Radio Guide

Radio Technology for Engineers and Managers

December 2006

Bringing AM and Cellular Together

Inside Radio Guide

Whenever the subject of locating a cellular structure near an AM radio transmitter site came up it was more often than not immediately quashed due to unknowns of what possible effects re-radiation from it might have on the AM station's radiation pattern.

Perish the thought of mounting cellular antennas on a hot AM radiator! Those sorts of things were just not done – and especially not done if the radiator was part of an AM directional antenna system. It was likened to opening a can of worms or sailing into uncharted waters.

Indeed we have come a long way in the intervening years.

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Contents

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Cover Photo

Installing cell antennas on an AM directional at WXCT, Southington, CT. Photo courtesy of General Manager Charlie Profit.

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Radio Waves

by Barry Mishkind – Editor

Several new IBOC receivers were released in November, which should please those committed to the technology.

Thanks to the Internet, news circulates within minutes of a product's release. Comments on sensitivity and sonic qualities were noted, as well as some of the addition features. One intrepid person actually disassembled the radio and reported on the PC boards inside.

SOME GOOD NEWS

It is true that in some markets (especially those which suffer from major multi-path issues), reception has improved dramatically with IBOC receivers.

The broadcast technical community continues to install new equipment, solve bandwidth and antenna problems, and operate some very clean plants. This is a good thing, improving both analog and digital transmissions. (It might be even better if there was sufficient monitoring and test gear to reduce the diversity delay errors that drive listeners crazy, for example. Too many stations fall short here.)

SOME REALISM

Even if the current receivers have flaws, it is important to credit the manufacturers for their investment in time and money, despite slow sales outside of the broadcast industry.

True, the real need is for good portable and auto radios priced where consumers will buy them. But if every receiver released gets nothing but criticism, manufacturers will give up and make more profitable things. It is not their fault current design and cost factors are such hurdles.

Will IBOC gain traction in 2007? With Satellite Radio, Wi-Fi, Wi-Max, and all the other alternatives out there, if IBOC continues to roll out slowly it could lose momentum to some of those other form factors.

Engineers are doing their jobs. The need for compelling programming, smart promotion, and wise direction from the FCC has never been greater. – *Radio Guide* –

The Marriage of Cell Sites to Hot AM Radiators

by Jack Layton, CPBE

Normally, you would not expect to see AM and cell phone transmitters sharing a tower. In fact, a common nightmare scenario is for an engineer to go to the transmitter site only to find a new stick has "sprouted" in the array. However, as Jack Layton shows, AM and cellular can live together.

We have come a long way in the last twenty years. Back in the 1980s cellular telephones were in their infancy. The heretofore-unknown monopole antenna support structures for cellular antennas were popping up everywhere like weed seeds in springtime.

NIMBY!

Whenever the subject of locating a cellular structure near an AM radio transmitter site came up it was more often than not immediately quashed due to unknowns of what possible effects re-radiation from it might have on the AM station's radiation pattern.

Perish the thought of mounting cellular antennas on a hot AM radiator! Those sorts of things were just not done – and especially not done if the radiator was part of an AM directional antenna system. It was likened to opening a can of worms or sailing into uncharted waters.

Indeed we have come a long way in the intervening years. All of the above mentioned taboos have become common place practice in the dawning years of the 21st century.

A MORE PRAGMATIC VIEW

Vertical real estate in some places has become more valuable than strategically located, choice commercial property. Local ordinances have become so restrictive that the unthinkable of yesterday is out of necessity becoming the commonplace of today.

The vertical tower is the support structure for the cellular antennas. The vertical tower is the radiating system for the AM broadcast station. AM broadcasters have been mounting FM antennas, STL antennas and associated transmission lines on their radiating structures for years. Why not use the same vertical tower to serve as a cellular site *and* AM radiator?

The only magic involved is introducing the cellular transmission lines onto the tower without substantially altering the structures ability to continue to serve as an efficient AM radiator. And really, there is no magic to it provided you do not violate some of the basic laws of physics. In addition, the broadcast licensee generates a new stream of revenue and the cellular carrier avoids the aggravation and hassle of the not-in-my-backyard public hearings.

All of this means that the era of the marriage of cellular sites to existing AM broadcast antenna systems has now come into its own. With that in mind, let us examine several acceptable methods – and some of the precautions to be taken – to make use of a tower up to about 135 electrical degrees in height (at the AM frequency) for this dual purpose.

GETTING PAST THE INSULATOR

Most AM radiators sit on base insulators. The AM energy is introduced between the base of the structure and the buried ground system. This arrangement is commonly called a series-fed radiator. If one were to directly introduce coaxial transmission lines onto such a tower the base insulator would be effectively short circuited.

On the other hand, if the transmission lines are mounted on insulated hangers up to the 90-degree point on the tower – a quarter of the wavelength at the AM frequency – they become transparent to the RF energy being introduced across the base insulator. The shields of the coax cables should be tied together, using grounding kits, and connected to the AM ground system where they leave at the bottom of the structure. At the quarter-wave point the shields are again tied together and electrically connected to the structure.

Common practice is to use grounding kits that tie the shields to a bus bar that is electrically connected to the structure at the 90-degree point. (The height of the 90-degree point on the tower is determined by the formula 245.7/f MHz.) This is commonly called a quarter wave stub.

SKIRTING THE AM RF

A second method that is commonly used is to ground the base of the tower. Feed lines then can be introduced directly onto it. The structure is excited with the AM energy through a skirt. The skirt consists of three or six wires symmetrically dropped down the faces of the structure. Typically they are supported 24 to 36 inches off the face of the tower by insulators at 50-foot intervals.

Using a skirt to isolate the AM RF from the cell antennas.

The wires are electrically tied to the structure at the top or at the 90-degree point. At the bottom they are tied together with a wire ring. AM RF energy is introduced between the ring and the ground system.

The input impedance to the system is determined by the height at which the skirt is tied to the structure. It can be selected by moving a short between the skirt wires and the tower thus lengthening or shortening the skirt. The resistance will increase as the skirt/tower short is moved higher on the structure.

The input reactance will be inductive. If the short is placed where the resistance is 50 ohms, matching to the AM feed line can be accomplished by the use of a vacuum variable capacitor between it and the coax line.

Everything on the tower must have a good electrical bond to it. The idea is to make cellular antennas and transmission lines all part of the AM radiating system. The shields of the feed lines must be bonded to the tower at ground level and at no more than 30 electrical-degree intervals thereafter. This arrangement is called a shunt feed. Various manufacturers of skirts market them as Unipoles and Tunapoles.

ISOCOUPLERS

Isocouplers can be used to bridge the coaxial feed lines across the base insulator of a series fed AM antenna system. The typical isocoupler couples the 1.8 GHz cellular energy across the base insulator with about 2 dB insertion loss and appears as a small capacitive reactance across the base insulator at the AM frequency.

As previously mentioned, the shields of the feed lines must be connected to the structure at intervals of not more than 30 electrical degrees. The low end of the isocoupler must be electrically bonded to the AM ground system with 2-inch or larger copper strap. Kintronic Laboratories manufactures isocouplers for cellular use. They are capable of withstanding AM RF voltages encountered with 10 kW across the base insulators of towers in the 90-degree height range. They typically introduce 40 pf of capacity.

CONSTRUCTION POINTERS

When adding cellular antennas to an existing AM radiator attention must be given to RF exposure to construction workers. In addition, the integrity of the ground system must be preserved.

When the concrete pad for the cellular equipment is installed, the ground screen, if one exists, should carefully be cut and bonded around the concrete pad with 2-inch or larger strap. The location of the AM coax feed line, sample lines, AC power lines for tower lighting and any control cables should be determined before the first spade of dirt is turned.

Electrical and telephone cables for the cellular installation should be brought to the structure in a straight line in from the edge of the ground radial system. This will disturb the least number of the wire radials. Any radial wires that are broken should be brazed together when the installation is complete. Last, but not least, if the structure requires painting the black transmission lines running up one face of it must be painted to match the tower painting.

When the installation on a non-directional radiator is complete, the base impedance must be re-measured. If necessary, the matching network should be touched up to present 50 j0 to the coaxial transmission line.

AM AND CELL TOGETHER

A recent installation at WRAA in Luray, VA for Shentel (Shenandoah Telephone) involved the dropping of an old structure and the installation of a new tower, ground system and antenna coupling unit in its place. This necessitated the station to go silent for about 10 days.

When the new tower was up and the skirt installed, the tuning unit was adjusted to allow this daytime station to temporarily resume operation. After the installation of the cellular antennas and transmission lines were complete the base impedance was re-measured and final touch-up to the coupling unit was accomplished.

Finally, a 302 Form was completed and filed with the Commission. A new license document was issued by the FCC reflecting a new value of base impedance and base current.

CELL ANTENNAS ON DIRECTIONAL ARRAYS

The installation of cellular antennas on one element of a directional antenna system is a bit more involved. Nevertheless, with proper attention, the mating can be done successfully.

Any of the three described methods of introducing the cellular transmission lines onto the tower is acceptable. If the towers are already shunt fed the method of introducing the coax lines onto the tower is a no-brainer.

It is no longer unthinkable to mate cellular antennas to an AM radiator, even in a directional array.

For series fed radiators, the least disruptive method of bringing the transmission lines across the base insulators is to use isocouplers. There will be six or more coaxial lines to be installed on the tower. This means six or more isocouplers. Each will present about 40 pf of capacitance.

(Continued on Page 6)

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The Marriage of Cell Sites to Hot AM Radiators

– Continued from Page 4 –

Before any construction is attempted certain steps should be taken to ascertain that the directional antenna system is operating properly. The monitor points described in the station license should be within specified limits. The operating parameters of the directional antenna system should be within tolerances specified in Part 73 of the Rules. The Common Point impedance should be measured and found to be correct. Ascertain that the transmitter is capable of meeting power output as specified in the license.

An STA (Special Temporary Authority) for non-directional operation at 25% of normal power and/or "monitor points within limits operating parameters at variance" must be obtained from the FCC. The station should be set up for non-directional operation using a tower other than the one on which the cellular antennas will be installed.

All of these procedures are advisable to avoid muddying the waters if difficulties are later experienced. You will appreciate all of this when it comes to doing a partial proof-of-performance after installation is complete.

INSTALLING THE CELL ANTENNAS

A recent installation at WXCT in Southington, CT for T-Mobile involved mounting PCS antennas at the 150-foot level of one element of a two-tower two-pattern 990 kHz directional antenna system.

The self-supporting, tapered 250-foot, 90-degree tower is series fed. An STA was obtained for 25% power non-directional operation. The second tower was set up for low power non-D operation for the ten-day period during which the installation of the antennas and transmission lines took place. The structure was securely tied to the AM ground system to avoid problems caused to personnel by induced RF burns.

This cellular system required twelve 1-5/8 inch coaxial transmission lines. Each was brought across the base insulators with Kintronic Laboratories isocouplers. This presented 480 pf of capacity – about 330 ohms of capacitive reactance – across the AM RF feed point.

An isocoupler bank at the base of one of the WXCT towers. All of the installation precautions previously identified were taken.

SUCCESSFUL MARRIAGE

When the directional antenna system was reenergized it was noted that the phase on both patterns had shifted about 7 degrees and the loop current a few percent. The day pattern was adjusted to its licensed operating parameters. Monitor points were measured and found to be well within tolerance.

The night pattern had significantly deeper nulls in it. When parameters were returned to licensed values the monitor points were somewhat – but not drastically – above the specified maximums. Individuals equipped with a field intensity meter, tripod and cellular telephone were positioned on each of the two points while the parameters were adjusted.

The points were brought to values within the specified maximums within just a few minutes. The end result was a phase reading within the allowable three degrees from licensed values and a loop current slightly different from the licensed value. The common point values for both patterns were measured. Only slight adjustment was necessary to return it to 50 j0.

To complete the installation, a partial proof-of-performance was done on both patterns. A 302AM Form, along with a request for new night time operating parameters, was submitted to the Commission for approval. WXCT is operating as designed and the cell phone company is happy.

The installation of cellular antennas on AM radiators – even on elements of a directional antenna system – does not involve smoke and mirrors or magic. Pre-installation planning and careful attention given to the installation will result in everyone involved leaving the site with a smile on their face.

Jack Layton is a long-time consulting engineer, author, ABIP inspector, and surveying enthusiast, located in McMurray, PA. Contact Jack at layton2@earthlink.net

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Safety Guide

by Patrick M. Griffith

Portable Fire Extinguishers in Broadcast Facilities

Selection, Use and Operation

Most broadcast facilities have at least one fire extinguisher on the wall. However, it is unlikely there has been any training of staff as to its use. Furthermore, as Patrick Griffith shows, the contents and use of a fire extinguisher deserve attention – one size/type does not fit all. Is your site properly protected?

Fire can be described as a rapid oxidation process involving a chemical reaction between a fuel and an oxidant manifested in light, heat, and toxic by-products.

Several essential elements are needed in order for a fire to maintain itself: fuel, oxygen, heat, and a sustained reaction between these elements. Fire fighters call this the fire tetrahedron. In the most basic terms, if you remove one or more of these four elements, the fire will be extinguished. That is the purpose of a fire extinguisher.

NEARLY TWO CENTURIES OF SERVICE

Fire extinguishers are generally believed to have been invented in the United Kingdom around 1819. The types of fire extinguishers that we will discuss in this article are typically designed to be handheld and to be manually operated by an unskilled operator. These are known as portable fire extinguishers.

Portable extinguishers are designed to contain a limited quantity of solid, liquid or gaseous product for the purpose of controlling or extinguishing small fires. They are generally pressure vessels and the products contained within are typically stored under pressure.

The range and capability of the fire extinguisher is limited by the need to remain light enough in weight to be readily transported and operated by the average adult. The large variety of products available for use in fire extinguishers are all designed to break the fire tetrahedron by removing one or more of the essential elements of fire.

TYPES OF FIRES

In the United States, the National Fire Protection Association (NFPA) classifies fires into the following types:

Class A = ordinary combustibles (such as wood or paper)

Class B = flammable liquids (such as gasoline)

Class C = energized electrical equipment (usually Class A or B materials)

Class D = combustible metals (such as magnesium)

Class K = cooking oils

A typical fire may involve a combination of two or more of these classifications. For the purpose of this article we are generally concerned only with Class A, B or C fires.

Underwriters Laboratories (UL) provides ratings for fire extinguishers based on the tested capabilities of these devices. These ratings help in determining the size and quantity of fire extinguishers needed for a particular location.

The UL ratings for Class A and B extinguishers are preceded by a number that identifies the capacity of that device. The number preceding the A rating is multiplied by 1.25 to give the equivalent capability in gallons of water when fighting a Class A fire. The number preceding the B rating indicates how many square feet of Class B fire the device might be expected to extinguish. Higher numbers mean more firefighting capacity.

Many fire extinguishers have multiple ratings. For example, a 2-A:20-B:C rating would indicate that the extinguisher is rated for Class A, B and C fires, is equivalent to 2-1/2 gallons of water on a Class A fire and can be expected to extinguish 20 square feet of Class B fire. (There is no additional number rating for Class C rated extinguishers. A Class C fire will typically involve Class A and/or Class B materials along with the presence of electrical energy.)

CHOOSING AN EXTINGUISHER

What type of fire extinguisher do you need? This is a very important question to consider in the selection of fire extinguishers for use around valuable and sensitive electronic equipment. There are many types of fire extinguishers available. Some are better than others around electronics and electrical equipment.

Of course, what we are presenting are basic guidelines for fire extinguishers that might be used in and around broadcast facilities. It is not intended as a comprehensive reference. There are many variations in the legal requirements and recommendations for the purchase and placement of fire extinguishers from community to community and state to state. You should always consult the local Authority Having Jurisdiction (AHJ) before you purchase and install a fire extinguisher.

The AHJ is the organization, office, or individual responsible for enforcing the fire codes and standards in your area. This might be a building official, a representative from the fire department, or a representative of your state fire marshal. In most cases it is the AHJ who has the final say about the type and quantity of extinguisher you must install. You might also need to be responsive to the requirements of your insurance carrier or a designated safety official within your organization.

SELECTION CRITERIA

While there might be some merit to thinking that, in a fire situation, it is more important to extinguish the fire than to worry about the type of extinguisher being used, other factors should also be considered.

One of these factors is the selection of an extinguisher that is not going to endanger the operator, such as using a non-Class C-rated extinguisher on an electrical fire. Another factor to consider is that the extinguisher might be accidentally or mischievously discharged when there is no fire. In some cases this could result in significant damage to sensitive electronics.

Still another factor to consider is peripheral damage that may occur to equipment that is nearby but is not actually involved in the fire. In some cases, a poorly selected extinguisher might cause more damage than the fire itself. Whenever possible you will want to provide an extinguisher that will minimize the potential for negative effects of its use at the location where it will be placed.

FIRE EXTINGUISHING AGENTS

As mentioned previously, a fire extinguisher may be designed to emit a solid, a liquid, or a gas. There are a large variety of chemistries available for the purpose of suppressing a fire. Some are very exotic chemical compounds while others are quite basic.

Some materials that were commonly used for this purpose in the past have been determined to be hazardous to people, or damaging to the environment, and have fallen out of favor or have been deemed illegal.

Carbon tetrachloride (CTC) is one glaring example. Beginning around 1912, CTC was a very common and popular extinguishing agent in use for many years. It was eventually determined to be carcinogenic and, when exposed to the heat of fire, it produced some highly toxic by-products that resulted in deaths when used in confined spaces.

• **WATER:** Water is the most basic and most common suppression material available for use in fire extinguishers. It is quite effective on Class A fires. In the small quantities provided by a handheld fire extinguisher, water suppresses fire primarily through the reduction of heat.

Of course, on Class C fires the operator stands the danger of electrocution. In some cases, where it is possible to safely and reliably remove the electrical current, a water extinguisher might actually be preferred over certain other types of extinguishers for use on de-energized electrical equipment since it is relatively clean and leaves little residue behind.

However, be aware that some water extinguishers may contain *additional materials* such as anti-oxidation chemicals to protect the interior of the extinguisher from rust or surfactants to help the water cling to steep surfaces.

• **FOAM:** There are a large variety of foam type extinguishers available for various applications. The foam works by both cooling and smothering the fire.

Foam extinguishers are commonly found in areas that might expect Class B fires such as auto repair garages. However, they can also be very effective on Class A fires as well. Foam extinguishers usually contain water as the basis of the foam and should not be used on Class C fires unless specifically Class C rated.

• **MULTI-PURPOSE DRY CHEMICAL:** The most common type of fire extinguisher found in the average home, business, or vehicle is the multi-purpose dry chemical also known as dry powder. These are referred to as "multi-purpose" because they generally carry an A:B:C rating.

Dry chemical extinguishers generally contain a chemical agent called mono-ammonium phosphate and/or ammonium sulphate. This material is designed to smother the fire. The product may also react with heat resulting in the formation of a crust of material over the fire surface which helps to isolate it from the surrounding air.

Unfortunately (for most electronic sites like radio studios, etc), these chemicals come in the form of an extremely fine powder making their dispersal wide spread and clean-up extremely difficult. They are also corrosive, especially if exposed to moisture, and are likely to render most sensitive electrical equipment unsalvageable.

In some cases the damage from the corrosive effects may not become apparent for years after the exposure. It is generally advisable to replace any electronic equipment that has been exposed to these materials.

• **REGULAR DRY CHEMICAL:** Another common fire extinguisher is the regular dry chemical. These extinguishers likely carry only a B:C rating and usually contain either sodium bicarbonate or potassium bicarbonate.

This material is also somewhat corrosive to electrical equipment and is a powder that will be difficult to cleanup. These extinguishers are often found in small vehicles.

• **CARBON DIOXIDE (CO_2):** Yet another common extinguisher is the carbon dioxide or CO_2. These generally carry a B:C rating. They work mostly by smothering the fire and, to a lesser extent, by cooling the material.

The product emitted is extremely cold and may result in a cold-related injury to the inexperienced user. Additionally, the discharge of this material is rather loud sometimes resulting in fright to the inexperienced operator.

(Continued on Page 10)

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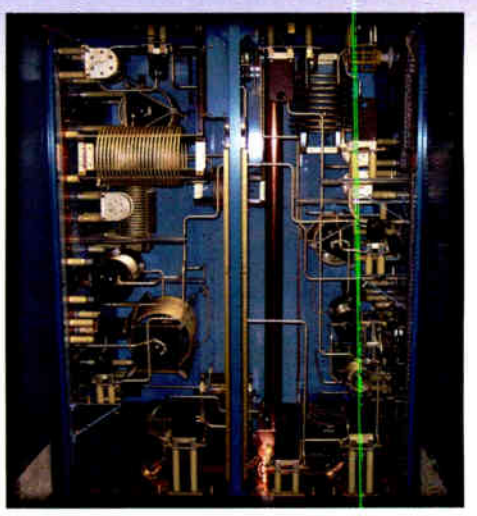

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Safety Guide

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Portable Fire Extinguishers in Broadcast Facilities

Continued from Page 8

CO_2 also presents a higher risk of damage to sensitive electronic components because the extreme cold of the discharged product may cause thermal shock and the discharge of this material produces large amounts of static electricity.

• **CLEAN AGENTS:** These materials have mostly been developed specifically to leave little or no residue behind and to be kinder to equipment and materials that survive the actual fire.

Halon is a compound consisting of bromine, fluorine, and carbon. Halon was introduced as a fire extinguishing agent for aircraft and tanks in World War II.

It was once the agent of choice for use on electrical equipment and sensitive electronics. One of the reasons for the huge popularity of halon is that it was effective in very low concentrations of around 5%. At those concentration levels it was considered safe to breath. However, halon was considered as an inhalation hazard at higher concentrations.

Still, halon was much less toxic than many alternatives. Therefore, it found favor in enclosed areas such as offices and computer facilities. Although halon is effective against Class A, B, and C fires, it actually exhibits relatively poor performance on Class A materials. Large portable halon extinguishers normally carry a low Class A rating. Halon also has a tendency to be easily deflected even by light airflows.

The bromine in halon has been identified as being very harmful to the ozone layer. Because of this halon is mostly being phased out in favor of more environmentally friendly alternatives. In some countries it has been completely outlawed except for certain specific applications.

Recycled or previously produced Halon products are still available for sale in the U.S. Production of new material ceased at the end of 1993. The extinguishers are usually very expensive due to the restrictions on production and import of the product. A number of manufacturers are now producing halon alternatives.

An Halotron I extinguisher stands guard in the rack room of a station. It is important to use the right kind of extinguishing agent.

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FE-36™ is a hydrofluorocarbon produced by DuPont. It is available commercially in Cleanguard™ brand extinguishers. It has no ozone depletion potential. This material also discharges as a liquid and flashes to a gas. It is electrically non-conductive and will not cause thermal shock to sensitive electronic equipment.

We will continue this topic in the next issue, where we will cover safe usage, maintenance, and operation of fire extinguishers.

Patrick Griffith, CBT, CBNT, CRO, works for NRC Broadcasting in Denver, CO. His previous career was that of a fire fighter/fire investigator. A graduate of the National Fire Academy, he is a Certified Fire and Explosion Investigator (CFEI) and Certified Fire Investigation Instructor (CFII). Contact Patrick at antennawixard@hotmail.com

Tower Topics

by Jeff Johnson

Environmental and NIMBY Issues

Thinking about repairing, rebuilding or modifying your broadcast tower? There are forces gathering in many places that make such work difficult, if not impossible. While being forewarned might not prevent problems with the NIMBY and BANANA crowds, Jeff Johnson's look at the matter may help you deal with local issues before they get to a critical point.

Once they are built, all too often little thought is given to broadcast towers unless there is storm damage or other mechanical problems. As some towers reach the end of their service life (or get flatted by storms or accidents), it gives opportunity for local activists to insert themselves into the process, hoping to slow or stop construction.

Perhaps you have heard the environmentalists' cries about our broadcast towers killing multitudes of birds. You may have even have become aware of their agenda demanding removal of towers or of zoning boards refusing construction permits for new towers or modifications of existing towers. What can broadcasters do to protect themselves?

RISING PRESSURE AGAINST TOWERS

As an example, we regularly hear the environmentalists quoting chapter and verse from the US Fish and Wildlife Service (USFWS) website, decrying the presence of broadcast towers as sure death for migrating fowl.

"At its core, the bird/light/tower issue is a turf war and our lighting and construction techniques are being proposed as a new mechanism for NIMBY control," says Andrew Skotdal of KRKO in Everett, Washington.

"The action taken by the USFWS to publish "recommended guidelines" for communications towers really brought the bird/light issue out as a tool for anti-tower groups and was cited by the opposition groups who filed with the FCC for a programmatic study of towers across the Gulf. It's now a 'go-to' download for every NIMBY in America," added Skotdal.

"JUNK" SCIENCE?

The US Fish and Wildlife website guidelines can be found at: http://www.fws.gov/habitatconservation/communicationtowers.htm

The site tells us, "Lighted, guy-wired towers taller than 199 feet above ground level (AGL) are particularly hazardous to migratory birds, especially night-migrating song birds. While lighting for towers taller than 199 feet AGL is required by the Federal Aviation Administration to avoid aircraft accidents, certain types of lighting may attract birds to the towers. Lighted towers are particularly hazardous during periods of poor visibility caused by low cloud ceilings, rain, snow, or fog. Documented cumulative losses of birds since 1955 number over 1 million."

The USFWS, according to Skotdal, published the guidelines based upon such "facts" without rigorous peer revue. It therefore may be considered by some to be "junk" science.

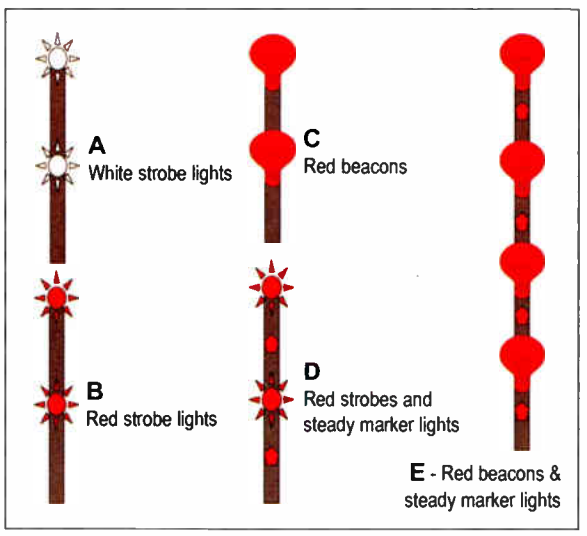
Many of us, as broadcasters, can state that we virtually never have discovered a single dead bird, let alone flocks of fowl, garroted by our guy wires. Where does the truth lie? Neither side of the argument stands on scientific evidence informing its opinion. Evidence, to be accurate and truthful, must be derived from the scientific method.

SCIENTIFIC RESEARCH IN MICHIGAN

Just such a study has been conducted recently in Michigan for the Michigan Public Safety Communications System (MPSCS). Michigan is a major migratory bird route – and also sports broadcast towers of all sorts. Joelle Gehring of Central Michigan University has published the results of an academic study – two instances of which were from data collected in Spring 2005 and Fall 2005.

Gehring reports, "The following night-time tower light systems were compared: towers with white strobe lights but no steady burning marker lights (A), towers with red strobe lights but no steady burning marker lights (B), towers with red blinking incandescent beacon lights but no steady burning marker lights (C), and towers with both red strobe lights and steady burning marker lights (D)."

In addition three guyed towers greater than 1000' tall with red blinking incandescent beacon lights and steady burning marker lights (E) were included in the study. Over twenty mornings during the peak of songbird migration season, each tower site was systematically searched for bird carcasses.



FOUR AND TWENTY BLACKBIRDS

The result of these studies was striking. A statistical analysis was made in Spring 2005 of four sets of towers in the 380-480 foot range, and three towers over 1,000 feet.

The study revealed the following number of bird carcases found:

(A) Towers with white strobe lights – no steady burning marker lights.

3 Guyed	3 carcasses
3 Self supported	3 carcasses

(B) Towers with red strobe lights – no steady burning marker lights.

3 Guyed	3 carcasses
3 Self supported	4 carcasses

(C) Towers with red, blinking incandescent lights – no steady burning marker lights.

3 Guyed	8 carcasses
3 Self supported	4 carcasses

(D) Towers with red strobe lights and steady burning marker lights.

3 Guyed	37 carcasses

(E) Towers greater than 1,000 foot tall with red, blinking incandescent lights and steady burning marker lights.

3 Guyed	132 carcasses

It is clear from these results, essentially repeated in the Fall 2005 study, that the presence of steady burning side marker lights – especially on guyed towers above 500 feet, drastically increases the instance of bird mortality.

WIND TURBINE TOWERS

Another study done – involving wind turbines, not broadcast towers – but in a similar manner comparing blinking and steady burning lights, came to a similar conclusion.

Paul Kerlinger, of Curry and Kerlinger, LLC, et al, conclude in an FAA document titled *"Federal Aviation Administration Obstruction Lighting And Night Migrant Fatalities At Wind Turbines In North America: A Review Of Data From Existing Studies"*: "Because most turbines are equipped with L-864 flashing red lights at night, it can tentatively be concluded that these lights do not attract or disorient large numbers of night migrants in a way that causes large scale fatalities. Just as important, turbines do not have guy wires, which are the structures that kill a vast majority of night migrants at communication towers. Also, it is important to note that ... that the numbers and types of lighting may be important."

Kerlinger concludes with, "No fatality events involving large numbers of birds in a single night have ever been reported from these structures when they are lit with L-864 or L-810 flashing red lights nor is there a difference in fatality numbers between turbines at the same site that are lit with L-864 or L-810 red flashing lights and turbines without lights."

A SIMPLE SOLUTION TO LARGE BIRDNETS IN THE SKY?

Another document titled *"What Have Studies Of Communications Towers Suggested Regarding the Impact of Guy Wires and Lights on Birds and Bats?"* and subtitled "Wind Turbines and Avian Risk: Lessons from Communications Towers" by Paul Kerlinger is found on the Office of Scientific and Technical Information website (Department of Energy at http://www.osti.gov/bridge/servlets/purl/837479-1u3LKM/native/837479.pdf)

The information states: "There is evidence that suggests that different types of lighting schemes may differentially attract birds. Flashing lights appear to be less of an attractant than steady-burning lights at night. It seems that tall communication towers with steady-burning red lights and guy wires essentially act like large bird nets in the sky."

Could the solution be to simply change the lighting requirements and extinguish steady-burning side markers? Research, as we have seen, clearly points to this conclusion.

A THREAT TO OUR TOWERS?

Here is some rather scary reading for tower owners and operators:

"The construction of new towers creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. Communications towers are estimated to kill 4-5 million birds per year, which violates the spirit and the intent of the Migratory Bird Treaty Act and the Code of Federal Regulations at Part 50."

Further in the document, it states: "If collocation is not feasible and a new tower or towers are to be constructed, communications service providers should be strongly encouraged to construct towers no more than 199 feet above ground level (AGL), using construction techniques which do not require guy wires (e.g., use a lattice structure, monopole, etc.). Such towers should be unlighted if Federal Aviation Administration regulations permit."

(Note: browse to www.fws.gov/migratorybirds and follow the hyperlinks:)

www.fws.gov/migratorybirds/issues/towers/towers.htm
www.fws.gov/migratorybirds/issues/towers/comtow.html

SEEKING SOLUTIONS NOW

Perhaps this is the time – before you have the need to approach local authorities for permits – to ask some very important questions.

Should we as broadcasters, whether owners or engineers, be forced to succumb to the will of NIMBYs, BANANAs, and governmental agencies bent upon viewing our towers – the very towers serving the same citizens and government – as undesirable hazards? And should we not challenge the FCC and the FAA on tower issues by enlisting the NAB and the SBE to fight *for us* in this cause?

Furthermore, should we not expect the FCC to *fight for us*, using Federal Pre-Emption statutes against other regulatory agencies in our attempts to meet the terms of FCC-issued Construction Permits? After all, what good is an FCC broadcast license without a broadcast tower?

Meanwhile, those stations that are planning work requiring permits should start now to investigate whether the current regulatory climate might raise the possibility that repair or replacement will not be possible due to bird strike issues and other NIMBY objections. It is important for us to not only carefully maintain our existing towers, but also strive to change the laws governing new and upgraded towers. Our future as broadcasters may well depend on it.

Here are more references to Paul Kerlinger's work:

www.towerkill.com/workshop/proceedings/pdf/pan8.pdf
www.wvhighlands.org/VoiceText%20PDFs/VoiceDec03%20P3.pdf

URLs in this article are found at www.radio-guide.com/URL.htm

Jeff Johnson is a frequent contributor to ***Radio Guide****. Contact him at jeff@rfproof.com*

RF Guide

by Alan Alsobrook

An Educational Opportunity in Orlando

***Radio Guide** is presenting an AM RF Seminar in mid-February at Orlando, Florida. Alan Alsobrook explains why the arrangements were made and how you can benefit from it.*

Do you think it takes a "Witch Doctor" to tune up an AM radio station? Some days it may seem like it, but it is really not that hard to make everything work correctly once you have the basic understanding of what is going on, along with a little bit of experience on how to tweak those coils and capacitors.

IDENTIFYING A NEED

Working as an Alternative Inspector (under the ABIP) and doing my normal contracting work has helped me understand a lot about the state of the industry.

For example, I have seen that many of the guys coming into the world of AM engineering find that working on AM RF systems is somewhat of a mystery to them. But, it did not really hit home until Phil Alexander, several other engineers, and I were batting around few neat situations on the "Tech-Zone" mailing list (www.radiolists.net). I also received several personal emails asking questions about how different parts of the RF system worked and asking me to keep going on the mailing list as they were learning so much.

This gave me the idea that we really needed an AM RF class to remove some of the mystery from the art of setting up AM systems. After discussing this with Phil and then Barry Mishkind (Editor of this very magazine), we came to the conclusion that this would be a very important class to have.

THE RIGHT TIME AND PLACE

For reasons of distance, expense, and time it is hard for many to attend the extended seminar sessions sometimes presented at the trade shows. So to that end, with the help of ***Radio Guide***, we will be presenting an AM RF class in February in Orlando, Florida. (Full signup details are on page 2.)

This will be a three-day seminar, which will allow enough time for Phil and me to cover the basics and get into a fair amount of the advanced material. Ron Rackley will also join the program, which will include an informative question and answer session.

One of the key parts of the seminar: while we will be covering AM theory, we will also have time for *hands-on work, actually adjusting* matching networks – using bridges, generators, and plenty of other tools and test equipment of the trade.

SEMINAR COURSE CONTENTS

We will start the class out very basic: going over the components involved and how they work. Topics will include reactance, resonance, series circuits, parallel circuits, and, of course series-parallel circuits.

Once we get the basics out of the way we will show you how to put these circuits together to make matching networks. Since you might need some transmission line to get the signal from the transmitter to the tower – that topic will get covered as well. In addition to the theory, we will be presenting real-world examples along with demonstrations to help understand the theory.

A good deal of emphasis will be placed on how to troubleshoot problems that come up. I am sure a few war stories (I mean "case scenarios") will be presented to get everyone thinking about how to proceed in isolating and locating troubles.

The bottom line is this course will give you the opportunity to learn most everything it takes to remove the veil of black magic from AM work.

CERTIFICATION OPPORTUNITY

A special note: After the seminar we have made arrangements with the Orlando Chapter of the SBE for them to administer the AM Directional (AMD) exam.

However, if you are qualified to sit for that exam and you want to take it in Orlando after the seminar you will need to *have your application in by December 29th.* (To apply for a specialist certification, you must currently hold certification on the Broadcast Engineer, Senior Broadcast Engineer or Professional Broadcast Engineer Certification level.)

Since this will be done as a regular testing session you should be able to take any other SBE exam instead of the AMD exam if you would prefer. Just be aware you can only sit for *one* exam during a testing session.

COME AND LEARN AM

If you do not feel that you are as strong as you should be working with AM – or it is just totally a mystery – this is a wonderful chance for you to come and increase your knowledge along with your comfort level.

Our goals are: first, have an excellent educational program that is desperately needed; second, make it as inexpensive as possible so even those on tight budgets can afford it; and third, put it in a fun place so you have the opportunity to come early or stay over – even bring the family – and enjoy the area attractions if you wish. (Race fans: the Daytona 500 is the weekend after the class).

Come on down, have a good time, and learn how to be a "Witch Doctor" yourself!

Survival Guide

by Rich Wood

A Healthy Work Schedule

Some people just are unable to decide when enough is enough. Call them at 7:00 a.m. and they will be at work. Call them at 8:00 p.m. and they will be ... at work.

DEFINING "ENOUGH"

However, the concept of "enough" entails more than just how much time you spend on the job. It also means whether or not being at work is voluntary or forced by too much responsibility, or too few people, to cover the cluster's needs.

The nominal U.S. workweek is 40 hours, the national tradition since the Fair Labor Standards Act (FLSA) regulations were adopted in 1938. Nevertheless, many engineers work 70, 80, or even 90 hours a week.

Part of the problem is that employers often consider engineers to be management and "exempt" from overtime. In 2003 the government revised the definitions of "exempt" to include "management" people who have no more authority than the receptionist. (Formerly "management" meant the ability to hire and fire and to make decisions that carried the backing of the company.)

Insult is added to injury when you come in late after a long night risking your life with high voltages, to be met with a derisive "nice of you to make it in!" That from fellow staffers who are required to work a rigid schedule and resent your "freedom" to come and go as you please. Though an engineer who is out of sight is usually at the transmitter, the perception is that you just slept late.

ENLIGHTENING MANAGEMENT

Usually there is no recourse available other than working or walking. Not being an attorney, I cannot give advice on where the law stands regarding your personal situation – both for pay and the number of hours you may be regularly required to work.

At the same time, my impression has always been that a salaried (exempt) employee was expected to be available and willing to work more than 40 hours when something special required more time – but not 80 hours as a *regular weekly requirement.*

The solution is to enlighten management (and staff, to minimize resentment) so they understand you might have been at three of the eight stations overnight. Developing a relationship of trust is critical. When a breaker trips and you spend the night at the transmitter, management should understand and let you sleep late.

ENLIGHTENMENT

Many managers in major markets develop a self-serving enlightenment. Every minute off the air costs a fortune in lost revenue and the engineering "cost center" suddenly becomes the station's salvation.

My experience has been that most managers understand the "always on call" nature of engineering. Those who do not understand rarely get the cream of the crop, instead getting consulting engineers and ballooning engineering budgets. Worse, important, yet expensive maintenance gets ignored.

Unfortunately, such enlightenment is on a case-by-case basis, even within a company. I know of engineers fired for refusing the risk in some life threatening situation – such as during a natural disaster still in progress.

STOP AND TAKE A BREAK

Some engineers arrive early because they can get work done before the phones begin to ring. These tend to eat lunch at their desk or simply work through lunch. My doctor tells me that is not very healthy. You need a periodic breather, even if you arrived late because of that Garden of Eden transmitter site visit at 3:00 a.m.

Some managers have even been known to buy the occasional pizza and beer for the engineer – even bringing it to the work site personally. That kind of mutual respect cures a multitude of ills. Small and medium market engineers deserve no less. The financial stakes may be lower, but are no less critical to a station's success.

Another necessary break is for education. A heavy workload limits the ability of an engineer to keep up with the latest developments in technology – instead spending excessive time keeping old gear going at a far higher cost than something new. Getting to demonstrations, seminars, and other educational opportunities is important. Management should make it easy for this to happen.

And do not forget regular refresher courses in safety. You need time for that. Bred by familiarity, veterans often overlook safety; younger engineers have yet to learn what an RF burn feels like. Again, management's understanding of what you do – enlightened self-interest – will result in fewer insurance claims and fewer hospital visits.

MANAGEMENT THAT UNDERSTANDS

Of course, none of this will happen without the engineer making it clear when his workload has reached "enough."

My most recent station experience was ideal. The owner had a personal interest in engineering and a very close relationship with the Director of Engineering. There was never even the suggestion of dereliction of duty.

Engineers are not slaves. But they should not make themselves slaves either. Set up a reasonable work schedule, take proper breaks, and help management see your value. Your job satisfaction and survival will be greatly enhanced.

Rich Wood is a regular contributor to ***Radio Guide****. Contact Rich at richwood@pobox.com*

Studio Guide

by George Zahn

Watching Your P's and S's

*In the past three issues of **Radio Guide**, George Zahn has discussed the different families of microphones. Now we get to the fun part: putting them to work and getting the most from them. But first, as they say, this cautionary advice ...*

Having the right microphone in the right situation is more than half the battle of creating memorable audio, but working the microphone incorrectly can counter even the best planning and placement. As a professional who has experienced the gamut of training students to producing broadcasts and recordings with professional announcers and musicians, I have seen the good, the bad, and the ugly.

AN EVENING WITH THE "POPS"

We start with one of the true basics: those popping "P"s. Fortunately, unless you have a really cheap microphone in front of you, the microphone probably has a built-in pop filter.

The problem is from the sudden rush of air our mouths make on certain enunciations – especially the letter "P." These gusts are called "plosives" and they wreak havoc on even the best internal pop filters. These filters, which help to deflect and disperse the plosives, usually are just inside the capsule of the microphone and generally are made of a diffuse foam material.

To get an idea of what concussion the microphone element must withstand on plosives, hold your hand about an inch or so in front of your mouth and recite the old Peter Piper tongue twister we did as kids. It might be best not to be within eyeshot of the sales folks as you do this exercise – they might think you have gone off the deep end of the Arbitron ratings.

AN ENEMY OF CLEAN AUDIO

What you are feeling as you recite Peter Piper is the one thing that microphone element designers cannot easily battle.

Remember, we want the element in the microphone to be as light as possible and to move freely. That helps us recreate wonderfully bright sounds, but it also makes our good friend, the microphone, more susceptible to the tsunami of sound that is the plosive, which actually translates into a loud pop as the microphone element is pounded by the air.

This pop can be equalized out later, especially in today's digital world of Adobe Audition and other software. A very nice low frequency cut on only the affected sound can render the plosive perfectly and practically powerless. That is fine for fixing it in the mix, but it can be time consuming to re-equalize each popped "P" or concussive "K."

Then there is the matter of live performances? How do we prevent plosives from happening in the first place?

LIVE SET UP

Here is a true story about a major touring solo artist I worked with one evening at Xavier University; I was brought in to record his concert for later radio broadcast.

Working from the stage plot and contract rider for the microphones requested, I met with the PA engineer and we set up a split of two piano microphones (for stereo), one microphone for an acoustic guitar, and two vocal microphones (one at each location so the artist could switch from piano to guitar and still sing).

Using a standard setup for vocal microphones, I placed windscreens – external super pop filters that go over the element of the microphone – on each of the vocal microphones. Despite the urban myth, windscreens do not color the sound waves as they pass through the foam material.

WHY ARTISTS ARE NOT BRAIN SURGEONS

Once set up, we still had some time before the artist was to arrive, so we left the theater area and ate lunch at the grill down the hall in the same building. When we returned, there was no evidence of anyone on stage, but the windscreens had been removed and placed on the floor. Not wanting to believe in a Phantom of the University Center, I shrugged it off and replaced the windscreens.

Moments later, I was speaking with the PA person in the wings as we waited for the artist to show for the sound check. While we chatted, the artist came into the wings, looked out at the microphones, shook his head, walked past us before we could introduce ourselves, and went out to take the windscreens off, again placing them on the floor. It seems he had arrived early and made his preemptive windscreen strike while we were noshing down the hall.

As an accomplished artist, he was dead set against the windscreens and not about to acquiesce to our pushing the point about plosives. He was more concerned about coloring the tonal quality of the sound. (A quick side note on dealing with musicians and vocal talent: The more established the artist, the more entrenched many become. When you deal with young artists or announcers, try to instill good microphone habits early on.)

A MATTER OF DEGREE

Our first line of defense against popping was just taken from us. We were fortunate that this artist at least understood the perils of plosives.

How did he avoid them? Well, he did not totally, but he did minimize them by not working the microphone directly "head on." The microphone was in front of him, about three inches away and at a 45-degree angle. This placement for any vocal work allows most of the plosive air to pass by the microphone without directly impacting the element straight on. Keeping some minimal distance from the microphone also helps to minimize the damage.

Announcers and vocalists are often trained to work close to the microphone to get more "warmth" (more on a phenomenon called "proximity effect" next time). Even with the best directional microphones, you can almost always minimize plosives pounding by using three main strategies: (1) keep a distance of about three to five inches away for vocal consistency and presence, (2) use a windscreen, and (3) work the microphone at about a 45-degree angle.

Remember not all voices are the same, and you might need to experiment a bit with announcers and performers to get the least pop for your buck.

SIBILANCE SSSSSSIBILIANCE

It is more than just a stereotypical spoof of musical artists and announcers. In the effort to make microphones excellent at higher frequency reproduction, the microphones can sometimes fall victim to another speech problem, sibilance, or over-accentuated "S" sounds.

A note on sibilance: just as "P"s do not pop when we hear them with our ears, some announcers with sibilance problems do not sound that way to the human ear. Yet for a select few announcers and singers, something in their formation of that "S" sound, usually around 3500 - 4500 Hz, drives microphones absolutely berserk even though their voice does not bother our ears.

The exaggerated sibilance problem is rarer than plosives, but also less correctable by microphone placement. Distance is one way to minimize the problem, but there are electronic de-essers that can be fine tuned to notch out the over-modulated "S." These de-essers work. When I was a radio producer for Will Warren at WCKY in Cincinnati, a de-esser was used on his microphone to solve the problem.

A LITTLE GEOMETRY

Another facet of microphone use is to understand the design of the microphone as either "axial" or "radial." This greatly affects how the microphone is placed, mounted, held, and used.

To envision a radial microphone, think of one of those classic old radio RCA ribbon microphones. The radial microphone is almost always mounted on a stand or boom and is spoken into from the side of the microphone.

To see an axial microphone in your head, just flashback to the most recent *"American Idol"* or other singer showcase with microphone wielding performers singing into the "front" end of the microphone. If a microphone is designed to be handheld, it is almost always an axial microphone even if it is mounted on a stand or a boom.

Speaking of stands and booms, the best rule of thumb for announcers and singers is not to touch or handle the stand or the boom. The movement can, and usually will, translate into unwanted audio in the microphone. Some particularly stiff microphone cables can also contribute what we call "handling noise." Handling noise can also be picked up by fidgety fingers of nervous performers as they hold microphones.

SHOCKING DEVELOPMENTS

Touching the microphone can also be problematic, although it was more so in the early days of condenser microphones. Condenser microphones require electrical power to be supplied for the microphone to function and, in those early days, the grounding circuitry was not quite perfected.

A case in point: In the late 1950's, singer Rusty York, now a prominent recording engineer and producer in Cincinnati, was in studio recording and singing "Sugaree," which would become a major hit for him. While singing, his nose hit the microphone, unwittingly completing a circuit and caused him to scream at the slight electrocution he had just experienced. Interestingly, that scream was kept in the mix and it became a signature!

Even though microphones are safer now, it was an early warning to announcers and vocalists everywhere – do not touch the microphones!

KEEPING THE MICROPHONES WORKING WELL

Although, most microphones are relatively low maintenance and perform well when used properly, there are a few other common sense rules that broadcast folks often have broken.

For example, no matter how "germ-o-phobic" you might be, do not try to clean or soak a microphone with disinfectant. If you are that worried about contracting someone else's little bugs, simply switch windscreens. Some stations offer each of their announcers their own headphones and windscreens for just such concerns.

When doing microphone checks, do not spit into the microphone or blow into it, especially if it is the more fragile ribbon microphone family. Liquid and microphones do not mix, unless it is a specially designed underwater hydrophone used for recording whales, manatees, etc.

The bottom line is that there is little substitute for properly working with microphones. Always keep in mind that these are precision instruments that perform best when handled with some degree of care.

Next time around the world of microphones, we will talk about pickup patterns and why you need to know more than just the microphone "family" to get the best audio.

Just when you think you have experienced everything is the time you learn the cruel truth that the world is a very big and unpredictable place. We invite you to share your favorite microphone story, tales of survival or creative solutions. Send them to George Zahn, WMKV-FM Station Director, at GZahn@lifesphere.org

Operations Guide

by Smitty Margaret Walden

Due Diligence: Ins, Outs, and Hazards Of

In every company, someone gets to do this job: inspecting the stations that are being acquired or considered for acquisition. His job is to visit the property and, without tipping his hand nor alarming the existing staff, find out the real story and status of the facility, the good, the bad – and the ugly.

In the process of buying or selling a radio station, "Due Diligence" means "The process of gathering information about the condition and legal status of assets to be sold."

WE WANT INFORMATION

Due Diligence is sort of a legalese type term to explain what is the right number of hoops to jump through – and things to inspect – to determine if it is safe (or at least legally defensible) to buy or sell a station. In other words: getting enough information to prevent any unpleasant surprises during and after a transaction.

I am not an attorney, accountant, or auditor. I am however in charge of a large company's engineering department and have been involved in buying dozens of stations over the last several decades. We occasionally have sold or swapped stations, but mostly we have been buyers. Some were in unrated small markets, most were in medium and large broadcast jungles.

The amount of information Due Diligence covers can vary a bit depending upon the company, how many people are involved, how secret the deal is, how much time is available, and how many dollars or traded assets are at stake.

WHAT EACH SIDE WANTS

Fundamentally, the buyer is trying to make sure they get everything owed to them. The seller wants to do an ethical deal, get the transaction closed, and bank the money. They would like to stop hearing from the new owner as soon as possible and start their (quiet enjoyment) of the largesse.

Generally a set of documents related to the deal are pulled together. The contracts (Letter of Intent, Asset Purchase Agreement, leases for studio or tower sites, other assumed contracts, consulting/non-compete agreements, joint operating or joint sales deals, etc.) are accumulated by a team of accountants and lawyers.

Engineers enter the picture to do inventories, assess condition of equipment, and get a feel for what will be needed in the way of a capital expenditures forecast.

COUNTING IT UP

Start with the inventory. The seller will probably offer one, but you will want to make your own. Go to the site(s), look at the equipment, and "take in" all the information you can hold. Photos are very helpful, but they have to be labeled to be of much continuing use – a memory card can hold thousands of pictures and station equipment starts looking alike after a few trips.

Do your homework before you talk to the station's people (if you are allowed to do so) or go to the site. Licenses, recent applications, ground, aerial and topographic maps are all available on-line. Get a feel for what the station is doing before you try to size up its equipment. Call signs and dates or facility IDs can be very useful information.

You can get a lot of information on a station from the Internet: try www.fcc.gov/mb/cdbs.html for the FCC's database, or www.fccinfo.com at the Cavell, Mertz & Davis site. Both sites are considered "secondary" to the paper files, so although they will get you started quickly, they do not always have the last word.

DIGGING FOR INFORMATION

Listen to the people at the sites if you are able to do so; let them do the talking

If no one at the target station is talking, there are the degrees of separation. Someone you know knows someone who knows someone else. As we all move around to different jobs, the knowledge base gets spread out. But with a little work, you can learn a lot.

There are websites that feature broadcast histories and sites where announcers or engineers congregate. These can tell you much of the prehistory of the station without getting up from your chair. Some judicious probing will get you information that can guide your inspection.

EQUIPMENT CHECKOUT

What size operation is this? If it is a big operator, in a big market area, it is likely that the station has lots of equipment. You will want to get a good handle on what there is and its condition.

A large inventory does not mean that it is the latest equipment. Some of the traditional large groups hung onto cartridge tapes well into the 2000s and there are still some very big stations running relatively old transmitters. This is often because the big stations had the larger staffs and the most expertise. Some other companies would rather you have lots of equipment (main/spare/aux's) rather than more staff. And there is every shade of in-between.

Of course, all of this is subject to change after a sale, and will figure in your recommendations as to how the new owners will handle the operation going forward. Here you are eyes and ears of the advance force. Take back all the info you can.

OPERATING CONDITIONS

Station paperwork should include permits, licenses, renewals, STAs, and on. Ask for all the old records you can get. Generally, the better the records, the better the detail work is done. Some companies have document retention policies and will have gotten rid of anything older than the FCC required periods. Ordinarily this is between the seller and their lawyers, but as a potential buyer you have an interest in learning the entire story.

Make a list of the operating modes. An AM station may have several (Day, Night, Critical Hours, some other mode negotiated between co-channel station DAs, etc.) modes and even may operate from more than one site. At each site, there may also be some auxiliary modes for tests or emergencies.

As you check the station authorizations, you may find a station might have a license to operate a smaller auxiliary transmitter into the day antenna at a power lower than nominal, one allowing the night site to be used during days, or one using the day site at night, at some suitable power level. Find out about these and ask that the station demonstrate all modes to you.

Most of the time, an FM has just one a single site, but often has more than one transmitter and antenna. This usually means they use transfer switches or patch panels and you will want to check these to see them operate. If the station is set up for remote switching, check that the system works. If auxiliary sites exist, check them, too.

TALL THINGS IN THE FIELD

Tower inspections could fill a book. Start by asking to see the record relating to tower installation and maintenance. Read the instruction/installation book.

One hopes the tower was designed by a professional. If it was ad libbed, you may need to have a structural study done. How are the base and anchor piers? Is the fence in good shape and at the right distance to protect the public from RF radiation? Is it secure enough to prevent trespassers from getting on the tower?

Everything about towers has improved in recent years. We have better materials and better planning and construction tools. Still, you can tell a lot if the station has an album full of photos showing the tower going up, documenting that the anchors really have enough metal and concrete, that they were made deep enough, and not planted in the Balkan winter (there are ways to make concrete in cold weather – I would want notes and pictures of that work, too).

Every quarter the station should confirm that the lighting system is intact and working properly. You will want to see every entry and especially those that relate to lamp changes and repairs to the lighting system.

If you get the studios in the deal, you will have another site to study and another inventory to pull together. If you are not getting the studios, you still may be getting the studio-transmitter link equipment and attendant authorizations.

MORE PAPERWORK

Sometimes you will have to decide how hard you are going to push about certain details. A radio station's value is largely in the non-asset assets. While it has to be on the air at full power to make the most of its signal, the station could be sold out or commercially naked (a stick, startup or turnaround).

(Continued on Page 20)

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Operations Guide

Continued from Page 18

The station could have no track record or one going back for decades. These reputational items and going concern values are often much larger than the hard assets. In fact, as the markets get larger, usually the plant starts getting to be less and less of the value.

To show the wide variation in value: there could be a $100,000 sale where the station is a recent sign-on and has run commercial free for a time but has no sales – and the technical plant is more than half of the sale price. On the other hand, the same number of parts might run a major market station that will sell for $100,000,000. The big market station will probably have main gear and spares, and the assets are likely to be way less than 1% of the deal. (By the way, Management's interest in your capital plans tends to follow this market-size reasoning.)

THE RIGHT PERSPECTIVE

Also it may be helpful to invoke the Golden Rule here: Generally do unto others as you would have them do unto you (or communicate to others as you would want to be communicated with). If you are taking the hard line with a seller, would you be as interested if the roles were reversed?

I once had a buyer tour a site and send a five-page list of exceptions. There were two potentially troublesome items, which took two paragraphs, a bad set of monitor point descriptions and an oily spot that could have been one ounce or half the contents of the *Exxon Valdez*.

As a group executive, I should have run those monitor points, but had not done so. It took two days to dig up the old paperwork and figure out that we had a bad set (actually a once proposed set) of monitor point descriptions. They had been changed and filed with the FCC, but the license did not reflect the changes.

The oil deal was easier because we had had the site all of the time it had a generator and had first hand knowledge that the spill was in fact a drip from a slightly sloppy fuel jobber.

PICKY, PICKY CAN BE COUNTER-PRODUCTIVE

The buyer sent an army of people, climbed around and groped everything, and used a laser rangefinder to size up an 18-foot square cinder block building. (The joke was on me; I would have counted the tiles, paced it off, or guessed it as 20 feet square). It was not flooded or flooding and had no marks on the walls. Everything worked, though the impedance had wandered a couple of ohms due to recent heavy rains.

Their report said we did not have RFR plans nor OSHA-type safety info, which is weird because they had photographed every part of the building including the map of the site, the escape plans, the RFR charts, maps, photos, and drawings. They also had the tower count wrong.

I got them into a comfort zone on the station and the deal closed. I mention all this, because if I bought a station from them now, I would be torn between doing a good diligent job and showing them *how tough I could be*. Not a nice attitude.

But be warned: you may be dealing with someone who has an ax to grind, did not want their station sold, is about to lose their job because of the sale, is angry because they were not consulted, or has other issues. You may wander into this hornets' nest of hurt feelings and there is often nothing you can do, except tough it out.

TROUBLE SPOTS AT CLOSING

Here are some additional items that can range from merely irritating to danger signs that there is something wrong at closing time:

Anything Environmental: Unused quantities of paint and lubricants should go away prior to your deal. Some sites used to be staffed at all hours and there were people to use these things. Now, they might be little more than an expensive problem the seller wishes to leave behind.

If they have been there for many years the paint is probably shot anyway. There are lots of chemical improvements in late model products and it might pay to use the newer versions.

Any smudge of oil or gas on the ground must be checked. Environmental studies are arranged in phases (1, 2, or 3). A Phase 1 is a rudimentary inspection of a site and a study of pertinent public data bases. If any "smoking guns" are found, further study may be warranted. These are not free, but are definitely cheaper than liability for some trouble you did not (but should have) known about.

Wiring Style Changes Markedly: If it is all bundled neatly, except for the ancient looking processor, or if the dust or surrounding painted areas do not mesh, it may be that a cheaper unit was substituted for the one that was on site. Processors and monitors often fall into this category.

(Continued on Page 22)

Operations Guide

Continued from Page 20

Gear Substitution and Disappearances: Some owners are a little more "hand to mouth" than others. They may want to take everything in sight with them, including wire ties, the carpet on the studio walls, and the cover plates for the wall switches. Others are just trying to prove a point or be difficult for one reason or another.

I have seen backup antennas, backup coax, and even backup transmitters disappear in deals.

Some "enterprising" sellers have changed out transmitters (where did that solid state transmitter go?) or moved from a nice, shared space (say next to a once sister TV transmitter) into a cheap shed stacked precariously on blocks. How about spare parts generally? Did someone make off with spare tubes for your transmitters?

Sometimes things are shared in a cluster or group. A seller may take out spectrum analyzers, tunable modulation monitors, and other goodies that were used or useful in the station, but that were taken out to serve in a sister station. AM field strength meters used to be license specified, required equipment, but slipped over into the more permissive areas in the eighties. Be clear who gets them. These are four or five figure items and there could be gnashing of teeth.

Occasionally, a generator is magically needed elsewhere and never seems to come back at sale time (although it is harder to get the transfer panel out – that usually takes an electrician). Station vehicles can also be a problem. (You may be offered the oldest in the seller's fleet.)

Bottom Line: Do your homework so that at closing, you will get all of your stuff. If problems arise, communication is key. Talk to the other side. Work something out and do what you say.

CHECKING BEHIND THE CURTAIN

Sometimes, you will find corners have been cut by a seller. Sellers are sometimes in bankruptcy and may not have two nickels to rub together. Or, the seller may simply be trying to economize while a deal goes through.

Did the station go silent for a time to save electricity? A directional AM that has been off for six months is supposed to do a proof in order to see that all is well.

What are they not telling you? Have they been cutting the weeds and keeping the site neat? If not, or if the site has turned into a dump, this will not make the neighbors happy.

DETERMINING WHAT IS IMPORTANT

How you handle missing or purloined equipment depends, again, on how big the deal is to you and your company or client. In a small deal, you may want to really press for all of the goodies. In a large one, you may have plans to update anyway, so you might want to let it go. (Remember to think about whether you would think your request was fair, if roles were reversed and if it came from the other side.)

On the other hand, some pretty petty actions by a seller can have expensive ramifications to the buyer.

One station I bought had been part of an FM and TV combo. The FM antenna and TV antenna were on the same tower. When FM was sold, the TV chief ordered the FM deicer cables be disconnected, since there was only one power feed and one breaker in the building. He (or the manager) did not want to pay for the FM deicers. We were not told – not that we would have wanted to pay for putting it back – but there we were. An unprotected antenna will not last for very many seasons in bad weather.

If the sites are leased, are there long-term deals? Are there any problems that you have not heard about? Angry neighbors? At some sites you may be inheriting decades of hurt feelings (Two quick examples: Look out Mountain by Denver, Colorado and Mt. Sutro, in San Franciso.) If land is being acquired have the title searches been made? Nasty surprises have occurred.

AFTER CLOSING

After closing you should take the time to peel or pry off old inventory control tags.

While the former owner may no longer be in the business, some companies will trim their fleets and still have stations in your town, maybe even at your tower site. You want to get their tags off the equipment and yours on – so that there is no confusion.

As you have seen, there are a myriad of things, both in terms of equipment and legal matters, that require attention in a sale or proposed sale. The more you can do to uncover the real physical and legal state of a facility and solve any problems before a sale, the more your value to your employer will be enhanced and the less time you and your employer will spend with lawyers and other legal hassles.

Yes, Smitty Margaret Walden is a pseudonym. It was lovingly chosen by a veteran radio engineer who is always willing to help others, but is restrained by his/her corporation's lawyers from allowing his/her name to be used in print. Email for SMW can be addressed to Editor@radio-guide.com

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IT Guide

by Chris Tarr

VPN: The Virtual Private Network

Have you ever gotten halfway home when you suddenly remembered you wanted to do something on the automation system or check the transmitter logs?

It used to be the only solution was to turn around and go back to the office. However, taking advantage of a special connection to the computer, you can check, change, fix, and even document things from home, a restaurant, the car – virtually anywhere you have Internet access.

In this day and age, there are more and more radio stations – and fewer and fewer Engineers. Trying to keep on top of everything can be very difficult! Would it not be great if you could access your servers, transmitter controllers, and automation systems securely, from wherever you happen to be?

INSECURITY

There are ways to do it, but most of those ways involve opening ports, usually common ones, on your firewall, exposing your network to the outside world. These days you have to worry about Hackers, Crackers, ex-employees, and, if you are a public company, Sarbanes-Oxley compliance.

When you dial-in or connect to the public Internet, you are given a "public" Internet address on a large "shared" network. Anything you send goes through routers all over the world. This traffic is not encrypted and is available for all to see.

Fortunately, there is a way to access your internal network resources without sacrificing security, and it is pretty easy and inexpensive to set up.

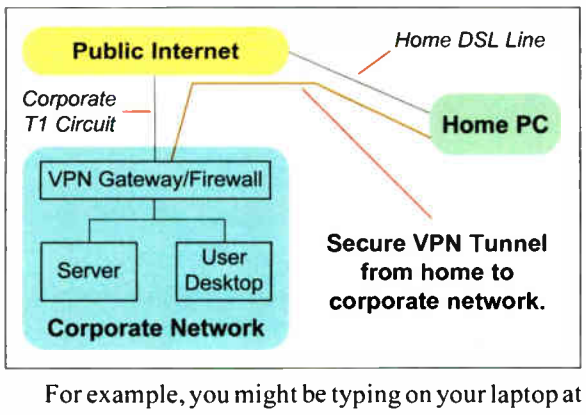
VPN = SECURITY

A VPN (Virtual Private Network) is a "tunneling" protocol that connects two remote networks through the public Internet. It creates an encrypted tunnel between networks or clients and networks.

When you are connected to your office via a VPN, you are creating a secure "tunnel" that piggybacks along the public network, directly connecting your computer to your company network. The client and host challenge each other upon connection, if they cannot agree on encryption, the connection fails before anything is sent.

After you are connected, your computer is issued a second "private" Internet address from your office network.

For example, under VPN you might want to issue a command to the automation to change the satellite receiver's channel – saving you a long drive to make a simple adjustment. As you connect with the VPN program and type your name and password, your computer connection undergoes a transformation.



For example, you might be typing on your laptop at home, connected to the Internet via a WiFi connection. In this case your computer's IP address changes – virtually – from 192.168.1.100 (your computer's local address) to 192.168.1.1 (on your router) to 24.151.141.97 (the IP address assigned by your ISP).

At the other end, the Office router at 38.144.23.220 takes the feed and sends it to the router and server. As the connection is completed, you now appear to be on your office network as 10.1.10.220. Meanwhile, keystrokes are encrypted in transit, you become a user on the internal network, and can now connect via Remote Desktop or PCAnywhere to any computer to which you have access.

Now you can work just as if you were in your office – it is just like having a *very* long CAT-5 network cable between you and your office. Any traffic sent to your office network is routed through the secure tunnel straight to its destination.

SETTING UP A VPN

Most of the time when you mention setting up a VPN, most people immediately think of a project that it both difficult and expensive. Believe it or not, it is relatively easy and costs less than you may.think to set up a VPN. (Keep in mind that due to Sarbanes-Oxley regulations, and even corporate IT policy, you should always get the green light from your IT department before setting one up.)

On the office side, the easiest way to create a VPN is to simply buy piece of hardware, commonly called a VPN appliance. The appliance is similar to a router – your Internet connection plugs into one side, and your internal network connects to the other. You can then set up the accounts for your users using the appliances web interface.

An example of this is the MultiTech RouteFinder Internet Security Device, which sells for about $180. Alternatively, if you have a server running Windows 2000 server or Windows 2003 server, the software can be configured to act as a VPN server, though it will require some skill to set up and maintain.

I use a Netopia 3346N DSL Router with the Enterprise Firmware, which adds VPN capabilities. **Figure 1** is a screen shot of the user configuration screen:

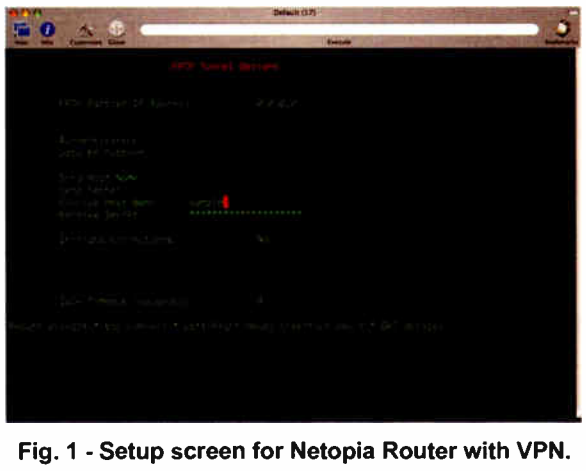


Fig. 1 - Setup screen for Netopia Router with VPN.

On the client side, Windows 2000, XP, and Mac OS X all include free(!) VPN clients. The setup for each is slightly different, but simple, to set up.

Figure 2 is a screen shot of a VPN configuration screen on a Mac running OS X:

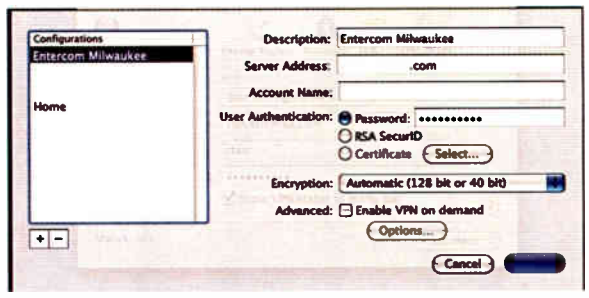


Fig. 2 - The remote user uses this screen to log in to the network via VPN.

PUTTING VPN TO WORK

Now that you have your VPN set up, the question becomes, what do you want to do? Since as far as the network is concerned, the connection makes it is appear that you are right there in the office, there really is almost no limit to what you can do – although you cannot quite reach the printer from your remote seat!

To give you an idea of the flexibility of the system, here are some of the things I do through my VPN:

- Remote control of transmitters via Burk Auto-Pilot software.
- Lock and unlock facility doors using our security system.
- Administer users on our Novell and Microsoft servers.
- Access audio loggers and streaming computers.
- Control studio automation workstations.
- Adjust the processing on our Optimod 8500.
- View transmitter site webcams.
- Access the desktop computer in my office and print to my printer there.

That is just a small list of things I have set up. In addition, my office network is extended out to my transmitter sites as well.

CONNECTING VPN TO VPN

This leads me to another quick note about the flexibility of VPN - you can set up what is called a "point-to-point" VPN that connects two complete internal networks together through the Internet. It is great if you have Internet connectivity at a transmitter site and you want to "merge" it with your office network.

In using a VPN, remember: if you can do it on your office network, you can do it anywhere you can get an Internet connection.

In the next article, we will look at how to set up your network to take advantage of your new VPN, plus discuss how you can, in turn, check up on your servers, studio gear, audio processors, and even your transmitters from nearly anywhere by using a Palm or Blackberry "Smart Phone."

In the meantime, here are some links to check out:

How VPN's work:www.howstuffworks.com/vpn.htm

How to set up a VPN connection in Windows XP: http://compnetworking.about.com/od/vpn/ht/newvpnwindowsxp.htm

Link to the Netopia: www.netopia.com/equipment/products/3000/3300_bus_models.html

Link to the MultiTech: www.multitech.com/PRODUCTS/Families/RouteFinder_SOHO/

See www.radio-guide.com for a clickable list of URLs.

Chris Tarr, CBRE, CBNT, is the Director of Engineering for Entercom in Milwaukee and Madison, WI. Contact Chris at ctarr@entercom.com

Tech Tip

by Bob Burnham

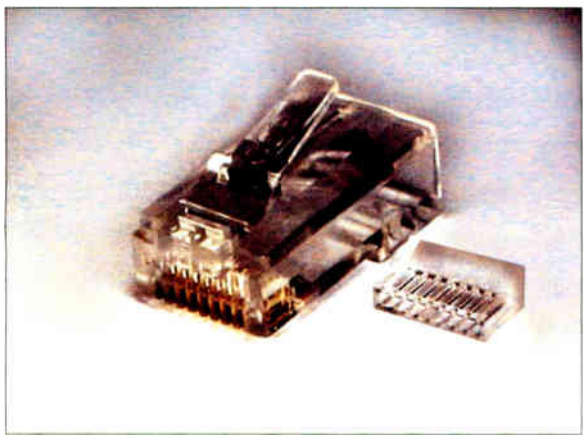
Building "Ruggedized CAT 5 Cables

Bad cables have annoyed engineers forever. With proper construction and wiring, many can stand up quite well even to the abuses suffered from jocks who seem to enjoy wrapping microphone cords around booms or from life in the remote van. Bob Burnham notes the love-hate relationship some have with Cat 5 cables and offers some tips on making it a happier relationship.

No one would have believed a few decades ago that our favorite phone company would implement a modular style of connector – one that seemed rather flimsy and fragile at first but would actually withstand the test of time.

THE RJ-45

We are talking about the ever-present RJ-45 connector – and its smaller sons and daughters – that has become a computer networking standard. And as we know, it also finds heavy use in broadcast studios, once dominated by screw terminal barrier strips, "Christmas Tree" solder blocks, and XLR connectors.



A generic plastic RJ-45 plug.

Category 5 and 5E (Cat 5) cabling is now just as common in a broadcast facility as any other type of audio or coaxial cabling. In fact, one broadcast console company advocates the use of Cat 5 for **all** connections in a studio including analog audio. Radio Systems manufactures a special line of products, "Studio Hub," to simplify such an installation.

For general applications, the use of pre-built Cat 5 jumpers is common and their low cost and high reliability makes them suitable for most situations.

THE WEAK LINK

But what about that time when the locking tab for your ISDN connection breaks off during an important remote – and you forgot to bring a spare? I would bet you wished the phone company had settled on the bullet-proof nickel-plated XLR connectors instead, or even the *really* old-fashioned 4-prong phone plug.

It can happen in milliseconds; the air talent backs a chair into a plugged-in plastic RJ-45 or someone steps on the one you were just about to plug into the CODEC. Either way, the locking tab has been broken off or the connector smashed into unusable bits, forcing you to search for a spare cable or your crimper tool to put on a new plug. Meanwhile, you are thinking "there *must* be a better solution!?"

Welcome to mass-produced, microprocessor-based circuit boards with complexities demanding far more conductors in less space than ever before. A standard RJ-45 connector compacts four pairs in less space than an XLR carrying one pair, but that does not make up for the durability or lack thereof. The original design typically assumed the cable would be plugged in once and left alone for most of its life.

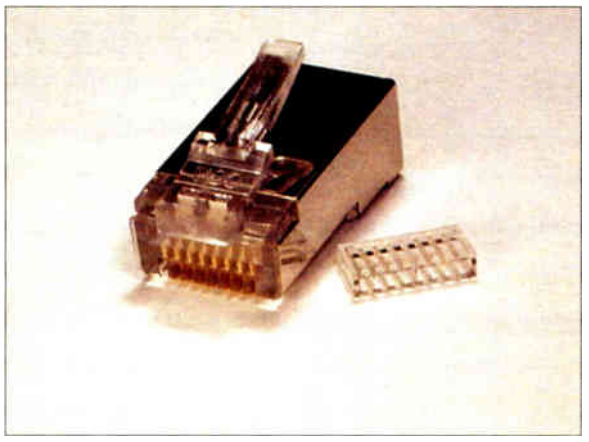
THE RIGHT SOLUTION

In contrast, broadcast equipment often is constructed like military equipment. It is time for a reality check though. That was actually back when equipment was designed around steel, hand-wired chassis with rows of 12AX7 vacuum tubes.

So, what is an engineer to do? There are two options:

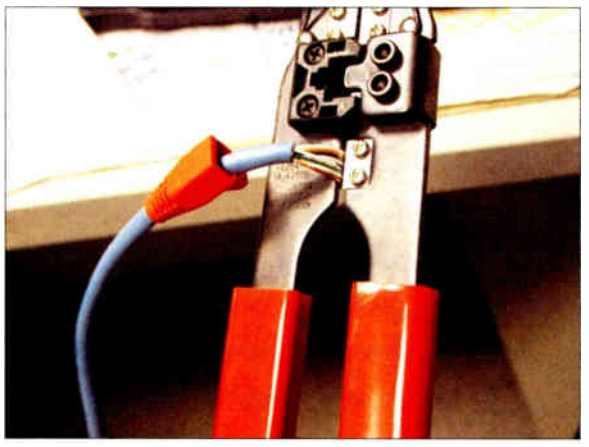
You could buy spare pre-made cables in large lots. Or you could spare yourself the aggravation altogether, spend $1.00 per end, and end up with a metal encased/shielded RJ-45 connector and its companion "hood."

If you have any IT experience in your background, putting an RJ-45 on a cable is no big deal. The metal encased connectors are no different than the ten-cent plastic connectors and in fact, use the same crimper.



MCM's shielded version of the RJ-45.

The MCM Electronics' part number for the shielded RJ-45 connector is CNRJ45/SH. The protective hood – which you may have already seen on pre-built patch cords – protects the locking tab from being snapped off. It is part number 1225. www.mcminone.com is the website. 800-543-4330 is the number, but make sure you have part numbers if you are going to order by phone.



Getting ready to make the cable.

BUILDING THE CABLES

If you are new to the world of Cat 5 assembly, you may be well-advised to practice on a couple of the less expensive ends. Your neighborhood Radio Shack can sell you a bag of them for a couple dollars, as well as the crimping tool, although both are available from MCM as well. The shielded connectors do need to be ordered.

As far as the actual assembly, if you have not done it before, set aside everything you know about the dozens of other connectors you have installed.

First, use the cutter built into the tool to strip off a couple inches of the outer jacket. Next, completely untwist all four pairs and tug on each one to make the wires as straight as possible. For the third step, continue tugging on the wires while arranging them in the order in which they are to be installed.

The standard and most common Cat 5 order ("T-568B") is shown below:

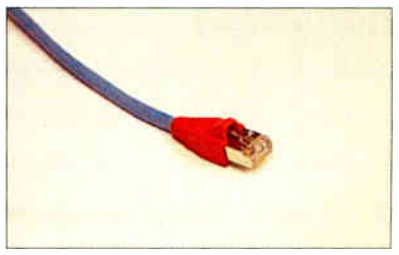
Pin 1 - White with orange stripe
Pin 2 - Solid orange
Pin 3 - White with green stripe
Pin 4 - Solid blue
Pin 5 - White with blue stripe
Pin 6 - Solid green
Pin 7 - White with brown stripe
Pin 8 - Solid brown

The pin numbering looking at the connector from the cable insert end (with the tab facing down) is *left to right* pins 1 through 8 respectively.

FINISHING THE PLUG

The most critical step is making sure the wire bundle is completely flat before insertion and they are cut at an accurate angle. Each wire should be exactly the same length.

Once you have all the individual wires untwisted and stretched straight, in the right order (and pulled tight between fingers), use the crimper cutter to cut 90 degrees straight across, about 1/3" up from the jacket. Insert the flattened bundle into the connector until they are all fully seated. You can sort of double-check through the clear plastic area that the wires are still in the proper order.



A finished RJ-45 plug, ready to withstand DJs and remote use.

Insert the entire connector into the crimper tool and squeeze firmly. I actually squeeze a couple times to be extra sure.

You should now check continuity of your work using a cable checker or any appropriate device. . Wiggle the wire to make sure the connections are secure. If not, cut it off and try again.

If you are using flat cable rather than round, the process is simplified although Cat 5 generally is only available as a round cable.

ADDING THE HOODS

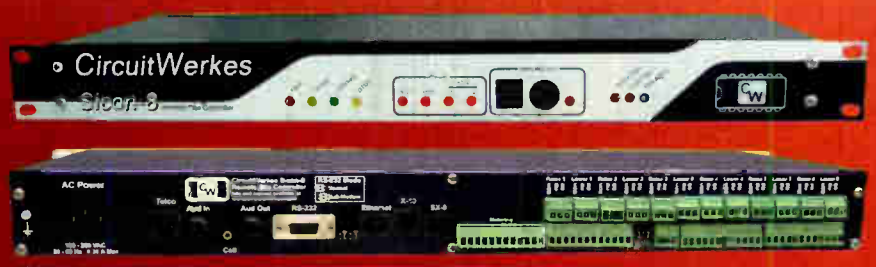
If you are using the hoods, you can insert it now. If you are doing both sides of the cable, insert the first hood from the opposite end of the cable. Note: *before* you put the second plug on (or before the first one, if you are replacing just one plug), make sure you have inserted the hood(s) for the connector(s) facing the appropriate direction.

For data and networking applications, unshielded Cat 5 cable works fine ("UTP" – Unshielded Twisted Pair). If you are running analog audio through the cable, I prefer the shielded variety ("STP" – Shielded Twisted Pair), although unshielded also works as long as you are using balanced audio. The "twist" is what makes it especially suitable for the purpose.

So far, the metal encased connectors have outlasted a several sets of the plastic connectors in my applications.

A veteran of wiring XLR cables and connections at the Specs Howard School of Broadcast Arts in Southfield, Michigan, Bob Burnham also has used many RJ-45s, but he is relieved they are not used on microphones – yet. You may contact Bob at: bburnham@specshoward.edu

The New Sicon-8 Voice Remote Control



Introducing the Sicon-8, a revolutionary transmitter site controller with custom voice recording technology for perfectly natural sounding dial-up or radio link control. All of the I/O, including 8 channels of relays, are included on the main board so there is no need to buy anything else. All metering, status and control connections are on depluggable screw terminals. An expander chassis, the SX-8, adds eight channels of metering, status & control to an existing Sicon-8 for a maximum of 16 channels. Designed to be controlled from any dial-up telephone, an auto-answer cell phone or from its serial port, the Sicon-8 gives you the control options that you need. A free, Windows program, the Sicontroller, gives you full access to all of the Sicon-8's programming and control functions. Basic logging functions are included. Live Internet interfacing is accomplished with an inexpensive accessory. Visit us online at www.circuitwerkes.com for complete info on the Sicon-8.

The CircuitWerkes Sicon-8 Voice Remote Control

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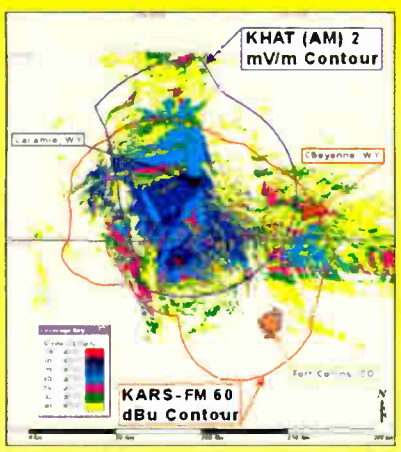

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Studio Guide

by Ted Alexander

Talk Show Tech

Putting a Talk Studio Together

When a major format change occurs, there are many factors to consider during the implementation. Of the possible new formats, few involve as many choices and decisions as talk shows, largely due to the constant direct connection to sources inside and outside the station. Ted Alexander returns with some more tips and tricks to get the most out of your studios.

The word is on the street: "coming soon to your station, *it's live and local talk*, direct from new studios deep in the heart of your home city!" You have ordered the new equipment and its arrival is imminent. Times are exciting. So, how is the studio construction going?

BRING IN THE FURNITURE

By now you should have researched the needs for your talent and have used that information to lay out the physical part of your new studio (or addition to your existing studio) and built or installed the furniture to handle the talent, producer, and in-studio guests.

Since much more activity will now be going on while the microphones are open, as compared to a music studio or recording studio, as well as the probability that you will have guests in studio with your host, attention to "creature comforts" is appropriate. With more comforts, the host and guests can better concentrate on performance rather than disturbances.

For the guests, a comfortable chair and a "pod" to control things like headphone levels and a cough switch are very desirable.

A good talk studio has plenty of comfortable space for guests and good sight lines.

Laying out the studio so the main host has the door clearly in his field of vision (so no one can sneak in behind him or her) adds an extra level of comfort and helps the host to focus on the on-air performance instead of worrying about what is going on out of view. And, with all those people in one room, do not forget the critical need for quiet, capable HVAC.

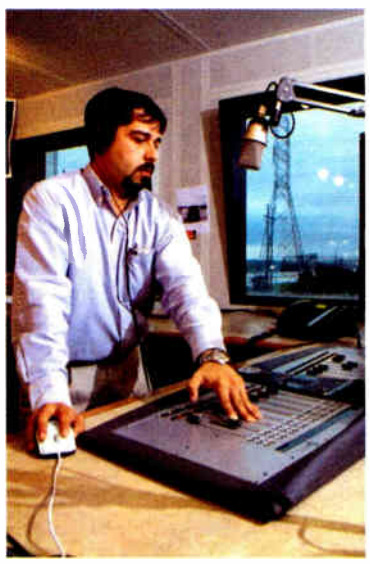
THE TECH SIDE

Except for some major market or network studios, the host usually will be running the board. If you ordered correctly, your console will have the mix-minus busses and other features needed for the host to produce the talk programming on the fly.

In old days, it was nice and flexible to have a 28-fader board, but do you really need that many today? What with the majority of spots, promos, liners, etc. now being originated from a hard drive, you no longer really need a dozen faders for each input source type; it is not often that more than three faders will be needed for the hard drive/computer inputs.

Meanwhile, it is not often that more than six microphones are going to be used at any one time. Add in two remote/utility faders and two telephone faders, and you should have enough input capability with a 15-fader board.

If the host is not one of the smoothest board ops, less complication is a plus. Having at least two busses available for mix-minus is a necessity – even three is less of a luxury than a necessity, especially if you plan on any expansion.



A clean layout will keep the show operating smoothly.

HOLD THAT THOUGHT!

In this day and age of tough FCC enforcement of objectionable content, having a foolproof profanity delay is of utmost importance.

At a potential of $325,000 per offense, a reliable, even multi-level profanity delay system (and the fail-safe ability to activate it) is the best insurance you can have. Even if you cascade three separate, and separately controlled, profanity delays, the cost will probably not exceed $10,000, and you will have a solid "insurance policy" against the FCC's no-no's.

Hard wiring in the "dump" button to your delay will eliminate any chance of a software glitch that results in a failure to dump the unmentionable. If the host, and/or anyone else responsible for content has a big, mushroom-top DUMP switch (like the kind you see at a gas station for emergency shutoff) they will not have to fumble around finding it in a time of "profanity crisis."

If you plan on airing a lot of controversial material, multiple levels of protection make a lot of sense. For example, the show's talent and producer would have a dump button for the primary delay and the PD would have a dump button for the secondary delay. You could add another one for the GM.

CHECKING THE OUTSIDE CONNECTIONS

Once the great majority of hardware is on site and the real installation has begun, it is time to make sure you have the right connections to the outside world. For example, you did order your phone lines, right?

If you ordered POTS (Plain Old Telephone Service) lines, have you checked that your "hunt group" functions the way you want? Are the Hotline and Warmline going to go to a separate phone instrument or through the main talkshow system? If you are going to use ISDN, have you ordered the properly provisioned BRI lines for the system? (Given the recent difficulties in getting ISDN lines in some areas, make sure your local telephone company will supply them.)

On the other hand, if you ordered, for example, a Telos 2101 system, have you ordered the right T-1 or PRI service? Did you make sure to tell your phone company that your call-in lines should be originating from a "choke" exchange?

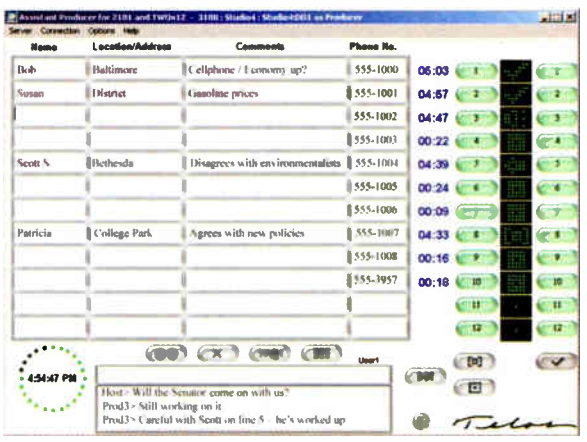
And here is an important point to remember: all phone lines are not created equal. Please do not order your call-in and on-air lines from a VoIP service. VoIP is not ready for prime time use on talk shows yet. Also, it is not always possible to get a good hybrid null with a VoIP line – there may be a lot of echo.

At the present state of the art, do order your POTS and ISDN lines so they originate from your telco's central office. Based on past experience, you may save yourself hours of aggravation by using only central office originating call-in lines. If you have questions or need assistance to make sure it all comes together properly, call the Tech Support folks at the manufacturer of your telephone interface equipment. (Telos users also can visit www.telos-systems.com/?/techtalk/isdn_order.htm for tips on dealing with ISDN.)

CALL SCREENING

If you have a sufficiently large supply of Post-It notes, your staff may not need a computer and call handling software package to keep track of the callers.

On the other hand, an Assistant Producer program will add to the smoothness and coherence of the show. Such software allows the call screener to more easily communicate with the host so he or she will know ahead of time the name and subject of the next caller in the queue, along with the time they have been on hold.

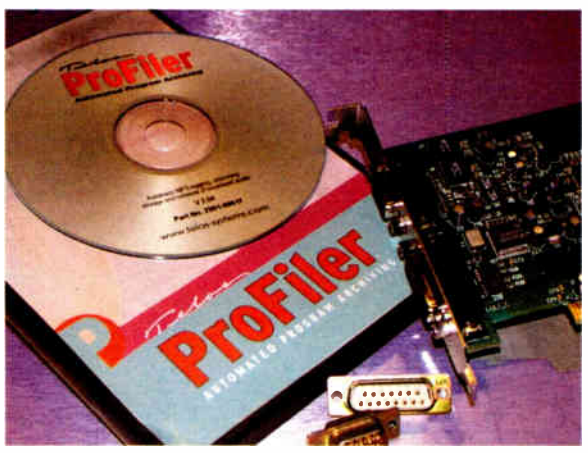


A call screening program for use with some Telos products.

Some of these programs also allow a "point and click" selection of callers in addition to the call-selection hardware buttons on an external or console mounted switch console. By the way, it is highly recommended that you dedicate one computer for exclusive use as your Assistant Producer's server and not use it for any other functions. The reason why? You surely would not want an unrelated program to crash your morning drive's computer-aided call assistant.

ARCHIVING THE PROGRAMMING

Even though the FCC has not demanded a 24/7 archive be made of all material broadcast on broadcast stations, there are reasons to do just that.



One choice for program archival is the Telos Profiler

It is easier and more economical than ever to keep six months or more of programming archived on a hard drive. Aside from having a complete, word-by-

(Continued on Page 30)

Studio Guide

by Ted Alexander

Talk Show Tech

– Continued from Page 28 –

word archive of all material recorded from your off-the-air monitor, it also is usable as a sales tool to prove to a questioning client that their spot exactly ran as scheduled.

Software/hardware packages like the Telos Profiler allow programmable combinations of air quality skimming, archival quality air-checking, and off-site (remote) access to the archives from a PC. Here is a neat trick for your sales department: if a station representative is in a client's office and they question if their spot ran at 6:45 a.m., you can connect to the station via any PC connection and play back the show segment that contained the spot.

PREVENTING PROBLEMS

Local stations rarely run 24/7 with local origination these days, so you will have at least some "down time" to take care of any component or system failures. However, when you want to be up and running consistently – at least 6:00 a.m. through 7:00 p.m., for example – you will want to eliminate as many "single points of failure" as you can.

If you were fortunate to have been able to install new equipment, you can be reasonably sure you will not have any major failures for (one hopes) several years, at the least. Of course, that assumes you have installed things like UPS's for all critical equipment and lightning suppression components for telco lines and other lines connecting you to the outside world. Auxiliary mains power is always most desirable, but that discussion is for another time.

Most outages that happen to stations using a talk format center around a failure of the telephone hybrid(s) and the remote broadcast lines. Without lines and/or hybrids, you are stuck in "monologue mode," so you should plan on having as much of a backup store of equipment as can be afforded. Look upon it as insurance.

Especially in lightning prone areas, enough backup equipment should be ready and waiting to allow you to maintain your format even if you have multiple failures due to a severe thunderstorm. If you are adamant about having a backup transmitter and audio processor, you also should be equally adamant about having a backup to your critical studio equipment – you should have at least one spare single-line hybrid on the shelf, ready to go.

EXTRANEOUS NOISE REDUCTION

If you are planning on using a computer in the studio itself to assist in call selection, plan on installing the noise generating portion of it outside the studio. Especially if you have multiple microphones open, you will quickly hear a whole lot of hard-drive whine (or fan noise) in the background if the computer is anywhere within the soundproof studio.

It takes planning and proper equipment placement to get a really quiet control room environment.

Ideally, when installing ancillary equipment, *anything* that produces audible noise should be installed outside of the studio. Use a KVM to extend the keyboard, monitor and mouse into the studio, leaving the hard drive(s) in an adjoining room.

The less you have to install inside a studio, the less noise with which you will have to contend. A further benefit: if any of those pieces of equipment fail, you will not have to interrupt the ongoing show when performing maintenance and repair.

Most broadcast installations are custom affairs – you normally just do not buy an "off the shelf" studio, prewired and sound-proofed; you have to design and build the studio yourself. Pre-planning for not just the anticipated use, but also to accommodate the unexpected needs, as well as the inevitable maintenance and repair, will pay off many times over in keeping your programming on-air (and the cash register ringing).

Ted Alexander is part of the technical support team at Telos-Omnia-Axia as well as a well-experienced engineer and voice talent in the Cleveland market. Contact Ted at talexander@telos-systems.com

Tech Tip

by Scott Todd

Finding Gold in the Storeroom

Virtually every station seems to have a pile of older computers stacked somewhere around the plant. Sometimes it is hard to know just why they are being saved, but Scott Todd reached into his pile and solved some problems.

Got any dead computer power supplies around? Do not toss them – reuse them! They make great project boxes.

FROM COMPUTER TO CONSOLE

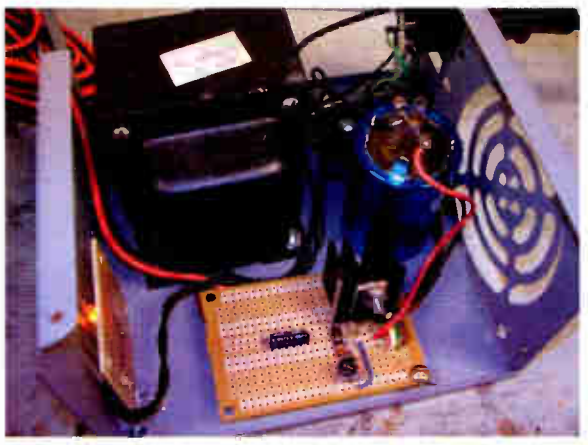
I needed a power supply for a small Sparta console that I was resurrecting for use at one of my transmitter sites. The project started because I wanted a way to make sign-off announcements when I was going to take my stations down instead of just cutting the carrier as I have had to do until now – a procedure which leaves the audience wondering where we went.

The original power supply was gone so I had to build another one from scratch. Instead of spending a bunch of money buying a box from one of the catalogs or a local supply house, I grabbed a dead power supply module from one of the old computers lying around and tossed the defective board.

NEW FROM OLD

Inside the case, I rebuilt the supply with a simple cookbook LM317 affair, placing the regulator on a small scrap of perf board with a surplus-house transformer and some old electrolytics that needed to be used up. There is more than enough ventilation and it runs quite cool.

Since the power supply draw would be light and the supply itself would not be enclosed in a computer case, I did not need the fan either – so I removed that, too.



A former computer power supply now ready to power a console.

Another good thing about the module is the on/off switch and power cord connectors. In the past I had always wondered how best to handle the mounting of the power cord since I did not have one of those fancy punches for the strain reliefs nor a strain relief tool.

As they were already built-in the original power supply case, it took no time at all. The solves the problem and saves some of the time that would otherwise be spent cutting and drilling. The connecting wires easily fit in the notch designed for the computer power cables. And there was plenty enough room to install a "pilot light" to indicate the power supply was turned "on."

READY TO GO

A few parts from the bin, a few hours work, and there is was, a suitable console power supply. Now I could easily control program audio from the transmitter room, making appropriate announcements as necessary.

I have used similar boxes to build a few small monitor amplifiers with an LM384 chip, and a relay

lamp-switching unit for a game-show setup for one of our stations to use at the State Fair. OK, so you will not save the station a ton of money, but free is free and, with part of the construction done for you, it might make it worthwhile to build rather than buy some small project.

The repurposed power supply connected to the console. The existing case had the AC socket and on/off switch already in place.

They might be gathering dust in some back room. But, do not write off those old computers. They might just solve a problem for you some day.

Scott Todd is the Chief Engineer for KKMS in Richfield/Eagan, MN. Contact Scott at stodd@kkms.com

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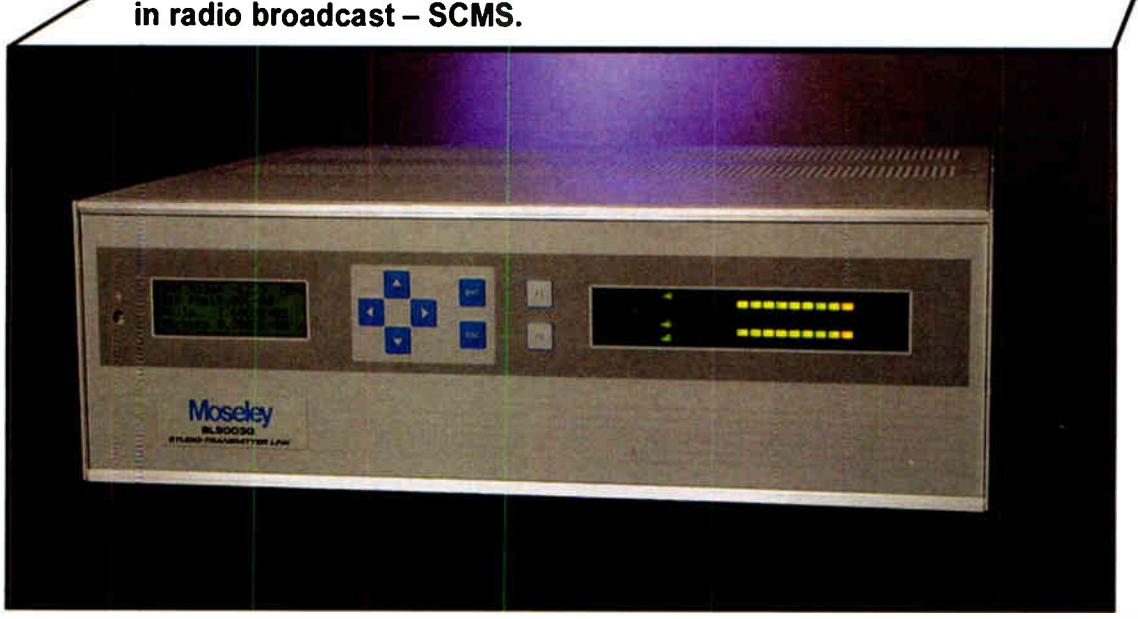

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Radio War Stories

by George Whitaker

How to Steal a Radio Station – or – Keep Yours From Being Stolen

Next year marks fifty years since I first started sweeping floors, cleaning the toilets, and part-time announcing. Along the way I have seen many wonderful, uplifting things. But, I have also observed some dastardly, plain rotten, things.

In this series of articles I am going to tell you how certain people stole an antenna, a roll of 3-1/8 inch coax, and even a complete radio station. Knowing how that was accomplished, hopefully, you will not allow yourself to become a victim.

IT REALLY HAPPENED

Personally, I would like to give real names and call letters. I can prove every word if I had to. But, to play nice, any names and call letters will be fictitious.

One thing I found is that crooks do not steal from people who have the money to defend themselves. Crooks know how to pick their victims and they always select someone who cannot spend the money to put up a legal defense. If you are a wealthy, high billing station you do not have to worry about things like this. It is the station that is just making ends meet that gets targeted.

First, we will look at how to steal an antenna.

MOVING EXPENSES

A number of years ago there was a C-2 that was owned by a large, quite wealthy, company. They wanted to go to C-1. However, there were two Class A stations that would have to change frequency.

These two small-town A's were just barely getting by, so they jumped at an offer to pay all their expenses and a lump of extra cash if they would cooperate with the C-2 and change to new frequencies. A contract was signed and the two small stations did as the contract specified and filed for new frequencies. They each had to change their antennas to accommodate the new frequency. This left each of them with an antenna on the ground that was worth six to ten thousand dollars on the used market.

At this point the two smaller stations had changed frequency and had received expense money as they went along. Neither station could afford the expense as the changes progressed so the contract provided that C-2 would reimburse expenses as the changes progressed.

However, the lump sum was to be paid once the C-2 got their C-1 upgrade. So, there was a waiting period after the smaller stations finished their frequency moves.

AN OFFER ARRIVES

During this time the C-2 offered to buy an old antenna for $6,000, whereupon the engineer from the C-2 and I loaded the antenna up and took it to the C-2 transmitter site. It was just right for them to use as a standby after they received their change to C-1. Therefore, it made sense for them to buy the antenna.

Months went by waiting on the commission to approve the new frequency for the C-2. Yet, nothing was ever paid on the antenna.

Then the C-2 became a C-1 and, after a number of months, the smaller stations began to ask for their final payment – the promised lump sum for making their moves. My employer also was pressing for the money for the antenna.

A NASTY TURN

Now, here is how the C-2 had set it up to steal from both stations.

One day a certified letter arrives at each station from a high-toned legal firm saying that the small station had been "uncooperative" (remember that clause in the contract?). The C-2 said that unless they forgot about the antenna and the lump sum payment the C-2 would sue the Class A for being "uncooperative."

The Class As eventually would have won any suit the C-2 might have pursued because there was nothing to substantiate the claim. However, the Class As would have to come up with a hundred to two hundred thousand in legal fees to – ultimately – get that back, plus the money owed to them as the lump sum payment, plus the antenna.

NO WIN SITUATION

We knew we could win but we certainly did not have the money for the legal fees in the interim. Therefore, the C-2 got their part of the upgrade from us for just the bare expenses of our Class A changing frequency and they got a standby antenna to boot.

Like I said, crooks target the people who cannot afford to defend themselves.

But they might have guessed wrongly on the other Class A. While I have no personal knowledge of the situation with the other Class A, I did hear that they had resources the C-2 did not count on. Apparently, the other Class A did fight it out in court and, after several years, got their money and their legal fees. But they had spent hundreds of man-hours pursuing the case and there was no compensation for that.

Next time, I will tell you how to steal an expensive roll of cable.

George Whitaker is a long time broadcaster, based in Arlington, Texas. You may contact George at: boss@mikeflags.com

We're all talk.

And all action, too.

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

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

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

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

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

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

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

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

Radio History

by Barry Mishkind

Reginald Fessenden Gives Radio a Voice

Broadcast "history" is full of claims. "The First" this or "The First" that. Although repeated over and over in many of the textbooks written and used by academics, a lot of what is accepted as history has been found to be based on claims from press releases of companies like AT&T, Westinghouse, and others.

In reality, most of the true pioneers were more concerned with getting on – and *staying* on – the air, than registering their achievements in some ledger. The delays in documenting their achievements often created opportunities for errors of memory, competitive boasting, and plain poor journalism to affect our view of the pioneers.

You would like an example or two? Sarnoff did *not* stay at the telegraph key while the Titanic sank. WEAF did *not* run the first commercial. Uncle Don did *not* make a disparaging comment about his audience when he thought he was off the air. And, despite the verbal and logical gymnastics employed, we really do not know who was the first to broadcast.

Indeed, the definition of "broadcast" itself is subject to tremendous debate and turf-defending parsing of words.

THE "HISTORY"

No matter how you look at it, it was quite an amazing event. True, it was not the first time that voice had been transmitted. And there even had been a "tip" that something was going to happen.

Nevertheless, what those ship radio operators and radio enthusiasts heard coming through their wireless earphones on that cold December day in 1906 must have astonished them. Instead of the normal patterns of dots and dashes, a voice was heard to speak! Not only that, there was music, singing, and more.

This broadcast capped developments made over the preceding six years, as the man responsible for the broadcast, Reginald Aubrey Fessenden, moved far beyond the telegraphy that had already revolutionized communication over large distances.

A CHANGE OF DIRECTION

Oddly enough, Fessenden did not start out to be the first voice heard over the airwaves. Indeed, if his parents had had their way, he would have been a minister or teacher. And, for a short period of time, he did teach. But, we get ahead of ourselves.

Fessenden was born October 6, 1866 in Canada. The eldest of the four sons of Anglican Minister Elisha Fessenden and his wife Clementina, Fessenden showed his aptitude early on: mastering mathematics, languages and music, among others.

After leaving school at that age of 18, he accepted a position as a headmaster and teacher in Bermuda but, as he said of himself, when he closed his eyes, he dreamed of inventions, including wireless transmissions around the world. "There's no future in that," his mother told him. Fortunately, he did not listen to her, he just kept dreaming.

FROM BERMUDA TO THE U.S.

While teaching, Fessenden kept up with his subscription to "*Scientific American*" and built a scrapbook of clippings about Thomas Edison and his inventions. After two years in Bermuda, he developed a determined attitude to meet Edison and, he hoped, to work with him. Thus, he moved to New York.

Ironically, Fessenden, who would develop a reputation as a self-possessed, somewhat arrogant man, actually failed in his first attempt to meet Edison because he understated his qualifications. Not sensing the whole of the man applying for his attention, Edison did not make himself available.

Reginald Fessenden
Approx 45 years

Fessenden had to be satisfied with being "in the neighborhood" and waiting for another opportunity.

FESSENDEN AND EDISON

It did not take too long, however. After a short period of time writing articles for popular journals, Edison Machine Works offered him a job testing the cables being laid in the streets of New York City.

Although it does not sound exciting, this position actually worked to his advantage, for Fessenden was quite talented, rising to head tester and developing a relationship with several powerful people, including the banker J.P. Morgan.

(Continued on Page 38)

"We outgrew our old studios. With Axia, that won't happen again."

"Kaya FM is a trailblazer. We were the first independent radio station licensed in South Africa after apartheid. We invented our own unique format, a mix of music and talk. We grew into one of the most popular stations in Johannesburg. And we completely outgrew our original studios.

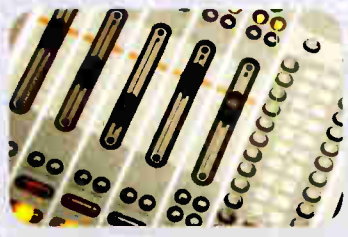
"Moving to Newtown, the city's cultural and entertainment center, required 'showcase' facilities; **dynamic, striking studios** that mirrored the buzz and excitement of our station and community.

"We also needed a routing system that would **seamlessly link all of our studios** and news facilities — cost-effectively, of course.

"Our equipment search began with the usual suspects, but nothing clicked until we saw Axia. Using Ethernet switches and CAT-6 cable to share audio between destinations makes a lot of sense, and costs a lot less than those expensive mainframe routers. Axia is **more flexible, too.**

"This is **a system we'll *never* outgrow,** because we can expand it by plugging in more audio nodes wherever we add new inputs.

"The on-air **staff loves the Axia consoles;** they're very flexible and easy to operate. Powerful, too: you can store custom show setups and call them up with one button. This really simplifies switching between talk and music shows — just load the show profile you want and the board is ready in seconds! And no more worries about setting up mix-minuses when doing remote broadcasts; the surface takes care of all that for you no matter how many callers or remote lines you have.



"I think **Axia was the perfect choice** for Kaya FM. We have all the functionality we wanted, and we got it for half the price of systems with less features. In fact, we've already ordered another new Element control surface! Axia is a technical dream... I can't imagine a better fit for our station."

— Russell Pope, Operations Manager
Kaya FM, Newtown, Johannesburg, South Africa

AXIA
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www.AxiaAudio.com

Radio History

by Barry Mishkind

Continued from Page 36

Promoted yet again, Fessenden was assigned to the chemistry division of Edison's enterprise and developed an insulation for electrical wires that was not only successful, but impressed Edison himself. Nicknaming him "Fezzy," Edison made him Chief Chemist and his personal assistant, using Fessenden as a sounding board and source of advice on solving problems.

INTO LOFTY COMPANY

Now fully installed as a peer, Fessenden had access to the best libraries and the intellectual giants of the time. In addition to Edison, Fessenden would associate with Lord Kelvin, George Westinghouse, and Dr. Arthur Kennelly.

Kennelly was the one who, along with Oliver Heaviside, first described the existence of the ionized layer of atmosphere we call the ionosphere and its quality as a "reflector" of radio waves. This concept was considered so crucial to the long range transmissions Fessenden eventually accomplished that he even named his only child Reginald Kennelly Fessenden in honor of Dr. Kennelly.

In 1890, as Edison was leaving for Europe, Fessenden received the promise that he could devote his energies and company funds on wireless transmission. This would have been five years prior to Marconi's work, but the Edison laboratory was shut down as a financial consideration before the work could be initiated.

FROM EDISON TO WESTINGHOUSE TO TESLA

Instead, Fessenden began several years work with Edison and then Westinghouse on power transmission systems. (Those were the years of debate over the merits of AC or DC power supplies.)

Leaving Edison's side for Westinghouse must have been difficult but, once again, things worked out well for him, as Fessenden eventually landed a position as professor at Purdue University. There he had the resources to attack his ever closer dream: sending sounds through the air. Unfortunately, he found little time to teach and left Purdue with a year.

With some assistance from Westinghouse, who sent him on to Pittsburgh, Fessenden soon met Nikola Tesla. The time in Pittsburgh was productive, as he now began patenting his inventions and building the foundation for the coming technological leap.

In time, Fessenden would receive more than 200 patents, participate in hundreds more, and publish even more articles. His inventiveness touched everything from microphotography, early medical x-ray designs, turbo-electric drive for ships, early sonar equipment, and even air cooled engines.

But the activity for which we usually remember Fessenden relates to his work at Cobb Island, MD and Brant Rock, MA.

FROM DOTS AND DASHES TO VOICE

The road to Brant Rock went through Arlington, VA, where, under contract to the Weather Bureau to develop wireless systems for weather information gathering, Fessenden built several stations which could transmit up to 50 miles by 1899.

However, his big achievement occurred on December 23, 1900. From a test site on Cobb Island, Maryland Fessenden used a modified phonograph cylinder to create an "interrupter" capable of transmitting intelligible voice without wires over the distance of a mile.

For the record, the first message was "One, two, three, four. Is it snowing where you are, Mr. Thiessen? If it is, telegraph back and let me know." Thiessen did so and Radiotelephony (wireless transmission of voice) was born.

A DIFFICULT TIME

The results of this transmission led Fessenden to begin development of a better receiver, as well as seek a better method for producing the high frequencies needed for clear audio. It also set the stage for another, more unfortunate part of Fessenden's life – lawsuits to protect his inventions. (In this case, it was against Lee deForest who had appropriated Fessenden's work for his own use.)

At this time, Fessenden had begun work with GE to develop a high frequency generator. By 1902, GE had gotten as far as 10 kHz, not much more than what Fessenden had already done, but more would come soon. At least he now was able to transmit over some 50 miles from several sites in North Carolina.

Meanwhile, another dispute was building, as the Weather Bureau did not want to allow Fessenden to keep his inventions.

REACHING WAY OUT

To protect himself, Fessenden had to move on, and began working with two Pittsburgh millionaires who set up the National Electric Signaling Company (NESCO) to compete with Marconi's operations. One of the sites where the new company desired to operate was Brant Rock, MA. Two stations, with giant towers over 400 feet tall, were built there and the new company enjoyed significant success in its initial operations.

National Electric Signaling Company
Brant Rock, Massachusetts

Signals were heard as far away as Alexandria, Egypt - a distance of about 6,000 miles. Additionally, Fessenden actually beat Marconi at sending Morse Code *both ways* across the Atlantic Ocean.

(Continued on Page 40)

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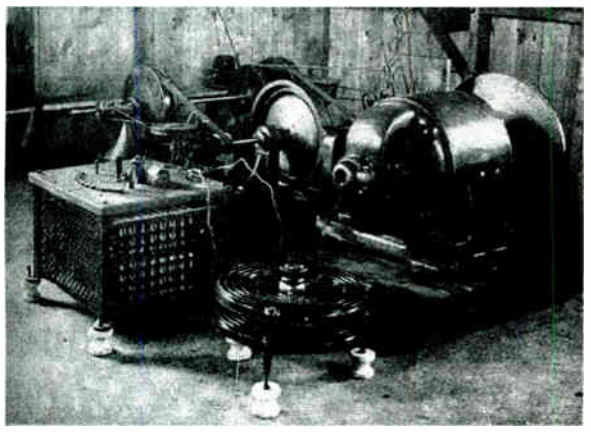
Radio History

by Barry Mishkind

Continued from Page 38

As much a success as the achievement was, it was not voice transmission, which was Fessenden's focus. He wanted to improve on his early experiments in Virginia and Maryland, and expand not only the quality of the transmission but the range.

This led Fessenden to return to GE in 1904 and set a rather impressive goal for Dr. Ernst Alexanderson – he wanted Alexanderson to design a machine which would generate a frequency of 100,000 Hertz. Another requirement: the output of this high frequency generator had to be measured in kilowatts.



Fessenden's Brant Rock, MA transmitter utilizing an Alexanderson Alternator.

It took two years of experimentation and effort but, in 1906, Alexanderson constructed a 100 kHz alternator with an output of 2 kilowatts. Fessenden installed it in his transmitter at Brant Rock, MA and began his experimentation. The new alternator worked exactly as hoped.

THROWING HIS VOICE WAY OUT THERE

At first there was some difficulty in receiving the transmissions in Scotland. But shortly after Fessenden sent his best assistant over to work on the problem, they reported being able to clearly hear conversations in the Brant Rock facility that had been transmitted over the Atlantic.

Then, we presume, in December 1906, an historic broadcast took place. Often credited as a Christmas Eve and New Year's Eve transmission, there is no contemporary evidence to assign those dates to what happened. Proceeding from letters written over three decades later, perhaps coming from somewhat dimmed memories, the story seemed too good to pass up. Journalists and authors repeated it over and over until it was "known" and the story spread.

According to the story, following a series of "CQ" transmissions in Morse code, listeners on December 24th were said to have been surprised to hear Fessenden's voice reading the Bible and poetry. As wireless rooms filled with the curious, a woman was heard to sing. Handel's "Largo" was played on the Ediphone.

It did not take long for the first case of "mike fright" in history to set in, as Mr. Stein, an assistant, choked and was unable to say anything at all. The program concluded with a violin solo of "Oh Holy Night" and a short speech. To show that it was not a fluke, the broadcast was said to have been repeated on New Year's Eve, 1906.

"ENHANCED HISTORY"

As we noted earlier, this was not the first time voice had been heard on the air. Fessenden had accomplished this a number of times over the past six years. Still, many histories list December 24, 1906 as the date of the "The First Broadcast."

According to historians like Donna Halper, the source for the date and its characterization as the "first broadcast" was a biography of her husband's life by Helen Fessenden; it was published in 1940, after his death. Although not a witness to some of the key events, she was a passionate defender of her husband's achievments and, determined to get his story told, related stories she had heard from others in a way that caught the attention of journalists. And so the "enhanced history" grew.

It is of interest to note that just three days earlier (three days, by the way, was the "notice" given of the Christmas Eve broadcast, according to the story), on December 21st, a fully documented demonstration of radiotelephony had been conducted before a number of dignitaries, representatives of manufacturers, and several journalists. The demonstration was repeated the next day, perhaps leading to the recollection of a New Year's Eve broadcast.

No matter the exact date in 1906, the thing we want to remember is that Fessenden's work opened the door that would lead to Herrold's station in San Jose, WHA, WJR, KDKA, and the other early pioneers in broadcasting. Newstalk radio would be a lot less interesting today if we had to decode the dots and dashes to "hear" the talk show hosts!

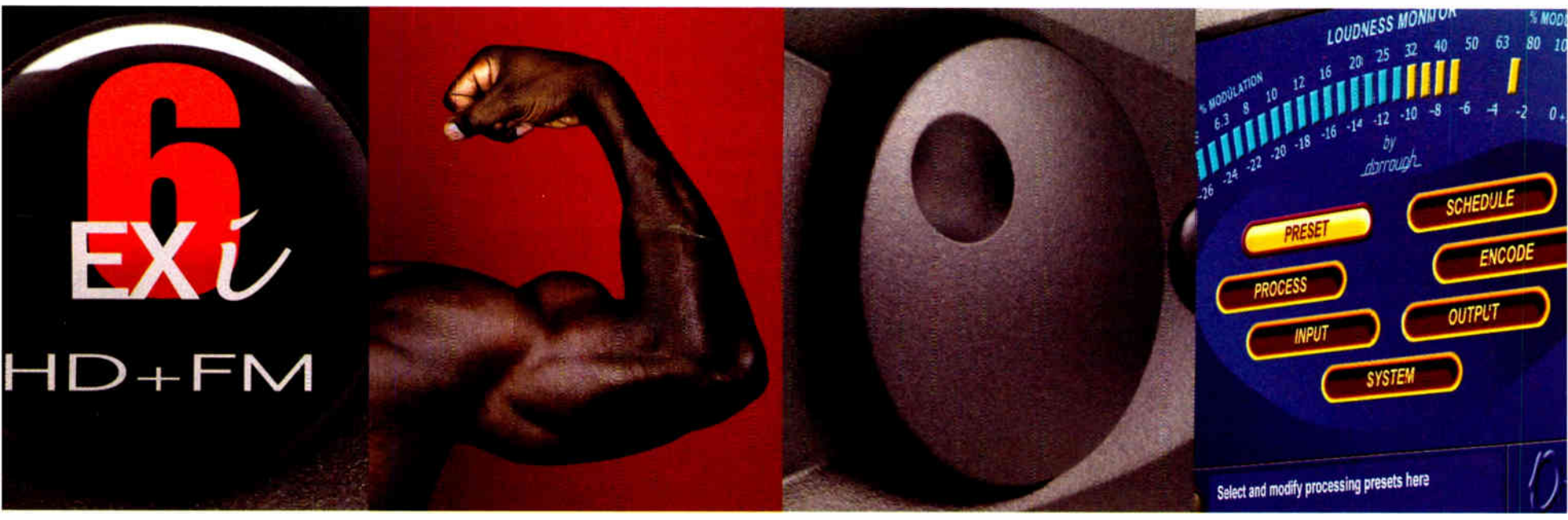
SLOW ROAD TO SUCCESS

Sadly, as with many such inventions, Fessenden found his backers did not understand the true potential of radiotelephony. The telegraphy of Marconi's company was predominant. NESCO saw no need for voice, even less need for music.

The end result was the company decided they did not need Fessenden any longer, seized his patents, and another lawsuit was begun.

Fessenden continued working in different areas, inventing new technologies such as the fathometer and sonar detection, while working for the Submarine Signal Company in Boston. The fathometer and a settlement of his wireless lawsuits in the 1920s, prompted by the fast growth of the broadcast industry, finally provided him with sufficient money to retire. Fessenden returned to Bermuda where he died at home in 1932.

Reginald Fessenden did indeed live to see his dream come true, something not very men have been able to accomplish. From out of his efforts, we have an industry that leapt from those dots and dashes to the wide variety of music and information that makes radio an essential part of people's lives today, all over the world. – *Radio Guide* –



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	50 kW	1982	Harris Combiner *(w/auto exciter-transmitter switcher)*

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Whenever Mr. Anthony Calls ...

The Story of KFI's Two Chief Engineers

by Newcomb Weisenbeger

Earle C. Anthony was sometimes called E.C., although the old transmitter men were asked to call him Boss.

Mr. Anthony was a hands-on man, closely watching over his radio stations. The owner of KFI – billed as "the country's most powerful station" – and KECA, was very much attached to his stations. It was reported that when NBC repeatedly tried to buy KFI, he responded by saying, "I wouldn't sell my wife. Why would I sell KFI?"

Anthony paid attention to everything: the people, the equipment, and the programming. He was interested in the antennas and signal strength, and called in from time to time to question what he heard – or what he did not hear. He could call at any time, from his home, from a train headed eastward, or from a boat in the Pacific Ocean. He wanted the audience to get the very best programming possible.

HIRING A CHIEF ENGINEER ... OR TWO

When E.C. needed a Chief Engineer for KFI, he hired Curtis W. Mason. He also hired Pete Dilts and Carl Sturdy as transmitter operators.

Several months into the operation E.C. called in to his CE for some technical answer and was told that Mr. Mason was "out to lunch." Let us just say that was not the answer Anthony – a millionaire when a million dollars meant something – wanted to hear.

It was then that he also hired Hedley L. Blatterman as co-CE. As you can imagine, having two Chief Engineers was highly unusual. I found them there in 1947 – and on through the next twenty-five years. They shared an office, a telephone, and a secretary. EC only made this stipulation: "The C.E.s will not lunch together."

WORKING TOGETHER

Untold is how they accommodated to this situation, each other, and the seemingly unstructured assignment.

It so played out that the two stations KFI and KECA could each use one of the two Chief Engineers. When one was at a transmitter, the other would often be at the studio. And between them, the engineering department was covered all the time – except on Sunday.

Of course, if you really stop and think about it, the real Chief Engineer of KFI was Earle C. Anthony himself.

This example of compulsive action and practicality was pure E.C. Anthony. Most engineers think of things, but E.C. acted on his ideas and had the backing to make them happen. He was correct in enough of his impulsiveness to be successful in a number of disciplines. When the Packard business passed through maturity, his "toy"– Radio KFI – was able to carry the financial load for both!

Newcomb Weisenberger was a KFI staff engineer for 33 years, starting at the transmitter site in 1947. Now retired, Newcomb has shared a number of KFI stories at www.oldradio.com/archives/stations/LA/nb.htm

The Worst I've Ever Seen

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

When Good Tower Sites Go Bad

While most of our readers are undoubtedly dealing with snow by now – or almost any other problem besides mowing the lawn – we just felt we had to share this one with you during the winter months. (Perhaps we miss those summer views and days without jackets.)

In any event, this picture emphasizes the need to properly maintain the *entire facility*. Of course, keeping the transmitter is a first priority, but it is important to keep an eye on the entire transmission system, including the part that is outside the building and out in the tower field.

For example, with ground systems being torn out by criminals seeking copper to sell for scrap, regular checks on the site's security and the condition of the ground system is not just a good idea, it is mandatory. And no one wants to see a tree left growing near a guy anchor get entangled in the guy wires or disrupt the anchor itself. Tall, heavy grass is bad, too, since it obscures things.

One might think that it would be axiomatic that every engineer would immediately grasp why it is necessary to keep the area clean – especially inside the tower fences. However, Sam Garfield shares a picture where it is clear that someone did not get the message.

It is hard to tell who or what to call in first: the lawn mower, the carpenter, the warning signs, the fence painter, the tower painter, the tower crew, or the demolition experts. No matter which way you look at it, this probably is

one site where you would not want to host an inspection. Not without a *lot* of notice.

Sam Garfield says he was practically unable to find the right words to describe the picture. He finally settled for this simple comment about the site: "The worst case of what an AM tower area should not be." – Radio Guide –

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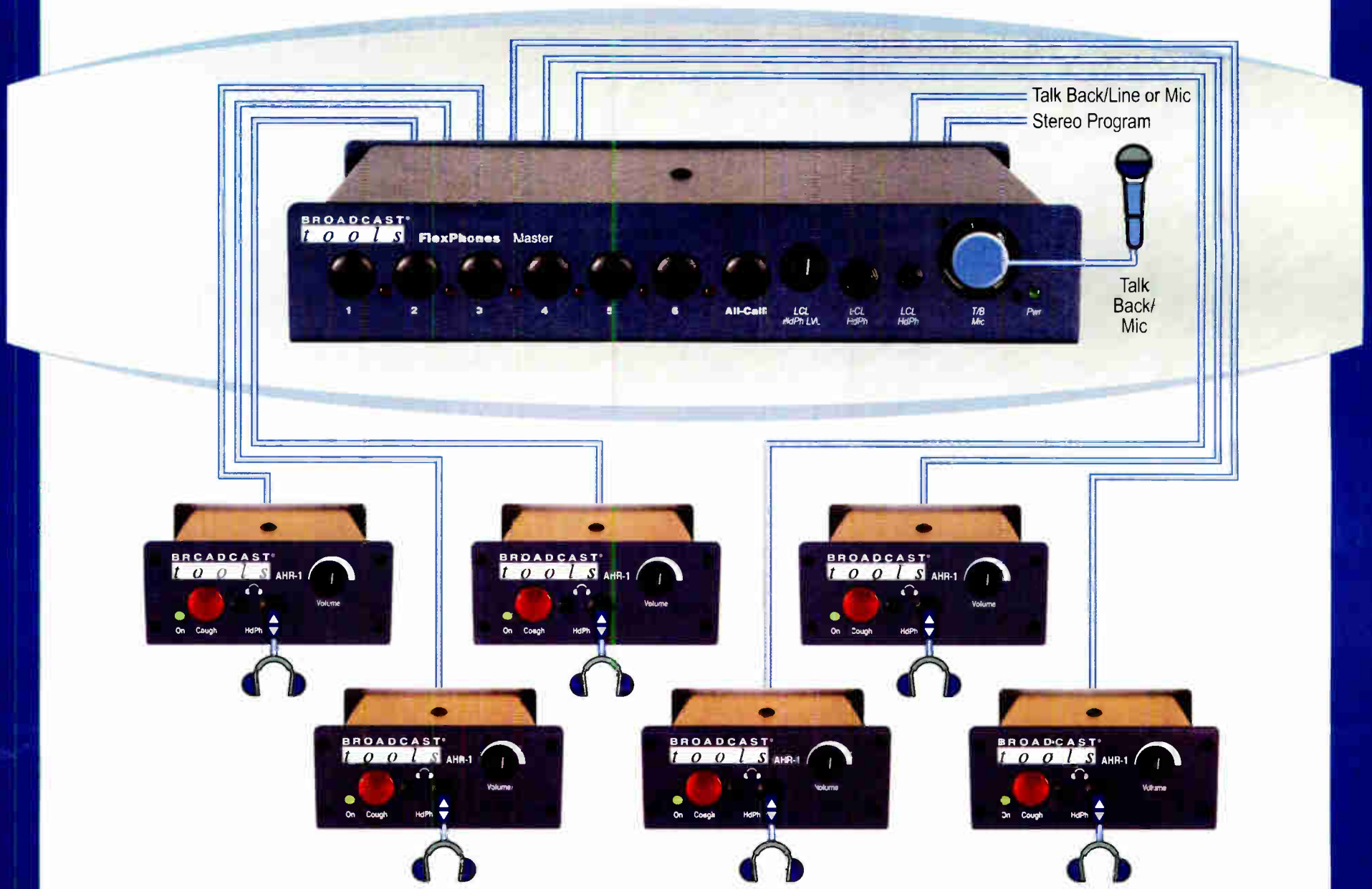

FlexPhones Master

The FlexPhones Master is a professional Broadcast/Studio six channel distributed headphone system with independent talkback capabilities. Each of the six channels provides stereo program monitoring and selective talkback with interconnection via CAT5 cable to multiple Active Headphone Remotes (AHR-1) and/or Monitor Selector Interface (MSI). Multiple masters may be cascaded to form larger systems.

The FlexPhones Master is equipped with inputs for stereo program and talkback audio. Rear panel program and talkback trimmers are provided to pre-set maximum input levels. The microphone/line level talkback input is available via a rear panel plug-in euroblock connector, while the front panel XLR connector facilitates the use of a user-provided gooseneck microphone or headset. The front panel is equipped with a level control for local headphones with both 1/4" and 1/8" stereo headphone jacks. The six front panel talkback switches allow the user to independently communicate with each AHR-1 listener and can be configured to insert talkback audio into only the left or both ears and dim either or both program channels. Any combination of switches may be pressed, while the "All-Call" interrupts all listeners. The Talkback function can be remotely controlled. Six RJ45 jacks are provided to distribute audio and power via CAT5 cable to the AHR-1's, which conform to the Studio Hub format. Low-Z balanced audio distribution is used to preclude audio degradation with long cable runs.

AHR-1 Active Headphone Remote

The Active Headphone Remote (AHR-1) contains a stereo amplifier designed to work with any combination of high-efficiency headphones with impedances between 24 and 600 ohms. The AHR-1 is equipped with 1/8" and 1/4" headphone jacks, level control, user-configured utility momentary pushbutton and LED indicator. Two rear panel RJ45 jacks are provided for connection via CAT5 cable to the FlexPhones Master. The AHR-1 may be desktop mounted, under counter or with the optional HR-1/MP or HR-1/MP-XLR mounting plates, which may be turret or counter-top mounted.

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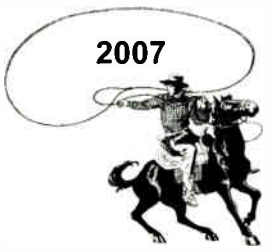

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www.icce.org

Consumer Electronics Show (CES)
January 8-11, 2007
Las Vegas, Nevada
www.cesweb.org

2007 Annual AM Transmission Seminar (by Radio Guide Magazine)
February 14-16, 2007
Orlando, Florida
www.radio-guide.com/amseminar.htm

National Assoc. of Tower Erectors (NATE)
February 12-15, 2007
Nashville, Tennessee
www.natehome.com

National Religious Broadcasters NRB2007
February 16-20, 2007
Orlando, Florida
www.nrb.org

Country Radio Broadcasters Convention
February 28-March 2, 2007
Nashville, Tennessee
www.crb.org

Great Lakes Broadcasting Conference & Expo
March 13-14, 2007
Lansing, Michigan
www.michmab.com

2007 IEEE Symposium on Broadband Multimedia Systems and Broadcasting
March 28-29, 2007
Orlando, Florida
www.ieee.org/organizations/society/bt

National Federation of Community Broadcasters
April 11-14, 2007
New Orleans, Louisiana
www.nfcb.org

NAB 2007
April 14-19, 2007
Las Vegas, Nevada
www.nabshow.com

OAB Annual Convention and Engineering Conf.
March 16-17, 2007
Tulsa, Oklahoma
www.oabok.org

SBE22 Broadcast & Technology Expo
October 16-17, 2007
Verona, New York
www.www.sbe22expo.org

National Association of Farm Broadcasters
November 14-16, 2007
Kansas City, Missouri
www.nafb.com

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Exam Dates	Location	App.Deadline
Feb 9-16, 2007	Local Chapters	Dec 29, 2006
April 17, 2007	NAB Las Vegas	March 2, 2007
June 1-11, 2007	Local Chapters	April 20, 2007
Aug 10-20, 2007	Local Chapters	Jun 8, 2007
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This international event networks thousands of Christian communicators, from program producers to authors, pastors to engineers, directors to vendors. NRB's professionals emphasize strategy and innovation to tap the power of new media ministry models.

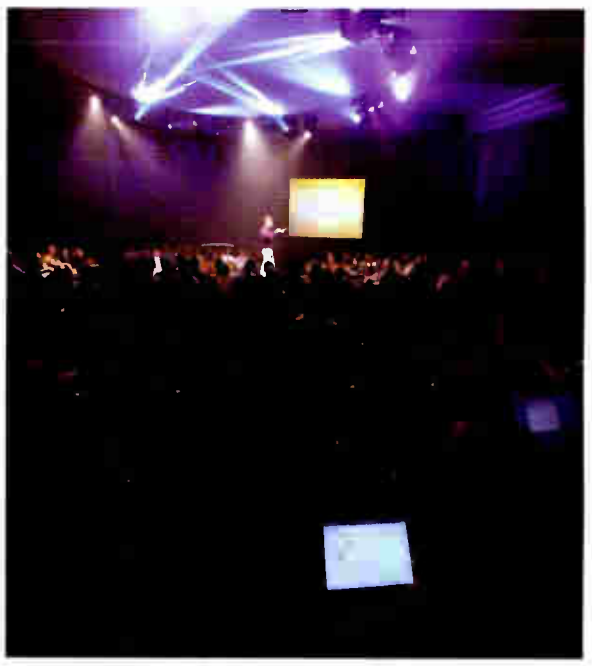
Beyond highly qualified speakers in keynote sessions, hands-on demos in the Tech Lab, and the world's largest Christian media exposition, NRB 2007 provides professional training in four key areas:

NRB BROADCAST Essentials – core principles for operating a broadcast ministry

Reach ENGAGING OUR CULTURE THROUGH MEDIA – an innovative media channel seeking effective ways to engage our culture

NRB Leadership & Management COURSE – equipping leaders with tactical approaches to optimize results

NRB TRAINING ACADEMY – in-depth sessions hosted by educational institutions, specialists, and vendors



If you're looking for a smarter way of doing media ministry, you'll find it at NRB! See you in Orlando!

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