Radio Guide

Radio Technology for Engineers and Managers

November 2005

Inside Radio Guide

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Radio Guide

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Radio Waves

by Barry Mishkind – Editor

Preparing for the Season

I admit that I am one of the very fortunate. Most of my working career has been in places immune to many of the things that drive engineers crazy.

Snow? Pretty much against the law around here. Time zone changes? Not since the late 1960s. Seasons? Sure, warm and – ahem – warmer. (!)

Of course, if I really want to see white stuff, it is up there on the nearby mountains each winter. About our worst problem is the monsoon season each summer with its potential for power problems and lightning damage.

However, for those of you who enjoy all four seasons, it is nearly time for the annual appearance of snow, ice, and the other crummy stuff – nice to look at, but a terrible environment in which to work.

Before the weather in your area turns nasty, we invite you to use Dave Dunsmoor's article on Page 4. His tips on preparing satellite and STL dishes for winter form a good beginning checklist. Since each station and location has its own requirements, putting together your own custom list of winter preparations will prevent all sorts of hassles as the seasons change.

Other chores should be part of every station's regular maintenance list. For example, generators cannot save the day during a power outage if they do not start. Scott Cason concludes his series on generators with some maintenance tips on Page 12. And Alan Alsobrook focuses on a different power issue: those little batteries inside transmitters, consoles, EAS units, etc. His tech tip is found on Page 36.

And please remember to use safe engineering practices while doing your maintenance. We recommend Phil Alexander's shock-free tips on Page 8.

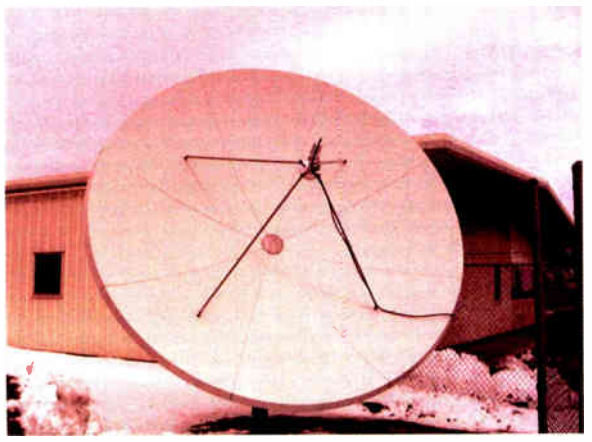
We hope you have a safe, problem free winter. RG

Getting Dishes and Antennas Ready for Winter

by Dave Dunsmoor

It is that time again – time to give attention to the winterizing of satellite and STL antennas. The days are still warm, it is not hot and humid (the dry season is a good time to check and re-seal coaxial connections) and it is a pleasant time to be outside.

Generally late September through early to mid-October is a good time to finish up our winterizing plans. Well, last night around midnight winter returned with a vengeance up here in North Dakota. A foot to 15 inches of wet snow, wind 30 to 50 m.p.h., trees, bushes and power lines down all around.



Once the white stuff falls, easy maintenance time is past.

Hmmm. *Last week* would have been a good time to do these checks.

AFTER THE FACT

For many stations, winterizing the outside satellite hardware usually amounts to brooming the snow out of the satellite antennas after the fact. Sometimes that is all that can be done.

The phone conversation usually goes something like this:

[Talent/automation guru]: "We're off the air, the network's down."

[Engineer]: "Have you cleaned the snow out of the dish?"

[Talent]: "I don't have time to do that. I don't know where it is. I don't how to do that. I'm busy, I have a show to run."

[Engineer's response #1]: "The broom is in the closet; you walk outside and carefully brush all the snow off all the satellite antennas, and your network will return. You don't have anything to do as long as the net's down anyway."

Usually leading to:

[Engineer's response #2]: "... OK, I'll be there in a few minutes."

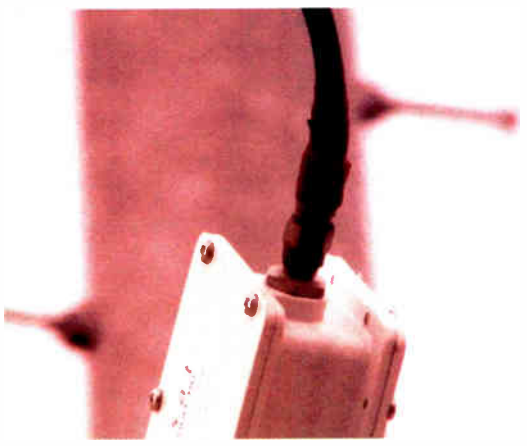
So the snow is cleaned off the various antennas, and the net returns ... or it doesn't. Now the troubleshooting starts. Is *all* the snow (and ice – especially ice) cleared off the dish? Is the coax wet? Is the power good to the LNB? And so on.

A BETTER PLAN

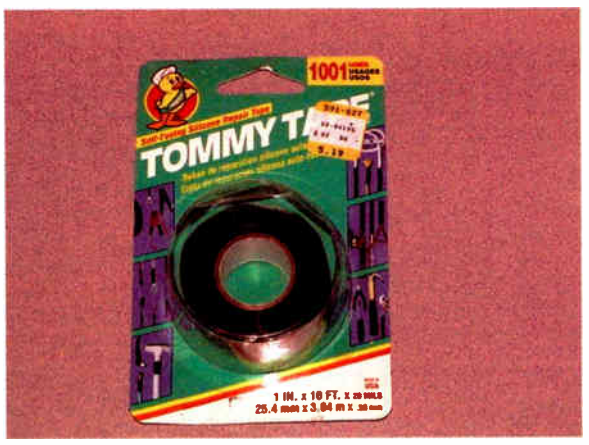
Why not control the calendar for ourselves and do the winterizing before it is too late for this year?

There are several items to check, so exactly where you start is not really important – just check everything that is likely to become a problem later (when it is *really* cold, and you are *really* off the air). I usually start by checking the coax and connectors, especially the weatherproofing of the F connector at the LNB.

I have used several methods over the years, but what has worked best for me over the past 25+ years is something called "F-16 tape" by the military guys. It is more commonly known as silicone, or MOX-tape®. I have found it in hardware stores, usually in black.



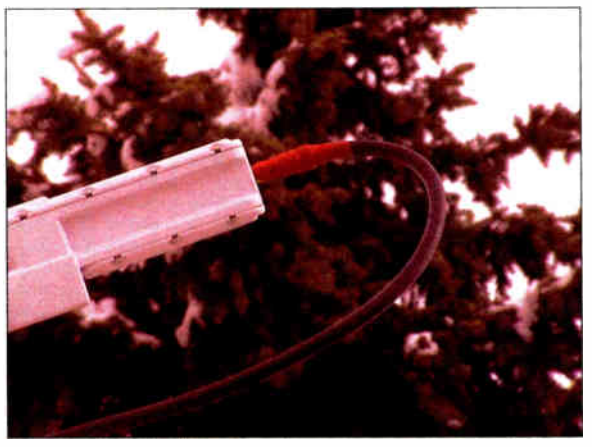
An F-Connector waiting to become a problem.



F-16 Silicone Tape

You may also find it at Radio Shack, orange colored. Either version is an excellent way to weatherproof connections. It fuses only to itself, it stretches and completely conforms to whatever part it is applied.

A few layers properly applied and water will not migrate into your connector. Although it completely fuses to itself, when it is time to remove it just run a knife down the glob of tape and it peels off like an orange rind. It is fast and effective. I love it.



An F-Connector that will make it through the bad weather.

CHECKING THE COAX

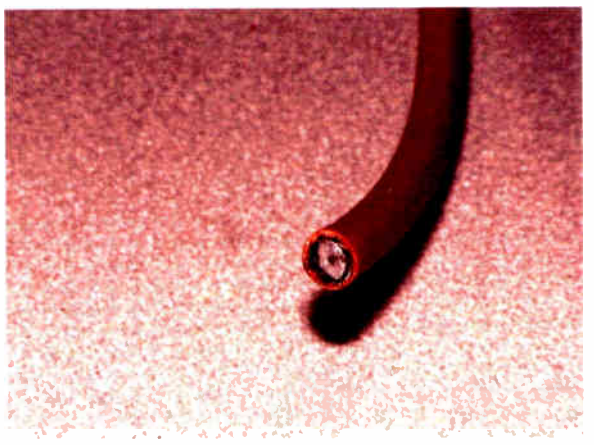
Next thing to look over might be the routing and physical condition of the coax.

Half-inch foamflex with RG-213 or RG-214 pigtails on each end used to be the common standard – and is fairly robust – but with the move to the Starguide-type digital satellite receivers, RG-6/RG-9 is most prevalent. In either case, cable protection is imperative.

Whether it is run underground via PVC or overhead attached to a messenger wire (or, heaven forbid, laying directly on the ground), give it a close inspection. You are looking for cuts, kinks, scrapes, etc. that would allow water to penetrate the outer jacket.

The reason we do not want water inside the coax is that it causes excessive signal losses and, under severe conditions, can cause the DC supply voltage to the LNB from the satellite receiver to drop to the point of complete signal failure. For new installations I prefer the messenger wire method. It keeps the cable out of harm's way, is easy to repair/re-locate if necessary, is quick to install, and allows the cable to dry after rain/snow.

The next best choice would be to run the cable to the building underground through PVC conduit. This does allow for good physical protection, but has the disadvantage of eventual moisture buildup, which we are trying to avoid. However, this will not affect good quality cable.



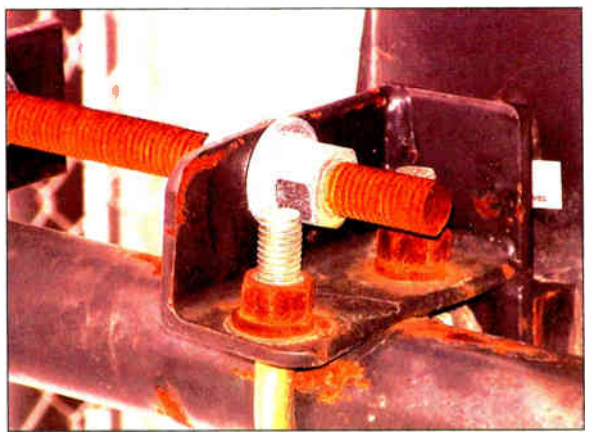
Here we have an example of coax that has a sticky waterproof gel impregnated into the shield (look for "floodant" in the cable specs for this cable). Water will not displace this stuff; the electrical properties of this cable will remain stable even if the sheath is cut and it is placed underwater.

This type of coax is stable as long as the physical characteristics are not damaged. A minor drawback is the gel is *very sticky*, and hard to remove form your hands and tools. Fortunately, there is a special "cable floodant and gel remover." I recommend it highly.

CHECKING THE MOUNTS

It is also a good idea to check the mounting and alignment hardware at this time.

Seldom do we move antennas from one bird to another, but if and when it is necessary, that seldom part usually brings one of Murphy's Laws into play. Hardware that is reluctant to move when needed really makes a simple (in theory) task into a real chore.



Adjustments on this assembly are not likely to be quick!

What I like to use when initially assembling the hardware (or moving it later) is a product called Jet-Lube SS-30. It is about $5 or $6 for a 1/4 pound can, and it will last a long time. It is superb for use on stainless bolts that tend to seize up (and then require a hack-saw for removal), and I use it on all sorts of hardware.

I have purchased this product from Polyphaser Corp; they sell it for use in their grounding kits.

(Continued on Page 6)

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Getting Dishes and Antennas Ready for Winter

Continued from Page 4

It is a copper-filled high-temperature grease. It is an excellent anti-seize compound and works well as a sealant for ground connections. I have used it on coax grounding kits, on copper strap, on ferrous and non-ferrous hardware.

CLEAN DISH SURFACES

Having determined that the coax, connectors, alignment, and so on, are all OK, some attention to the antenna surface is in order. Rough, oxidized fiberglass holds moisture very well. Ice sticks to it, snow builds up on it, and it becomes a real mess.

A new coat of gloss paint every so often will help a lot in allowing the ice and snow to slough off on its own and it makes it easier to broom off when that becomes necessary. I have used two-part epoxy paint, but it seems to oxidize fairly quickly – usually in just two to three years.

This year, I tried Sherwin Williams exterior paint and will have to wait a while to see how it weathers. According to the local Sherwin-Williams store manager, it retains its sheen longer than the epoxy type paints.

After a new coat of paint, a coating of Armor All is a good finish. It should be reapplied annually, but does work fairly well and it is very inexpensive.

I have also used Teflon spray (a mold release agent) with "OK, but not great, results." It usually takes several cans and, in the end, I just did not feel the cost and time was worth the effort.

HYDROPHOBIC COATING

The one product that sheds water and ice like no other I have used is Vellox (www.vellox.com). This is a hydrophobic coating that prevents water from touching the base surface; therefore there is no adhesion. This also hinders the formation of ice.

Vellox is available in spray cans, quarts, gallons, etc., and is expensive as I seem to remember. It should be reapplied every year or so according to the manufacturer, as it is somewhat fragile (its appearance and texture remind me of glass beading material). However, it does work as advertised.

I have not had the opportunity to use embedded heaters of any type so I cannot comment on this with great authority, but I would expect that a run of heat tape (the type used for wrapping water pipes or roof and gutter deicing) fastened to the bottom of the dish would help prevent icing somewhat and might even melt snow fast enough to prevent a significant buildup. Of course, any experimentation here would require GFI circuit breakers or outlets.

I would be tempted (on a spare antenna perhaps, preferably one with extra surface area, or gain) to install heat tape on the top surface and then overlay it with aluminum tape with the expectation that the irregularities would not significantly disrupt the signal. If you care to try this, I would be interested in hearing about your results.

SNOW BUILD-UP ALERTING

One idea that has been suggested is monitoring signal strength as a possible method of determining when the antennas are filling up with snow.

True, in the good old days this could be accomplished by placing a Simpson 260 on the AGC line. However, with today's current digital satellite services, this is not quite as easy.

Usually, the satellite receivers are located at the studio. If they are out in the parking lot – OK, it is relatively easy to get to them and deal with snow and icing conditions as necessary. But if they are up on the roof, then it is often much more difficult to get to them and that usually does not happen until it is time to go up and "fix it."

It is possible to set up a PC with your favorite communications program for monitoring the various parameters. You can either manually connect the serial cable to each receiver or use a switchbox to select one of many if that is your situation.

I would like to submit that inserting a small satellite signal meter in the line up/out to the antenna might make quick work of casual monitoring, would be easy for any of the staff to read, and could be read at a glance. The fact that the IF from the LNB is amplified and then detected for display on a DC meter lends itself to any number of creative alarm and/or monitoring options.

Such meter readings could be remoted to the control room, to the engineering room, or to the secretary's desk if need be. It certainly is not a replacement for the specific parameters detailed by PC access of the receivers, but it would suffice for a go/no-go determination.

ADAPT AND SOLVE

This article was not intended to be an exhaustive list of step-by-step "how to" instructions but rather more a thought-provoking session – something to give you ideas that might work at your facility.

Some of the ideas presented here I have done, some I have considered – as I think they are quite plausible – and others are just me wondering: "What if..." The differences should be apparent, I think.

It has been my experience that some empirical instruction mixed with some good imagination results in some effective problem solving. I hope what I have tried to present here will help you.

Dave Dunsmoor always prefers to work on dishes and antennas before he can see his breath. Got some tips on getting through the winter? You can email Dave at mrfixit@min.midco.net

Words of Experience

Keeping a Special Profession Strong

by Richard Burden

I was honored just recently in a surprise recognition for "55 years of contributions to the art of broadcasting." As a further surprise, my daughter Nanuet had flown in for this occasion to join me on the dais.

It was an experience of a lifetime. As I looked out at those in attendance, I saw the many special friends I have in this industry. It was a humbling experience and one which brought me to tears. Broadcast engineering is not all about wires, capacitors, formulas and Ohm's Law – it is the people and a purpose.

A SPECIAL BREED

When was the last time you heard about a broadcast engineer who did not offer to help a fellow engineer when he had a problem? We share in this ever-changing medium and are extremely generous in the exchange of our ideas and expertise.

Some may ask: what does it take to make this profession into a rewarding career? The answer is easy – it is really a trap. Admit it: you either love radio or you leave it. It is a neat fraternity.

I see many of my fellow engineers just once a year at the NAB shows, but they are still part of my life. I can pick up the phone to call any one of them and ask for an opinion or their expertise at any time. Somehow, no matter how busy they may be (and we all are busy) there is always time for conversation.

A SPECIAL PROFESSION

Looking back, I was blessed with being part of the Golden Days of Radio. Radio was part of everyone's world then and it was fascinating. Many early engineers were also amateur radio operators who put their love of radio into a successful broadcast career.

It was those engineers who made radio happen and the entrepreneurs who made it viable. It was very much a team effort.

CHANGES – AND NOT GOOD ONES

However, as we look at those within our engineering ranks, do you notice that we are all getting older? How do we interest young people to join our profession and fill our shoes? What words of advice would you give someone who showed interest? I know what some would say – and that bothers me.

The Chief Engineer of yesteryear was responsible for the total physical plant. He was a member of the management team and he had a staff to insure the assets of the facility were in proper order. His word was law – messing with this guy was the equivalent of giving the finger to a witch doctor.

I personally prefer the title of Director of Engineering – one responsible for the success of the technical operation. The mandate is to provide proper direction for all engineering matters and responsibility for the physical assets of the facility. It is much better than the present meaning: "Chief Fix-It"

Somehow the respect for this position has changed.

THE ADS TELL THE STORY

Have you ever looked at engineering want ads? Likely, you will see something like the following:

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This is a manager looking for the mechanic who can keep the company vehicle operational at an inexpensive rate. Smart management looks for a mechanic who understands the vehicle and takes loving care of it with regular scheduled maintenance. Really smart management does it on a trade out!

What kind of engineering community do we desire? Are we looking for Mr. Fix-It or one responsible for a successful facility?

Management that does not encourage their engineering staff to stay current on engineering matters is short-sighted. Similarly, an engineer who makes little effort to keep current on technology, offer his views or expertise to others, or stay in touch with the engineering community is equally short-sighted.

REACHING OUT

As SBE chapter program chair, I work hard to find good programs that bring engineers up-to-date on various subjects. Despite a flexible schedule, many times the turnout is poor in relationship to chapter membership

How do we attract new blood into our fraternity? And how do we train them? We must give considerable thought to this matter.

It is our responsibility as broadcast engineers to pass our skills on to others. It is our employer's responsibility to provide an attractive working environment.

CRUCIAL POINT COMING

Consider this scenario: suppose new FCC Rules did not allow engineers to retire until we provide a suitable replacement. Can you picture us reporting to work with our walkers or getting lost on our way to the transmitter site?

Humorous as this scenario sounds, the potential situation may not be as funny.

Baseball has a "Farm System." We used to have an equivalent in the engineering side of broadcasting. This has been lost to a change in business practices. Somehow, some way, there needs to be an alternative. Again, where do we find new blood? How do we create an interest? How do we train them? We need engineers as mentors.

If you could not retire until you had a trained replacement, how would you react? This is a job for all of us. I welcome your comments.

Still active in broadcasting after 55 years, SBE Honoree Dick Burden is based in Canoga Park, CA. Share your comments with him at rwburden@pacbell.net

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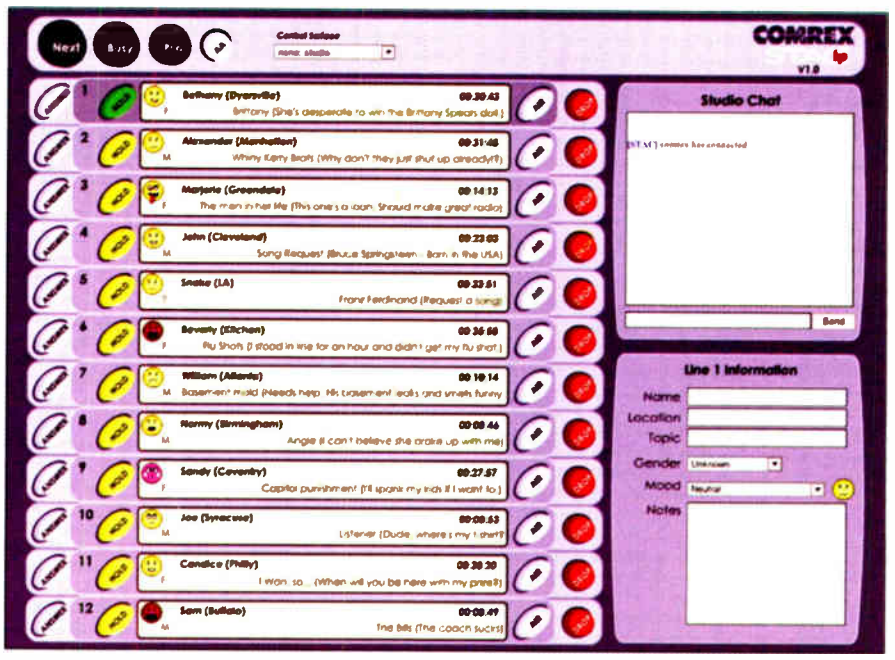

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Safety Guide

by Phil Alexander, CSRE, AMD

Saving Your Own Life – One Day at a Time

Ours is a very unforgiving business. We can keep ourselves safe by carefully managing risks, but one little oversight – one finger in the wrong place at the wrong time – means *instant death*, with no chance for a "do over." This is a true "fatal error" with no reboot possibility.

LETHAL POTENTIAL

In most electronic devices there is enough power to kill you under the right circumstances.

Remember it is the current flow through your body that kills you, not the voltage. All the voltage does is break down skin resistance and cause current flow. In theory, if you have open cuts on both hands and contact them with a flashlight battery, *it can kill you.*

If you touch an incompletely discharged 200 volt supply in a solid state transmitter while touching ground, unless your skin resistance is high, the odds of death are not something I would ever put to a test of "faith" – or any other kind of test. If the transmitter is a tube type with 2.5, 5 or 15 kilovolts, there are no odds; become a part of that circuit and you will not live to tell about it.

Suppose you visited your doctor and were told, "If we do nothing you will die in less than three months," your next words probably would be: "What can we do?" If the doctor suggested a new drug that is 100% effective in controlling your problem with no side effects, you probably would beat a path to the nearest pharmacy and buy it almost before the words left the doctor's mouth.

Why not give the same thought to saving your own life on the job on a daily basis? Is that equally worthwhile? The cost is far less than the cost of a prescription medication for a medical condition. What can you do? That is the question. Here are a few ideas for saving your own life:

STAYING ALIVE

First, be alert when working around electrical voltage, not "tired to the bone."

Never work alone, or if you must do it "just this once," take the extra time to double check and triple check everything. It really does take less time to get that transmitter back on the air if you are there to do it, rather than being fried inside it.

• Turn off the power.

Before you open a transmitter, any power supply or power RF device, turn off all power disconnects to it, and make very sure you find *all* of them. This sounds too simple. Sometimes it is.

I have seen some transmitters with as many as three AC feeds. For example, consider an old transmitter, originally built with crystal heaters, but now running with a newer exciter, and a main high voltage primary supply. Suppose the high voltage supply is fed from a three phase breaker, the exciter from a single phase 240 VAC breaker and the old crystal heater terminals are connected to a 120 VAC utility circuit. Until you open all three circuits, you are not safe from primary voltage.

• Use an AC "sniffer.

A "sniffer" is one of the greatest tools you can have in your box. I use and heartily recommend the ***Radio Guide*** sniffer (see Page 18). But, remember all "sniffers" have a couple of inherent problems. First, they are sometimes not where they should be. For example, in a shirt pocket at home rather than in the one you are wearing. Second, they are very poor DC detectors.

• Discharge the Circuits!

Disconnecting AC power is not enough. Residual charges in capacitors can be fatal. Yes, we have interlocks, shorting contacts and bleeder resistors, but suppose part of your last maintenance required bypassing the interlocks and blocking the shorting contacts open to observe the operation of part of the transmitter. Further suppose you were in a hurry and forgot to remove the blocks from the shorting contacts. Also, bleeder resistors can and do open. They cannot be trusted with your life.

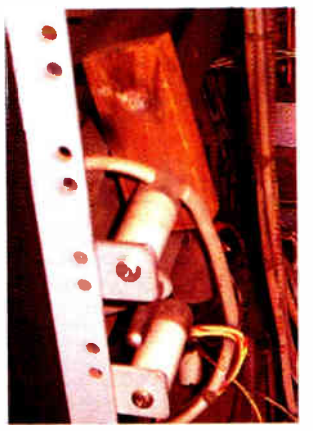

Photo Courtesy: Jay White

Then there are situations "left behind" by a previous engineer. More than one engineer has been "bitten" by a jury-rigged solution that was never corrected. Have you ever seen an interlock "jammed open" by a wooden block?

This is why nearly every transmitter has at least two "J-sticks" or manual grounding sticks with long insulated handles. You know which ones I am talking about because they are always getting in the way as you open a transmitter.

(Continued on Page 10)

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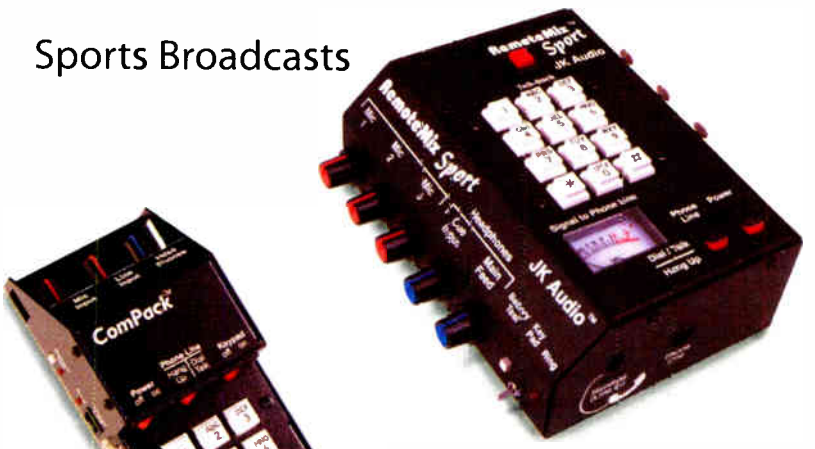

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Safety Guide

by Phil Alexander, CSRE, AMD

Continued From Page 8

• Check to make sure the Grounding Sticks are good.

If they are working – and if you use them – they could save your life. But, that means there must be a chance they will not save you. Unless they are solidly grounded, J-sticks may be worse than nothing at all. They may make you feel safe when, in reality, you are one touch away from death.

How do you know? As a part of normal inspection, J-sticks, bleeder resistors, interlocks should be inspected for integrity on a frequent schedule. When in doubt, use your own *external* J-stick. This is a J-stick with a long, non-conductive handle, a well insulated cable and a large bulldog clamp on the end of the cable that should be in every transmitter engineer's tool box.

When you open a transmitter for the first time, always use an external J-stick that you know is a short in the *milli-ohm range or lower*. At the very least, check it with your ohmmeter on its lowest scale for a reading that is the same as the one you get when you cross the ohmmeter test probes – a reading of less than 0.5 ohms and preferably less than 0.1 ohms.

It is crucial to ensure circuits are discharged.

But do not stop there. Connect your external J-stick to the bare metal of the frame of the transmitter and measure from the end of the stick (the "J" end) with your ohmmeter to another bare metal spot on the frame. Make very sure neither of those bare spots is anywhere near anything that could be "hot" if the transmitter were energized.

This is better done before you open any door or panel, but not always possible. Unless the reading is less than 0.5 ohms, you need to find another spot to clamp your portable J-stick.

• Let the Bleeder Resistors bleed!

Any time you begin working with a transmitter you have not seen before, carefully – and slowly – crack the door of the transmitter about 1/2 inch and go away.

Yes, go away! Have a cup of coffee or just stand there and look at your watch for five minutes. Do whatever works for you to give the built-in safety protection (grounding switches, bleeder resistors etc.) time to do their job.

After that – and *only* after that – use your external J-stick. Hit every obvious high voltage terminal first, and then every bare wire terminal you can see. Always touch a wire with a J-stick first, and always work with one hand in your pocket.

• Carefully check components in the system.

Once you have confirmed the transmitter is dead and discharged, turn your attention to the internal J-stick(s). First check them visually; then check them with a wrench to make sure all connections are tight. Then check them again with your ohmmeter. Do this at least once a month as your first maintenance activity.

Never trust anything you have not checked personally using test equipment you have personally verified as accurate.

Always remember that any time you open a transmitter, you have the chance of becoming yet another proof of Kirkoff's Law – with you as part of the circuit. In its simplest form, Kirkoff says that given the chance, current will flow (equally, around all parts of a circuit, etc.) and you do not want to be the conductor that closes that circuit.

BE SKEPTICAL, BE SAFE

Remember that while sniffers are great for checking to see that all AC has been disconnected from a piece of equipment and are far less destructive than a J-stick when used for finding a previously unknown connection, they are not foolproof. Thus, your life may be longer if you let the J-stick complete every potential circuit to ground before you touch it – even if the sniffer cannot "smell" a field.

There is one special precaution for AM where a sniffer can save creating a problem. RF contactors usually are hot wired to the 120 VAC supply and work by momentarily grounding a lead from one of the solenoids. If the contactor actuating lead runs into a transmitter, grounding that lead may switch the contactor to the dead transmitter. In other words, if the contactor control circuitry is as rudimentary as some I have seen, it could switch to the transmitter you are working on and take the station off the air.

While I would never wire a contactor with a momentary ground from the PA "On" circuit, I have seen them installed that way. If that is the case, even though you have disconnected all primary AC to the transmitter, by touching the grounding line of the contactor *you* will be completing the grounding circuit of the solenoid.

It will not feel good and if the resistance through your body is unusually low, the tingle you feel may be your last feeling on this earth.

The sniffer will find that line the easy way, without taking the station off the air. As you know, there are some stations where staying on the air does matter, especially if it happens during a spot – or worse – during a book.

Each of the steps I have mentioned takes time. The goal is not to be quick. In fact, if taking precautions does not allow you enough time to get your work done, consider that you may be in the wrong line of work.

Safe working practices have allowed Phil Alexander a long career in manufacturing, customer tech support, and contract engineering. His email is dynotherm@earthlink.net

Multicasting.

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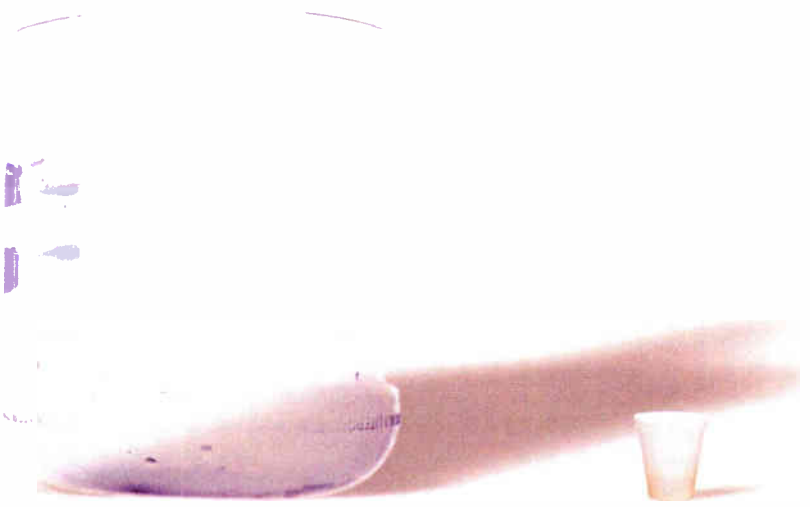
well, you know.



Management has decided to multicast. Which seems like a terrific idea — until you consider just how little bandwidth each channel will get. How will the sound of your station(s) survive these shrinking bitrates? Omnia can help.

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Maintenance Guide

by Scott Cason

Keeping the Power On

Part 3: Generator Maintenance

In his first two installments, Scott Cason looked at factors that influence what kind and size of generator you will purchase. This time out, he focuses on what happens once the generator is on site and operating.

The installers and electricians are gone, and the excitement of installing and testing the generator are over. Now it is just you, your genny, and the dull roar of the transmitter fans in the background. What do you do now?

THE NEW GENERATOR

A generator is an engine, similar to the engine in your vehicle, except in this case the engine is attached to an alternator instead of a transmission. Just as you would not allow your car to sit in the yard for six months without running it, neither should you allow a generator to sit that long without checking it.

But first, we should step back a little bit and consider how to choose the right vendor for your generator purchase.

Necessary to the operation of any power generation system is a well-planned preventive maintenance program. In fact, most warranties require periodic maintenance by qualified technicians or the warranty will be voided.

Since no one is better qualified to do this than the vendor from whom you purchased the generator, I recommend you choose a vendor with a good service department and sign a service contract with them for yearly maintenance. Their field techs will be factory certified to work on your brand of generator.

Using a load bank to fully test a generator.

Here's a tip: even if you are experienced with generators, take a few minutes and let the shop foreman walk you through all the key points on the genny, to familiarize yourself with any special features on the unit.

MAINTENANCE PROGRAM

Between those yearly visits, it will be up to you to insure your generator is in top condition and ready to go at a moment's notice. The same way as you do with maintaining your car.

Start with the guidelines in the owner's manual for the generator and perform the tasks they recommend. It is best to set up a monthly maintenance schedule. That way, even if something occasionally comes up to prevent your schedule for a month (or even two), you are still in good shape.

Ideally, you will want to do your maintenance service on a nice, sunshiny day with no threat of severe weather that might cause you to need the generator. However, squirrels do happen and main power lines can go out for no reason.

START SAFELY – RESET TO NORMAL

Therefore, a very important first step – *before* you start to work around or on a generator – is to be sure you set the generator control from the "auto" to the "off" position and disconnect the positive terminal from the battery.

This safety practice can save you a lot of problems – you certainly do not want to find yourself in a precarious position over the fan and suddenly hear the generator start up!

Then – before you leave – make sure the battery is hooked up and the generator is in "auto" mode. While not strictly a safety issue, it sure would be embarrassing and frustrating to go off the air due to a power failure because you forgot to put the generator back in "auto" the last time you left the transmitter site.

CHECKLIST

It is a good idea to develop a custom maintenance checklist for your particular generator and facility and try to cover as many of the points each time as possible.

Start by opening the cap on the radiator and make sure you can see water and/or antifreeze. Most generators will shut down during an overheating situation. But cracking an engine block in the wintertime because the water froze is inexcusable. It also means ordering a brand new generator in most cases.

Your local auto parts store sells inexpensive testers with which you can check the potency of your antifreeze; be sure you check this before the cold season sets in. Remember: engine block heaters can fail.

Next, check the oil. There is a dipstick on the engine (similar to the one on your car) that will allow you to make this check. Check for the same things you look for on your car. Make sure the oil is at the proper level and there are no water or foreign particles contaminating the oil. I would recommend keeping a couple of quarts of oil on hand to keep the proper oil level in the generator.

BATTERY CONDITION

Check the battery. If it is a sealed type, there will not be much to check, but most sealed batteries do have some kind of indicator to check for proper fluid levels, perhaps a green dot in a window or some such thing.

If the battery it is not a sealed type, open it up and check the water. Make sure the level is over the lead plates. It is a good idea to keep some distilled water on hand for this since impurities found in well and city water cause the lead plates to deteriorate faster. Auto parts stores also carry testers. I would recommend having one on hand and test the battery once a month.

Note the date of purchase on the battery; when the battery reaches three years it becomes a weak link – replace it. You can use it in a station vehicle or as a standby somewhere, but most lead-acid batteries show a sharp decline in cranking power after three years.

To repeat: even if it still starts the generator, replace the battery after three years. When the power goes out, you need the generator to be ready to do its thing on a moment's notice.

BATTERY SAFETY

Always treat batteries with respect. They can – and do – explode with no warning. The best way to ruin your day is to be bending over a battery about the time it explodes.

It is smart to keep an inexpensive pair of safety glasses and rubber or neoprene gloves nearby to use when you are inspecting and handling the battery. They will keep you from inadvertently splashing acid in your eyes and to keep acid off of your hands. A good idea is to touch the battery carefully to make sure it is not hot.

Do not forget that trickel chargers can fail, too: when you set one aside, do not allow it to sit in the sun for extended periods.

THE TRANSFER SWITCH

The transfer switch is the next system component to check. There is not much routine maintenance to do for transfer switches, but check the documentation that came with your switch to make sure. If it has incandescent indicating bulbs, replace any of them that have blown. Also, check for critters who may think they have found a new home in your switch.

Once you have made sure the engine (and transfer switch) look good, start it. Starting it after you check it out will also insure you have hooked the battery back up and the generator ready to put back to "auto" when you leave.

EXERCISING THE GENERATOR

Ideally you want to run the generator under load when you test it.

Running it under load will allow problems to present themselves that normally would not show running the generator off-load. Running it under load will also allow you to observe the generator under its normal operating environment, allowing you to check for proper operating temperature, oil pressure, voltage, current and frequency.

Manually operate the transfer switch and bring your auxiliary transmitter on line. Turn the air condition down to simulate as much load as you can. (During the yearly maintenance visit, your service tech should hook up a load bank – not unlike your transmitter dummy load – and operate the engine at full capacity.)

FULL SYSTEM TEST

Every three months or so – and before your local severe weather season – I recommend scheduling an intentional power disconnection, pulling the main switch to the building if you can. This will simulate a power failure and will allow you to watch the entire process from start to finish.

Make sure the generator starts and the transfer switch operates within prescribed time limits. Generally, it is three seconds for engine start and five seconds after that for load transfer. Transfer back to mains is usually 10-15 minutes to allow the utility to stabilize after restoration and another 10-15 minutes for the engine to cool down, unloaded, before it shuts down.

Newer transfer switches have exerciser clocks that will start and run the generator on a predetermined basis. I have mixed feelings on these personally. What good is an automatic exerciser if nobody verifies the unit ran properly?

Most newer generators provide dry contact closures for remote status indications. This can be interfaced with your remote control so it alarms when the generator is running and calls out to report it. If you have generator voltage telemetry set up, you can verify the generator is indeed running with the right voltage.

Similar contact closures on the transfer switch can tell you when the switch is in the emergency position and the generator is powering your site. Once a week you get a call to your cell phone indicating the generator is exercising.

PROPER VENTILATION

While it is running, check for proper ventilation. Do the automatic louvers open and close as they should? Are there any obstructions to airflow? A running generator is going to be sucking a lot of air through its radiator; you do not want any obstructions inside or out to prevent that.

A majority of generators pull air across the engine and force it out the front of the generator. You will want to make sure during installation that prevailing winds do not blow the opposite way – back in toward the genset – thus preventing the proper cooling effect.

If the generator is located inside the building with the transmitter, make sure it will pull enough air through the building when it starts. It is easy to forget in wintertime and close outside air intakes. Motorized louvers can be installed to open when the generator starts up.

Even better is locating the generator in a separate room. The building will not instantly become hot when the generator starts up and it will be much easier on your hearing.

Overall, take good care of your generator and it will be there for you when you need it with reliable, clean power. Station staff and management will be happier, and your stress level will be much lower.

Scott Cason has over 25 years of experience in radio and TV. He is currently President of LaGrange Communications, a contract engineering firm, in Louisville, KY. Contact Scott at scott@lagrange-com.com

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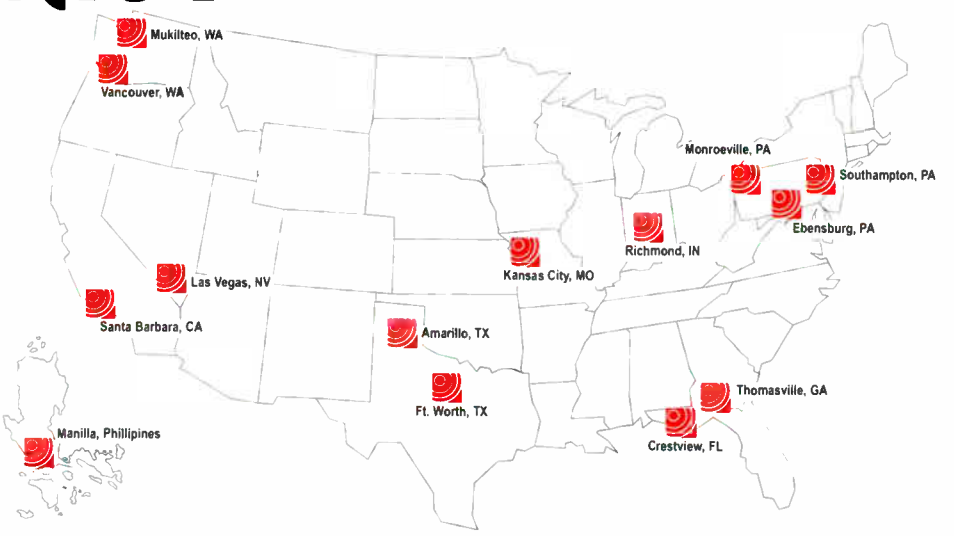

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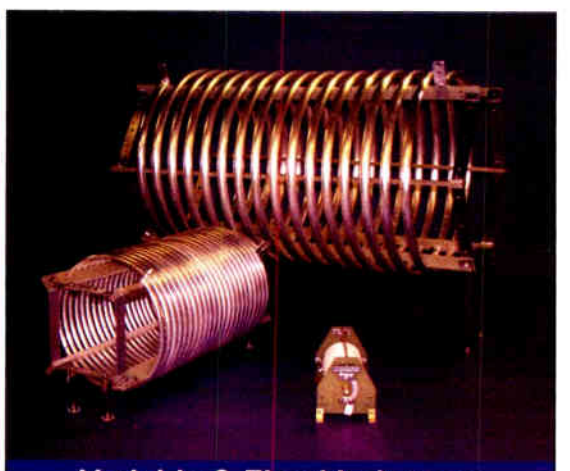
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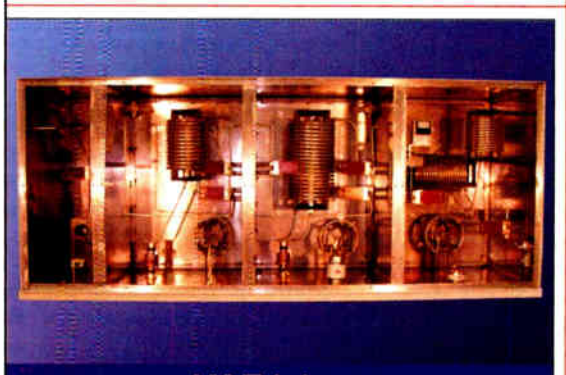
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DA Q&A

by Ron Rackley

Phasors in the Digital Age

Question: We are about to install a digital-ready AM transmitter for HD-Radio. Will it be necessary to buy a new phasor and antenna tuning units to go with it?

Answer: That depends on the performance of your present system. There is no reason to replace a phasing and coupling system simply because of its age.

Unlike transmitters, older phasors can perform just as well as new ones for HD-Radio transmission. In fact, a new phasor – if designed without particular attention paid to proper computer modeling of its bandwidth characteristics – could be worse than the older one that it replaces.

Fortunately, the performance that can be expected from an existing system can be readily determined by measuring certain critical characteristics early in the project planning process.

LOAD BANDWIDTH

Virtually all AM antenna systems – both directional and non-directional – have narrowband antenna input characteristics, as antenna input characteristics go.

Antenna impedance is important over a 30 kHz span for AM HD-Radio transmission – three percent of the carrier frequency at mid-band and almost six percent at the lower edge of the AM band. By comparison, the FM HD-Radio channel is about 400 kHz wide, or four-tenths of one percent of carrier frequency throughout the FM band.

Because antenna input impedance changes with frequency, we must deal with transmitter load impedances that can change significantly when transmitting AM HD-Radio signals. To avoid the pejorative connotation of the word "narrowband," I prefer to say that AM transmitters operate into "limited bandwidth" loads.

Every AM station contemplating HD-Radio transmission should make a transmitter load impedance sweep over a span of at least +/- 15 kHz from the carrier frequency for each mode of operation. This information is important for determining the feasibility of digital transmission by ruling out antenna systems with excessive sideband VSWRs and, for systems with acceptable bandwidth, providing the information necessary for designing the phase-rotation networks necessary for transmitter load optimization.

HANDLING THE HD SIGNAL

So, how do you deal with a limited bandwidth load when you have to pass a HD-Radio signal through an AM transmitter and antenna?

Some AM transmitting antennas may require custom-designed bandwidth correcting circuitry – containing carefully placed high-Q network branches to improve their input impedance bandwidth. Others may be impractical to use for HD-Radio transmission at all. Our experience to date indicates most systems should be able to provide acceptable performance in terms of transmitter loading with proper selection of phase shift between the transmitter output and the antenna.

In some cases, it is possible to simply readjust the phase shift of the existing phasors' common point matching networks (or the ATU networks of non-directional antennas) to provide the load characteristics for optimum final amplifier performance, but in many cases installing a new phase-shifting network at the transmitter output is required.

The results of the recommended impedance-vs-frequency sweep, viewed in terms of the transmitter manufacturer's specified optimum load characteristics, will make that determination.

PATTERN BANDWIDTH

Beyond the ability to operate HD-ready transmitters into the limited bandwidth loads presented by AM transmitting antennas, pattern bandwidth is also a concern where directional antennas are involved.

No matter how well the transmitter is matched to the load, far-field pattern shape changes with frequency will determine where the HD-Radio signal components are delivered to listeners intact or unintentionally re-arranged. Pattern bandwidth determines not only where the HD-Radio signal can be expected to be received within the normal analog coverage area, but also where undesired digital-to-analog interference may result to either the host station or other stations on adjacent channels.

Furthermore, the spacings in electrical degrees between the towers of directional arrays change with frequency (as do the individual tower heights). Self and mutual impedances also change with frequency, causing base operating impedances to change and which, in turn, cause the ratios and phases of tower currents to vary at sideband frequencies from the carrier frequency values read on the antenna monitor.

The resulting pattern bandwidth effects are determined by both the characteristics of a given tower array and its associated phasing system, and require very sophisticated computer modeling for their prediction.

SYSTEM EVALUATION

To evaluate an existing directional antenna system for pattern bandwidth, it is convenient to measure a frequency sweep of the tower current ratios and phases arriving from the sampling devices that normally feed the antenna monitor by using a power-amplified vector network analyzer system.

This also can be done without a vector network analyzer if a transmitter is available that can be driven by an external frequency generator with enough power output to allow the readings to be made conventionally on the antenna monitor. The observed directional parameter changes then can be used to predict the resulting far-field pattern changes at different frequencies +/- 15 kHz around the carrier frequency.

Before even considering replacement of an existing phasing system to make an AM radio station HD-Radio compatible, its input impedance characteristics should be measured and evaluated for both sideband VSWR and final amplifier symmetry using the iBiquity desired characteristics for both.

OTHER CONSIDERATIONS

Additional measurements can be made to allow characterization of the system's pattern bandwidth properties.

The resulting information is analyzed in terms of the iBiquity desired characteristics for transmission, system response and delay in order to have an understanding of digital coverage issues without waiting to experiment once the HD-Radio equipment has been installed.

A decision on replacing an old phasing system solely in the interest of HD-Radio compatibility should not be made without evaluating its expected performance first. Similarly, to ensure a new phasing system will be an improvement, its unique design must be studied for both impedance and pattern bandwidth using advanced computer modeling techniques, including some that are not always used when new phasors are purchased today.

Such studies – for common point impedance sideband VSWR and symmetry, in addition to far-field response and delay around the directional radiation pattern – must be specifically requested. This may cost extra for the custom engineering that is involved – and make it impossible to make the purchasing decision based simply on which manufacturer is the lowest bidder.

However, using the methodical approach will result in saving a lot of time, money and hassles as the station moves toward digital transmission.

Ron Rackley is a well known consulting engineer who has solved problems for many stations over the years. He especially loves designing and talking about directional antennas, and is happy to share his thoughts. Do you have any questions about directional antennas? Please send them in to: editor@radio-guide.com.

Transmission Guide

by Barry McLarnon

IBOC: The Long and Winding Road – Part 2

It was November 1999 when the FCC opened the Rulemaking entitled "Digital Audio Broadcast (DAB) Systems and Their Impact on the Terrestrial Radio Broadcast Service." The FCC and the NAB were united in the desire to bring about digital radio, but not to the detriment of the analog service.

Twenty five years later, 99-325 now is virtually finished. Many adjustments – some technical, some political – have been made to the goals, proposed standards and the players. As we pick up with Barry McLarnon's account how the whole process evolved, another change is about to take place.

It is important to note that the Federal Communications Commission made it clear at the inception of the Rulemaking (99-325) that although they encouraged IBOC developments to continue to move forward, they were aware of the risks to existing aural services.

KEEPING BROADCASTING STRONG

The FCC felt, *"We must ensure that the introduction of DAB does not weaken the vitality of our free, over-the-air radio broadcast service, which provides service to virtually all Americans through a strong, independent system of privately owned and operated stations."*

Indeed, the Commission sought, *"a rapid and non-disruptive transition to DAB for broadcasters and listeners. A viable system must minimize interference to analog AM and FM stations during that period when digital and analog service operate concurrently ... A non-disruptive transition for consumers must protect listeners' investment in over one-half billion radio receivers."*

The NAB was supportive of this goal.

Meanwhile, a reactivated National Radio Standards Committee (NRSC) DAB Subcommittee provided some guidelines on what it wanted to see from the proponents. US Digital Radio (USDAR) and Digital Radio Express (DRE) agreed to provide technical details and test results on their respective systems to the NRSC by December 15, 1999.

A CHANGE IN PLAYERS

But more twists lay in the road ahead. On the day before the deadline, USADR and DRE announced a "strategic alliance." DRE (purveyors of the recently introduced FMeXtra system) would drop out of the IBOC race and concentrate on data sub-carrier applications.

It appears that in return for stepping aside DRE obtained an agreement that some of its patented technology would be licensed to USADR.

In January 2000, USADR announced that it was joining with the DRM Consortium to "work together in developing and promoting a worldwide standard for digital AM broadcasting." At the NAB convention in April, both USADR and Lucent Digital Radio (LDR) had on-air demos of their systems running.

IBQUITY IS BORN

And then came the blockbuster announcement: on July 12, 2000, USADR and LDR announced they were merging to form a single entity called iBiquity Digital. The whole complexion of DAB development in the United States changed overnight.

The NAB had long since rejected any approach other than IBOC, so the NRSC was not inclined to look at anything else at this point. And there was just one IBOC option left on the table; it was no longer a competitive situation – the NRSC now simply had to answer the question: "Is it good enough?" The corollary to that is: "If it is, how do we convince the FCC?"

The DAB Subcommittee dusted off the test plan used for the IBOC system tests in 1994-96 and made some revisions.

CREATIVE TEST RESULTS

Unlike the previous round of testing of competitive systems on neutral ground, this time it was up to the proponent to perform the tests, and the NRSC would simply provide observers to monitor them at times. The proponent was free to choose subcontractors to perform the laboratory and subjective audio tests.

It also seems they had some latitude in how they interpreted the test plan, although this would not be readily apparent to anyone not closely connected with the process.

For example, one of the AM IBOC system tests was designed to compare the audio quality of the four tested analog receivers when subjected to first adjacent interference at different D/U ratios, with and without IBOC on the interfering signal.

The test was run with several different music and speech selections on the desired signal, and the undesired signal was modulated with "processed pop music." The recorded audio was assessed by a listening panel. A certain subjective test score was deemed to be the "tune-out" threshold, where half of the listeners would stop listening.

POSITIVE TEST RESULTS

The results are interesting. Although the audio quality often dropped significantly when IBOC was turned on, it almost never dropped below the tune-out threshold.

At a 30 dB Desired Signal to Undesired Signal (D/U) ratio, the interference was reported to have had little effect with or without IBOC. At 15 dB D/U, the test scores of most of the receivers plummeted when IBOC was turned on, but they still remained slightly above the magic threshold.

At 0 dB, on the other hand, the scores were nearly all at or below the tune-out threshold even without IBOC. As a consequence, the NRSC evaluators were able to summarize these results by commenting that the introduction of IBOC on the first adjacent signal would not cause listeners to tune out.

... OR "SPIN"?

But hold on, why do we have results only for these widely-spaced D/U ratios? Considering that the first adjacent protection ratio for AM is 6 dB, would it not make sense to have a test at that D/U ratio, or at least something close to it?

No doubt it would make sense and, in fact, it is right there in the NRSC test plan: the tests were to be done at 0, 7.5, 15, 22.5, and 30 dB. From the results at 0 and 15 dB, one can easily guess at the nature of the test results at 7.5 dB – they would have shown many cases where IBOC caused a drop in quality from well above to well below the tune-out threshold. Not good.

So, were the tests at 7.5 dB and 22.5 dB done and the results suppressed or simply never done at all? We do not know, because neither the iBiquity test report nor the NRSC evaluation report make any mention of the omissions.

The test plan itself had some serious shortcomings. One of the most glaring was the use of only four different radios to test for "compatibility" with analog reception.

It is simply unfathomable to decide such an important issue on the basis of such a tiny sample size. Contrast this with the battle over LPFM, when interference test results on a large number of receivers were trotted out by the NAB and others.

The introduction of IBOC has more far-reaching consequences than LPFM and deserves no less effort.

USEFUL DATA

Despite these shortcomings some useful data came from iBiquity's tests.

The results on digital interference to analog did not look encouraging. Two of the four tested AM receivers, and three out of the four FM receivers, showed a significant increase in increase in audio noise level when IBOC on the host signal was turned on.

Both AM and FM had big problems with interference from IBOC signals on first- and second-adjacent channels, with the effects being highly receiver-dependent.

Also on both bands the receivers with the best selectivity (the car radios) suffered the most from first-adjacent IBOC because they were able to deal with the analog part of the interference, but not the digital, as that appears on-channel. The less-capable receivers had more problems with IBOC on second-adjacent channels.

To an unbiased observer these results showed that, for both AM and FM, widespread adoption of IBOC would largely eliminate any coverage currently enjoyed by stations outside their protected contours. Moreover, there is considerable potential for interference to occur inside protected contours, especially in the case of AM.

THE OFFICIAL REPORT

The NRSC DAB Subcommittee did not see it that way. Their evaluation report was issued in two parts: Part 1 (November 2001) dealt with FM IBOC and Part 2 (April 2002) dealt with AM IBOC.

In a nutshell, the report concluded that – with few exceptions – there would be no serious problems with interference to existing services. To anyone who has examined the raw test results in detail, the positive spin applied to these results in the NRSC evaluation report is obvious.

The most disturbing results are consistently downplayed and, in some cases, simply ignored. Lab test results showing significant interference were sometimes dismissed as being unrealistic and instead some field test results were trotted out to demonstrate less severe problems.

FM CONCLUSIONS

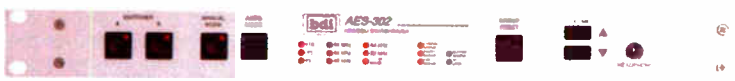
The evaluation report endorsed the iBiquity FM IBOC system unreservedly. Concerning the interference problems revealed by the test program, the report says: *"The impact of IBOC digital sidebands on the performance of existing main channel audio services is varied: listeners should not perceive an impact on the analog host signal, nor on the analog signals on carriers that are either co-channel or 2nd-adjacent channel with respect to an IBOC signal.*

"With respect to carriers that are located 1st-adjacent to an IBOC signal, listeners within the protected contour should not perceive an impact, but a limited number of listeners may perceive an impact outside of the protected contour under certain conditions."

The report also claims the effects of digital interference from first adjacent IBOC stations often will be masked by analog interference from the same station (in lower quality receivers) or by the blend-to-mono function in car receivers.

(Continued on Page 18)

Digital and Analog Transmitter Audio Switching Solutions, Analog to IBOC!



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During my many years representing countless AM stations in markets from Punxsutawney to New York, I'd worked with virtually every major manufacturer of RF broadcast equipment and most major consulting engineering firms. Almost unique among these is Kintronic, family-owned and operated for over 50 years whose steadfast devotion to uncompromising quality and truly responsive customer service have earned it a hallowed position in the industry---with equipment in all 50 states and many foreign countries, from tiny stations to megawatters, including US Armed Forces and VOA."

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Transmission Guide

by Barry McLarnon

Continued from Page 16

The fact that one of the tested receivers demonstrated a potential for serious interference from second-adjacent IBOC signals inside protected contours is simply omitted from the conclusion section of the report.

SOME AM RESERVATIONS

On the AM side, the evaluation report stops short of a ringing endorsement. Regarding the interference issues, it says: *"Generally, interference attributable to IBOC on first adjacent-channels should only be noticeable in cases where listeners are located outside the protected interference-free contour and should not cause significant AM listening problems during daytime hours."*

The disturbing results obtained by Clear Channel in their daytime tests of the effects of WTOP IBOC on first-adjacent WARK do not seem to be factored into this mild conclusion. Comments about interference from IBOC on second-adjacents are conspicuous by their absence, despite the test results showing this could be a serious daytime problem (and, as we now know, real world deployments have proven this to be the case).

Clearly, the DAB Subcommittee had a more difficult time with endorsing the troublesome AM system, and they reached a compromise by recommending it for daytime operation only, despite its rather obvious shortcomings.

Concerning nighttime operation, they sounded a note of caution, *"the NRSC expects that first adjacent interference may pose potential problems for listeners during nighttime hours,"* and in their conclusion, *even raised the possibility that the hybrid mode might never be used at night: "Night service can either be revisited by the Commission at a future date or made available once the iBiquity "all digital" mode is authorized."*

FIRST REPORT AND ORDER

Following the submission of the two-part evaluation report, the FCC quickly opened comment periods and received the expected barrage of endorsements from the NAB and other IBOC backers.

The Commission responded with its October 2002 First Report and Order on DAB, taking the fateful step of selecting the iBiquity systems as the sole means of doing terrestrial digital radio broadcasting in the USA and eliminating all other possibilities from further consideration.

The NRSC subsequently began the task of drafting a standard for IBOC that eventually became NRSC-5.

With the FCC now on its side, IBOC was clearly gathering a head of steam, but there remained that nagging issue of nighttime operation of AM IBOC. AM owners who backed IBOC were obviously not too pleased with the prospect of waiting for the all-digital mode to become viable before beginning full-time digital operation, so they pushed for evidence to show the hybrid system could be used at night.

NIGHTTIME OPERATION FOR AM

In 2003, iBiquity produced three reports dealing with this topic: a theoretical study of the impact of nighttime interference, field tests of the nighttime performance of the digital system itself, and field tests of nighttime interference to analog reception.

This last report was the most critical to settling the issue since it was based on a real world interference situation. However, the field tests described were obviously very limited in scope, since they considered just a pair of first adjacent Class A stations, WLW-700 in Cincinnati and WOR-710 in New York City.

Basically, the tests consisted of recording audio from a few different receivers tuned to one of the stations while the other stations cycled its digital signal on and off. Audio samples with and without IBOC interference were then selected and used for subjective tests of the audio quality.

Because the interfering skywave signal faded in and out, an attempt had to be made to select audio samples for comparison made at roughly the same D/U ratio. Since the tests and analysis were done by the proponent, we have no way of knowing whether this selection was done in an even-handed way.

We discussed this scenario in our August ***Radio Guide*** article and concluded a large potential existed for harmful interference inside protected contours, especially for Class A stations.

Remarkably, this iBiquity report concludes otherwise: *"the primary service area of a station should not be affected by IBOC."* The main reason that they were able to claim this is some nifty sleight-of-hand concerning the definition of "primary service."

DEFINING THE PROBLEM AWAY

A Class A station service area should extend to 0.5 mV/m groundwave contour at night. Those are, after all, the FCC Rules.

The authors of this report, however, claim the actual service area should be based upon a calculated NIF (nighttime interference free) contour; for example, they say the WLW NIF contour is 2.7 mV/m – something like 20% of the area enclosed by the 0.5 mV/m contour. Sure enough, most of the harmful interference to WLW from WOR occurs outside this contour.

But strangely enough, iBiquity's own data indicates that analog reception was quite acceptable in the area between the two contours. Acceptable, that is, until IBOC was turned on. It is also worth noting that interference had to be rather severe before reception was considered to be "affected" by IBOC – the criterion being that at least half of listeners would "tune out."

There are other problems with this and the other reports on AM nighttime operation, but space does not permit a detailed analysis here. Still, it is important to note that the NRSC did not re-enter the picture to formally evaluate this new material. Instead, the reports were simply filed with the FCC, accompanied by a missive from the NAB recommending that blanket authority for nighttime AM IBOC operation be granted immediately.

The FCC subsequently opened a comment window on this issue in April 2004, but has yet to make a decision. Nighttime AM IBOC does not have the benefit of an industry-sponsored evaluation to support it and there has been a small storm of negative comments about it on MM docket 99-325. Despite this show of resistance and some hesitation on the part of the FCC, however, there seems little doubt that it will eventually be authorized.

WE ARE HERE

So this is where we are today. The pivotal time in this process came in 2000, when the competitiveness and rigor of the "DAB horse race" of the 1990's gave way to a new paradigm of making sure that the last remaining horse in the race made it across the finish line.

After more than a decade of development, it was clearly "do or die" time – if the iBiquity technology did not pass muster it would very likely be the end of the line for IBOC and a huge setback for DAB in the USA.

The members of the NRSC DAB Subcommittee were there because they believed a DAB standard was needed – and soon. It is little wonder then that they produced a favorable evaluation of the iBiquity system.

Although there were some issues with the performance of the digital system, the biggest potential stumbling block was the one that has always dogged IBOC: the hybrid mode of IBOC will cause interference to analog signals and there is simply no way of avoiding it completely. Reducing the digital power helps, but going too far will cripple the performance of the digital side.

Given the wariness of the FCC about the interference problems with IBOC as expressed in the 1999 NPRM, and at the same time avoiding alarming those broadcasters who were not yet convinced about the merits of IBOC, the subcommittee had to tread very lightly.

In the end, they crafted a carefully worded report downplaying the interference problems, reassured all concerned, and recommended that the iBiquity systems be adopted as the basis for a standard. The rest, as they say, is history.

Although the fate of DAB in the United States was essentially sealed when the 2002 Report and Order was issued, it is still far too early to say how this history will play out.

Will IBOC, especially the AM system, be hamstrung by numerous interference complaints or perhaps even litigation? And after all is said and done will the marketplace take any notice of digital radio? Stay tuned – there are interesting times ahead!

Barry McLarnon, B.Sc., M.Sc., was Project Leader, Radio Broadcast Systems, at the Communications Research Center (CRC) in Ottawa, Canada, where he was responsible for research on new digital radio broadcast systems and helping develop the DAB standard for Canada. His email is bdm@bdmconm.ca

Field Guide

by Charles Anderson

Probe 3 from V-Soft

When I first purchased V-Soft Communications' Probe 3 software, I was looking for a program to perform Longley-Rice propagation studies and to generate professional FM coverage maps and exhibits.

Now that I have used the software for two years, I find it to be an indispensable tool in all of my FM allocations work. The program incorporates the U.S. Census Tiger mapping data, and produces high quality coverage maps with terrain-based FCC contours or coverage prediction using any of a number of other propagation models.

A PRACTICAL EXAMPLE

Perhaps a good way to illustrate the program's utility is to look at its use in the preparation of some of the analyses and exhibits required for FCC FM applications and Rulemaking proceedings.

A new study is initiated with a choice of terrain databases – either the thirty-second or three-second database (other databases are available as additional options). For FCC exhibits, I usually select the thirty-second option.

The site coordinates, ERP, and either radiation center or height above average terrain are entered. The program automatically calculates the missing parameters. (For accuracy, the actual site elevation from a topographic map should be substituted for the database derived value.) If the coordinates are NAD 83, a drop-down NAD conversion utility is available to convert to NAD 27 or vice-versa.

PRIMARY COVERAGE CHECK

The 70 dBu and 60 dBu contours are selected, and a coverage map is produced based on any number of selected radials from 8 to 360. Custom labels and pointers may be produced with the programs utilities.

First, the 70 dBu contour is checked to determine whether it covers at least 80% of the community. If it covers less than 100%, Probe 3 includes a Polygon Tool that permits the area covered and the entire community to be traced with the mouse, and their areas and populations determined. If the community boundary has been imported from the 2000 U.S. Census database, the area can be calculated just by right clicking it.

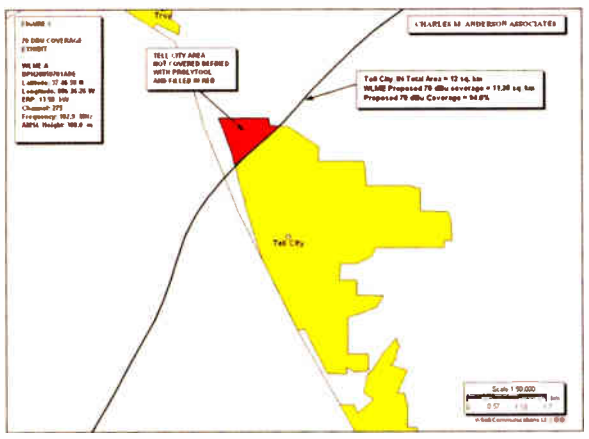

Figure 1 – a 70 dBu coverage plot.

With a smaller scale (1:100,000 or below) this calculation becomes very precise all the way down to street level. Population counts and areas for any contours with county-by-county and ethnic breakdowns are determined by simply left clicking on the station listing and selecting the contour and count option.

TERRAIN AND COVERAGE OPTIONS

With the 70 dBu coverage established, the line of sight to the community of license can be checked using the Profile Tool.

A terrain profile between any two points on the map – usually the transmitter site and city of license – may be produced by selecting the Profile Tool, then right-clicking on the transmitter site, dragging the mouse to receive site or city of license and releasing.

After looking up the exact community coordinates in another utility, these are entered and the terrain profile redrawn. The antenna height above ground may also be varied as necessary to obtain line of sight. Final exhibits are then printed to PDF, BMP or paper.

Adding a realistic prediction of coverage using Longley-Rice set for a two meter receiver antenna height is a simple matter, and is demonstrated in **Figure 2**. My preference is the gradient contour plotted transparently over the map features.

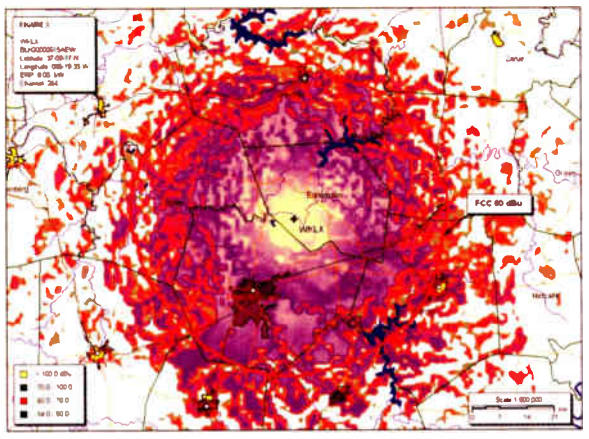

Figure 2 – Coverage contour plot.

Longley-Rice parameters are variable, and the signal cell size is adjustable down to 0.1 km. At that level, it takes a while to calculate.

ADVANCED FEATURES

An application I prepared in Cotton Plant, AR is a good example of the advanced Probe 3 features.

The preferred location was some twenty-four kilometers from the community, obviously beyond the standard FCC 16.2 km, 70 dBu contour. A Longley-Rice prediction was produced with the receiver height set at the FCC standard 9.1 meters, and **Figure 3** shows that the 70 dBu in blue actually covers Cotton Plant.

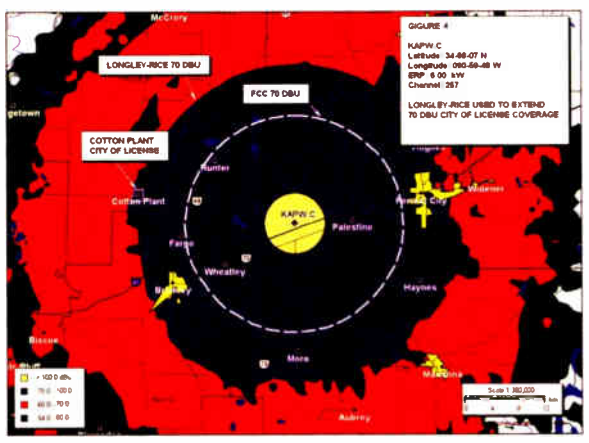

Figure 3 – Using Longley-Rice to extend coverage.

The actual city boundaries were easily added from the 2000 Census database and colored white for clarity. That was all well and good, but the Commission only permits the use of Longley-Rice to extend the 70 dBu if the terrain roughness factor (Delta *h*) is 20 meters or less or 100 meters or greater. In other words, it has to be very flat or very rough.

It should also be noted that the resulting contour for the extended radial must exceed the FCC predicted contour by at least 10% or the HAAT for the extended radial must exceed the standard 3-16 km radial HAAT by 35%.

By using a utility in Probe 3, Delta *h* is calculated for each degree of azimuth to the far edge of the community, and found to be about 6 meters.

The utility provides complete flexibility in the selection of azimuth and distance to the contour.

SOLVING PROBLEMS

Other important allocation studies easily done in Probe 3 include gain/loss studies and existing service studies for FM Rulemakings.

Any number of stations may be selected and their contours defined based on terrain or based on the uniform maximum class values used by Commission staff in Rulemaking proceedings. The Overlap Tool can be used to find the area and population of any contours or their intersections. This is a convenient way to quickly determine gain/loss areas.

The Polygon Tool can also be used to draw these areas and calculate population and area. One of the most difficult analyses for FM Rulemakings is the determination of gain and loss areas in terms of number of services (1-5). Probe 3's overlap utility will do this automatically and color codes them as well.

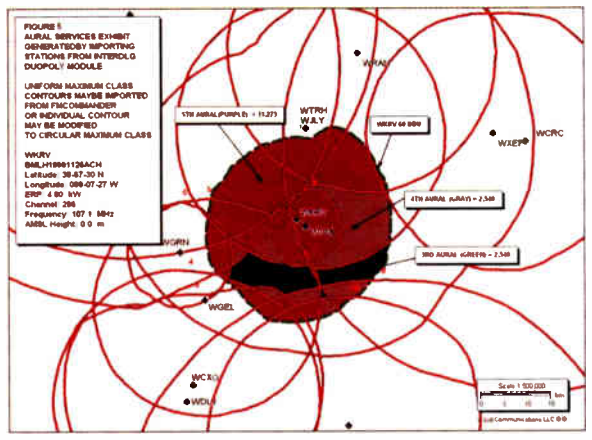

Figure 4 – An Aural Services exhibit.

The actual station contours may be imported from V-Soft's INTERGLG, DUOPOLY and FMCOMMANDER programs or they may be loaded from the FM database manually. If we need to determine whether a new upgrade or move-in covers more than 50% of a market's Urbanized Area, the UA is simply added from an optional database to the map, and the Polygon Tool is used to calculate the area – a critical showing when working in larger markets.

ALL KINDS OF MAPS

Probe 3 provides complete format flexibility for any map: a basic map with only latitude and longitude tics can be used for a contour overlap study; a map with basic roads and communities boundaries for a 70 dBu coverage exhibit; or, a full coverage map with all roads, rivers, lakes, railroads, county lines and metropolitan areas.

Any of the features may be added or removed and the map will be immediately redrawn. Tower registrations from the FCC database are easily added as are zip codes. The color and thickness of all lines and the fonts including size and color for all labels may be customized. The map scale can be set to any value, and at smaller scales streets and street names are produced.

Among other features not discussed here is the interference calculation using the FCC model or any of the other propagation models.

My work is limited to AM and FM facilities so I have not focused on the fact that Probe 3 is equally at home with television by adding the optional TV module. All of the FM features discussed here – and more – are available for television. The OET69 feature permits the calculation of coverage and interference for digital television stations. These and other features of this software may be viewed at www.v-soft.com.

I have found Probe 3 to be among the most intuitive, flexible and stable pieces of software that I have used. My impatience, and perhaps a touch of attention deficit disorder, usually can crash almost any software – but not Probe 3.

Finally, it is worth noting something about the documentation and support. A very useful and well-written manual with illustrations is provided. And V-Soft technical support, although rarely needed for Probe 3, is excellent.

Chuck Anderson is a consulting engineer who has been actively involved in AM and FM allocations work for more than 25 years. His company, Charles M. Anderson Associates, is based in Bowling Green, KY. Contact Chuck at charlesmanderson@bellsouth.net

FCC Focus

by Dick S. Pickens

Solving Renewal Time Problems

The Alternate Broadcast Inspection Program is designed to help broadcasters solve problems before they have problems during a real FCC inspection. The outside "eye" can often see things that station personnel miss in the pressure or routine of daily operations.

Here, Dick Pickens covers some key items that should be on your checklists for regular review, especially before renewal time. Doing so will make the whole process less stressful for everyone.

You would never lie to the FCC, would you? How about stretching the truth just a bit?

Some broadcasters have been struggling with themselves after discovering one of those little embedded questions on the license renewal form (136R) such as whether they had any "awareness of any violations during the previous term." Heavens to Betsy! That could even include the missed legal ID when that new operator was on the board last October.

Then there is that nagging question about whether everything was placed in the Public File in timely fashion. Oops!

Dealing with requirements like these during license renewal time often proves the truth of that old saying – "necessity is the mother of invention."

ROOM FOR IMPROVEMENT

I have inspected some fine broadcast operations, but I can honestly say that I have never inspected one where there was absolutely nothing they could have done better.

Of course, I may be tougher than the average FCC inspector. But I can give stations a "pass" if they have already corrected prior deficiencies or even give them a brief period of time in which to correct problems. My goal always is to make them squeaky clean ASAP and I encourage them to keep up that pace.

SUGGESTIONS

I recently did a presentation for the Texas Association of Broadcasters. As simplistic as it sounds, I pushed engineers (and managers) for a little bit of "organization" in checking the required things.

Among the suggestions I offered included using a Palm Pilot or a computer file that pops up periodically with deadlines and dates for required items such as the weekly log approval, the quarterly tower lighting system checks, and even a check every now and then to see if the current license is posted, with a copy in the Public File.

We all know about "the tyranny of the urgent," so we have to force fit some "organization" to keep us on track.

PUBLIC FILE POINTERS

Virtually every Public File has some discrepancies. Here are some that I find often during inspections.

• Poor organization of the contracts (or list thereof) asked for in the Ownership Reports. Even the attorneys are often at fault here, placing statements in the folder saying merely "on file." So the poor Public File supervisor has no idea what contracts must be kept available.

• Many stations have far too much paperwork in the Public File – one such file went back over *twenty years*. It is far better to create a separate "History File" and not give your renewal challengers a lot of extra material. I recommend doing exactly what is required but not overdoing it.

• I encounter stations where the receptionist has no idea what or where the Public File is or how one can see it. We always ask upon arrival how to see the Public File. One greeter told me "You have to know someone in the station to see the Public File." Wrong Answer!

• Frequently the Issues/Programs reports do not contain the required information: program name, date and time of airing, and a brief statement concerning the topic discussed. Some stations only have a list of Public Service Announcements in that folder and that is not the intent of Issues/Programs. A network list of programs will not meet the requirement either.

TECHNICAL ISSUES TO CHECK

On the "engineering" side, the current common deficiencies seem to be:

• Lack of maintenance logs and schedules.

• Missing tower registration signs at the tower (including at the gate to the property).

• Failure to paint the coaxial cables that are mounted on the outside of a painted tower.

• No logging of quarterly tower lighting alarm tests.

• No Equipment Performance Measurements.

• No Efficiency Factor available for the transmitter, nor Common Point (or Base) Impedance Measurement for the feed point.

• Missing or incomplete weekly Station Logs by the Chief Operator with signature and date/time of approval – or any notes concerning irregularities.

• Though not on the FCC Checklist, I also push for the required RF Hazard signs.

Then there is the matter of AM directional parameters and monitor points. But that is another whole 'nuther story.

Dick S. Pickens is the ABIP Inspector for Texas under the TAB/FCC program. A long time Texas engineer, Dick can be emailed at microcom@ev1.net

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2005-2006

RADIO ROUNDUP

The Radio Guide Industry Date and Event Register

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Email your information to: ***radio@rconnect.com***

International CES (Consumer Electronics Show)
January 5-8, 2006
Las Vegas, Nevada
www.cesweb.org

RAB2006
February 1-3, 2006
Dallas, Texas
www.rab06.com

National Association of Tower Erectors Expo
February 13-16, 2006
Orlando, Florida
www.natehome.com

National Religious Broadcasters Annual Conv.
February 17-22, 2006
Dallas/Fort Worth, Texas
www.nrb.org

Great Lakes Broadcasting Conference
March 7-8, 2006
Lansing, Michigan
www.michmab.com

Oklahoma Assoc. of Broadcasters Convention
March 31- April 1, 2006
Oklahoma City, Oklahoma
www.oabok.org

NAB 2006
April 22-27, 2006
Las Vegas, Nevada
www.nabshow.com

Mid-Atlantic Broadcasters Conference
June 5-6, 2006
Atlantic City, New Jersey
www.njba.com

SBE Certification Exam Dates

Exam Dates	Location	App. Deadline
February 10-20	Local Chapters	Dec. 30, 2005
April 25 NAB	Las Vegas	March 3, 2006
June 2-12	Local Chapters	April 21, 2006
August 11-21	Local Chapters	June 9, 2006
November 10-20	Local Chapters	Sep. 22, 2006

Email your dates to: radio@rconnect.com

State of the Art

Radio Industry News

by Chip Morgan

iBiquity Offers Cash for Trading in Analog Radios

Using eBay® as a clearinghouse, iBiquity is offering to buy analog radios from consumers for cash when they buy a new HD Radio receiver. Other items can be traded in, including PCs, cameras, phones, game systems, and Ipods. As a random example of a radio trade in, a 2005 Kenwood VR-6060 6.1 channel home stereo radio has a trade-in value of $18.50 plus a $20 mail-in rebate certificate, giving a total trade in value of $38.50.

A quick search on eBay at the time of this writing showed no HD radios for sale there. The Boston Acoustics Recepter HD Radio at $500 was temporarily out of stock at Crutchfield, however the car radio based Kenwood KTC-HR100MC tuner was available at $400 (plus the cost of the car Kenwood receiver).

More info:
http://www.ibiquity.com/press/pr/eBayRelease.htm

FCC Makes it Easier to Use Short Antenna on AM

Non-directional AM stations can now use the low profile KinStar antenna in areas where tall towers may be unacceptable without submission of a proof of performance, current distribution measurements, or a formula for the vertical plane radiation characteristic.

The KinStar antenna is a cage of typically four vertical wires around a central support extending 0.08 wavelength (75 feet at 1000 kHz) with a horizontal top-loading wire extending radially outward approximately 0.17 wavelengths (169 feet at 1000 kHz). This antenna requires a standard 120 radial 1/4-wave buried ground system.

The KinStar antenna is manufactured by Kintronic Laboratories, Inc.

More info:
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-2741A1.pdf

FCC Helps Stations Affected by Hurricane Wilma

Based on the essential need for broadcast services to the residents of the region affected by Hurricane Wilma, the FCC is providing relief for broadcast stations. All requests for temporary facilities or modifications to existing facilities are given expedited processing, including handling Special Temporary Authority requests as expeditiously as possible.

The requirement to notify the Commission within 24 hours of the use of emergency antennas has been waived. Full daytime facilities may be used during nighttime hours by AM stations, provided that all operation is on a noncommercial basis. Construction permit deadlines will be extended upon request for an additional 90 days.

More info:
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-261798A1.pdf

New NAB Leader Gives Up Beer for Radio

After considering approximately 80 candidates in the search for the successor to current NAB President and CEO, Eddie Fritts, NAB has announced that National Beer Wholesalers Association President David Rehr will assume responsibility on December 5th 2005. NAB reports that with more than 20 years of experience on Capitol Hill and in the lobbying community, Rehr has been an outspoken advocate for entrepreneurs and small business before the federal government.

As National Beer Wholesalers President, Mr Rehr increased the association's Political Action Committee spending from approximately $400,000 per election cycle to nearly $3 million per election cycle. This put the beer association in the top 10 dispensing PACs since 2003.

More info:
http://www.nab.org/Newsroom/PressRel/Releases/102005_Rehr.htm

When Will US Analog TV Die?

The current law calls for all digital transmission by late 2006 or when 85 percent of households have access to digital TV reception. Based on confusion about how to identify the 85 percent mark, Congress is attempting to set a "hard date" for the transition.

The Senate is proposing April 7, 2009 and the House is proposing December 31, 2008. Congress is also considering whether to keep a Senate provision calling for the federal government to pay for converter boxes for people who cannot afford or do not have digital TV sets at the time of the changeover.

More info:
http://msnbc.msn.com/id/9697337/

FCC Explains Obscenity, Indecency and Profanity

The FCC has a new web site full of information for consumers and broadcasters about obscene programming (which cannot be aired at any time) and indecent or profane programming, which cannot be aired between 6:00 AM and 10:00 PM. The site includes links to an indecency fact sheet, how to file an indecency complaint, the complaint process, who handles indecency complaints, complaint and enforcement statistics, frequently asked questions and FCC actions.

It notes that the FCC vigorously enforces the law where violations are found and that in 2004, the FCC took action in 12 cases, involving hundreds of thousands of complaints. Penalties and voluntary payments totaled approximately 8 million dollars in 2004. The site says that the Commission strives to address every complaint within nine months of its receipt.

More info:
http://www.fcc.gov/eb/oip/

Satellite Encroachment in the House

A bill in the House of Representatives is designed to codify an agreement between radio broadcasters and satellite radio companies to prevent future encroachment of satellite radio into local market content without the appropriate community commitment and responsibility.

The bill will instruct the FCC to codify the agreement between satellite radio and local broadcasters that ground based repeaters would not be used by satellite radio services to change local content.

More info:
http://www.house.gov/pickering/MediaVoice.htm

Digital Radio Set to Cover All of UK

Hundreds of digital radio stations are on the air now in the UK, and new facilities are planned to add at least 74 more local commercial stations and every local BBC station to broadcast in digital by early 2007. The number of digital radio receivers in use in the UK is 1.2 million, and this number is expected to grow to 20 million by 2009. The goal is for digital radio to reach all of the UK and to provide service for every major popular station, including digital-only broadcasters.

More info:
http://news.bbc.co.uk/1/hi/entertainment/tv_and_radio/4356606.stm

Sirius Radio Handheld Receiver

Sirius has introduced a new handheld rechargeable device that plays stored broadcasts, but not live ones. Billed as the iPod of satellite radio, the $360 model S50 unit is not a receiver. It determines which of three Sirius channels you listen to the most, and downloads 1 gigabyte, or up to 50 hours, of content. It can also be programmed to record certain regular shows.

More info:
http://www.businessweek.com/innovate/content/oct2005/id20051010_590073.htm

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Chip Morgan produces an (almost) daily email with a special dose of "big picture" news that affects the broadcast industry. More info at www.cmbe.com

Studio Guide

by Mark Shander

The Great Dynamic Microphone Shootout

Part-1: Setting Up

Over the past several months in this column we have discussed a variety of microphone types and styles.

We have considered the difference between condensers and dynamic microphones, danced around ribbons and looked at instances where one type might be more appropriate than another. We also discussed pickup patterns, from cardioids to shotgun models and omnidirectionals.

What we have learned is there is no right or wrong way to configure a studio. The various environmental conditions, as well as end user considerations and the intended purpose for capturing a signal will, somewhat dictate what microphone style might be most appropriate for a given situation.

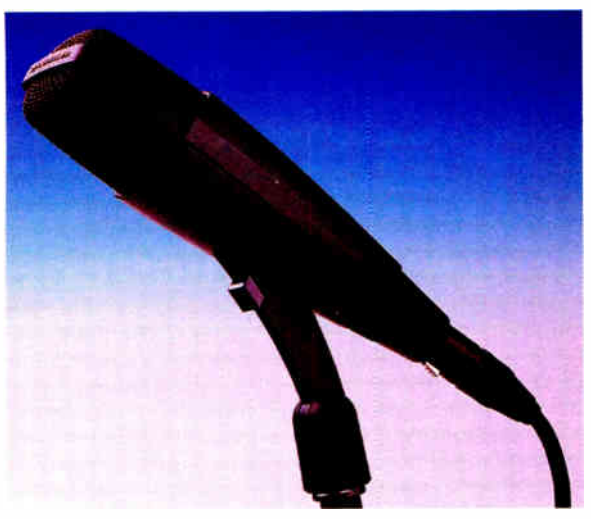
We are now at the point many of you have been waiting for: the Great Dynamic Microphone Shootout.

IN THE OPPOSING CORNER

First, let me introduce the players.

Born in 1960, the Sennheiser MD421 is sleek, stylish, and could have easily doubled as a model for a souped-up Starship vessel on the original Star Trek. That is, for any alien race small enough to fit in and only with the bass roll-off switch set to flat.

The MD421 has been a radio and music microphone icon for many years.



Sennheiser MD421

The Shure SM-7 is another industry talk studio staple.

Outliving the blimp-looking (but still popular) SM-5B, with its unique windscreen/grille and optional windscreen addition, the SM-7 has been described as (but fortunately not used as) a foamy toilet paper roll. Please do not squeeze the Shure.

The ElectroVoice RE-20 and new RE-27N/D may appear similar, but the sound is not exactly the same. While the RE-27 has a hotter output and a bit more presence, the RE-20 has been around awhile longer and therefore is taking center stage here at the shootout.

AKG, Audio-Technica, Heil, Sony and others have excellent microphones that would be fun to add to the shootout, but these three: the MD421, the SM-7, and the RE-20 are some of the most talked about and compared microphones in broadcast history.

THE SCENE OF THE EVENT

Now that you know the players, we should look at the environment where the shootout is going to be held.

Newark, New Jersey is the home to some professional – and even more grass roots and urban recording facilities – as well as some television production studios. Nearby cities with hills and sunshine sport mansions that were originally purchased for a song (no pun intended) in comparison to their worth today.

For this shootout, we used a recording studio nestled in the Cherry Hills of New Jersey, just a short train ride away from bountiful and elaborate production facilities in New York City. Recording artists who have cut tracks at this facility reportedly include some of the legends of the 50s, 60s, and the 90s. For some reason, pinball machines replaced pianos here in the 80s, and production in this facility was almost nil.

Most of the artists recording here were male, many with silky-smooth pipes that were captured for broadcast and posterity using one of our three selected microphones: Sennheiser MD421, Shure SM-7 or EV RE-20.

Shure SM-7

SETTING THE STAGE

This particular studio is now used for radio production more than for music production. It is stocked with a variety of microphones that one would expect to see used for recording, although the most prominent microphones found in the facility are the three models involved in our shootout.

The producer/engineer (we will call him Ted) shows us the studio using a Webcam.

ElectroVoice RE-20

The microphones were set up side by side in a 10 x 12 room, and were plugged into a bulkhead on the wall using a 20' snake. The bulkhead had wiring in the wall that lead to a patchbay, though some of the channels were hardwired into a preamp leading to a mixer channel.

This studio is reportedly the site where at least one record label published licensed music tracks sung by their own artists. Several dozen parody songs heard on New York radio stations also were recorded here.

Today we are going to record a male/female duet and, if time permits, do some voicetracking.

THE VOICES

Performers Harry and Selma are said to have been a big hit, live in the Catskills with Buddy Hackett in the 70s.

The brother and sister team has volunteered to record their comeback album today using our three shootout microphones. That is, Harry says, as long as the album takes no longer than two hours to record and consists of no more than three tracks.

On the other hand, Harry also says, if we like those three he will do a few more – if the price is right.

Selma says she will do a few more if she gets to take home the toilet paper roll microphone. We all laugh, as Selma explains that she has her own criteria for which microphone she likes better. She explains that humor was a big part of their act in the Catskills.

TIME FOR THE ACTION

It is time. Ted calls for "the spot" as if he was back in his element. The spot was a cheap, single floodlight Ted hung from a track in the ceiling.

Harry and Selma move in front of the three microphones, each isolated onto its own channel, and they start to sing By The Light of The Silvery Moon.

I listened in on the shootout from Phoenix over ISDN. The lights dim ...

Be with us next month as Mark describes the session and how they evaluated the results from the three microphones.

Mark Shander is has a long history in broadcast, recording studios, and the occasional supermarket opening. He welcomes your comments at mark@shander.com

Facility Focus

by Ken Benner, NCE and Barry Mishkind

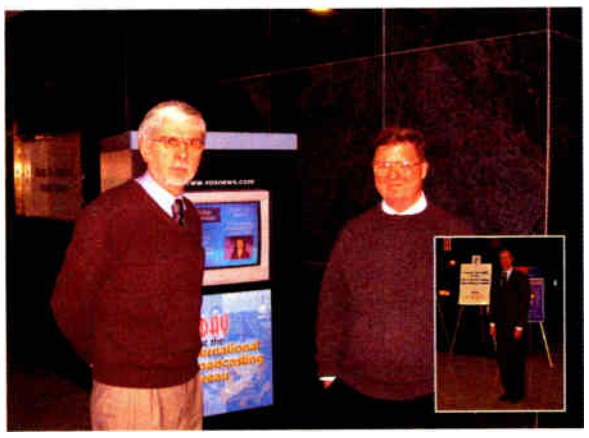
The Voice of America

Broadcasting to the World for Over 60 Years

Just across the street and to your left - three blocks from the National Air and Space Museum in Washington, DC - is the Headquarters of the Voice of America (VOA), at 330 Independence Avenue. This is a must visit for anyone in broadcasting.

SEEING THE FACILITY

You will always be greeted by professional tour guides who can answer any question you may have. The tours are usually conducted each weekday at 11:45 AM. Tours are free, but reservations are required. It only takes a phone call.



Two of the VOA tour guides, Joe O'Connell (l) and George MacKenzie, welcome guests and tourists from around the world. (Inset: Brian Mabry)

The 45 minute tours lead through the central newsroom, radio and television studios and other areas. It is not uncommon for these tours to include international tourists who have a huge curiosity about the origination of international broadcasts they have listened to for years.

During the tours, the guides provide an explanation of how the VOA has expanded over the past 60 years from wartime shortwave broadcasts to the variety of AM, FM, television and Internet services provided today.

VOA OPERATIONS BEGIN

Shortly after the Japanese attack on Pearl Harbor, Hawaii, the Roosevelt Administration decided the United States, the BBC and other Allied broadcasters needed a first-class international broadcasting service to respond to German and Japanese propaganda broadcasts that had been operating since the late 1930's.

It was February 24, 1942, less than three months after the United States entered World War II, when the Voice of America began its transmissions, using the transmitters of the British Broadcasting Corporation. From makeshift studios in New York City, announcer William Hale launched the service speaking in German with the words, "The news may be good. The news may be bad. We shall tell you the truth."

The VOA operates under the Broadcasting Board of Governors, (BBG) which is responsible for supervising all U.S. government overseas broadcasting, both federal broadcasters (e.g., VOA, Radio and TV Marti) and the so-called non-federal broadcasters (Radio Free Europe/Radio Liberty, Radio Free Asia, etc.)

The VOA receives an annual congressional appropriation just as any other federal agency. In 2005, VOA's budget was $158 million for radio and television operations, exclusive of transmission and other support activities. RFE/RL and RFA, as well as the newer broadcast entities now sending programs to the Middle East, are chartered as private corporations with the sole source of their funding being annual grants which the BBG makes from appropriated funds.

As many will recall, Section 501(a) of the Smith-Mundt Act of 1948 provides that "information produced by VOA for audiences outside the United States shall not be disseminated within the United States ... but, on request, shall be available in the English language at VOA, at all reasonable times following its release as information abroad, for examination only ..." In other words, the VOA is not to provide competition to US broadcasters.

Nevertheless, the Voice of America churns out a lot of programming.

FORMAT VARIETY

The VOA operates 24 hours a day, seven days a week from a 30,000-square-foot complex in Washington. More than 1,100 hours of news, information, educational, and cultural programming in 44 languages come from 43 radio studios and four television studios. An estimated 100 millions listeners are reached each week.

This round tabled studio can be used for both live radio and simultaneous television production

Broadcast journalist Sadia Khalid and show director John Rynex screening international callers for the Urdu program "Radio is Your World," broadcast to Pakistan.

The VOA Newscenter was launched in late February 2004 with 5 radio studios with control rooms, 6 video edit suites, 2 voice booths and 2 digital audio mix/dub centers. Fronting the newsroom are control rooms and 3 sets for television programs.

It is fascinating to observe live VOA call-in broadcasts with people phoning in from all over the world asking questions, providing comment, sharing information in some of the rarest of languages. Such programs frequently have internationally prominent statesmen and citizens appearing live.

Obviously, such programs require hosts and screeners to speak the appropriate languages. Indeed, a tremendous variety of VOA multi-lingual and multi-ethnic on-air talent and support staff is essential to providing information during time of peace or political upheaval.

VOA-TV

Television is developing at the VOA with news, public affairs, live call-in shows, and "weekly magazine" type shows intended to provide viewers with "the story behind the story."

A small portion of the television transmission control room.

A wide variety of acquired programs are also used including "The NewsHour with Jim Lehrer," "First Business," and "Nightly Business Report" among others.

All together, more than 30 hours of television per week come from the VOA studios, including newscasts, talk shows, and magazine shows in more than 20 languages.

USING CURRENT TECH

More than 1,000 hours daily of original programming, both live and on-demand, are streamed via the Internet.

VOA uses a distributed network, including over 14,000 servers in more than 65 countries, to deliver Internet content.

The use of compressed MP3 audio files permits the rebroadcast of VOA programs throughout the global network at a fraction of the cost of traditional means.

For the past five years, VOA also has provided the latest text news and information on www.VOANews.com, along with audio and video features. News is also available via e-mail subscription service in English and an increasing number of broadcast languages.

One of the tape rooms.

The VOA is now converting its massive audio archive to solid state storage. The project has been ongoing and completion is expected by this year's end.

(Continued on Page 30)

Facility Focus

by Ken Benner, NCE and Barry Mishkind

The Voice of America

Broadcasting to the World for Over 60 Years

Continued from Page 28

Additionally, the VOA was a founding member and remains active in the international consortium, Digital Radio Mondiale, established as a worldwide standard for digital shortwave broadcasting that greatly reduces fade and atmospheric interference of shortwave broadcasting.

FROM STUDIO TO LISTENERS

Most programming leaves the VOA Washington headquarters from satellite dishes atop the building to over 200 countries with more than 1,300 affiliates around the world in addition to more than 250 RFE and RL affiliates who rebroadcast programs locally.

While tape editing is rapidly becoming extinct, the facility is still available to talent.

The VOA utilizes a network of over 150 transmitters with a combined power of over 35 megawatts into almost 400 antennas to send its programming out to its estimated 100 million listeners around the world. The transmitters and the staff that maintains them is quite a story all by itself.

Master Control Operator Donna Harrell monitoring 13 separate on-air audio feeds. The operating desk is capable of controlling 100 separate programs

Radio Guide writer Ken Benner discusses American Broadcasting with members of the National Press Club.

Twice each year the VOA's Spectrum Management Division revises its transmission schedule to compensate for ionospheric and sunspot cycles to optimize signals to target audiences.

FULFILLING THE CHARTER

The VOA Charter that was signed by Pres. Gerald Ford in July 1976 provides protection for the journalistic integrity of programming which is so critical for its success and appeal to its world-wide audiences.

The mission statement under which the VOA operates states: "To promote and sustain freedom and democracy by broadcasting accurate and objective news and information about the United States and the world to audiences overseas."

The VOA charter reads as follows:

The long-range interests of the United States are served by communicating directly with the peoples of the world by radio. To be effective, the Voice of America must win the attention and respect of listeners. These principles will therefore govern Voice of America (VOA) broadcasts.

1. VOA will serve as a consistently reliable and authoritative source of news. VOA news will be accurate, objective, and comprehensive.

2. VOA will represent America, not any single segment of American society, and will therefore present a balanced and comprehensive projection of significant American thought and institutions.

3. VOA will present the policies of the United States clearly and effectively, and will also present responsible discussions and opinion on these policies.

Only with a visit to the VOA headquarters in Washington can one fully appreciate the significance of these words.

If you are unable to visit the VOA in person, punch up www.voa.gov. We are sure you will find it interesting and informative. You also will be able to monitor some their broadcasts via the Internet.

When Ken Benner is not out inspecting stations under the ABIP he likes to take a moment and reflect on the wide variety of different broadcasters and broadcasts on the air. Ken's email is bennerassoc@comcast.net

Transmitter Shack

by Robert Meuser

Clear Channel NYC Moves to Digital

In May 2005 the Clear Channel Cluster in New York City went digital. Recently, Josh Hadden director of engineering for New York and Long Island generously took ***Radio Guide*** on a tour of the facilities.

ASSEMBLING THE CLUSTER

The cluster, like most, consists of stations acquired from other existing groups. This initially presented the common problem of having to deal with different types of equipment and transmitter design philosophies.

The cluster includes WHTZ (Z100) and WKTU, which came from Chancellor Media and Evergreen Media respectively and were stand alone New York stations at that time. WLTW and WAXQ were part of the Original Viacom Group which was sold in 1998 to become part of what ultimately became AM-FM before being merged into Clear Channel, and WWPR a stand-alone station owned by Bonneville before being purchased by AM-FM. WLTW and WAXQ has new build-outs prior to being sold and use BE FM10b's.

The plants, spread over different floors of the Empire State building, have been upgraded to a common set of design philosophies and equipment.

VARIETY IN SITES, GEAR

Z100 first went on the Empire State building in 1983 when it was still "worst" before going "from worst to first" shortly there after. The old WVNJ, which became Z100, moved a lot of existing equipment to Empire from Harrison, NJ, when they were first starting up.

The Z100 transmitter room received a partial upgrade in the late 80's with the advent of the new master antenna which required a lower transmitter output. A BE FM-10B was added and an existing Harris FM 25K with a power cutback kit added was back up.

WWPR also uses a pair of FM-10B's which, with the advent of the new master antenna, more or less became the "standard" transmitter for the Empire State Building complex. WKTU had previously broadcast from the World Trade and its facilities were destroyed September 11th, 2001.

The cluster also has a full-power auxiliary site at 4 Times Square in Manhattan. Each of the five stations has a Platinum Z10 in service there. The facility was designed from the ground up with digital in mind. However, at this time only the analog operation is backed up there.

Unlike the Empire State building, which has an infrastructure consisting of various upgrades to a 70-plus-year-old base infrastructure and does not easily provide all tenants the opportunity to have backup power, 4 Times Square is a modern state of the art building and, among other amenities, has full backup emergency power.

DELIBERATE MOVE TO DIGITAL

Hadden has been taking a slow a methodical approach in preparing for digital. One of the first steps was the complete rebuild from scratch of the WHTZ Empire State transmitter facility.

At the inception of that project, there were plans to ultimately move WKTU from the World Trade Center to the same room on Empire as Z100. The WTC site had somewhat different coverage in Manhattan and a move to Empire would put the station on an equal footing with the other NY commercial stations. The possibility of a large rent increase from the new WTC landlord was also a consideration.

The Z100 transmitter project was completed August 28, 2001. The destruction of the WKTU site 13 days later drastically accelerated the planned move of WKTU to the newly rebuilt Z100 room. Both stations have a pair of Platinum Z10s and operate from the Master FM antenna.

Another advance move Hadden took was to move all the stations to delivering uncompressed digital audio via T1 to each station and relocating processing to the transmitters. This, of course, involved keeping each station's sound highly competitive and to the liking of the Program Directors in the highly competitive New York market.

One of the four Harris Z10s in the WHTZ/WKTU transmitter room

ATTENTION TO ANALOG

With the long range elements in place, the immediate plans toward implementing digital were centered on protecting the existing analog operation.

The term "pioneers walking around with arrows in their back" has been applied to more than one leading-edge technical project. The Clear Channel New York operation can be better described as "pioneers walking around with arrow and bullet-proof vests."

During the considerable advance planning necessary to safely build out the new digital transmitters, everything possible to protect the analog operation was done.

WKTU Equipment racks and Z10CD transmitter.

Hadden points out: "Analog FM is our meat and potatoes," and according to that philosophy everything possible was designed into the system to protect that operation. Independent audio processing is but one part of that philosophy.

PLANNING AHEAD

In addition to the obvious factors – investigation of floor loading for each room, heat load and the availability of enough power (there was a severe power shortage at Empire as TV returned to the building after 9-11) – a concern was being able to achieve proper insertion of the digital signal into the master FM combiner.

After an investigation by ERI of what impact additional signals would have on the safe operation of the combiner, it was concluded that the Clear Channel project would not dangerously degrade the combiner headroom. Fortunately, the combiner also had sufficient bandwidth to accommodate the digital carriers.

However, in the future as all stations go digital new options may be necessary. A possible combiner upgrade to provide a safer amount of headroom for all stations or possibly some form of space combining may be two of several future options.

PREPARING FOR NEW TECH

Digital exciters of any flavor are basically computers, sometimes running on a PC hardware platform. At times these devices can crash. Depending upon the installation, this takes both analog and digital signals down.

With many transmitters having computers as their core, UPS is a necessity.

One way to protect analog is to use an external diversity delay and not require the analog program to pass through the digital exciter. The newest high-end digital audio processors offer the ability to set the diversity delay in the processor and then directly feed the analog exciter. Hadden chose the Omni 6 for this task; it is backed up with an uninterruptible power supply.

Meanwhile, an ongoing research project centers on the best way to deal with a reject load failure. This would cause the digital signal to flow back into the main analog transmitter and take the station down.

Better digital power metering is another issue.

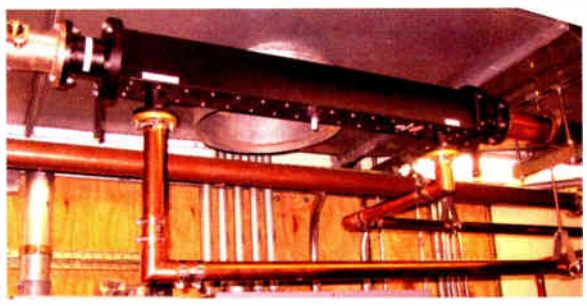
PLANNING PAYS OFF

With all the advanced planning, Hadden says the preparation work and actual install was fairly easy.

At this point in time high level combining was the only practical possibility for the Empire location. The 10 kW transmitters previously put out approximately 8.6 kW for the analog signal, which is above the level a solid state transmitter can operate with low level combining.

With high level combining, the required power increases to 9.4 kW, nearly the full rated output. Three of the five stations are using tube transmitters not capable of low level combining.

ZHD6 digital transmitters are used for WHTZ and WKTU.

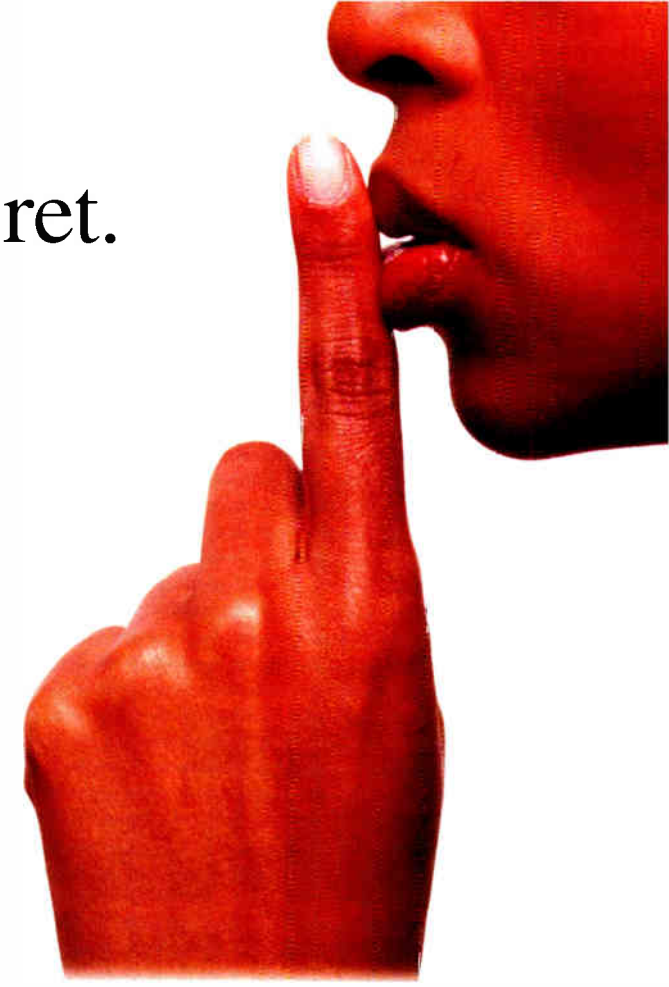


WKTU power injector.

Dielectric power injectors were used for all installations. The injectors have a high level of rejection which was an aid to meeting the emission mask with both tube

(Continued on Page 34)

Our client list is secret.



Every day, more than 750 broadcasters rely on TWOx12 twelve-line phone systems to insure their critical talk radio programming. Two advanced digital hybrids deliver the best caller audio possible, thanks to our famous Digital Dynamic EQ. Status Symbols visual call management (a Telos exclusive) helps producers screen calls easily, without guesswork.

Planning a big, consolidated build-out? Consolidate your phones as well with Series 2101, the world's only multi-studio talkshow system. Series 2101 lets you expand your facility's call capacity when needed — allows control of up to 96 callers and 32 studios. Not only that, Series 2101 uses high-quality digital phone lines to deliver caller audio that's next-room clear (and help reduce Telco wiring, too).

At Telos, we're all about choices. Take our Desktop Director (right); it works with TWOx12 and Series 2101 systems, can be expanded to control up to four hybrids or up to 24 lines when used with Series 2101, and has a built-in handset, speakerphone and headset jack. Or, choose the new Call Controller (left) and "bring your own phone" for screening... even works with wireless phonesets.

ONE-x-Six is perhaps the world's most popular auto-nulling multi-line phone system. Also the world's most affordable! Like all Telos talkshow systems, ONE-x-Six integrates with our optional Assistant Producer software to allow fast, intuitive remote screening via LAN or WAN connections.

Naturally, we are obligated to protect the identity of clients who use Telos talkshow systems. We would no doubt get a Stern warning from any user whose name we revealed.

But rather than Rush to superlatives, let us just be Frank'n get to the point. When you're ready for the world's best talkshow system, the answer is Clear; it's as easy as ABC. Whether your station is located in Salem or Susquehanna, Telos has a broadcast phone system just right for you. Why, the possibilities approach Infinity.

In our eyes, reliability is King. After all, if there's a failure, you can Kiss your ratings goodbye. You need your phone system to be a Citadel of Mega reliability. Not to Mix metaphors, but you need something Hot, Lite on the pocketbook, and full of Power. Really, it's Radio One-oh-one.

And unlike gear with tech as dated as an old Bonneville, Telos talkshow systems undergo constant improvement. With us, it's a never-ending Saga of advancement.

Telos. Striving for Greater Media through advanced technology.

(And don't worry... we'll keep your secret.)

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Transmitter Shack

by Robert Meuser

Continued from Page 32

and solid state transmitters. He says that was one lesson learned by some of his Clear Channel colleagues who were earlier adaptors.

DIGITAL CHOICES

Z100 and WKTU use a Harris Z6 HD for digital transmission while other stations use the BE FMi 301. All stations use the BE FXi 60 exciter and FSi 10 Signal Generator, now located at the transmitter.

BE FMi 301 installed in WLTW transmitter room.

At this time digital is supported via a pretty maxed-out T1 line. In the future as new services are added, another approach to STL will be necessary. Ultimately the Encoder will have to be at the studio if they decide to multicast.

Hadden cites the lack of protected licensed spectrum as an issue that remains to be solved. He is reluctant to become too dependent on unlicensed spread-spectrum systems. Others in New York City have experienced problems with spread-spectrum systems during times of crisis or major events, such as a political convention.

The analog operation is backed up with composite STLs, although they do not back up the digital signals. Hadden says that the situation will absolutely change as receiver penetration grows. Once iBiquity completes some minor changes with the standards, the certification process for receivers will speed up and more radios will be flowing through the pipeline.

Asked about problems with talent and delay, Hadden said it was not a big issue since there was already ISDN delay on remotes for most stations; that plus the universal implementation of profanity delays on all Clear Channel stations makes the point moot.

DISASTER PREPARATIONS

Clear Channel has certainly made a serious commitment to their listeners and advertisers in the New York area by assuring continuity of their bread-and-butter service under all conditions.

WKTU lost minimal air time when their transmitter at the World Trade Center was destroyed thanks to the 4 Times Square backup and Hadden recalls how good he felt at the time of the August 2003 blackout when all his stations were up in full operation – although many other New York City broadcasters learned how vulnerable the telephone system can be in such a situation.

A disaster recovery studio to backup all five stations has been built in a separate location outside the city. It has various means of connecting to both transmitter locations, including spread spectrum, but does not support digital backup at this time.

Additionally Z100 and WKTU share a transmitter of last resort – a wideband 1 kW Harris Quest.

A 1 kW Harris Quest, just in case everything else fails.

The Quest independently feeds a separate ERI rototiller antenna on the lower ice shield of the Empire State Building. It can produce an adequate signal in the event of some catastrophic failure of any part of the main system, including feedlines, switching and patching.

LISTENING TO IT

In summing up his reaction to the final digital product, Hadden says he has been impressed with the HD sound.

When he first turned on the receiver in his office, the analog signal blended to digital and "everything just opened up." Hadden also said that it was "awesome to work for a company to make a commitment early on."

Look for lots more technical innovation to come as Clear Channel and its competitors continue the transition to digital transmission systems.

Robert Meuser, a long time engineer based in New York City, writes on the application of new technology. He can be contacted at robertm@broadcast.net

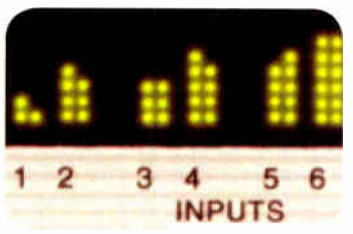
"IP-Audio in New York City? Not on my station."

"Buckley Radio decided to move WOR to a new location, leaving behind studios we'd called home for over 50 years.

"My staff and I had spent months carefully planning new facilities, and we were more than halfway through preparations — then, the rug got pulled from under us.

"Quotes to build new studios were astronomical! I had to cut our equipment budget *in half*. And the huge amount of syndicated, network and local programming WOR produces *demanded* digital audio routing and consoles.

"I'd heard that the Axia IP-Audio system could give us the high-end features we needed. And they said our budget wasn't a problem; Axia costs less because they use standard Ethernet for audio routing instead of expensive proprietary mainframes.



"Using Ethernet for Audio was certainly new and different, and I had some concerns. But moving from cart to PC was a big change, too — and for the better. In our industry, change is natural.

"The more I learned about Axia, the more impressed I became with their routing switcher and consoles, and how well their network topology was designed. I began thinking that this Ethernet stuff might just work!

"So I decided to break new ground and order the Axia consoles and routing setup, nine studios worth. It's been on the air half a year now, and we love it. Our operators keep raving about how easy things are to operate. Even our listeners tell us how good WOR sounds.

"And from the day the Axia surfaces, engines and IP-Audio nodes were hooked up, we've had zero downtime. Zilch. Zip. Nada. Axia works — end of story."

— Thomas R. Ray III, CPBE, Vice President / Corporate Director of Engineering, Buckley Radio

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Tech Tips

by Alan Alsobrook

Do Not Forget Those Hidden Batteries

How would you feel if a forgotten 39-cent part took your station off the air?

Unfortunately, this is an all-too-possible situation, the result of some pesky little battery – buried deep in some piece of equipment – failing and leaving the station off the air.

BALKY CONSOLE

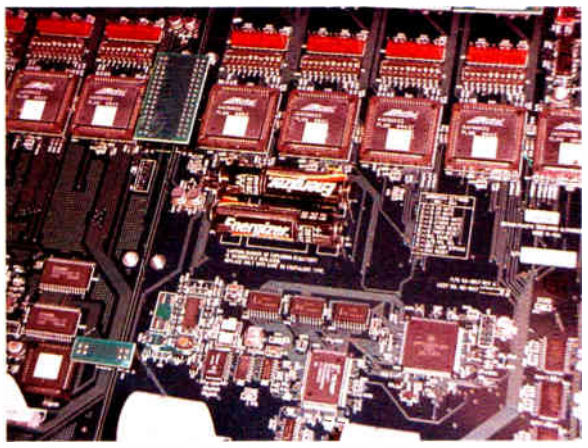
I most recently experienced this with a Harris Impulse console in use at a station about 30 miles away for which I do contract work.

There had been a power failure and when the console came back up all of the console logic appeared to work just fine, except it would not pass any audio. Over the phone, I had station personnel reboot the console, but that did not work – the station was still silent.

Once I arrived at the station and opened the console, the batteries jumped into my field of vision. I changed them out and powered down again, but once more there still was no audio. What I had to do was power down *with the batteries removed* before the console would return to service.

Thinking over the difficulty I experienced getting the console working again, I would surmise that with the batteries in a run-down condition an invalid logic state was saved; even though the console was powered down, the invalid logic was retained. Only after removing all power – including the batteries – was the console system able to do a proper power on reset and return to operation.

You can be sure regular replacement of the batteries will be on my maintenance list from now on.



Backup batteries on the Harris Impulse motherboard.

EAS CLOCK HASSLE

The Sage ENDEC is another prime example of a battery that needs to be changed on a regular basis. These units started coming out in 1997 and about now all the CMOS clock batteries are going belly up. The primary symptom is a flashing light on the front panel and a date that jumps back to 1995 and cannot be updated.

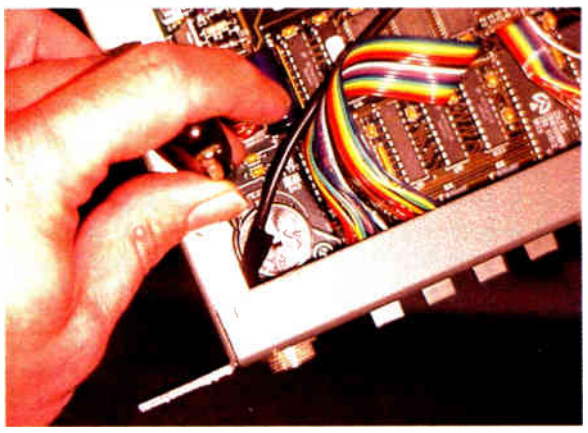
This battery looks a bit intimidating to change but it is actually quite easy. Just pry in towards the front center of the unit and slide the new one in from the direction the old one came out.

The more difficult aspect with the Sage is getting the battery. It takes a CR 2330, which does not seem to be available at any of the local stores around here. I had to order in a bunch of them from one of the supply houses.

NO BATTERY, NO RF

Another place to look is in your transmitter. It has been a long-standing joke among engineers about the 9V battery that "appears" to run some transmitters. If you have one of the newer transmitters from Harris, BE or even Nautel, it most likely has a battery in there doing some sort of memory backup.

On a Harris DX-10 (3 Carbon Zinc AA's) when the battery dies and you try to turn it on after a power failure it looks like it comes on but you get no RF. The loss of the battery kills the memory of the previous power level, resetting it to "0."



Change the battery before your EAS box starts acting up.

This is easily fixed – just hold the "raise" button long enough to bring the power back up to the proper level. For a remote transmitter, this situation will most likely trigger a trip out to the shack to see why the transmitter did not come back up correctly. The question is: when you figure it out, will you have a spare handy or will it mean a trip back to town to get a replacement?

When was the last time you replaced those batteries? Do you even remember? If not, it is probably time to change them. Perhaps we all should add changing the batteries to our yearly schedule, along with replacing of all the smoke detector batteries.

Alan Alsobrook is a contract engineer based in St. Augustine, FL. His work kit contains a selection of batteries. Contact Alan at radiotech@bellsouth.net

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SS 16.16

The SS 16.16 provides audio routing of 16 stereo inputs to 16 stereo outputs. This type of routing allows any one stereo input to be assigned to any/or all stereo outputs. The SS 16.16 may be controlled via front panel encoder controls and/or a multi-drop RS-232 serial port. A 40 x 4 LCD back lit display provides for input descriptions and macro setup. Additional features: headphone amplifier with front panel jack and level control, front panel monitor speaker with mute switch and level control, internal audio activity/silence sensor with a front panel ACT indicator and rear panel open collector, and a 16 GPIO port. FREE Windows NetSwitch remote control software, which supports Serial, USB and Ethernet with the optional ESS-1 Ethernet to serial converter, is available for download. Installation is simplified with plug-in euroblock screw terminals.

SS 16.4

The 16.4 provides matrix audio switching of 16 stereo inputs to 4 stereo plus 4 monaural outputs. Matrix switching allows any/or all inputs to be assigned to any/or all outputs. The SS 16.4 may be controlled via front panel switches, contact closures, 5-volt TTL/CMOS logic and/or the multi-drop RS-232 or RS-485 serial port along with 24 GPIO's and input expansion port. Installation is simplified with plug-in euroblock screw terminals.

ACS 8.2

The ACS 8.2 provides matrix audio switching of 8 stereo inputs to 2 stereo plus 2 mono outputs. Any input assigned to output one has fading capabilities. Matrix switching allows any/or all inputs to be assigned to any/or all outputs. The ACS 8.2 may be controlled via front panel switches, contact closures, 5-volt TTL/CMOS logic and/or the multi-drop RS-232 serial port along with 16 GPI's, eight relays, eight open collector outputs, and input expansion port. Installation is simplified with plug-in euroblock screw terminals.

SS 4.2

The SS 4.2 provides matrix audio switching of 4 stereo inputs to 2 stereo plus 2 mono outputs. Matrix switching allows any/or all inputs to be assigned to any/or all outputs. The SS 4.2 may be controlled via front panel switches, contact closures, 5-volt TTL/CMOS logic and/or the multi-drop RS-232 serial port along with 16 GPI's, eight GPO's, and input expansion port. Installation is simplified with plug-in euroblock screw terminals.

SS 8.2

The SS 8.2 provides crosspoint switching/routing with 8 stereo inputs, 2 stereo plus 2 mono outputs. 3 switching modes, I/O trimmers, internal silence sensor, selectable headphone and powered speaker level controls and outputs. LED VU meters, 16 GPI's, eight relays and eight open collector outputs. Multi-drop RS-232 and RS-485 serial ports, plug-in euroblock screw terminals and input expansion port .

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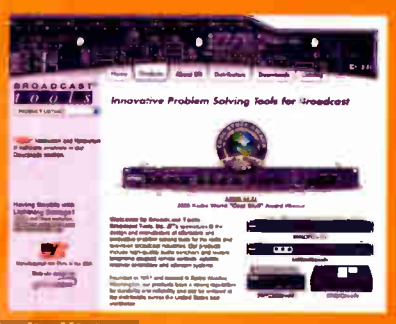

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The Case of the "Possessed" Transmitter

Usually, when you turn a transmitter off it should stay off. Right?

So how would you feel if, after pulling the lever on the disconnect box, a blower motor suddenly started up and the transmitter began running again, indicating high voltage? You might wonder momentarily if it could be "possessed."

Rod Zeigler, Chief Engineer of the Salina Media Group in Salina, KS, might be excused if he began wondering just what was going on when he and his Director of Engineering decided to look inside one particular transmitter, shortly after he started his new job.

Rod relates: "Upon my first visit to this site I found this mess:"

A curious transformer and a lot of "stuff" hiding in a rack.

"This was one of many such things in this group, but the station was on the air, and stable. I had bigger fish to fry at this time so I quietly backed out and hoped for the best."

SURPRISE!

"When our Director of Engineering visited for our first tour of the sites together we wanted to look inside this transmitter to see what else was going on. We shut off the plate and filament, threw the breakers to the transmitter. But as we started to open the back door, we heard the generator come on, and found the transmitter indicating half the normal high voltage!"

This certainly would be enough to unnerve most any cautious engineers. What was going on here? Were they trapped in some sort of Grade B horror film scenario? The answer was both less and more frightening. A previous engineer had kludged together a home-brew circuit to cope with power failures.

A sort of outboard "PA blower."

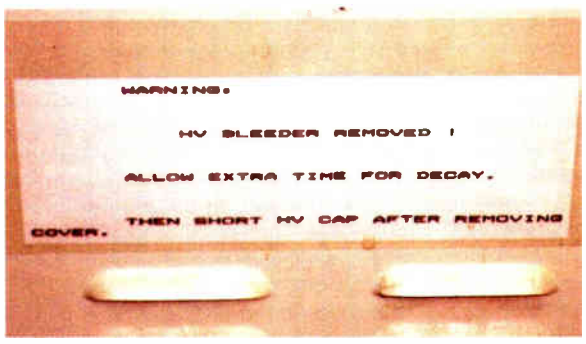
Rod said: "What this conglomeration was doing was putting the transmitter at half power whenever there was a power failure and the single phase generator came on line, basically changing the transmitter from 3-phase operation to single phase."

There was even a single phase blower sort of jammed up into the back of the transmitter.

FIGURING IT OUT

Rod continues: "Plans were made at that time to get this taken care of. It took six days of work and parts ordering/receiving, but the transmitter is now back to normal with all upgrades installed.

"Oh, and Documentation? Original prototype drawings glued to the wall, with few, if any, of the later modifications included." And then Zeigler discovered a notice taped to the transmitter that instantly made it clear that it was dangerous to touch anything.



Not quite up to GEP standards.

"It always amazes me at what some people will do to kludge a system. It is stunning when you see the interlocks bypassed and safety features set aside," he says.

At least Zeigler got an unexpected benefit from this experience: "One good thing came of all of the modifications that we removed: I did not have to put sandbags in my engineering pick-up this winter. Just loaded a few of the pieces and got around quite nicely, thank you!"

Thinking back to the series of events begun when a transmitter he thought was completely shut down instead stirred back to life, Rod summed it all up quite succinctly: "Wow! Quite a trip!" – *Radio Guide* –

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Tool Guide

Test, Tools, Tips and Applications

Triplett Model 3271 TDR/Cable Fault Finder

Anyone who has ever worked on troubleshooting a fault in a high power transmission line is keenly aware of the value of a TDR (Time Domain Reflectometer). In layman's terms it works like "radar," transmitting a signal down the line and measuring the return time of reflections to gauge the distance to a fault or termination. Similar units are available for cable TV installers and other specialized applications but whatever the use, a quality TDR can typically cost several thousand dollars or more. That price can easily be justified when the cost of digging or hiring a tower crew to search for what may not be a visually obvious defect can be minimized or eliminated.

Now there is an affordable TDR for performing the same type of analysis on audio cable, structured cabling, common coax, telephone lines, or any other type of common studio wiring. This can be an invaluable tool when troubleshooting a fault in wiring that may be in walls, conduit, above the ceiling or under the floor, one of many cable bundles on a ladder, or generally anywhere that access is limited.

Triplett is just introducing their Model 3271 TDR, Cable Fault Finder. It has an internal library of 39 different cable types (including CAT-5 Shielded and Unshielded, Coax Solid, Coax Foam, RG-6, RG-58, RG-59, Twinax 78 & 100 ohm, and several types of Twisted Pair, to name only a few) each with their unique VP (Velocity of Propagation) which will support use on virtually any wiring found in the typical broadcast facility. However, if you do find a type that is not in the library, or for use on cabling that may be introduced in the future, the VP setting may be manually entered – from 0 to 99%. (Most cable manufacturers list the VP value of every applicable product in their specification sheets and websites.)

Or, here is a trick: you can manually determine the VP of any cable type by experimenting with a sample of predetermined length and adjusting the TDR's VP setting until you achieve the correct reading. Once the distance to a fault is determined, the TDR's 810-1110 Hz oscillating tone can be used as the "Fox" (signal generation) part of a Tone & Probe Kit to home in on the actual location.

Operation of this TDR is one-handed, and readout of both the cable type/VP setting and results of test are on a LCD display. The range of measurement is 2,500 feet to 6,400 feet, dependent on the cable type under test, with an accuracy of 3% over distances greater than 200 feet. It uses a standard 9V battery, battery life is estimated at an average 2,000 measurements, and at just 8" x 3" x 1.5" and 8 ounces it is small enough to fit easily in your tool bag, or to hang on the belt.

So the next time that you are planning a studio project, remodeling, or expansion – and you know that you are going to be tasked with finding a short or open at some point – what is your time worth? At under $200 (and that includes the carrying case), this TDR can save plenty of that valuable time. – *Radio Guide* –

Triplett Model 3271

Consultant Guide

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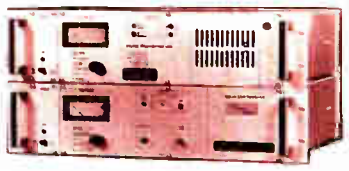
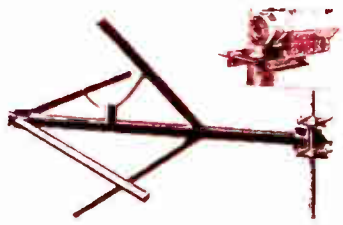


Both Transmitter and Receiver

$3,500.00

Broadband FM Antennas



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	5 kW	1982	Harris MW5A
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	12 kW	2000	Nautel XL12 ***Solid State***
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	2.5 kW	1984	Continental 814R
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	10 kW	1988	BE FM 10A
	10 kW	2001	Henry 10,000D-95
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	20 kW	1978	Collins 831G2
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	25 kW	1982	Harris FM25K
	30 kW	1986	BE FM30A
	35 kW	1990	Continental 816R-5B
	50 kW	1982	Harris Combiner *(w/auto exciter-transmitter switcher)*

Miscellaneous Equipment

USED MISC. EQUIPMENT:

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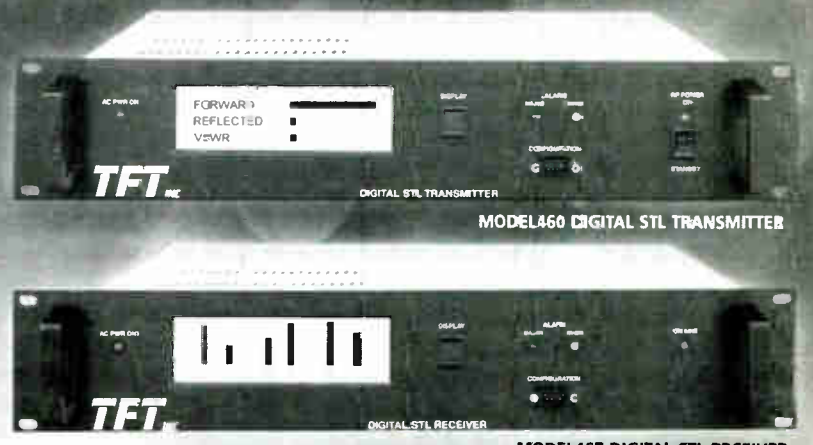

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Gear Guide: RPU, STL, Wireless Remote Control, Monitors

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XLink is Armstrong's newest generation of field proven STL systems. This microprocessor controlled system is frequency agile with improved sensitivity and better selectivity.

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XLink is backed by Armstrong's one year part and labor warranty, our 24/7 technical support and our emergency loaner program.

Five XLink systems were bought by United Radio Broadcasters of New Orleans to serve as a link between the Baton Rouge studio and transmitter facilities in New Orleans after Hurricane Katrina.

Belar

FMHD-1 – Precision Digital FM HD Monitor

www.belar.com • 610-687-5550

The Belar FMHD-1 is a state of the art HD radio monitor based on the latest decoder from Ibiquity The monitor decodes both HD and analog signals simultaneously, displaying HD radio status, data, time alignment, and configuration information, as well as audio metering and RF/audio spectrums.

The FMHD-1 currently supports monitoring multiple audio streams and simultaneous monitoring of two streams with an optional second plug-in HD decoder.

The units have 8 user assignable analog audio outputs, and 3 assignable optical AES/EBU outputs to provide support for a wide variety of broadcast scenarios, including Tomorrow Radio and 5.1 Surround Sound.

In addition to an antenna input for monitoring off the air, the FMHD-1 has two high level RF inputs for transmitter site operation. The dual RF inputs allow for monitoring at installations using two transmitters to generate the combined Analog/HD signal. The FMHD-1 is compatible with the Belar Wizard Software.

Bext

CDXE & CDXD – Codecs

www.bext.com • 888-239-8462

The Bext CDXE & CDXD codecs pair is an elegant solution to digitally enhance a standard STL System. It is designed to operate with the Bext LD STL Series (factory IF modification required) or with other STL Systems that are sufficiently wide to meet the bandwidth requirement to pass the digital stream.

Perfect for difficult paths or for multiple hops where the digital audio is preserved regardless of the number of hops, these codecs are available for either two or four digital channels and offer minimal latency and much higher immunity to noise and interference when compared to analog links. Automatic muting is provided in case of sync loss.

The two channel pair has one additional Auxiliary Data Channel; the four channel has two additional Auxiliary Data Channel.

Broadcast Electronics

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While existing wireless and terrestrial studio-to-transmitter links (STL) will remain an appropriate program and data transport choice, many radio stations and networks are seeking new options.

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With up to 45 Mb/s bandwidth, Big Pipe has the capability to deliver your main channel audio at full 44.1 kHz or 48 kHz sampling rates, HD Radio coded audio, HD Radio Secondary Program Services and advanced HD Radio data services for multiple transmitters-while additionally providing Ethernet connectivity, serial data, video and telephone connections to your remote site via wireless or wireline path.

Big Pipe's bidirectional link eliminates the need for separate telemetry, communications and backhaul links.

Broadcast Tools

WRC-4 – Web-Based Remote Control

www.broadcasttools.com • 360-854-9559

The WRC-4 is a fresh approach to remote site monitoring and control, or providing an inexpensive solution to Internet-enabling your present remote control system. The WRC-4, combined with web access and your favorite web browser, brings you the following features all available in this small, but powerful tiny TOOL: A powerful built-in web-server; 10/100baseT Ethernet port; four each channels of 10-bit analog inputs; optically isolated status (contact closures) inputs; SPST relays; open collector outputs; front panel status indicators and a single front panel temperature sensor.

The WRC-4 is supplied with plug-in Euroblock terminals and loaded with a generic web page that may be edited by the end user. Multiple WRC-4's may be used with a user provided Ethernet hub. The WRC-4 may be set on a desktop, mounted on a wall or up to four units mounted on the 1-RU, RA-1 shelf.

Gorman-Redlich

CMR – DA Digital Antenna Monitor

www.gorman-redlich.com • 740-593-3150

The Model CMR is a state of the art instrument of unequalled accuracy and stability, at a price comparable with analog monitors. With typical modulation, the CMR's true ratio readout is a factor of 10 more stable than instruments that measure normalized amplitude, and its phase readout is accurate, rock solid, with automatic phase sign. Practically, these features mean quick, accurate log or remote readings. The CMR is fully remoteable, using standard remote control equipment.

The CMR's outstanding performance and reasonable price make it ideal for new DA installations or for modernizing the instrumentation of existing stations.

True Ratio reading: Non-Reference and Reference amplitudes are separately measured and divided electronically to give an accurate digital reading that will not vary with carrier level, and is exceptionally stable under conditions of deep, unsymmetrical modulation.

Gear Guide: RPU, STL, Wireless Remote Control, Monitors

Inovonics

Model 520 – AM Mod-Monitor

www.inovon.com • 831-458-0552

The Model 520 from Inovonics is a simple and accurate AM Mod-Monitor, and includes a synthesized, frequency-agile preselector that tunes in 10 kHz increments across the band. If a hunk of wire stapled to the wall is not a sufficient antenna, the firm offers an optional amplified ferrite-rod antenna that is phantom-powered by the monitor for rooftop or other low-noise remote location. The 520 also features an untuned high-level input for direct connection to the transmitter or ATU and a balanced, NRSC audio program output.

Positive and negative modulation, plus the incoming RF level, are displayed on a high-resolution LED bargraph meter. One set of peak flashers is set at +125% and -100% modulation, and a second set may be user-programmed for other values. The peak flashers and alarms for loss of carrier and loss of program audio also give back-panel ground closures.

Moseley

Lanlink 900D – LAN Extender/Data Link

www.moseleysb.com • 805-968-9621

Create a data link to the transmitter site with Moseley's Lanlink 900D. Whether for HD Radio™, RBDS, transmitter remote control, off-premises servers, or surveillance video, Lanlink provides bidirectional Ethernet and RS-232 communications.

HD Radio installation is more efficient with Lanlink transporting the Supplemental Audio Channel for Multicasting and the Main Digital Program as a data stream. This reduces the number of audio channels required in the STL and allows the audio processing and encoding to remain at the studio.

Lanlink operates in the 900 MHz ISM band so no license or coordination is required. And it is so close to the 950 MHz STL band you can duplex into your existing antenna system eliminating additional antennas, tower leases and loading issues.

Users who install Lanlink are quick to locate a computer at the transmitter site for Internet and email access too, a real time saver.

OMB

MT/MR Platinum – Studio Transmitter Link

www.omb.com • 305-477-0973

OMB has recently introduced to the market its new model MT/MR Platinum STL system. The transmitter has a power output of 20 W (twice the RF power than the earlier models), it is microprocessor-controlled and has an LCD display for parameter selection and readings; it is externally synthesized, and very easy to work with. The receiver, with same easy to use features, offers double-conversion for very clean reception. It is designed for frequency bands from 200 MHz to 400 MHz and 900 MHz in band blocks of 20 MHz.

OMB provides a delivery lead time of about three days, and a continuous stock of spare parts and technical support. OMB STL systems offer quality signal transmission, and reliability They are well designed throughout, and are offered at a reasonable price.

Sine Systems

RFC-1/B – Remote Control System

www.sinesystems.com • 615-228-3500

The RFC-1/B is an affordable, full-featured transmitter remote control system that can be accessed through a standard telephone or cellular phone. Readings are reported with a natural sounding human voice. A basic system consists of an RFC-1/B and an RP-8 Relay Panel that provides eight channels of telemetry and raise/lower control. Up to eight relay panels can be connected for a maximum of 64 channels. The RFC-1/B can be programmed to perform power/pattern changes and take readings automatically.

It can also be programmed to alert station personnel during an alarm condition. Several accessories are available: For surge protection on the telephone line and telemetry signals use the SP-8 Surge Protector. Model RAK-1 provides battery backup, printer port and data modem. Use model ACM-2 for tower lights.

TFT

5200 Series – Frequency Agile STL

www.tftinc.com • 408-943-9323

The new 5200 Series of STLs from TFT features true front-panel frequency agility for any frequency in a given STL band without need for adjustment of any kind. The Model 5290 Transmitter has a 20-Watt output, and the companion Model 5291 Receiver can be either mono or composite. TFT began shipping units in October.

The 5200 Series is ideal for a low-cost system or a stand-by for an entire cluster of stations because both transmitter and receiver can be set to any frequency by personnel with minimum technical skills. No adjustment or test equipment is required for a frequency change.

Although 20-Watt systems will initially be available, powers up to 40-Watts will be offered. MUX and SCA packages are also available, and an automatic switchover circuit is standard in the receiver.

WIT Inc.

easi-8 – Monitor and Control System

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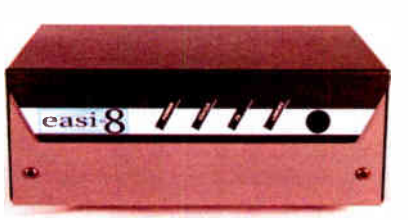

This is the box they are all talking about. The easi-8 was designed with universal inputs so it can monitor many types of equipment without the need for complicated external interfacing circuitry. Gone are the days when you had to deploy external isolation amplifiers, voltage dividers, and other circuitry necessary to "feed" a traditional equipment monitor with a ground-referenced DC voltage.

Each input channel contains a balanced, differential, auto-ranging instrumentation amplifier with a wide range that can sense AC and DC voltages. A 16-bit A/D converter operates at full scale over the auto-selected gain range. Because the input amplifiers are true differential amplifiers, you can measure signals which are not referenced to the chassis ground. You can feed most signals directly into an easi-8 with virtually no external wiring or signal-conditioning circuitry. The easi-8 takes the "fuss" out of monitoring.

Service Guide: Radio Equipment Products and Services

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Final Stage

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From Our Readers

Radio Guide:

My question is regarding the Marantz PMD 660. [***Radio Guide***, Sep-05, Page 26]. I've been reading about it and considering buying one. I'd like to know your opinion on the product. Also, would you happen to know what a 1 GB flash card costs?

How rugged is the unit? What are the downsides?

I've been using my old trusty Radio Shack recorder(s) for years. I want to take a step up and this unit seems to fit what I need.

I look forward to hearing from you.

Thanks!

J.P. Skelly, News Director
KORN Radio – Mitchell, South Dakota

Author John Devecka Replies:

I got 1GB cards at Best Buy for $85. You can do a bit better shopping around; I needed them immediately so paid a bit more. Try www.newegg.com as they usually have excellent prices for computer stuff.

The units seem reasonably rugged, considering they are basically all plastic now; the connections are recessed a bit so they should not be as readily banged up, and the buttons seem decent enough. Nothing, in my opinion, is as rugged as it used to be for field work. I have students using PMD222 decks for their intro to radio class and they hold up very well. I suspect that the PMD660 would be more likely to get chipped or have its LCD display cracked in their hands.

We have got pretty responsible kids handling the 660's and they have not had any problems.

The biggest concern is the microphone preamps, which seem to be more of an issue for some people: www.transom.org has a number of discussions about the preamps.

I think it depends on what kind of microphones you are using. I haven't run it in the field with phantom power, but was planning to try. Since I got ours, I have lent them to others on campus and there are at least three folks that have bought them.

It is nice that you can use it as a USB drive, but it is unfortunate that you have to have the AC connection in place to do that. Of course, I just use a PCMCIA card frame and stick the card in my laptop. You can do that in the field pretty easily and edit it fast with something like Audition.

It is also nice that you can drag n' drop files off onto a CD burner and make backups easily.

My students have had good success using it in the field; we have not broken one yet, and the recordings are good. I would call it a success. There is one caveat: they all know that I *will* make them pay for any damage to the unit, so maybe they treat it better.

You might even be able to get one of the dealers to lend you a demo model if you are thinking of buying several. I bought mine from Broadcasters' General Store (Dave Kerstin) for $470 each.

John Devecka, WLOY Operations Manager
Loyola College – Baltimore Maryland

Radio Guide:

I enjoyed reading Kevin Kidd's article on "Using the GM as as Assistant Engineer." [***Radio Guide***, Oct-05, Page 34] It brought back memories of many years ago when I was the responsible on-site person for a contract engineer.

I started off with nothing but the outside-the-box stuff, then got to the point where I could be trusted with some of the inside-the-box stuff as well. From there I was interested enough in Broadcast Engineering that I started pursuing it seriously. Possibly this could be an avenue for attracting more engineers, as well as better serving clients.

The only thing that struck me as curious about the article was having "Using the GM as an Assistant Engineer" followed immediately by "Making a Dummy Work for You."

Mark Tomlonson
Chief Engineer, WMUK/WIDR
Kalamazoo Michigan

BROADCAST LINK OF THE WEEK

from Telos Systems

If you are a phone system freak like many of us are (that's freak, not phreak), check out Albert LaFrance's tribute to the Bell System's Long Distance network at **www.long-lines.net** There is a lot of historical information and photos about the L1/L3 coax networks, the radio repeater networks, much from AT&T's own publications, and off-site links to microwave data as well. Cool stuff! Props to Bob Gonsett of the CGC Communicator for passing along this link.

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