the community of license, and the transmitter will still have sufficient reserve for IBOC operations.

W-QRM has one of the best engineering staffs in the country (Why not? This is all imaginary – they even are *paid really well* in this fantasy!). Their total cost study has indicated that 3-1/8 inch flexible air line is the best choice to feed this antenna. The STL antenna system can operate more than adequately with 7/8 inch line. A similar total cost study indicates that air line should be used for this installation as well.

Since two antennas cannot share the same space and they both need to be pointed at the main market, a decision has been made to place the STL *above* the FM main antenna. The heat flutes from a pesky ridge on the mountain nearby that the signal needs to pass over (and similarly a bothersome building rooftop close to the studio) are worrisome. To obtain proper clearance, this exalted tower elevation is needed.

The Mighty Fine FM Antenna Company (MFFMAC), founded in 1947 by a truly inspired engineer, has made several suggestions based on their experience of over 7,500 extraordinary FM antennas used in 126 countries. The first is that the antenna should be their proprietary full wave spaced big element, wide band model which uses a special coating to resist icing. This antenna does not have deicers.

A quarter wave stub will bring the antenna's total length (at 108.8 MHz) beyond its COR to 20 ft.

As mentioned, the greatest force that has to be dealt with on a tower is the wind resistance of the loads. This antenna is *big* and even though its elements are rounded and elegantly simple, there is still more than 700 foot-pounds of wind load to be dealt with.

MFFMAC has also provided some initial counsel on tower face widths and orientation to minimize the interaction of the antenna and tower in signal dispersal.

TOWER SIZE CONSIDERATIONS

Concerning the tower structure size itself, the station has deferred to the judgment of their consultant engineer on this part of the project. After running some preliminary numbers dealing just with the big antenna, the consultant determines that the tower face will need to be 36 inches or greater on a guyed tower. MFFMAC does not like 36 inches in this application; their initial studies indicate that 42 inches will have the least deleterious effects on the signal in this face range.

Probably you have just noticed something important in this last paragraph. The design process for towers is interactive rather than linear. Each piece of information gathered requires a review of all previous decisions filtered through the overall goals of the project and the experience of the people involved in the process. We have just come upon the first of many times in this process that we will see this effect.

Courtesy: Dielectric Communications

Very subtly we have also seen how the experience of the principle parties involved appears in the initial decision to focus on a guyed tower of slightly wider than initially intended size.

It is worth noting that there are vague boundaries where, on just a cost basis, as the structure height increases, it is most prudent to move from a consideration of towers that are self-supporting and guyed to only guyed.

Only when land is extraordinarily expensive or site restrictions demand it, does a self-supporting tower stay in the equation for FM after about 350 feet AGL.

MFFMAC has sent us some range studies done for others on a similar combination of antenna and tower face. We feel confident enough with our decision to proceed by specifying a 42 inch face guyed triangular tower.

TOWER LOADING

The remaining loads include a 450 MHz remote pickup (RPU) whip antenna at the tower top with preamp and 1/2 inch line and a single bay standby FM antenna at 250 feet AGL. The latter is a full power one bay version of the new main antenna.

The old tower was 199 feet high (to avoid lighting requirements). Therefore we wanted this standby to be higher to attenuate interaction with the nearby old tower. Not only will this standby antenna be a great backup for a main failure but will also allow easy maintenance of both structures while the station stays on the air. By judiciously toggling between antennas, towers and power levels, we can avoid exceeding RF level maximums in the latest OET-65, and keep any maintenance climbers within "safe" levels.

A tower at this 450 foot or so height will need to be lighted. The consensus from pilots and the land owner (Spruce Goose Land and Lumber) is that medium intensity strobes by day and reds by night are best. This is what was requested, and now approved, by the FAA and the FCC.

With this information, we can now tabulate our loads expressing and delineating the point loads in both windload and dead weight. Similarly, we can begin to consolidate the distributed loads such as the tower's own sectional wind loading, coax and conduit as well.

LOCATION CONSIDERATIONS

At this point we need to consider our location, the second half of *loads and location*, to identify the peak wind design (the maximum that we expect to encounter and allow for) and how much of the tower is exposed to that wind.

Furthermore, we must tentatively position the tower, which will dictate the deployment of the guys and the address of the tower, and the loads into the peak prevailing winds. All of this is critically important so that what we finally erect has the greatest chance of survival under duress.

The top of Mt. Alexander is like many mountains in that the amount of flat space is very limited and already occupied by several other towers. Guying, without endangering other structures, will be a problem.

The industry perception is that the "ideal" guy length is where the anchors are located out at 60% or more of the vertical height of the guypoint on the tower along the horizontal. In an effort to equalize the forces on a guyed tower at the guy landing, all guys in that level should have not only equal spacing around the circumference of the tower (120 degrees for a three guy tower) but also the same angular address from the tower face. If the desired angle address for a particular guy is 45 degrees from the tower face, then they should all be 45 degrees at this guy landing.

Because the ground is so uneven in elevation on Mt. Alexander, it will take some careful positioning of these anchors to achieve this even angle. If a guy is called for at 200 feet AGL and we want exact "60% guys" then the anchor needs to be horizontally out 120 feet from the base of the tower.

On the tower, this would achieve a 37-degree angle. If the ground near one anchor is higher than the base, then the anchor will need to be closer to the tower to maintain that angle. Similarly, if the ground is lower (which it usually is on the face of a mountain), then the anchor will need to be placed further away.

As you can imagine, if the ground really drops off, then the anchor guy line can be very, very long to achieve that 60% and so, quite often, some compromises in percent of guying has to be made and the strength and stability desired made up in other ways.

Climatically speaking, a prevailing dome of high pressure over the corporate offices, a tendency of the jet stream to swing south, the fact that Mt. Alexander is the highest of the Gaglio Range, means that 90 mile an hour (MPH) peak winds are the norm.

With the identification of that potential maelstrom, we will break until next our episode where we will do our final pass on loads, determine our final height and make a final pass on calculations to determine not only the tower fabrication dimensions but also the foundations for the base and anchors.

A legendary consulting engineer, Leonard Weenou has overseen many tower projects. So far as we can tell, all have stayed erect! Contact him at editor@radioguide.com

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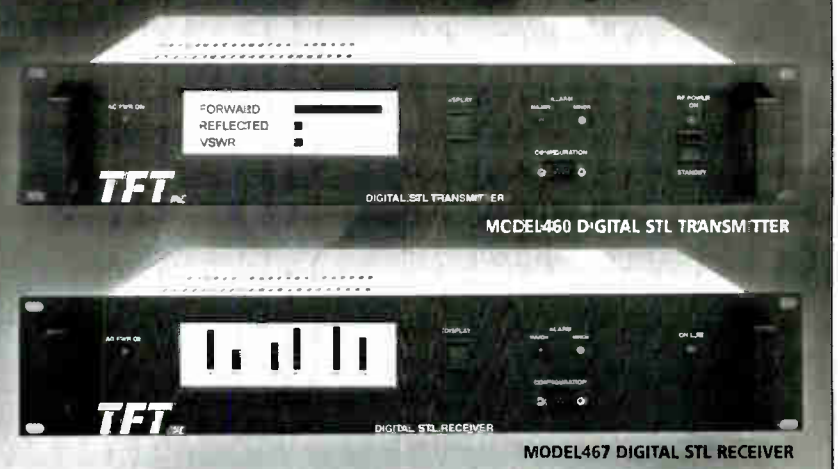

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FCC Focus

FCC Tower Compliance Issues

Part 3 – Tower Access Items

Terry Baun, CPBE, CBNT

What do the FCC's inspectors look for when they visit your tower site? Earlier this year Terry Baun discussed some of the key issues, and in this final installment, he considers issues regarding access to towers.

[INDIANAPOLIS, Indiana - November 2004] By its very nature, broadcasting seeks to be an inclusive medium. Welcoming visitors to our airwaves is critical to our mission, and so too is welcoming them to our broadcast facilities, whether to do business, pick up prizes, or just take a tour.

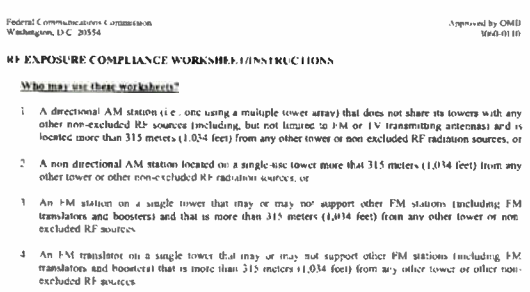
However, there are areas of broadcast facilities where access must be controlled for the safety of those visitors as well as employees and contractors. In the past ten years, those safety issues have become the focus of a good deal of scrutiny from the FCC and other federal agencies. But it is important to note that access control is also of significant interest to our insurance carriers, who want to be assured that our facilities are not only secure but also free from hazardous conditions that might adversely affect visitors and workers.

Considering the significant dollar amounts currently being awarded in civil liability suits, it could well be that an FCC fine might represent the smaller part of a station's "exposure" in this area. And if we wish to extend our concerns on access to include OSHA and Homeland Security issues, there are even more reasons to pay close attention to how we physically protect our towers

THE FCC AND RF RADIATION

From the FCC's viewpoint, the primary issue about tower access is to make citizens aware of and avoid coming into contact with energized RF sources. Secondly, the FCC requires limiting the exposure of the general public and communications workers to guidelines set under the FCC's OET-65 rules.

If your station has recently filed for license renewal you certainly are aware the FCC is taking those RF exposure rules seriously. The "RF Exposure Compliance Worksheet" is a part of the FCC renewal form 303-S (pages 13-23), and includes calculation worksheets that allow you to determine your station's RF compliance status under OET-65.



Federal Communications Commission
Washington, D.C. 20554

Approved by OMB
3060-0110

RF EXPOSURE COMPLIANCE WORKSHEET/INSTRUCTIONS

Who may use these worksheets?

1. A directional AM station (i.e., one using a multiple tower array) that does not share its towers with any other non-excluded RF sources (including, but not limited to FM or TV transmitting antennas) and is located more than 315 meters (1,034 feet) from any other tower or non-excluded RF radiation sources, or
2. A non-directional AM station located on a single-use tower more that 315 meters (1,034 feet) from any other tower or other non-excluded RF radiation sources, or
3. An FM station on a single tower that may or may not support other FM stations (including FM translators and boosters) and that is more than 315 meters (1,034 feet) from any other tower or non-excluded RF sources.
4. An FM translator on a single tower that may or may not support other FM stations (including FM translators and boosters) that is more than 315 meters (1,034 feet) from any other tower or other non-excluded RF sources.

The RF Exposure Worksheets (Pages 13-23 of FCC Form 303-S) can be found at: www.fcc.gov/Forms/ Form303-S/303s.pdf

Your station must certify itself as compliant with the RF exposure rules in your renewal application; should you fail to do so, the FCC will delay granting your renewal until they receive that certification.

ASSESSING RF EXPOSURE

Although the worksheets are tremendously useful for single AM/FM/TV stations, unfortunately, they cannot be used in the case of complex installations.

As an example, the area around the base of a tower which supports only a single FM or TV antenna (and is not an AM radiator) need not be signed and fenced under OET-65 Rules if the ground level radiation at the tower base is within the limits prescribed under those rules. However, if additional antennas or towers in close proximity are added, the Rules require a more complex RF assessment, usually requiring actual measurements, to determine the total RF exposure which exists at that point from all sources.

If that number is in excess of the Maximum Permissible Exposure (MPE) or if "hot spots" created from such an RF mix exist at the tower base, a station would be required to erect a fence and install warning signs around the tower even though their antenna alone does not cause the MPE to exceed the limits.

For most FM and TV stations, the MPE calculations are only necessary to determine the height to which tower workers can climb the tower without violating occupational exposure limits during periods of normal station operation. It is the rare FM or TV station that will encounter RF exposure problems at the base of the tower, unless, as previously discussed, other nearby RF sources cause the MPE to be exceeded in that area.

Of course an important exception applies for towers mounted atop occupied buildings where radiation to occupants on the top floors or in adjacent buildings must be considered, as well as issues involving contractors who perform work on the rooftop.

TOWER FENCING

When we consider AM tower access, recall that there is a dual reason to provide fencing: first, to keep the public away from the strong electromagnetic fields surrounding the tuning unit, feed, and the AM radiator; and secondly, to prevent the public from contacting any energized RF components at the antenna base that might cause shock or burns.

For that reason, it is important to make sure any existing fences are not so low as to allow a person to reach over them and come into contact with any exposed transmission feed line or other energized component. If a person can reach around the side of the tuning house and touch RF components, including an unjacketed transmission line, some additional protection must be provided to make this contact impossible.

Snow Fence, No Fence, Offense! Here is an FCC violation for sure. Not only does this AM tower fence offer no protection against radiation, but also there is nothing to prevent someone from walking right into the energized unjacketed feedline!

Warning signs (in English *and* other languages as necessary) should always be posted at or near the fence.

By the way, if your station has a secure perimeter fence around the entire tower site the FCC will permit that fence to serve as your required barrier and you need not erect additional fences around each tower for RF exposure and contact protection so long as all areas outside the perimeter fence are within the MPE limits.

Nevertheless, be sure that you have *your own* secure fencing around the entire parcel of land; depending upon "natural" barriers such as swampland, railroad right-of-ways, or adjoining private property instead of fences will generally not suffice.

OSHA AND LIABILITY CONCERNS

However, beyond those FCC issues, decisions about access control around towers also involves consideration of legal liability, safety rules that might be required by the Occupational Safety and Health Administration (OSHA), and the desire to protect station assets from vandalism.

Given the complexities of those issues, a reasonable tower access plan would seem to require installation of protective fencing around the base of *any* tower. Trespassers could be injured from entanglement with cables or antennas, contacting high voltages from faulty lighting or deicer circuit wiring, or simply by tripping over items around the tower base. Personal injury liability suits resulting from such an occurrence will inevitably name your station, even if the person has trespassed onto your property.

And even when authorized contractors are working at your tower site, OSHA regulations may well require a written safety plan if hazards or hazardous conditions exist in areas around the tower base or building roof, requiring fall protection and/or fencing among other remedial measures.

Pictured here is a Class A FM tower. There is no need to fence the tower base because of RF radiation, but what about other hazards to the public and/or authorized workers? Do you see any liability issues here?

SUMMARY

We have seen that access control for broadcast towers is most directly related to RF radiation and human contact safety issues, but that there are also other very good reasons to provide barriers that limit access. These reasons involve common sense and the desire to limit liability and off-air time due to trespassers, whether "base jumper" daredevils, frustrated mountain climbers, or inebriated types in search for souvenir tower lamps or tower registration signs to decorate their "Rec Rooms."

Before leaving this topic, it is important to note that in our current geopolitical climate, there is another very real concern: the prospect of intentional sabotage, particularly in the case of major market TV stations, cable plants, satellite up/downlinks, and network installations. Thus the issue of access control should always be based upon first and foremost the concerns about RFI and safety, then upon liability issues previously discussed, and finally the potential loss of service and revenue that would result from acts of vandalism or sabotage.

Most of all, access control is all about common sense. The FCC requires we protect the public and our workers, but we also need to protect ourselves. After all, what other business would allow its most important asset to be located outside, unguarded, and unprotected, 24 hours per day?

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

User Reports From Radio Guide Readers

Field Guide

Boosting FM Power and Performance

by Jay White, Corporate DE-Morris Communications

[PALM SPRINGS, California - November 2004] If a few hundred watts are good, a couple thousand watts must be even better.

That may be true for the main broadcast signal, but it is not always the case for boosters. As any first-year engineer knows, too much booster power can push the signal past the main service contour and into dangerous territory with the FCC. Not enough power, on the other hand, could render a booster essentially useless to the area it serves.

This is pretty much where we found ourselves at the beginning of 2004 as we re-examined our previous efforts to fill-in the KDGL (formerly KYOR-FM) coverage area with a 500-watt booster on Edom Hill.

INITIAL TRY

At the time – in 2000 – the low-watt booster seemed to be the only option available for KDGL, Morris Communications' Class B licensed to Yucca Valley, Calif. With 4 kW ERP from a four-bay antenna at 1371 feet height above average terrain (HAAT), we had Yucca Valley covered.

On the other hand, Coachella Valley, where more listeners (and more advertising dollars) are located, was blocked by the mountains of the Joshua Tree National Monument. Using a 500-watt Booster on the south side of the range got us coverage into Palm Springs, Palm Desert and surrounding areas.

But while 500 watts stayed within the 0.5 mV/m contour as required by the FCC for a Class B FM, and reached car radios well enough, it was not enough power for good reception on many tabletop and portable radios. Furthermore, it barely penetrated the offices, the malls and the other buildings into which our listeners entered a good part of the day.

The 500-watt limitation became especially noticeable once we decided to change format from Adult Contemporary to Classic Hits, a format with a decidedly daytime audience.

POTENTIAL FOR INCREASE

As a Class B station with up to 10 kW booster power available to us for this purpose, KDGL had some room to grow – providing we did not exceed the protected service contour of the primary station at any azimuth. So we hired veteran RF consultant Joel Saxberg to work up several pattern studies.

He came back to us with at least 20 pattern arrays at various powers, including one that used one of our AM antenna sites. We settled on a solution using four (two horizontal and two vertical) log-periodic antennas together with a power splitter to net 2.7 kW at 300 degrees maximum power from Edom Hill.

The directional pattern appeared to be just what we needed to push the signal as far as it could go without exceeding our allotted contour. Even though the main and booster site are just 16 miles apart, from all the calculations and based on our experience with the existing 500-watt booster, we knew we did not need to synchronize the main and the booster signals due to the mountain divide.

But the real test would come after we installed the transmitter and exciter.

BE RF GEAR MAKES IT WORK

As we got closer to transferring our pattern study from paper to actual physical implementation, I called up Broadcast Electronics and ordered an FM-2C, 2 kW solid-state transmitter and a Broadcast Electronics FXi 250 FM digital exciter, the next generation of the BE FX-30 exciter used on KDGL's main transmitter.

I have used BE transmitters in the past – we acquired six this year alone – and the KDGL booster install was my third experience with the FXi (I have also purchased the exciter for other stations in our group). I am a firm believer that the exciter is where the quality is either gained or lost, and I hoped to gain quite a bit of quality with the FXi. I liked the idea that the FXi exciter was linear and that it did not have to switch to analog in order to up-convert to the required modulation frequency.

BE FM-2C transmitter and FXi 250 digital exciter.

This direct-to-channel modulation scheme and just the simple ability to input AES/EBU audio directly into the exciter made it possible to send digital audio from the studio, via STL and through the exciter–digital all the way. Given the exciter's design, we would be able to pass an additional 2dB of audio performance through the transmission chain.

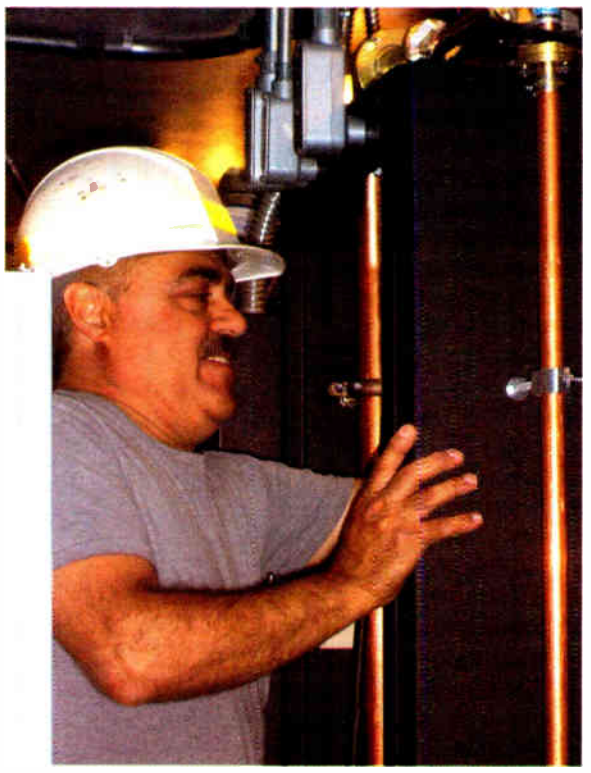
In our booster situation especially, any additional performance is greatly appreciated since we have to limit power to stay within the service contour. The design of the FXi means 2 dB more loudness. That is important when your competitors are pushing 50 kW.

ON THE AIR

On install day, we ran programming from the studio and over a Moseley Starlink to the Edom Hill site that housed the newly installed FM-2C transmitter with FXi 250 exciter. The main transmitter site receives programming from a CatLink STL over T1 circuit because we do not have line-of-sight between the Palm Springs studio and the Yucca Valley transmitter.

The FXi GUI is a very intuitive and navigating through the menus to set up the RDS, pilot injection and modulation levels was very easy and quick. I also like the fact that if I lose my AES-EBU STL system, the exciter is equipped so that the back-up analog STL is brought up on the air right away, and the remote control notifies me of the fault.

After the installation, we noticed right away that the transmitted sound was cleaner. We have zero noise – no artifacts whatsoever coming off the booster channel. And the over-the-air audio is the exact image of the CD, except for some minor limiting as needed to keep the modulation in check. (OK, we *do* process the pants off this thing, and this pip-squeak booster is the loudest and cleanest station on the dial!)

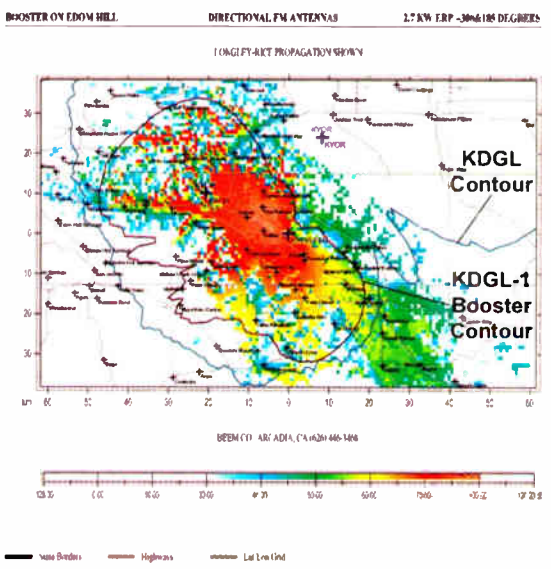


Frank Markase, KDGL Chief Engineer

PROBLEM SOLVED

Most importantly, the booster system does a very good job of getting 70-plus dBu signal into most of the high population areas in Coachella Valley. The overlap zone is somewhere in the mountains, where no one can hear the interference. KDGL's booster signal can be heard from Banning and Beaumont to the west, to Cactus City to the east.

We were able to send a very large lobe of power west along I-10, so as our listeners travel away from the city or to the city, they can hear our booster signal for probably a good two-hour commute – from far west of Palm Springs and all the way through and out of Coachella Valley to the east.



The predicted contour of the new booster.
(KYOR is now KDGL)

The final listening test came in the first rating period: KDGL went from a 1.3 in the fall of 2003 to a 7.1 in the spring of 2004. The station went from the bottom of the barrel to the number three 12-plus radio station in the market thanks to that booster. I would call that success!

Jay White is the Corporate Director of Engineering for Palm Springs, CA based Morris Communications. Contact Jay at jay.white@morris.com

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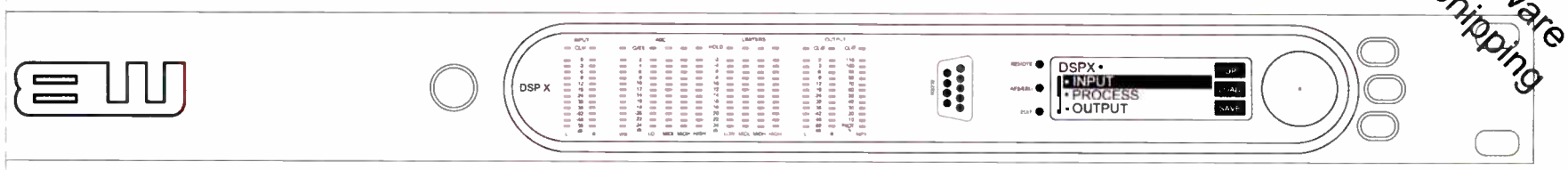

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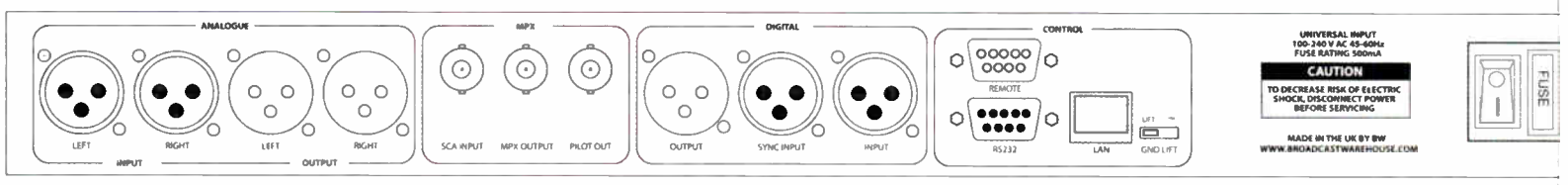

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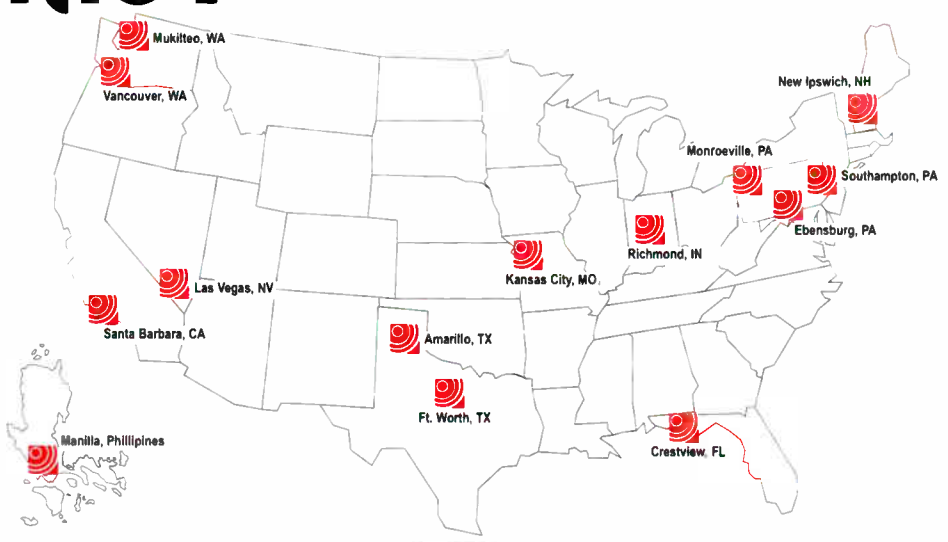

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Kids on the Radio

by John Devecka

[BALTIMORE. Maryland - November 2004] We have discussed how the FCC Rules work for low power, unlicensed radio, and I have tried to show just how easy and relatively inexpensive it can be to implement them. I think it is time for a really good anecdote.

And – being me – it is an anecdote about more than 20 low cost installations in schools. Twenty because, well, one seems too easy and perhaps 30 is just bragging. So let us see how easy, inexpensive unlicensed stations can have a real impact in the real world.

RADIO SPROUTS ON THE DESERT

A long time ago, in a Phoenix suburb far, far away (from the author, at least) a neat little idea germinated into a radio station. Not just any old radio station, but one at an *elementary school* and *run by kids*! How cool is that? Cool enough that there have been more than 20 of these Kid Star Radio stations set up in Arizona now.

These stations stream, they play live on AM and they have interviewed people from Reba McIntire to Senator John McCain. They have been touted by Senator Orrin Hatch on the Senate Floor as a top juvenile crime prevention tool. Yes, we are still talking about little kids. All of it thanks to one teacher and one radio station DJ (or "personality" if you prefer).

Perry Damone (the radio guy) and Linda Tuttle (the teacher) got together and started a station at the Shumway Elementary School in 1988. This Carrier Current AM station signed on at 590 AM with excited kid DJs named things like Crazy Kristen and Airwave Dave.

Perry formed a non-profit organization to help fund KdSTR Radio (aka Kid Star) and even built a Celebrity Golf Tournament to raise money (it is Arizona after all, it is not like it would be a hockey tournament). Sponsors pitching in helped build the kitty up and Kid Star was able to provide equipment at little, or no, cost to many more schools.

The idea behind the Kid Star plan was to find a way to get kids "out of their shell," and give them a way to build confidence and skills that was both entertaining and valuable. Perry, having spent many years as the afternoon host at KESZ (KEZ-FM), knew a few things about the power of radio. And Linda, having spent many years teaching, knew a few things about how fast kids learn when they are interested. Together, they formed the Kid Star Radio Program, fostering a learning and entertaining environment for elementary age kids.

A SUCCESS STORY

Kid Star has grown over the years, and trained hundreds, if not thousands, of kids in how to play radio. They have learned how to conduct interviews, meet celebrities, mix their own shows and even do commercial voice work for commercial radio stations! As many as 27 elementary, middle and high schools have participated in some manner, with a core of 18 remaining regularly operational and keeping involved in the program. Rather amazing, when you consider few of the participating DJs are over 12 years old!

As Perry says, "The great thing about Kid Star is how it changes their lives. When they have a chance to interview their heroes, you can see the impact and it's just amazing."

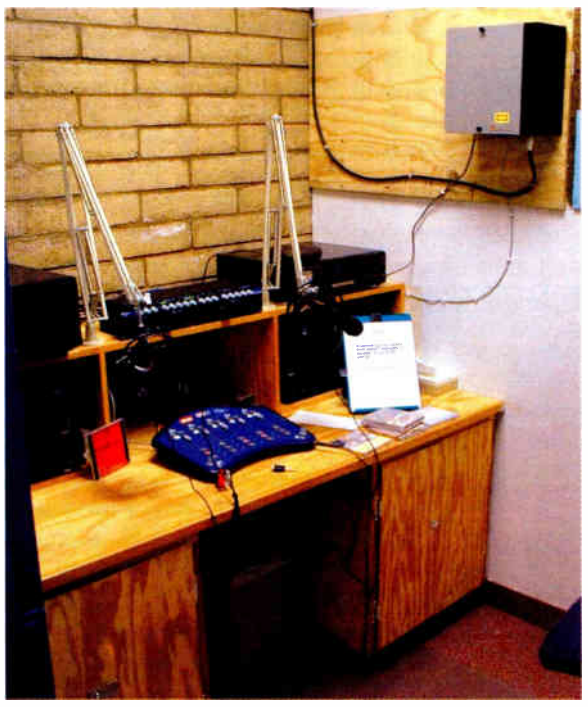
The program was designed to build confidence in kids, to help them explore their world more interactively and to make the impossible seem easy. How else do you explain 5th grade homeless kids interviewing First Lady Laura Bush? They did have to point out to her that they could not turn off their TV – as she suggested – and read, since they did not have TVs – or houses. But they have been able to interview an amazing array of celebrities, politicians and sports figures as part of their Kid Star station.

DOING A LOT WITH LITTLE

Despite humble beginnings and very limited funding, Kid Star has managed to do some great work. A simple package of Carrier Current AM or 100 mW AM transmitters serve most locations, while some only stream on the web only. They make do with simple studios, built around LPB or Mackie consoles, consumer level CD and Cassette units, microphones and headphones. In some cases, where the schools are able to financially participate, the studios are more elaborate. Many are even working them into a curriculum in technology.

The typical school station is under $5,000, including both the transmission system and the simple consumer grade equipment. Transmission systems among the Kid Star family include campus-limited vertical antenna AMs (FCC §15.219), 100 mW AM systems (FCC §15.221) and Carrier Current AM units (FCC §15.209). Since most of these systems land in the $1,000-3,000 range, you can still have plenty left under $5,000 for studio gear and installation – especially if you can lay your hands on a friendly neighborhood SBE member!

Participating schools cover wide demographics, from wealthy suburban kids to the Thomas J. Pappas School for the Homeless. Several tribal reservation schools are also participating. Your humble author was invited to the ceremonial blessing of the Kid Star station at the Sacaton Elementary School on the Gila River Indian Reservation, a unique life experience to be sure.



KTAO Studio, Sacaton, AZ

Some of the stations are just basic after school activities, but many are much more. Sacaton School, on the Gila River Indian Reservation, has integrated their campus-limited AM system into their technology program. This allows kids to both become a DJ and learn about the technology. They added a web streaming system as well, getting their signal beyond the bounds of terrestrial broadcasting and showing the kids the power of the internet.

A RADIO SCHOOL FOR HOMELESS

Thomas J. Pappas School for the Homeless is probably the coolest idea I have ever seen in education. It is really what it says – a school for the homeless founded in 1989. While they receive some funding from the public school system (of which they are a part), financial resources are thin. So they have to ask the community to help. And help it does.

The community has donated buses, equipment, playgrounds, etc., all to try to give homeless kids an equal footing in the educational system. They have had to fight innumerable funding battles and have garnered support from all over the country. Every day they send buses out for kids, some walk in, some move around and come when they can. But they *make an effort* to come to the school because they know it matters and they are not faced with the stigma of being homeless in a traditional public school setting.

Every politician making a stop in Phoenix also stops at Pappas, which often means interesting interviews for the kids. The Pappas School program has been so successful there are now schools for the homeless through High School in Phoenix. With the skyrocketing growth in homeless families, this is an amazing program to have in place and one that should be emulated outside of Arizona.

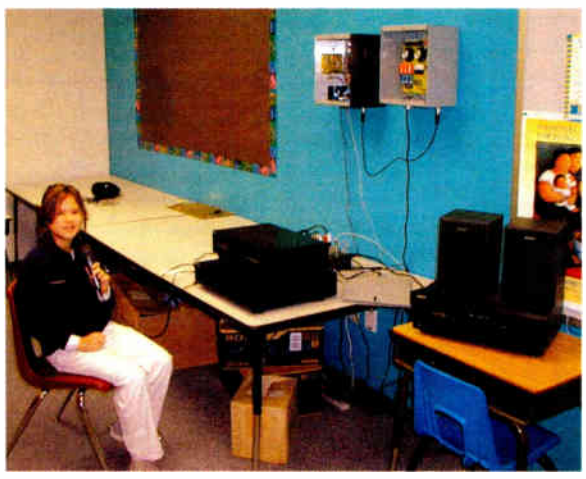
I think it is safe to say that their parents value the school in ways that the more fortunate among us could never grasp. They have a lot of great things at the school, but among them is a radio station, with a DJ booth and a lot of nice gear, donated by local vendors. It is truly amazing what can happen when a community actually cares about its members, is it not?

YOUNG TALENT

Copper Canyon Elementary, another early Kid Star adopter, produced one of the more amazing things from its tiny studio of consumer gear: a 5th grader voicing commercials for KEZ! Perry tells the story of the day Nari Ely came to the station to try to voice a commercial for their client, Well For Life.

"She came in to the station; this tiny girl often climbed (with some struggle) up onto the station's barstool studio chair, took the rough copy [from the owner of Well For Life], started making on-the-fly edits to the material, then sat back and asked if everyone was ready.

"When they were, she pulled the microphone over and whipped off a voiced commercial - *in two takes* - while everyone sat there stunned!" Perry relays this over the phone but you can hear the grin of amazement years after the event. Nari – only 10 at the time – continued to work at Copper Canyon's station until she moved on to bigger things, like Middle School.



Nari Ely at Copper Canyon Elementary School

So, what does Kid Star mean to these kids? I caught up with Nari, now an ancient 14 years old, and asked her a few questions. Nari is currently working on her singing career, which has already had her singing the National Anthem for the Diamondbacks, performing for the Make-A-Wish Foundation and much more. (Did I mention that she is 14?)

She gives Kid Star most of the credit for both fostering creativity and confidence in kids. "It really was wonderful; we created our own contests [and] developed teamwork and great public speaking confidence. I learned that the DJ is really like the quarterback for the station and how important that public performance is. Kid Star really helped me with the confidence I needed to pursue singing."

(Continued on Page 16)

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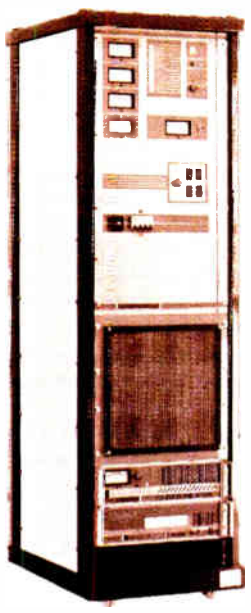

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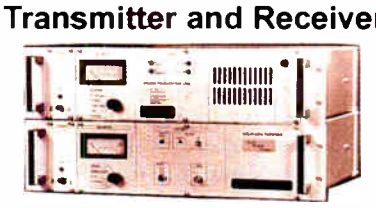

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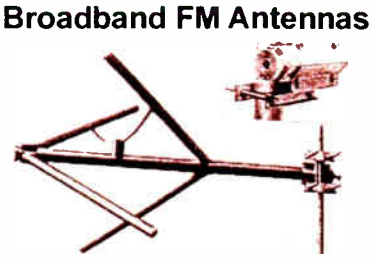

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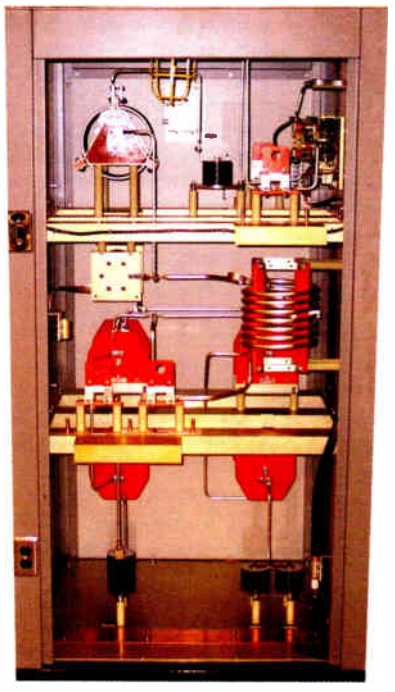

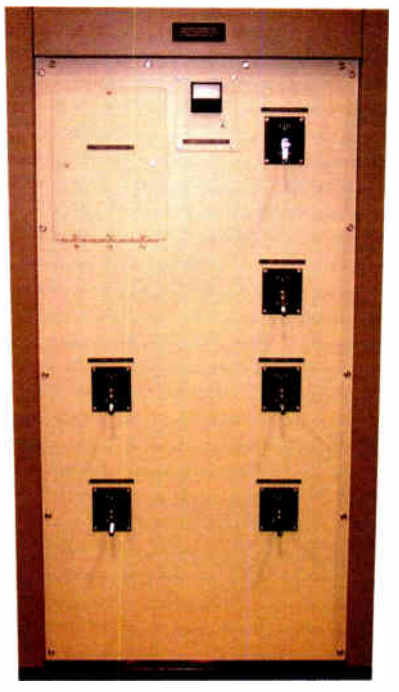

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Kids on the Radio

Continued from page 14.

While it is still a bit early, Nari already has set her sights on Stanford and a Communications major!

Just so you understand that these are not some kind of hyper-financed, super tech stations, here is the basic equipment complement at Copper Canyon: Technics Cassette Deck, Fisher CD Player, Radio Shack mixer, LPB Carrier Current Transmitter/Coupler, Radio Shack Microphone – and they recorded their shows to the cassettes for playback. Not exactly KISS-FM, is it? As they say, it is how you use the instrument, not how shiny it is.

NEW STATIONS

KCBQ at Cibique High School in Cibique, Arizona is one of the latest Kid Star radio stations, signing on at the beginning of 2004. This campus-limited antenna system is the first radio station on the Fort Apache Reservation in Northern Arizona.

Cibique is a community with about 1,200 residents, a mean income of about $13,000 and a more than 96% Native American population. Once again, Kid Star brings kids an opportunity they could never have expected.

The crew at KCBQ get ready for their first show.

The organization's ideas and success have begun to reach out around the nation and the globe. Interest in starting Kid Star programs has come from Florida and New Jersey, as well as Rome and Stockholm, including representatives flying in to Phoenix to visit local operations. Perry hopes that the idea will take root and benefit kids everywhere.

STRUGGLES AND SUCCESSES

It is not always easy to get a station established and maintained. "What we need to find are regional commitments by school systems, which can be supported locally by committed teachers." Perry explains, "Without a daily commitment from teachers and schools, Kid Star can't happen – it results in a dusty, unplugged studio. We've even seen a case where a new principal simply killed the *free* program with no explanation."

WAYS TO HELP OUT

In this author's humble opinion, it would certainly make sense for a radio group to support creating Kid Star stations within their local schools. Get the local teachers to commit the basic time, send your talent in to hang out with the kids and show them how it is done. In return you get PR that is priceless, for less than $5,000 a school. If you have a stockroom of older, but serviceable gear available, you get a donation *and* great PR. And if you are really lucky, you get someone like Nari Ely that you can hire!

Shortly the newest Kid Star station will be up with the Scottsdale Boys & Girls Club – the first Boys & Girls Club in the country to have its own radio station, and a continuation of the great work of Kid Star in opening doors for kids in need of support. Do yourself a favor and look at what these people are doing. It is, to borrow Perry's words, "Truly amazing to see."

Perry has had help from Martin James, a local printer and big supporter of the program. They hope to expand operations throughout the US. If you wish to reach Perry, you can do so at Damone Management in Phoenix at 480-816-0892 or perrydamone@damonemanagement.com.

Martin may be reached through the same number, and Kid Star is on the web at www.kidstar.org.

If you know someone with spare equipment, or in need of a tax deduction, please try to help out this great cause. Do radio a favor and support a new generation of kids, before the computers take over!

John Devecka is the Operations Manager of WLOY at Loyola College in Maryland, but he has a secret past involving lots of schools and boiler rooms and other icky places to hide low power transmitters in the service of good. He can be most easily found via email at wloy@loyola.edu

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Things You Need to Know

[TYNTK is a periodic collections of items that ought not escape your personal "radar." Some have a tech orientation, others come from the legal side.]

EAS NPRM FILING DATE APPROACHES

The FCC is conducting a Proposed Rulemaking on EAS matters. You can read the 89 comments already made at **http://gullfoss2.fcc.gov/prod/ecfs/comsrch_v2.cgi** by entering "04-296".

Reply comments can be made until November 29th at **http://gullfoss2.fcc.gov/prod/ecfs/upload_v2.cgi** again using "04-296" as the Docket Number.

EAS BATTERY WARNING

More and more often we are seeing reports indicating that many of the early Sage EAS receivers are have a second power supply problem. (Many engineers are already aware of the issue with the wall wart power supplies that lose capacity and cause "spontaneous reboots" of the entire EAS machine, often in the middle of an alert. The solution is to replace the power supply.)

This additional concern regards the internal batteries. Many of them have now reached the end of their useful lives. The symptom is a display of "Time is Bad" at startup, and a flashing red LED.

Several broadcast groups and some governmental agencies have reported this problem, and advise replacing the battery. Some suggest not waiting for your particular unit to fail – if it is over five or six years of age, replacing the wall wart and/or battery should be on your "To-Do" list.

The battery is a CR2330, 3 volt lithium unit. It is in a socket immediately behind the microphone connector on the front. It would not hurt to "buff up" and clean the socket at the same time you replace the battery.

WHAT STATION IS ON OUR FREQUENCY?

Speaking of EAS issues, it is always worth mentioning that even if you are automated, someone from the station should be assigned to monitor your air signal at all times. Sure, it is important to know your programs and spots are running correctly, and that should be checked too. But, it is also possible for a station "upstream" of you to forget to send an EOM, especially if they are running the EAS tones through their console, and are sloppy.

Depending upon how your system is set up, you could be re-transmitting a competitor for quite a few minutes, or longer.

One could imagine a "worst case," where the re-transmitted station had a shock jock, but one of *your* listeners filed a complaint with the FCC for indecency!

KEEPING SQUATTERS OFF NCEFM CHANNELS

Buildings and houses that are unoccupied for a long time often attract "squatters" who move in and take over. Sometimes it can be very difficult to evict them.

There is another kind of "squatter" that may create problems, especially for educational stations that overlook a relatively minor Rule: Section 73.561, pertaining to required operations.

While many university and school stations operate well within the Rules during times when classes are in session, holidays and vacations can expose the license to squatters, unless proper plans and procedures are in place.

Although the Rule says FM Educational stations are not required to operate on holidays or summer periods, section (b) has been discovered by some "outsiders." Basically, this section says that if a NCEFM station does not operate 12 hours every day, it becomes subject to a provision allowing other entities to file for enforced "time sharing," in effect "squatters" on the channel.

In the past, this has not been much of a problem, but this year, several stations renewals have been challenged, and petitions filed to enforce sharing of the channel. Some schools have even made "easy pickings" of themselves by announcing on their websites that they go off for holidays and vacation periods.

If your station does have such downtime, it would be a wise move to consult your Washington Attorney to see whether or not this affects your station's license. Better to have some discussion and planning now, instead of a surprise later.

LOCATION, LOCATION, LOCATION

Does the FCC know where you are? There are a number of reasons to check your contact information, especially the mailing address, on file with the FCC, as well as who handles incoming items.

It should be no surprise that the FCC does require you respond to their correspondence. That includes routine matters, questionnaires (such as the EEO Compliance Audit for that is randomly sent to stations, or a Notice of Violation (or Liability) initiated by an Enforcement Specialist.

Some stations, especially those owned by large entities, often have a "central" address for correspondence. However, especially with universities and churches, changes in personnel can cause incoming mail from the FCC to be delayed in handling, or even be ignored. Some college stations have had real problems caused from failure to answer a letter they never knew existed.

While most stations now have been through the renewal cycle, and have been asked to verify their addresses, it would also be prudent to check your organization's policies in passing along paperwork from the FCC. Simply sitting in some "President's File Cabinet" is not good enough, especially for items that should be posted or in the Public File. – *Radio Guide* –

Leading POTS Codecs Compared.

	Comrex Matrix	Tieline Commander	**Zephyr Xport**
Audio Bandwidth @ 24 kbps	14 kHz	15 kHz	**15 kHz**
@ 19 kbps	11.2 kHz	9 kHz	**15 kHz**
Direct Internet Software Updates	No	No	**Yes, via Ethernet port**
Digital PC Audio Input	No	No	**Yes, via Ethernet port and supplied driver**
Audio Metering (XMIT/RCV)	Transmit only	One-at-a-time	**Simultaneous**
Audio Processing	None	Simple AGC	**Digital multi-band AGC with look-ahead limiter by Omnia**
Remote Control	No	RS-232 and dedicated computer	**Ethernet via Web browser**
Auto Dial Storage	19 Numbers	50 Numbers	**100 Numbers**
Frequently-Used Settings Storage	none	none	**30**
Standards-based POTS Codec	No - Proprietary	No - Proprietary	**Yes - aacPlus (MPEG HEAAC)**
Transmit-Receive Quality Display	No	Yes	**Yes**
Contact Closures	2	2	**3**
Display Resolution	120x32 LCD	120x32 LCD	**128x64 LCD**
Analog Cell Phone Interface	Optional	Standard	**Standard**
Mixer Inputs	1 mic, 1 mic / line	2 mic / line	**1 mic, 1 line**
Phantom Power	No	No	**Yes - 12 volt**
Automatic Voice-Grade Backup	No	No	**Yes**
Power Supply	External	External	**Internal auto-switching**
Local Mix Audio Outputs			
Headphone	Yes	Yes	**Yes**
Line Level	Yes	No	**Yes**
Direct Receive Audio Output	No	Yes	**Yes**
Uses ISDN at the Studio Side for More Reliable Connections	No	No	**Yes - your Zephyr Xstream becomes universal POTS and ISDN codec.**
Available ISDN Option	$850.00 (adds MPEG L3 & G.722)	$850.00 (adds G.722)	**$495.00 (adds G.722 & state-of-the-art AAC-LD for high fidelity and low delay)**
List Price:*	$3,700.00	$3,650.00	**$2,495.00**

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If you need a routing switcher but aren't made of money, consider Axia, the Ethernet-based audio network. Yes, Ethernet. Axia is a *true network*. Place our audio adapter nodes next to your sources and destinations, then connect using standard Ethernet switches and Cat-6. Imagine the simplicity and power of Ethernet connecting any studio device to any other, any room to any other, any building to any other... you get the idea.

Routers are OK... but a network is so much more modern. With Axia, your ins and outs are next to the audio, where they belong. No frame, no cards, no sweat.

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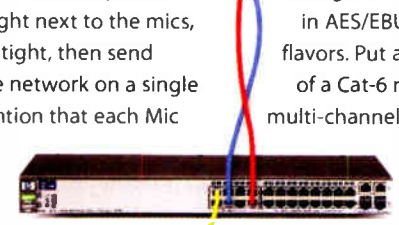
An expensive proprietary router isn't practical for smaller facilities. In fact, it doesn't scale all that well for larger ones. Here's where an expandable network really shines. Connect eight Axia 8x8 Audio Nodes using Cat-6 cable and an Ethernet switch, and you've got a 64x64 routing switcher. And you can easily add more I/O whenever and wherever you need it. Build a 128x128 system... or 1024x1024... use a Gigabit fiber backbone and the sky's the limit.

Are you still using PC sound cards?
Even the best sound cards are compromised by PC noise, inconvenient output connectors, poor headroom, and other gremlins. Instead, load the Axia IP-Audio Driver for Windows® on your workstations and connect *directly* to the Axia audio network using their Ethernet ports. Not only will your PC productions sound fantastic, you'll eliminate sound cards and the hardware they usually feed (like router or console input modules). Just think of all the cash you'll save.

There's a better way to get audio out of your PC. No more consumer grade ⅛" connectors – with Axia your digital audio stays clean and pristine.

Put an Axia Microphone Node next to your mics and send preamplified audio anywhere you need it, over Ethernet — with no line loss or signal degradation.

Put your preamps where your mics are.
Most mainframe routers have no mic inputs, so you need to buy preamps. With Axia you get ultra-low-noise preamps with Phantom power. Put a node in each studio, right next to the mics, to keep mic cables nice and tight, then send multiple mic channels to the network on a single Cat-6 cable. And did we mention that each Mic Node has eight stereo line outputs for headphones? Nice bonus.



Put your snake on a diet.
Nobody loves cable snakes. Besides soldering a jillion connectors, just try finding the pair you want when there's a change to make. Axia Audio Nodes come in AES/EBU and balanced stereo analog flavors. Put a batch of Nodes on each end of a Cat-6 run, and BAM! a bi-directional multi-channel snake. Use media converters and a fiber link for extra-long runs between studios — or between buildings.

An Axia digital audio snake can carry hundreds of channels of digital audio on one skinny CAT-6 cable. We know you're not going to miss soldering all that multi-pair...

With a little help from our friends.
A networked audio system doesn't just replace a traditional router — it *improves* upon it. Already, companies in our industry are realizing the advantages of tightly integrated systems, and are making new products that reap those benefits. Working with our partners, Axia Audio is bringing new thinking and ideas to audio distribution, machine control, Program Associated Data (PAD), and even wiring convenience.

Would you like some control with that?
There are plenty of ways to control your Axia network. For instance, you'll find built-in webservers on all Axia equipment for easy configuration via browser. PathfinderPC℠ software for Windows gives you central control of every audio path in your plant. Router Selector nodes allow quick local source selection, and intelligent studio control surfaces let talent easily access and mix any source in your networked facility.

Control freaks of the world, rejoice: intelligent Axia mixing surfaces give talent complete control of their working environment. Reconfigure studios instantly and assign often-used sources just where they're most useful.

Axia is already working with some great companies. Like Enco Systems, Scott Studios, Radio Systems, Balsys Technology Group, and of course Telos and Omnia. Check AxiaAudio.com/partners/ to find out who's next.

"This sounds expensive." Just the opposite, really. Axia saves money by eliminating distribution amps, line selectors, sound cards, patch bays, multi-pair cables, and tons of discrete wiring — not to mention the installation and maintenance time you'll recover. And those are just side benefits: our hardware is about half the cost of those big mainframe routers. That's right... *half*. Once you experience the benefits of networked audio, you will never want to go back. AxiaAudio.com for details.

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EAS Watch

Understanding DHS' New Alerts on NWR

By Gary Timm

[MILWAUKEE, Wisconsin - November 2004] Some new messages may soon be appearing on your EAS boxes. On June 17, 2004, the U.S. Department of Homeland Security (DHS) signed an agreement with the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS) addressing the transmission of DHS-originated emergency messages over All-Hazards NOAA Weather Radio (NWR).

DHS ALERTS

In the event the DHS becomes aware of a threat in a particular state or area of the country, coordination will be initiated with authorities in each affected area. Verified alerts will be issued to all NWS offices using a link from an operations center in the Washington, DC area. NWS offices with NWR coverage in the areas affected by the threat then will broadcast the message using the DHS-requested EAS/SAME Event Code.

Although many broadcasters already have upgraded their EAS Units to use the new EAS Event Codes released in 2002, it will be important to ensure those EAS Units are programmed to react to the new codes. In order to relay these DHS alerts, broadcasters need to know the Originator Code and Event Codes to program into their EAS Unit filters.

HANDLING DHS ALERTS

In reviewing NWS documents (NWSI 10-1710 & NWSI 10-518), as well as information provided by Herb White, Dissemination Services Manager at NWS HQ, the following are the recommendations we felt appropriate at this time:

The Originator Code on all DHS alerts will be **CIV** – Civil Authorities. Although the alerts are first broadcast on NWR, these non-weather related events will be originated by Civil Authorities and thus will not carry the WXR – National Weather Service – Originator Code.

Normally, one of three Event Codes will be used: **CEM** (Civil Emergency Message) or **CDW** (Civil Danger Warning) will be used to activate the alerts, and an **ADR** (Administrative Message) will be used to terminate the alerts. If you want to be on the safe side, Herb White advises you also program the following codes for possible DHS use: **EVI, HMW, RHW, SPW, FRW, LAE,** and **NUW**.

To reduce confusion or "lost" messages, NOAA has requested that DHS initially use only the CEM code. This will give some lead-time to alert the broadcast community about the new code usage. Broadcasters should make an effort to program these new codes into their EAS Unit filters as soon as possible, and all stations are encouraged to share this information with other broadcasters in their area.

Testing of the codes and the link from DHS to NWS is going on in the background, and should not affect broadcasters. And, while it may be implemented in the future, DHS alerts will not be relayed in text form on NOAA Weather Wire Service (NWWS), EMWIN, or any other NWS system.

STATE LEADERSHIP

The Wisconsin State EAS Plan has already been updated to provide guidance for broadcasters to program their EAS units for DHS alerts. Reports from the field indicate many stations have already moved to implement the programming.

The State of Wisconsin is currently in discussions with the NWS on an agreement to allow local county governments to request EAS alerts be broadcast over NOAA Weather Radio.

The newly-updated Wisconsin State EAS Plan, as well as any future NWS agreements, will be found on the webpage: www.sbe24.org/eas/

ALL HAZARDS RADIO

NWS is taking their new "*All-Hazards Radio*" moniker to heart, including making NWR more available to local civil authorities. As of June 30, 2004, all the new EAS Event codes were approved for use on NWR. On September 8, 2004, NWS offices began using the new EAS-equivalent Product Codes in text messaging as well (via NWWS, EMWIN, etc.)

In addition to the DHS alerts, a separate agreement between NOAA and the FEMA National Warning Center (NWC) exists for NWR to transmit warnings of nuclear attack as well as other non-weather alerts. Nuclear attack would use code CDW, and the other non-weather alerts could use any of the additional codes which Herb recommends adding above.

Using the guidelines regarding programming for DHS alerts should cover NWC alerts as well. As with the DHS alerts, the NWC alerts are separate from any EAN messages issued by the White House.

INFORMATION RESOURCES

NWS has published a helpful document, NWS Instruction 10-518, which aids local authorities in establishing a relationship with their local NWS Office for the purpose of sending local emergency alerts. Section 5 of the document, Civil Emergency Message, addresses local alerting. It deals with developing procedures, issuance criteria, and sample scripts.

Appendix C of this document is a landmark. Someone has finally defined the new specific EAS Event Codes! The definitions in Appendix C will be used as guidance for federal authorities in issuing alerts, and they can be most useful to local authorities as well. State and Local EAS Plans should be updated at this time to not only include the relay of DHS alerts, but also to incorporate these new EAS Event Code definitions. This document may be found at: http://www.nws.noaa.gov/directives/010/pd01005018c.pdf

Looking ahead, NWS is currently working on a system called HazCollect, which it expects to begin deploying in mid-2005. This would be a secure, centralized interface, with backups, which would be used to collect non-weather hazard messages from local, state, and federal authorities and get them into the NWR system. NWS is really going the extra mile to work with local authorities, and it is great to see this.

Gary Timm is a Broadcast Engineer at Journal Broadcast Group, in Milwaukee, and is Broadcast Chair of the Wisconsin EAS Committee. Contact him at: gtimm@journalbroadcastgroup.com. For questions on NWR, contact Herb White, NWS Dissemination Services Manager at NWS Headquarters in Silver Spring, MD. Email: Herbert.White@noaa.gov.

Studio Guide

Airchecks on a Budget

By Mark Shander

[PHOENIX, Arizona - November 2004] While many of us are fortunate enough have reasonable budgets to meet the needs and expectations of the stations for which we work, others have the same needs, but fewer resources.

AIRCHECKING ALTERNATIVES

In the "old days," we modified cassette decks to skim, or used Hi-Fi VHS decks and a tape rotation schedule to make sure we recorded everything that went out on the air. We were innovative. Then came digital storage and CDs and we started recording to hard drives.

Commercial products we able to handle aircheck recording according to elaborate scheduling needs. Many work well, and are still in use – even some DOS-based products! Still, some situations demand even cheaper alternatives.

One of the more popular ways to record digital content on a budget has been to use a program like Cool Edit (Now Adobe Audition) and record line-level analog program audio coming into the sound card. This method works well, but requires a lot of manual intervention.

The recording process has to be stopped periodically, and files have to be saved. Also, many people prefer to record at high bitrates because if archived material needs to be reused or re-purposed, the content must be of high enough quality to meet those needs. That chews up storage space very quickly.

Fortunately, there are easier ways. Many of the solutions I have put together for use in broadcast facilities are adaptations of programs designed with other purposes in mind. Perhaps one of these will work for you.

LOW COST ARCHIVING

Here is an excellent way to archive programming: it is inexpensive, and works like a charm. In fact, if you already have a computer, it only takes an investment of about $40 to make it work.

Run your station's Program Audio feed into the sound cards line-level input, just like in the Cool Edit example above. But instead of using audio recording software, download and install the latest version of the free Windows Media Encoder software from Microsoft's Web Site. Depending on the version, you can lock the encoder so it will only let your own machine's IP address attach to it.

Set up an audio only stream at a constant bitrate – say, 70 kbps – high enough quality to encode a very good quality stereo program audio stream. This streams takes about half a megabyte per minute, or about 700 MB per day (essentially a single burned data CD). Burning about a week's worth of programming on a single DVD is another option.

But this is just the beginning; we have a stream, but how do we actually record it?

RECORDING THE STREAM

WM VCR and WM Recorder are two new products from Applian Technologies. Their website is found at: www.wmrecorder.com. Download and install WM Recorder, then use the free demo mode to become familiar with how to set up recordings before purchasing it. The recorder will be connecting to the encoder on the same machine they are both running on.

WM Recorder: Records Windows Media streams.

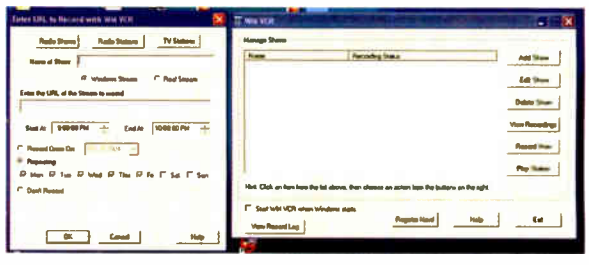
You will need to register the product (about $30) to set it up to record your schedule when you are ready to start, and will be recording the URL the encoder software suggests. Many folks set up hourly recordings so files can be found easily if needed. You can set up back-to-back recordings and miss very little as one recording completes and another begins.

If you choose to record an existing encoder stream, or intend to use one machine on your network to record and another for encoding the audio signal, make sure you are recording using the LAN URL rather than the Internet URL if you can. Depending on how your network is set up, the LAN URL will not tie up any of your Internet bandwidth.

MORE THAN JUST AUDIO

WM Recorder creates .asf files. If your station has a Webcam, you can actually record the video and the audio stream together. Imagine the possibilities for rebroadcasting video and audio content and archiving.

Your archive during the week can become a source of programming on weekends. It is a dream come true!



WM VCR: Program Daypart Recordings just like a VCR!

WM VCR is a cool product, especially if you are a streaming media or radio DX fan. It lets you schedule recordings based on radio station, TV station or program content information that is updated online, much like the way TiVO works. WM VCR registration adds another $10 or so to the package, but is well worth it. You might even find your station's stream already listed.

Who would have thought you could set up a complete archiving system with an existing PC and about $40?

Mark Shander has been in broadcasting and "new media" for 32 years – an interesting feat for a 40-year-old guy. His current projects are on view at www.shander.com

Tips From the Field

Keeping the Nems-Clarke 120-E FIM's Going

by Ken Benner, NCE

[TUCSON, Arizona - November 2004] For many years the Nems-Clarke 120-E field intensity meters (FIMs) were the "standard" by which directional AM stations determined the legality of their radiation patterns. As a matter of fact, the majority of these stations I inspect under the Alternative FCC Inspection Program still use these little gems.

RUGGED – YOU WANT RUGGED?

Gems, indeed! They are among the most rugged pieces of electronic equipment ever designed. Back in the late 1950s, they were manufactured by the Nems-Clarke Instruments Division of the National Electrical Machine Shops, Inc. for RCA in Camden, New Jersey. RCA referred to them as Model WX2D; under the Nems-Clarke trade name – with identical circuitry – they became the 120-E.

As a testament to the long, useful life of this product, let me just mention this experience: earlier this year, I inspected a station with one of the most battered, beat-up pieces of electronic equipment I have ever seen. It was one of the original RCA WX2D's – and let me tell you that little sucker had been through heck and back.

Nevertheless, after I installed a new set of batteries and fired her up, I could not believe my eyes when she calibrated within 1.2 per cent of our reference standard. This old warrior tuned almost perfectly – linearly – across the entire AM band. The guys who designed this unit certainly earned their paychecks!

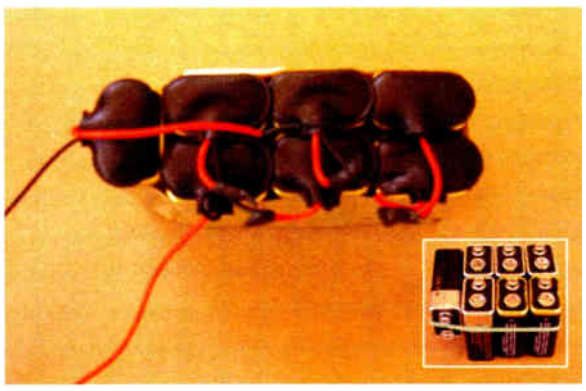
SOLVING A PROBLEM

With so many of these venerable meters still in use, one problem has presented itself: parts and batteries are getting more difficult to obtain – and are getting quite expensive. For example, the cost of those 67.5 V batteries, two of which are required for these meters, is not trivial. A friend of mine recently paid $32.50, plus tax, *each* for a pair. That is $65.00 plus another five bucks for the five filament batteries.

OK, you know where this is going, and while I have yet to see it, I suspect someone else has put together a similar effort to save all that battery money or the almost nine thousand dollar cost for one of those new fancy transistor models.

BUILD A BATTERY

You can build a power supply from a double set of seven 9-volt batteries snapped in series as shown , and then connect them to the meter in place of the old



EverReady 4677s. Since the five required D cells are still common and reasonable – simply replace those in the snap-in panel and you are in business for *well under fifteen dollars*!

About every month or so, Walgreens sells its "mid-value" 9-volt batteries for fifty-cents each. Seven of those plugged together in series give you about 68 volts (quite close to the voltage of a brand new 67.5 volt battery, which will read about 74 volts).

The receiver in these meters draws about 7 mA, while the calibration oscillator draws less than 3 mA. I keep track of the voltage of these battery packs and use the best charged one for the receiver and the least charged for the calibration side.

The manual suggests the meters will measure correctly if the panel meter reads between "5" and "7" as the "meter switch" is switched through positions AR, BR, AC, and BC. This amounts to roughly 1.5 V down to 1.1 V for the A batteries and 74 V down to 50 V for the B batteries. Managing the batteries this way can, as Nems-Clarke claimed in their manual, get you almost 500 field intensity measurements out of a single set of batteries.

CALIBRATING THE NEMS-CLARKE

Calibration is your next concern. A quick and fairly reliable way to check the calibration is to contact your buddy who is chief over at the big 50 kW DA up the road. Invite him to lunch – as long as he brings his recently calibrated Potomac Instruments field intensity meter!"

Take a few minutes in the restaurant parking lot and compare the readings for both meters at the middle and each end of the AM band. The chances are you will be amazed at how well calibrated that old meter is if it has not been bounced around in the back of a pick-up truck for a few weeks.

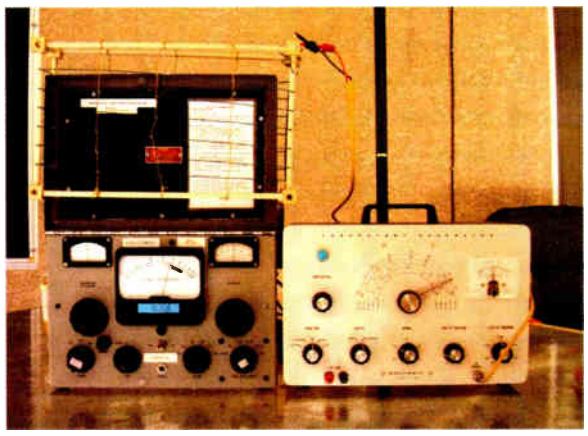
If your FIM does need to be calibrated, your choices are a bit more limited than they used to be. However, a friend of mine is willing to service these units and determine their calibration if possible.

You can call Dave Smith 307-367-2182 or email dave@davestechshop.com

Meanwhile, if you do not have and need to get a copy of the manual, I am certain the Pavek Broadcast Museum in St. Louis Park, Minnesota 952-926-8198 or fax 952-929-6105 can provide a copy for a nominal charge.

To calibrate my FIMs on the work bench, I start by determining what kind of field I need. This is accomplished with a loop fed from the output of a calibrated frequency generator. In this photo at 900 kHz, with about 50 µV into the loop, the FIM reads 5 mV.

With a little experimentation by varying the position of the loop, using the measurement of a local station, and then varying the field of the loop with the generator (as long as you have a standard to refer to), you can calibrate one similar FIM to another.



My system, with a home brew "tinker toy" loop.

In my travels, I have discovered that many of the RCA or Nems-Clarke units no longer have the original list of instructions pasted on the lid, for reference in the field. So, if you need one, take the list below and paste it in your FIM.

KEEP THE LEGACY GOING

The Nems-Clarke meters use only two tube types: four of the 1T4 and two of the 1R5 available from several electronics supply shops, including Antique Electronics in Tempe, AZ at 480-820-5411.

So, build yourself a B+ supply for your old FIM and have fun with one of the toughest pieces of equipment ever designed: those incredible, trustworthy Nems-Clarke 120-E FIMs!

When he is not out on the road as an Alternate FCC Inspector, Ken continues to spend time in the shop, keeping his Nems-Clarke FIMs in good condition. Ken can be reached at bennerassociates@aol.com

RCA Type WX2D & NEMS-CLARKE Type 120E FIELD INTENSITY METER OPERATING INSTRUCTIONS

Check Batteries

1. Latch cover open.
2. Turn Power switch to CAL.
3. Turn Meter switch successively to positions AR, BR, AC, and BC.

Meter reading should be in green area for each position. If not, replace appropriate battery (ies).

Calibrate Meter

1. Place meter with cover open and loop in vertical plane.
2. Turn POWER switch ON and LOG-LIN switch to LIN.
3. Turn COURSE GAIN 3/4 ON and FINE GAIN 1/2 ON.
4. Turn METER switch to FI and set FULL SCALE RANGE switch for expected reading.
5. Tune RECEIVER to desired signal and maximize meter reading. Then rotate instrument about vertical axis to obtain minimum reading. Do not change RECEIVER tuning after this step.
6. Turn FULL SCALE RANGE to CAL & POWER switch to CAL.
7. Tune CALIBRATING OSCILLATOR to received frequency and for maximum meter reading.
8. Turn METER switch to FI and adjust COURSE GAIN for same reading.
9. Switch between OSC and FI, adjusting the FINE GAIN to make readings equal in these positions.
10. Turn METER switch to FI and POWER switch to ON.

Measure Field Intensity

1. Switch LOG-LIN switch to LIN.
2. Rotate instrument for maximum reading on meter, using FULL SCALE RANGE switch to keep reading on scale. Re-check receiver tuning for maximum reading on desired signal. If far off, calibration must be re-checked (steps 5-10 above).
3. Read meter. Field intensity is equal to (meter reading) x (full scale range setting) x 1/10, i.e.: If meter reads 6 and FULL SCALE RANGE switch is in the 100 mV position, then FIELD INTENSITY equals 60/mV/m (60 millivolts per meter).

Restoring Old Radios

Part 3 – Digging Deep

by Allen J. Singer

Allen has found a radio, gotten new parts, and now is bringing it back to life. Has he got you interested in tackling such a project? Let's see how this one turns out.

[CINCINNATI, Ohio - November 2004] Some old radios are easier to restore than others.

Often you need only perform the basics: replace all the necessary parts and wires, test all tubes and replace bad ones, lubricate the tuning shafts and pulleys to ensure the string moves freely, ensure the volume clicks on and off cleanly, and clear any other issues you have encountered during initial parts replacement. Now you are ready to plug it in.

If you have a Variac supply, you can gradually increase the voltage to the unit to prevent any further problems. In any event, plug the unit in and turn it on. Does the pilot light come on? Do the tubes glow? Do you hear anything in the speaker? If the radio works, then perform some basic alignment for signal strength and gain. When the radio sounds good, put the chassis aside and work on the cabinet.

TROUBLESHOOTING

However, usually it is just not that easy. A tube might not light, the speaker might only play hiss or hum, or at worst a puff of smoke might erupt from one of the components. Now it is time to troubleshoot.

If you do not yet have a schematic, go to www.nostalgiaair.com to download a free one. This site also offers pages filled with advice like tube data lookup, cabinet restoration and even how to recone a speaker yourself.

The schematic will show tube data, including voltages at each tube pin. If tubes do not light, you must carefully measure voltages at the pins and compare with the schematic. If the voltages do not agree, you must identify surrounding components to make sure they are the correct ones, are of correct values, and are soldered in the right places. It can be easy to forget to install a component after disconnecting it, especially when it is late and you want to do "just one more." Analysis like this will help point you in the direction of the problem area.

SPEAKING OF SPEAKERS

Many pre-1950 radios used speakers that have a voice coil, and a field coil used to create the magnetic field for the speaker instead of a magnet. If you are lucky, the speaker will show continuity and the paper will not be torn.

However, any speaker with a small tear can be repaired with some silicone caulk. If the paper is so torn that it cannot be mended, it will have to be replaced or reconed. And if your only replacement speaker that fits the chassis uses a magnet instead of a field coil, not to worry-you, can still use it.

Four wires go to the field coil speaker: two to the field coil, and two to a transformer (which then go to the voice coil). Measure the resistance on the field coil, it will probably be 300 ohms. You can put a 300 ohm power resistor in the place of the coil, and put your other two wires to the transformer of the replacement speaker. Then just hide the resistor underneath.

Ideally, though, it is best to use the old speaker's field coil, but what if the coil is firmly attached to the speaker? No problem, just clamp the coil housing in a vice and smack a hammer on the speaker to snap the speaker off the coil. Now you can install the coil on the chassis, or underneath if there is room. Rewire as necessary.

Ready for the cabinet.

MORE TROUBLESHOOTING

When everything is working but you hear only hiss or variable audio levels in the speaker, there is a problem in the audio section of the circuit. Follow the schematic and, starting with the speaker, test the corresponding components for continuity and correct voltages. Hook up a signal generator to the antenna inputs and follow the audio with a meter or oscilloscope. Check all transformers and coils and make sure they are working correctly. Recheck the tubes – sometimes they work in the tester, but then will not work in the radio!

For additional advice, you can post questions on message boards on the web, like at www.antiqueradios.com.

Here you will find helpful forums, vintage articles and other information, and even a treasure trove of free downloadable MP3s of Old Time Radio shows. On the electrical restoration forum you can post your dilemma, and knowledgeable board members will help analyze the problem. In this forum, radio restorations are analyzed and discussed every week.

REFURBISHING THE CABINET

With diligence and patience, you can fix even the most troublesome radio and make it sound good – hopefully as good as the day it was purchased new. But the cabinet must look good too. Bakelite and plastic cases can be repaired using superglue, and you can usually get a wood cabinet to look nice using wood cleaner and polish.

More extreme cases will require refinishing with stain and lacquer, maybe even new speaker cloth and buttons. Genuine speaker cloth and reproduction buttons are available at Antique Electronic Supply and other online sources (www.tubesandmore.com).

Sometimes you may have to fabricate your own cabinet parts. This is not so difficult with a few basic woodworking tools. By using a drop saw, replacement square wooden buttons can be cut from a small rectangular piece of wood. Sanding and painting will yield a decent set of buttons.

A replacement knob can be made by cutting a few appropriate-sized circles out of an old pool cue-stick, using the drop saw. Choose the circle that works the best and drill a hole through the center to fit onto the shaft. When finished, the results will look good and function authentically.

When the radio works the first time after restoration, you can pat yourself on the back for a job well done. Whether you have restored an old cathedral radio, a rare Catalin or a Crosley console unit built when Glenn Miller hits emanated from the speaker, you have resurrected a discarded piece of history that can now be enjoyed by today's generation.

From junk to collectible, a Zenith 6D510

A nicely restored common table radio can sell on eBay for around $50, sometimes more, sometimes less. Big console units can sell on eBay upwards of several hundred dollars, always depending on the condition, demand, and what the buyer is willing to spend.

You will not always make a fortune selling a restored radio. On average, you might spend around $20 on the radio and new parts, and a few hours or days working on it. You might sell it for ten times your investment, or you might just break even. But radio collecting and restoration is a fun hobby shared by thousands of folks just like you all around the world. And the web allows you to connect with them so you can share your experiences any time of the day.

[Editor's note: Judging by the picture of the Zenith 6D510 in the wonderful book on Zenith radios by Harold Cones and John Bryant, Allen did a pretty nice job of restoration. By the way, yes, he did auction his radio on eBay. And while this radio did not make him rich financially, he reports the process was enjoyable and well worth the effort.]

Allen Singer is a freelance writer in Cincinnati. He writes on broadcast topics as well as two books on the Cincinnati subway system. You can email Allen at allensedge@yahoo.com

Solutions Cookbook

INNOVATIVE PROBLEM SOLVING TOOLS FOR BROADCAST

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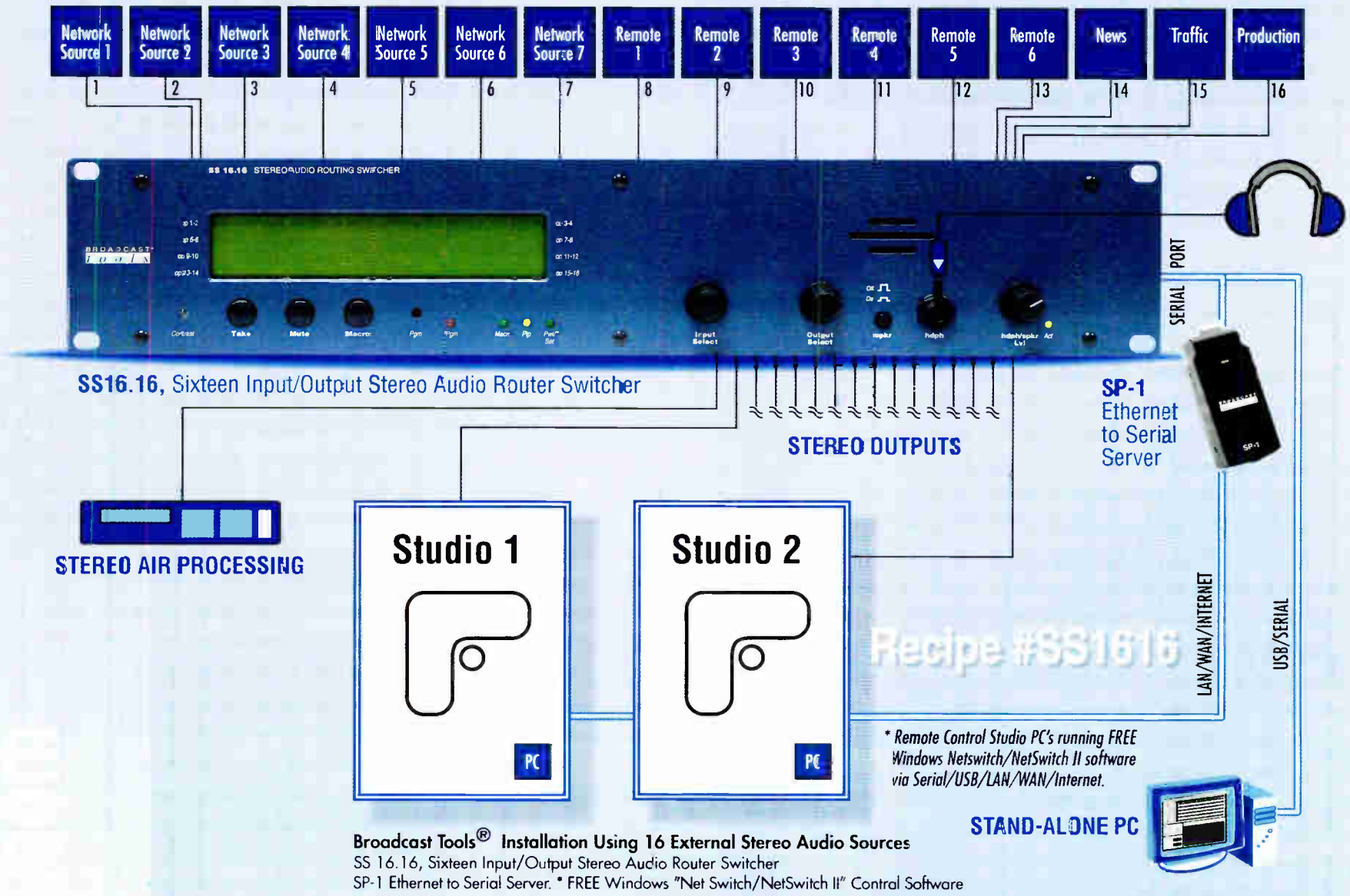

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Use the affordable SS 16.16 as a stereo analog audio router and cut costs by replacing racks of distribution amplifiers and associated equipment in your broadcast facility. For example, compare a single SS 16.16 audio router costing under $2,600 to a typical 16 stereo source-by-eight studio facility: 16 stereo distribution amps at $400 per unit, plus two stereo switchers per studio, at $500 each, is $14,400 in hardware costs alone...not to mention other costs, such as wiring, hardware and labor. With the SS 16.16 most installations require no additional wiring or hardware.

The SS 16.16 is configurable and accessible from each studio or anywhere, via the Internet using our SP-1 and FREE NetSwitch/NetSwitch II Windows OS control software. The 2-RU SS 16.16 is even equipped with a 16 GPIO port for use with automation systems.

FEATURES

- Stereo routing of any one input to any/or all outputs.
- Headphone amplifier with front panel jack and level control.
- Front panel monitor speaker with mute switch and level control.
- 40 x 4 back lit LCD display with user programmable nine character input descriptions.
- Internal audio activity/silence sensor monitors output channel sixteen. A front panel ACT indicator and rear panel open collector are provided. Sensitivity set at -34db.
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- Most configuration options may be set via the easy access rear panel dipswitches.
- 16 input GPI port (PIP) with LED indicator.
- 16 open collector channel status outputs or programmable via burst commands.
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- Multi-drop RS-232 serial port with data activity LED.
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SBE National View

Why Should I Join SBE?

By Thomas R. Ray, III, CPBE

[NEW YORK CITY, New York - November 2004]

On many occasions, I have been asked, "Why should I join SBE? What can it do for me?" Part of my answer is usually personal, and the other part is the "company line." Before we get into the "official" reasons to join the Society of Broadcast Engineers, let me start by telling you what I get out of SBE membership.

NETWORKING

A primary benefit is being able to network with other engineers in the area by attending the local SBE chapter meetings. In the highly competitive environments we all work in, it is nice to find out that you have much in common with the person who takes care of the engineering duties at your chief competitor. It is nice to find out that he and his organization are not the ogres or bozos you have been led to believe.

It is nice to discover others using the same transmitter you do and, between the spare parts that you each stock, you can come to rely on each other in the event of an emergency. You also can learn from their experience. Consider this: depending on your chapter size, you can easily have several hundred years of broadcast engineering experience in one room! What a great opportunity to bounce ideas off of each other. It is nice to know you are not alone with your challenges.

Local SBE chapter meetings are also a great way to learn about new technologies and see new products. With many companies reducing trips to the spring NAB Show, more engineers are learning about the new technologies or latest gear through presentations by manufacturer reps at their local chapter meetings.

A special treat is attending a meeting where someone from your chapter is doing the presentation. This usually leads to great discussions in a small setting where everyone can learn from each other.

Here in New York City, there is nothing cooler than getting a tour of a facility like the new CNBC complex or the new Master Antenna system at 4 Times Square overlooking the city at night.

SBE Chapter 15 Meeting at 4 Times Square

Tours of facilities in your area help you understand the playing field in your market. You may even discover a better way of accomplishing some particular goal at your facility.

PROFESSIONAL CERTIFICATION

Years ago (am I showing my age?), the FCC First Class license was the "ticket" to show the manager you were qualified for an engineering position. Since the FCC stopped licensing broadcast operators in 1985, SBE certification has become a guide for managers to know who can do the job.

There are several levels of certification (for radio and television operators) depending upon your experience and expertise, and it gives you a great feeling of accomplishment to take a certification test and pass it.

If you are wondering what else SBE certification can do for you, look through a copy of the *Certification Handbook for Radio Operators*. You will discover what all those transmitter meter readings mean, plus many other things that used to be standard knowledge to become an operator. This will make you better informed and therefore a more valuable employee.

OTHER BENEFITS

SBE also stands as a voice in the industry for the broadcast engineer and an advocate on all levels. Its services include *The Signal*, SBE's bimonthly newsletter, which gives information about various SBE chapters, technical issues, SBE's FCC filings and more.

Looking for a job? To help you in your quest, SBE's website has JobsOnline, a listing of job openings, and the Resume Service, which can put the resumes of SBE members into the hands of prospective employers.

Some SBE chapters hold regional conventions, offering a wealth of information. Additionally, SBE has instructional videotapes that can be borrowed at no charge, and you can purchase books on topics specifically related to the broadcast engineer at up to 20 percent off of retail prices. (You cannot find that in your local bookstore.)

SBE sponsors leadership training courses and cosponsors the Ennes workshops on current technologies. They have insurance programs geared to what we do for a living. Going to cover an NFL game? SBE is there, providing game-day frequency coordination services. Want to help a student who may be interested in becoming a broadcast engineer? SBE has student memberships available at both the college and high school levels.

Looking at the SBE website (www.sbe.org), I have covered most of what SBE membership is about simply from my personal point of view. You owe it to yourself to become an SBE member. I hope to see you at a meeting soon!

Tom Ray is the Corporate Director of Engineering, Buckley Broadcasting/WOR Radio, Chairman of SBE Chapter 15 (New York City), and serves on the SBE Board of Directors. Email Tom at tomray@wor710.com

Tech Tips

A New Use for an Old Tool

By John Stortz

[TAMPA, Florida - October 2004] Some might not believe this one, but it really worked. We were in the middle of renovating our studio offices and I was assigned to move all of the phone, data, and monitor speaker wiring in the manager's office. Of course, all this stuff must be relocated from the east wall to the west wall. And, thereon hangs this tale.

THWARTED

I was planning to use surface raceway to run the wires. However, during a previous renovation, the concrete walls were covered with 1" styrofoam insulation, covered with thin wood paneling (which was later covered with wallpaper). Moving the manager's couch away from the wall, I noticed there was an open – but empty – metal electrical box behind the couch. "How convenient, I thought."

Then, an attic check revealed there were *two* stubbed-off conduits rising out of the wall and into the attic. There must be a second box behind the panel, but how to find it?

A stud finder did not work, tapping the wall did not work, nor did a compass or gauss meter. Just as I was ready to give up, I happened to come across an old hand-held bulk eraser.

TESTING, TESTING

While the bulk eraser was energized, I slowly moved the eraser along the wall. When the bulk eraser was near the hidden steel electrical box and conduit, I could feel the eraser vibrate. Actually, now that I think about it, if I had been monitoring the current with my Kill-A-Watt, I could have "seen" a change in the tape eraser's current when the bulk eraser met up with the metal conduit [**Radio Guide**, February 2003].

John demonstrates how to locate a hidden conduit box with a tape eraser.

We then probed the wall by drilling small holes through the panel board and styrofoam, the second drill hole went into the void of the long-abandoned electrical box – which conveniently had no cover on it. It seemed like success!

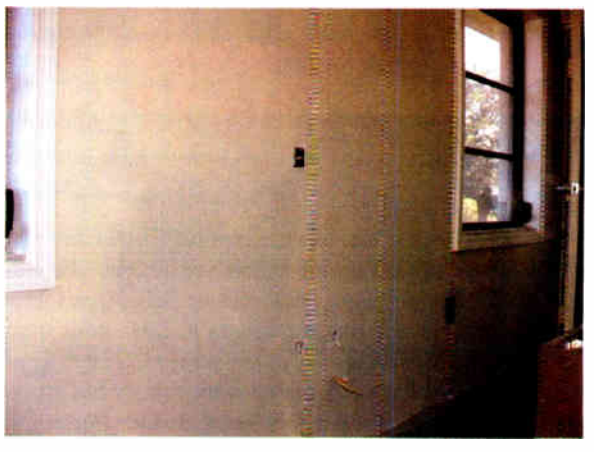
SURPRISES UNCOVERED

However, when we attempted to drop a fish tape down the conduit from the attic, the fish tape stopped very solidly before reaching the freshly opened electrical box. Making a full opening into the box in order to determine why the conduit appeared to be blocked, we discovered the conduit went to the floor, rather than the attic. It turned out to be a conduit connecting to the telephone box on the opposite wall.

So we adapted: My shop-vac made quick work of getting a string thru the conduit, and the string pulled the new phone wire. But what about that second conduit stub in the attic?

My helper suggested there might be another box in the wall, slightly above the one we had just discovered. Another "scan" with the bulk eraser revealed a third empty electrical box at just the right position to house a volume control for the room speakers.

If you look carefully at the picture, you can see why we thought the conduit stub went to the lower box, initially. It turned out that there were two boxes, one directly over the other. The box near the floor has conduit going down into the concrete floor and over to a telephone panel. The higher box was the one with the conduit stubbed off above the ceiling.



One box turns into three with the "magnetic probe."

So we discovered we already had outlets for telephone, data, and volume control – all built into the wall and forgotten, more than 20 years ago, but revealed with a more than 20 year old bulk tape eraser. And here you thought that old tape stuff was useless, just attracting dust in the storeroom!

THE OTHER SHOE

Of course, one of Murphy's Laws had to intervene. Perhaps it is number 18: "Anytime you install a switch or volume knob, someone will cover it with some furniture." Yes, shortly after we got all the boxes wired, new furniture arrived, complete with a seven-foot-wide hutch on the one side that would completely block any possible access to the L-pad knob!

Nevertheless, the project proved why a smart engineer saves all that old gear, instead of tossing everything not in current use into the dumpster.

John Stortz uses a lot of little tricks to get things done, and likes sharing his successes. His email is jlstortz1@juno.com

The Radio Guide Tech Initiative

As announced at the NAB 2004 Radio Show, **Radio Guide** magazine has embarked on a **Tech Initiative** to encourage the sharing of technical knowledge and experience among the engineering community.

As part of this outreach to encourage information sharing, a number of manufacturers have already contributed over $15,000 of gear, to be awarded to the best submissions. Some of the items include:

Audion Labs VoxPro Digital Audio Editor

Broadcast Warehouse DSP-X Digital Processor

Comrex DH-20 Digital Phone Hybrid

Henry Engineering Studio Drive Mixer

rfSoftware rfInvestigator (full package)

Orban Optimod 1100 Processor Card

What we are asking is for you to share your Tech Tips, User Reports and War Stories as well as longer articles on topics that interest you, from studio construction or renovation, to transmitter site maintenance, or the way in which you research new equipment purchases.

Do not worry about being a perfect writer; we will help you get it done. And besides the personal satisfaction of "giving something back," you will earn re-certification credits from the SBE, a check from **Radio Guide**, and the chance to receive one of the special awards.

More details will appear here. In the meantime, please address any questions or submissions to Editor@radio-guide.com.

Consultant Guide: Radio Consulting Engineers

Gear Guide: Studio-Transmitter Links & Satellite Equipment

Armstrong Transmitters

The Armstrong XLINK is the latest evolution in the company's STL line. This frequency agile STL is microprocessor controlled, it has improved sensitivity and better selectivity that the earlier models.

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The Xlink is a perfect platform for your digital conversion as it quickly interfaces with Armstrong's DX series of encoders and decoders.

Armstrong Transmitters
Phone: 315-673-1269
Website: www.armstrongtx.com

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BP Series high capacity, point-to-point microwave radios support up to 45 Mbps full-duplex bandwidth operating in the 5.3 GHz UNII band, reaching up to seven miles, or the 5.8 GHz ISM band, reaching up to 40 miles. Alternately, Network Interface Units connect Big Pipe via wireline networks.

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Bext Inc.

The Bext LD STL System is a microprocessor controlled composite 10 W radio STL with impressive audio specs.

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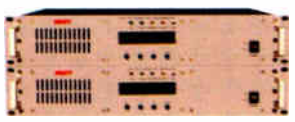

Both Transmitter and Receiver are front panel programmable anywhere in the whole 950 MHz US STL Band or between 220 and 450 MHz (for export).

Both have universal voltage sensors, allowing you to feed it anywhere from 85 to 255 VAC with no voltage selectors or transformer taps. A 24V DC input is also provided. The chassis construction is stainless steel.

Optional items are a digital encoder/digital decoder set and 20W or 35W amplifiers.

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Phone: 888-239-8462
Website: www.bext.com

D&H Satellite

DH Satellite has just introduced its newest antenna. This is the 3.0m antenna with a .4 f/d. This optimizes the feed system for the digital broadcasts.

The gain is only marginally different from the existing 3m antenna with the .3 f/d but with this gain difference, and the better S/N ratio, you will get better results on the digital and analog signals.

This system comes with either the fixed Az-El mount or the Polar system that will track the entire arc. For more details contact DH Satellite, or visit our website for complete specifications.

D&H Satellite
Phone: 800-627-9443
Website: www.dhsatellite.com

Energy-Onix

The Tele-Link consists of an enhanced encoder and decoder that permit wideband, reliable transmission over the Internet using a wideband, dedicated connection. Broadcasters may use the Internet deliver a noise free stereo program with 22 kHz response on both left and right channels, as well as AES/EBU digital services.

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New from QEI – the company that brought you the CAT-LINK Digital T1 STL/TSL and the Quick-Link Spread-Spectrum Digital Radio System now brings you the latest innovation in STL technology: The Rosetta™ Link Model 900. The Rosetta™ Link uses patent pending technology to transport your RF signal from your studio to transmitter.

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TFT Inc.

The TFT Model 460/467 is the world's first uncompressed digital STL with 6 full discrete program channels with 256/64/16 QAM or 8PSK modulation. Both the transmitter and receiver are PC configurable for frequency and input/output sampling rate. 12.5 kHz carrier step size is supported, and inputs and outputs can be either AES/EBU or analog.

Both transmitter and receiver are frequency agile within each STL band, and input/output sampling rates of 32, 44.1 and 48 ks/s can be selected. The method of modulation is automatically optimized for the number of channels and individual sampling rates.

9600 baud of data is also available in addition to the six program channels. Both major and minor alarms are user-defined. FCC authorization is pending.

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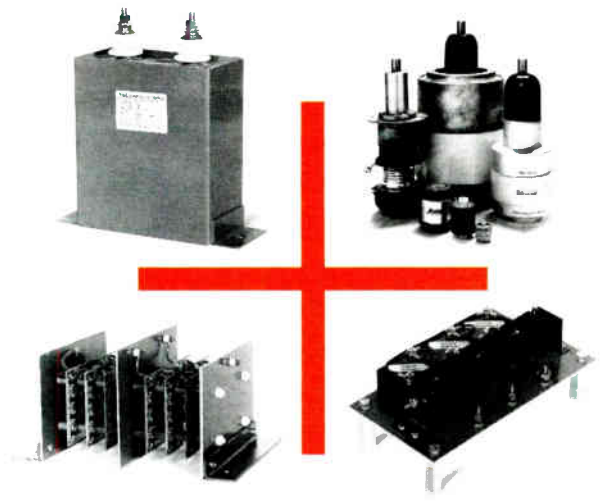

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Conex Electro Systems - 11	www.conex-electro.com
Comrex - 16	www.comrex.com
D&H Antennas - 9	www.dhsatellite.com
Decade Transmitters - 35	www.decade.ca
DRS Technologies - 29	www.contelec.com
Econco Tubes - 9	www.econco.com
Energy Onix - 2	www.energy-onix.com
ERI - 5	www.eriinc.com
Gorman Redlich - 33	www.gorman-redlich.com
Harris - 40	www.broadcast.harris.com
Henry Engineering - 2	www.henryeng.com
Inovonics - 5	www.inovon.com
JK Audio - 6	www.jkaudio.com
Kahn Communications - 28	none
Larcan - 7	www.larcan.com
Lightner Electronics - 6	www.lightnerelectronics.com
Logitek - 11	www.logitekaudio.com
Micro Communications - 25	www.mcibroadcast.com
Nautel - 31	www.nautel.com
Nott Ltd. - 19	www.nottltd.com
OMB America - 28	www.omb.com
Orban - 40	www.orban.com
Peter Dahl - 35	www.pwdahl.com
PTEK - 25	www.ptekpower.com
Pnasetek - 15	www.phasetekinc.com
Prophet Systems - 39	www.prophetsys.com
QEI Corporation - 33	www.qei-broadcast.com
RAM Broadcast Sys. - 19	www.ramsyscom.com
Ramsey - 19	www.ramseyelectronics.com
RF Specialties - 13	www.rfspec.com
Satellite Lynx - 25	www.satellitelynx.com
SCMS Inc. - 35	www.scmsinc.com
Scott Studios - 1	www.scottstudios.com
Sine Systems - 17	www.sinesystems.com
Spacewise - 33	www.spacewise.com
Superior - 15	www.superiorbroadcast.com
Telos/Axia - 20/21	www.telos-systems.com
TFT - 9	www.tftinc.com
Tieline - 5	www.tieline.com
Transcom - 11	www.fmamtv.com

Radio Guide Calendar

List your Convention, Event or Gathering Here
Email information to: radio@broadcast.net

Canadian Association of Broadcasters
November 28-30 – Ottawa – www.cab-acr.ca

SBE Certification Exam
Feb. 4-14 – Local Chapters – Dec. 27 App Deadline

National Religious Broadcasters Convention
February 11-16 – Anaheim – www.nrb.org

National Assn. of Tower Erectors (NATE) 2005
February 14-17 – Dallas – www.natehome.com

IBS International College Radio Conference
March 11-13 – New York – www.collegeradio.tv

SBE Certification Exam
April 19 – Las Vegas – March 01 App Deadline

NAB 2005 Spring Convention
April 16-21 – Las Vegas – www.nab.org

SBE Certification Exam
Jun. 3-13 – Local Chapters – Apr. 22 App Deadline

NAB 2005 Fall Radio Show
September 21-23 – Philadelphia – www.nab.org

Letters from our Readers

Dear Radio Guide:

Jeff Gulick is one of the finest, most professionally dedicated broadcast engineers ever created – ask anyone who knows him.

Today, Jeff is undergoing a horrible battle with bone cancer involving chemotherapy. He is admired by his fellow engineers and friends throughout the nation as one always willing to share his knowledge, experience and encouragement with anyone.

As a regional corporate engineer for 77 Western-US stations over a period of eight years he set an extraordinary example of professional dedication to a standard of excellence rarely seen in this age.

Today Jeff is unemployed and his doctors have advised he will be unable to return to work for at least a year. He has no other source of income than a very modest investment return that is rapidly being depleted with medical insurance costs and normal living expenses.

Jeff has long given generously to the art and science of American Broadcasting. Let's help him out now that he needs us. A special account has been set up in his name: The Jeff Gulick Fund, c/o Branch Manager, Wells Fargo Bank, 2500 East Second Avenue, Denver, CO 80206-4746.

From Ken Benner

Broadcast Engineering Books

If you are looking for the latest information on digital broadcasting, antenna adjustments, or any other technical details, having current reference books is vital for the information you need. BroadcastingBooks.com has brought together, in one location, a great collection of the latest technical and informational books available.

BroadcastingBooks.com brings you information on: Antenna Theory and Design, Digital and Analog Audio, Cable TV, AM directional antennas, TV & FM broadcasting, WEB streaming, Video, Fiber Optics, Networking, Electronics, Reference books, RF & Microwave, Satellite Communications, Amateur Radio and much more!

This website was assembled by contract engineer Dennis Baldridge of Baldridge Communications to assist engineers and broadcasters in acquiring the crucial information needed for today's advancing technologies.

www.broadcastingbooks.com

Communications & Power Industries to Acquire Econco

Communications & Power Industries, Inc. (CPI) has announced that it has signed a definitive agreement to acquire ECONCO Broadcast Service, Inc. from the founders and controlling shareholders of the company.

Established in 1968, ECONCO is the world's leading provider of rebuilding services for vacuum electron devices (VED's), allowing broadcasters and other users of these critical products to extend the life of their devices, at a cost that is lower than buying a complete new VED.

Communications & Power Industries
Phone: 800-414-8823
www.cpii.com

Bob Trimble Joins RF Specialties of Washington

Bob Trimble has joined RF Specialties of Washington, Inc. Bob comes to us with a background in both broadcast engineering and sales. Bob has served as chief engineer for radio stations in both the Portland and Seattle markets and, for the past few years, he has been involved in Satellite Internet sales and service, and in the IT world. He will be specializing in Studio Sales for RF Specialties, complementing Walt Lowery who specializes in RF Sales. Bob will be working from his office in Vancouver WA, and can be reached at 800-735-7051, or through e-mail at rfspec@bobtheitguy.com

RF Specialties of Washington
Phone: 800-7357051
www.rfspecialties.com

Burk Technology Releases New ARC-16 Firmware

Burk Technology announces immediate availability of new firmware for the ARC-16 transmitter remote control system. Firmware version 5.6 offers faster baud rates for digital communication links, providing more responsive site-to-site communication, especially with multiple remote sites.

Peter Burk, president of Burk Technology, says that supporting 4800 and 9600 baud benefits the performance of the ARC-16 without requiring more than one T1 slot. "In a lot of cases, bandwidth is at a premium," says Burk, "so we're careful to make sure the ARC-16 uses it economically."

Burk Technology
Phone: 978-486-0086
www.burk.com

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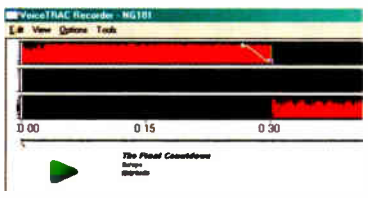
Runs a single station in Automated or Live Assist modes. The core license is required on all NexGen101 workstations, and includes the ability to create and execute logs, basic audio element production, day of the week clock templates, and audio backup/load utilities. All other modules can be added to the core license to create multiple workstation configurations.

Live Control Package $400 *Buy Now* ☐
Useful for high energy morning shows. Create and play audio elements outside of the log for random access or auto-play, send artist/title information. Includes following modules: Electronic Copy, Cart Deck, Button Bar and RDS Export.

Single-Source Satellite Package $400 *Buy Now* ☐
Enables your station to run in satellite mode and automatically record satellite feeds, with local spot insertion and time and temperature announcements. Includes following modules: Single-Source Satellite, Time & Temperature, DRR Automated Capture, and GPI.

Scheduler Package $400 *Buy Now* ☑
Schedule your station using either internal or external scheduling systems. Includes following modules: MusicGen101 integrated music scheduler, Traffic and Music Load, Multi-User Access.



VoiceTRAC Package $400 *Buy Now* ☐
Record breaks, intros and outros for when you can't be live, but still want to sound like it. Includes following modules: Basic VoiceTRAC, Enhanced Production Interfaces for third-party audio editors, CD Extractor/Audio Format Converter, and the Graphic VoiceTRAC Upgrade.

Buy Individual NexGen101 Software Modules for $101 each

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Basic VoiceTRAC Module *Buy Now* ☑
CDX/AFC Module *Buy Now* ☐
DRR Automated Capture Module *Buy Now* ☐
Enhanced Production Module *Buy Now* ☐
GPI Module *Buy Now* ☐
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MusicGen101 Module *Buy Now* ☐
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Check our website for a complete list of modules.

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