Radio Guide

Radio Technology for Engineers and Managers

October 2005

Disaster Planning Speeds Recovery

Inside Radio Guide

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Gulf Coast Radio Recovering After Katrina

One of the things man is just unable to control is the weather. Storms, hurricanes, tornados, and floods happen. However, as keys sources of local news and information, broadcasters need to have plans to survive natural disasters and resume operations as quickly as possible. The arrival of hurricane Katrina on the Gulf Coast in late August stressed even the most carefully laid out plans. Can we learn something from how Gulf Coast radio handled itself?

Even before Katrina slammed into the Gulf, major broadcast groups put their contingency plans in action. Working through the head offices of some of those broadcast groups, ***Radio Guide*** has been able to assemble a few of the behind-the-scenes stories, which might be helpful for future planning at your facility.

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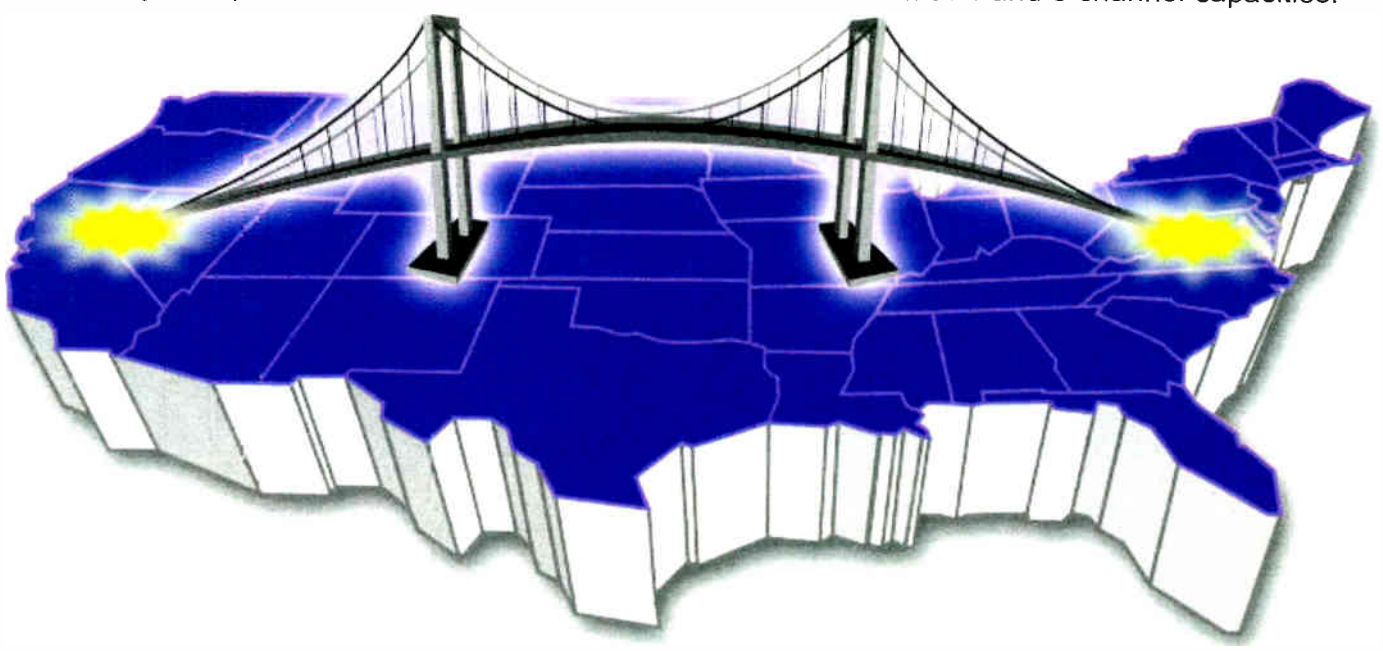

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Cover Photo: Michael Alan (WTKC, Entercom) on left, and Sheldon Williams (KHEV, Clear Channel) running the board and screening calls in the make-shift master control room for United Radio.

Photo Courtesy of: Troy Lanham

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Radio Waves

by Barry Mishkind – Editor

Disaster Planning Proves its Worth

Just as we went to press last month, Hurricane Katrina smacked the Gulf Coast. Then Hurricane Rita followed up with more wind, water, and destruction. Anyone who has paid attention to the news from Florida to Texas over the past month has certainly sympathized and agonized with the people trying to recover from the storms.

One thing the millions of storm victims needed was information. Those radio companies that planned ahead were able to serve both figuratively and literally as a life-line to their audience – most especially when they directed rescuers to those still trapped by floodwaters.

Our cover story (**Page 4**) this month discusses not only the plans some broadcasters put into place to deal with these disasters, but how those plans were modified – sometimes greatly – under the realities of dealing with the actual events. Of particular note is the many stations that dumped their normal formats and went with 24/7 coverage of local issues.

Furthermore, it was heartwarming to see engineers (and manufacturers) from all over the country offering assistance and equipment, often spending hours finding ways to get help delivered.

On the other hand, there were stations off the air for weeks, sometimes because of a lost tower or transmitter building, but others for lack a generator – or a plan.

A plan is necessary. Just because you have driven a car for five decades without an accident does not mean you do not need insurance. In broadcasting, auxiliary sites, generators, even partnerships with other companies are the insurance policies that keep stations broadcasting during critical situations.

Radio Guide salutes the many broadcasters – Clear Channel and Entercom in particular – who had disaster plans and rushed people and supplies into the affected areas to reestablish radio service as soon as possible. – *Radio Guide* –

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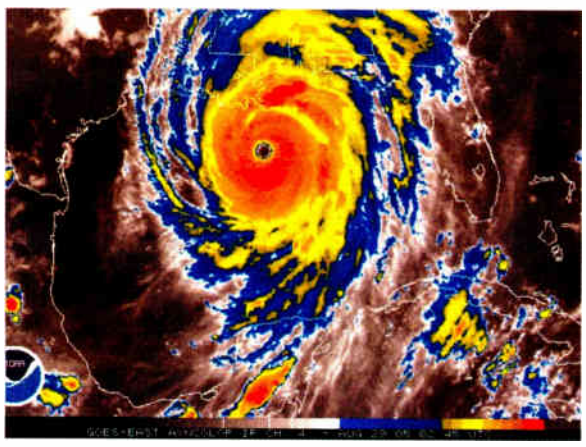
UNITED RADIO from New Orleans

Gulf Coast Radio:
Recovering After Katrina

by Robert Meuser and Barry Mishkind

One of the many things man just cannot control is the weather. Storms, hurricanes, tornados, and floods happen. However, as key sources of local news and information, broadcasters need to have plans to survive natural disasters and resume operations as quickly as possible. The arrival of Hurricane Katrina on the Gulf Coast in late August stressed even the most carefully laid out plans. Can we learn something from how Gulf Coast broadcasters handled themselves?

Even before Katrina slammed into the coastal cities, major broadcast groups put their contingency plans in action. Working through the head offices of some of those broadcast groups, ***Radio Guide*** has been able to assemble a few of the behind-the-scenes stories, which might be helpful for future planning at your facility.



August 29th Katrina ready to strike.

Throughout the Gulf Coast region, hundreds of stations were knocked off the air, towers downed and studios drowned, as the hurricane moved though. As many as one hundred stations were still off the air a week after the storm, along with a large part of the telephone (landline and cell) systems.

QUICK REACTION

The Federal Communications Commission was quick to respond to the situation by issuing a Notice delaying or relieving stations from many of the reporting and application requirements as they struggled to get back on the air. Applications received from the area containing all the information the FCC needed were reported to be turned around within 24 hours.

In many locations air staffs were pulling long and arduous shifts, trying to get information out to the victims of the hurricane: everything from reporting the damage to where to find food and assistance to announcing names of people looking for family members.

Real pressure was on the engineering community to find a way to get into some areas, assess the damage and get signals back on the air. It was not an easy job, since virtually nothing was available locally, from parts to fuel to food to beds.

Help came from all over. Engineers from as far as the Pacific Northwest arrived to assist any and all stations in the devastated area. Various Internet mailing lists sparked with offers of assistance. One station even offered to provide an entire transmission system, transmitter, coax and antenna, remote control, etc., completely retuned, to get a New Orleans station back up.

A PLAN IN PLACE

Clear Channel Communications has an ongoing, developing corporate plan for emergencies, including hurricanes. Both personnel and equipment is always at the "ready."

Part of the standard operating procedure is evacuation of stations in the impact zone before the storm arrives. Stations are put into 24 hour news/info mode and a Clear Channel Premier Network Channel is established as the program source. All stations in hurricane-prone areas have a post-console Starguide receiver to pass the network in an evacuated station.

Assets are leveraged across the entire company as needed. As an example, Clear Channel uses crane trucks from the Outdoor division to move fuel where needed.

Clear Channel Outdoor trucks provided a way to get much needed diesel fuel, gas and other heavy items into the disaster zone.

Then, response team members and material are staged outside the impact area and wait until the storm has passed before moving men and materials.

MOVING INTO ACTION

Once the storm passes, engineers triage via conference call, do a roll call, find out what is down and mobilize the appropriate resources to get stations back on the air.

The Clear Channel Radio building in Biloxi is located approximately 1/2 mile from the coast; it survived the storm with moderate damage, but 80% of the shingles on the roof were lost and water damage from wind-driven rain and roof leaks threatened continued operations. Giant tarps from the Outdoor division saved the day.

In addition to the engineering assistance, programming people from Clear Channel stations around the country were mobilized to come and assist the local staff, allowing them some rest time.

Clear Channel Outdoors furnished tarps from old outdoor ads to repair the studio roof as well as some employee's homes.

Clear Channel's Biloxi air staff was augmented by programming and news personnel coming from all over the US on the air giving out important information for listeners.

In addition, provisions were made to support the entire gathered staff, including food and shelter as needed.

One of the local Biloxi employees' moms came from Texas and cooked a hot meal for everyone at breakfast and dinner.

Of course, many stations – large and small – have plans for dealing with storm and other emergency situations. For some, it is little more than boarding up the windows, just like the rest of the population. Others have "hardened" studio sites, or perhaps an auxiliary studio well inland. Nevertheless, reports indicate that more than a few stations' studios were highly damaged. At least one cluster found themselves with only one operable console.

Manufacturers all over the country began shipping gear in to replace damaged items. Sometimes they had to be trucked long distances from the point of delivery into the disaster zone.

Still, it is the comprehensive planning by the larger companies that provides some of the most instructive concepts others might well adopt.

MULTIPLE PROBLEMS

In the specific case of Katrina, broadcasters had to contend with two separate situations. The first was the storm itself affecting three states, and then the second being the flooding of New Orleans.

(Continued on Page 6)

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Direct storm damage was worst for Clear Channel in Hattiesburg, Mississippi. Three towers were either downed or damaged. One was the studio STL tower which took out a common program feed. Another was a thousand-foot FM transmission tower; the AM tower for WFOR AM was damaged and not usable for other emergency transmission facilities.

Katrina smacked the WUSW/WNSL tower right down to the ground.

In the case of the thousand-footer, conditions in the area were so bad for transportation and communication that it was not known that the tower had in fact fallen until Thursday Sept 1st.

The stations came back on by whatever means possible. In this case it was a combination of an ad hoc STL, some off-air relay and the use of a truck-mounted Harris Z5 built for such emergencies.

Crews quickly installed satellite downlinks to connect the stations with the outside world, both for communications and program channels.

PUTTING THINGS BACK TOGETHER

Other stations had the general aftermath of the storm to deal with such as lack of telephone and power. In Biloxi, Clear Channel's staff found most of their STL dishes survived intact and aligned, but the RPU yagi used for incoming reports was found in the parking lot of a nearby gas station.

Tower crews quickly installed new DB224 and DB408 antennas and the new 7/8 heliax after the storm so that reports from the Emergency Operations Center and other locations could be broadcast live.

To restore communication with the outside world, Clear Channel set up VSAT terminals to provide data and IP telephone connections for several days until normal telephone service was restored. In Biloxi, service restoration was helped by being right across the street from the phone company offices – they were able to string a fiber cable right through the storm drain under the road.

A Y[illegible] used for [illegible] was found in [illegible]

Visiting Clear Channel engineers repair an audio connector for a news reporter.

Satellite links ran the phones until local lines could be strung, literally under the road.

SUPPLYING PEOPLE NEEDS

With all the personnel coming from around the country, and housing being in very short supply (some reports indicate there were no vacant hotel rooms available for sixty miles or more), broadcasters like Clear Channel brought in recreation vehicles, many with their own separate generators, to house and support the staffs of those stations as needed.

Another important issue was part of the plan: personal security. At Clear Channel Biloxi, private security was on site 24/7, brought in from as far as sixty miles away; there was one guard during daylight hours and two guards at night.

In such severe conditions, corporate planners decided it was very important that personnel working at the stations felt safe and could work without being distracted by worrying about anything going on outside.

Engineering and IT personnel from all over the US were brought into Biloxi and other affected cities to assist in keeping the stations on the air after the storm.

DEALING WITH FLOOD WATERS, AND WORSE

New Orleans presented a difficult situation for broadcasters. Recovery there began by following the standard plan, but as the rest of us saw on television, the situation deteriorated rapidly. Broken levees around the city resulted in 80% of the city being flooded with water and sewage from several inches to twenty feet deep.

A wet blanket covers Downtown New Orleans

The major news outlet for the city, 50 kW News/Talk WWL, is operated by Entercom. The WWL reporters were providing listeners with all the information possible in the aftermath of the tragedy. As with Clear Channel, they have plans in place to deal with such disasters.

Entercom had arranged for enough food for fifteen staffers to "weather the storm." However, as people fled the hotels and other areas where flooding first started, WWL soon found themselves with fifty people on site.

When the decision was made to evacuate their studio complex (located by the Superdome), WWL studios operations were transferred to the Jefferson Parish Emergency Operations Center. At that location there was a pre-installed STL link capable of feeding the WWL transmitter.

Coordination of the Entercom operations was via a "war room" established in Seattle for that purpose. It was staffed by Marty Hadfield and Ken Beck as the two prime decision makers for engineering and programming respectively.

As the situation worsened and the flooding of the city began, the crisis became much bigger than the aftermath of a typical hurricane. Clear Channel studios were put in auto-mode and vacated. Their staff was evacuated by helicopter, a service offered to the Entercom folks so they could get out as well.

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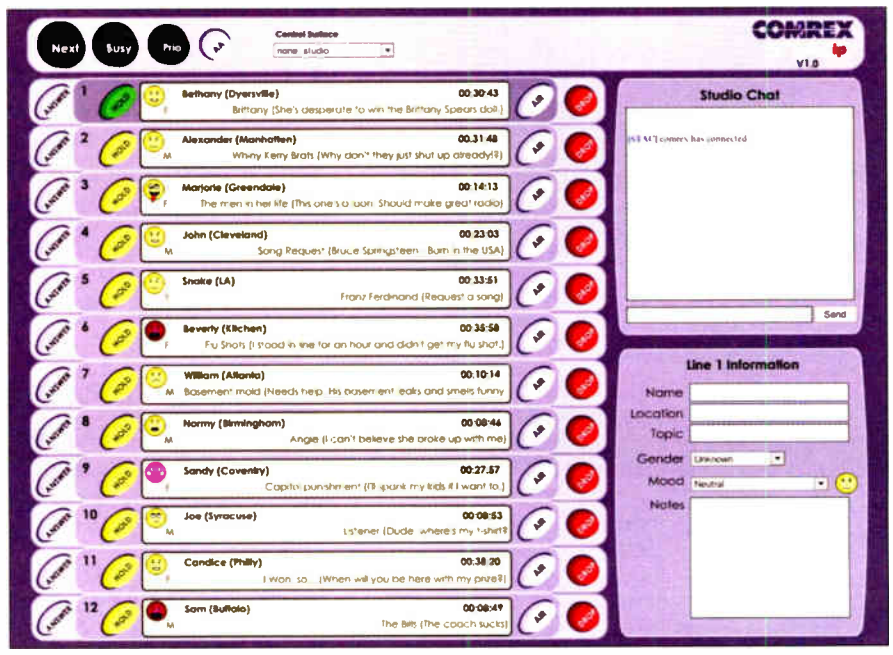

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Entercom's New Orleans operations were moved again and re-established this time at the Baton Rouge facilities of Clear Channel.

Although most damage was limited to windows blown out by Katrina, the deteriorating conditions in the area eventually forced the evacuation of the Entercom studios.

UNITED RADIO BROADCASTERS OF NEW ORLEANS

The two competing companies – Clear Channel and Entercom – decided to team up and form what became known as United Radio Broadcasters of New Orleans, using the best assets of both companies.

The heart of the operation was at the Clear Channel cluster in Baton Rouge. In just 22 hours on the day after the storm, engineers turned a small studio into a emergency facility capable of programming an ad hoc network of stations in Southern Louisiana.

Michael Alan (WTKC, Entercom) on left, and Sheldon Williams (KHEV, Clear Channel) running the board and screening calls in the make-shift master control room for United Radio.

As people arrived from New Orleans the combined staff was made up from talent assembled from 19 local radio stations – plus those arriving from other markets – all in the space occupied by just six stations before the storm.

With such a depth of talent, this effort provided a solid, single stream of information for citizens of the area via both companies' facilities.

Entercom was able to get their programming back into New Orleans via a channel on the Louisiana State Network. Local independent contractor Mike Patton provided a lot of the technical support; he was able to set up a link into the Jefferson Parish EOC to feed the STL to WWL's transmitter.

United Radio Broadcasters of New Orleans also eventually established an Internet stream and utilized shortwave station WHRI to feed the programming to most of the rest of the country, wherever victims of the storm were located.

KEEPING THE SIGNAL LOUD AND CLEAR

WWL itself had one additional problem, solved early on. Its nighttime coverage was being impacted by a daytime station operating after sunset. The station was quickly located by ham operator K4YMB and identified as WQRX, Valley Head, Alabama. Fred Broce, EIC of the Atlanta FCC field office, was quickly able to shut down the nighttime operations.

Keeping everything together during a continuing emergency is a challenge that requires on-the-fly innovation. The need for a steady flow of emergency power comes to the top of the list. WWL is a PEP station and has a FEMA-supplied 200 kW generator and 12,000 gallons of fuel.

WWL's transmitter site was built elevated and was undamaged, but difficult to access.

While there were some early bumps keeping the generator up, things were stabilized and WWL was kept on the air. Entercom began working through FEMA to get more fuel and a second generator. They also worked with local power provider Entergy to get land power on a priority basis.

Entercom decided to reduce the power of their DX-50 to 27 kilowatts in an effort to conserve fuel. FEMA promised they would do "whatever it takes" to keep the station on air.

Although many power poles in the area of the transmitter were down and travel difficult, Entergy was able to restore power on Sunday, September 11th, just under two weeks after the hurricane blew through town.

Entercom's other AM, WSMB, also stayed on air thanks to it natural gas powered generator.

SACRIFICES

For the New Orleans FMs, fuel supply was an even bigger issue. The Spectrasite Tower site has a common generator for all the FMs multiplexed there, but there was not enough fuel storage to power all the stations for an extended period.

Therefore the decision was made to shut down a number of commonly-owned transmitters to conserve fuel, leaving Entercom's WLMG their only FM on air. WKBU, located at a different site, was flooded out and off-air at the time.

With a tragedy of such a large scale, more reporters were brought in from other Entercom stations. Among them, WBEN, KMBZ and KIRO were tapped to support the effort in the New Orleans area.

FULL POWER LOAD

With the number of extra people, equipment and RVs growing in Baton Rouge, the three-phase 208 power there became maxed out. Patton was able to locate a 480 to 208 three-phase step-down transformer, borrowed from the Jimmy Swaggart Ministry to alleviate the problem.

Oddly enough, under the category of "power where you do not need it," on Sept 7th Entercom technicians were allowed back into their downtown studio complex to retrieve some needed equipment. The 4th floor studios were still up and running thanks to the gas-powered genset on the 5th floor that never gave up.

The various satellite dishes did not fare so well in the hurricane. (Note the dishes laying on the roof and the one with the giant "bite" take by Katrina.)

Overall, the result achieved by cooperating broadcasters in the wake of this massive tragedy provided the people of New Orleans and the Gulf Coast area crucial information.

All of this was accomplished by the planning, hard work, personal sacrifice and ingenuity of many. Although there were many cases of cooperation, Clear Channel and Entercom surely deserve praise for the way they assisted each other to serve their community. It is also the result of cooperation extended by competitors from other markets; for example, Cumulus and Cox were but two of the companies offering equipment, personnel or whatever else was needed.

Quoting Clay Freinwald, one of the sources for this report: "I think of this as radio broadcasting's finest hours."

Our sincere thanks to the folks at Clear Channel and Entercom who helped provide a look at their disaster recovery operations even while they were still in progress and their staffs extremely busy dealing with staying on the air. Photos from Biloxi: courtesy Charlie Wooten, Clear Channel, Panama City, FL; from Hattiesburg: Mike Gideon, Clear Channel, Nashville; from New Orleans: Mike Cooney, Entercom, Kansas City, MO; from Baton Rouge: Troy Langham, Clear Channel, Tulsa.

Robert Meuser is a regular contributor to Radio Guide. He can be contacted at robertm@broadcast.net

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Maintenance Guide

by Scott Cason

Keeping the Power *On*

Part 2: Studio Site Generators

We started this mini-series by discussing back-up power at the at the tower site. We now want to take a look at the other piece of the puzzle: back-up power at the studio.

SELF-SUFFICIENCY

For a radio station to be totally self-sufficient, back-up power is needed at both transmitter and studio. Of course, if they are co-located, things are much simpler. But if they are separate, it will require a little more diligence on your part.

Studio loads are a little more complicated than those at the transmitter site.

There are many kinds of loads at a studio: linear and non-linear, extremely voltage sensitive loads, motors with high starting current, loads that cycle on and off, and in some cases multiple loads may be required to be picked up and pulled by the generator at the same time.

HOW MUCH POWER/TIME

First consider what you need to accomplish. Power outages in larger cities rarely last longer than fifteen to twenty minutes – unless they go a lot longer.

Battery driven UPS units can carry loads up to thirty minutes at reasonable cost. However, a UPS is much more expensive per kVA than an engine-driven generator, and needs some sort of filtering to protect sensitive gear, especially on-air computers.

If your budget is large enough, pull the whole studio plant with a generator. This way, the entire station keeps running regardless of the power situation. On the other hand, if you are working on a limited budget you need to start making priorities.

PRIORITY SERVICES

First and foremost are the on-air signals – that is the whole reason we are here, right? Keeping the radio stations on the air is the primary responsibility. Without that, the rest is meaningless.

In addition to the consoles and computers in each control room, you need to take into account tech room power, lighting, heat and air, telco interfaces, servers, and anything else affecting the on-air presence of the station.

You also will want to double (and triple) check to make sure key equipment is covered. It is not going to be fun if the CHR PD comes to you during the first power outage and says his telephone hybrids quit working during a phone-in contest because their socket had not been moved to the back-up circuits.

OTHER USERS

Who comes second after on-air? Of course, every department is going to think they are the most important in needing back-up power.

I would suggest traffic; if they cannot schedule spots, staff cannot air them and you do not get paid. Most traffic departments, even at the larger station clusters, have a very small load: four to ten computers, several printers and overhead lights.

Again, be very careful not to miss anything. Scheduling is fine, but it is all moot if they cannot print out the program logs for the next day (and the as-run logs for today's billing) because the printers are on different branch circuits.

OTHER FACTORS

Remember, too, someone has to answer the phones, so allocate some power there. Power for the weather receiver? Lights in the rest room? Make a list of all the necessary items.

If you currently have small UPS units on individual computers or other equipment, use the full nameplate rating of the UPS to determine the load the UPS will place on the genset.

Once you have the load totaled, figure in an additional 20-25% for reserve power. This allows the genset more stability and also will accommodate load growth over time. Do not over-specify: running a generator at less than 30% rated load can lead to engine damage and reduce the reliability of the genset.

SELECTING THE GENERATOR

With this information, you can decide what type of generator to get. There are many flavors of gensets using different fuels, each having their own sets of pros and cons. For example, most LP and propane fueled systems can run to about 800 kW. Diesel systems can go as high as 2250 kW.

Genset sizes need to increase for a certain level of performance as the altitude and ambient temperature increase. Many forget to take this factor into consideration. Other factors include output voltage, phases and frequency; all should be worked out before selecting a genset system.

You will also want to factor in the amount of physical space you have available for the genset. If you choose to locate the genset inside a building, there should be a dedicated room with enough space to service the genset and enough airflow for cooling of the genset. Larger gensets may have their own separate building or they can be located outdoors in weather tight, sound attenuated ISO style containers.

DIESEL

The technology for diesel gensets was developed over 100 years ago. It is proven and not likely to go away anytime soon.

Diesel sets are also the most economically feasible, usually around $200-$300 per kW installed. Diesel fuel's higher ignition temperature makes it more stable, and with technology that widespread, emission standards are now easier to meet at economical prices.

In some earthquake prone areas, diesel is the preferred fuel due to the danger in gas line ruptures and/or rationing during times of emergencies – when you will need your generator the most.

LP GAS MODELS

Most larger cities have LP gas service readily available. Gas generators are ideal for extended run uses and there is usually no permit to store gas on site. And if push comes to shove with a propane generator, you can go to your local propane dealer and pick up a propane bottle.

In our next installment, we will cover regular maintenance for gensets and why that is important.

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

The Worst I've Ever Seen

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

The Antenna That Escaped ... and The Transmitter That Did Not

A lot of pictures coming out of the Gulf Coast could be considered "The Worst." The damage from Hurricane Katrina was stunning – as has been the case in other similar situations on the Gulf Coast and the Southeast USA.

We are fortunate that some of the folks in Louisiana and Mississippi were kind enough to take the time to share some pictures of the devastation down there. We hope to see some more (Hint, hint, to those of you out there with shots from the devastated areas!). Not that we want to laugh at these sights, but rather our objective is to realize some of the reasons that bad weather can make our jobs become quite a challenge.

NEW ORLEANS

These pictures come via Troy Langham of Clear Channel, as the engineers were finally able to access one of the New Orleans sites which had been flooded.

In the first picture, it almost seems like the tower "jumped" the fence, in an effort to escape the fury of the hurricane.

The winds, which reached speeds of over 150 miles per hour, caused an insulator to lose its grip on the guy wire and all 266 feet of the tower were propelled *right* over the six foot fence!

The porta-potty in the field is a "gift" from Katrina. Where it came from is not known. Another "gift" was a boat. It landed in the field outside the transmitter building, complete with transport.

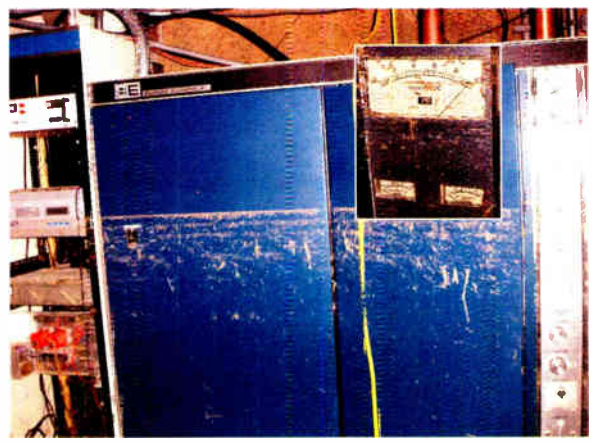
Where has the WYLD tower gone?

INSIDE THE TRANSMITTER BUILDING

If you heard one reporter say it, you heard it dozens of times: a sizeable part of New Orleans lies below sea level.

Some areas flood naturally, and most stations make the effort to construct their transmitters a few feet off the ground. When the levees broke and the flood waters inundated New Orleans, the transmitters could do little more than "sit and take it."

As you can imagine, between the water, chemicals, sewage and the left-over mud and mold, these transmitters were essentially total losses. You just could not trust them long term.



The water was over four feet high in the transmitter shack.

Even after the site started to dry out, it was not a place you would want to be.

Some sites affected like these were will probably be built up higher next time, as part of the corporate planning for disasters. Perhaps the biggest lesson from Katrina and Rita in 2005 was that more planning is necessary *before* the next storm.

The floor was definitely not clean enough to eat off of it.

Whether it is protecting the transmitter or ensuring program audio or installing a generator to keep the power on, many stations are now reviewing their plans and procedures.

This cannot be anything other than good for the stations, the industry, and the listeners who expect us to be there when there is an emergency situation.

Transmitter Site Guide

by Jeff Johnson

Continued From Page 12

UNDERSTANDING COOLING CAPACITY

Cooling capacity is important, although it is less critical to maintain comfortable human habitation temperatures and humidity in an unoccupied transmitter environment.

Certain mysteries surround this subject. For example, "tons" in reference to cooling originated with the ice-making industry.

The "latent heat of fusion" for ice is 144 BTU/lb (British Thermal Units per pound), and is the amount of energy that must be removed from water at freezing temperature (0° Celsius, 32° Fahrenheit) to convert its state from liquid to solid.

The temperature does not change during this process, just the state. This is the origin of the phrase "ice cold" – which for melting or freezing water is precisely constant. Once the state change takes place the temperature then raises or lowers.

One BTU is the heat removal required to lower the temperature of one pound of water by one degree Fahrenheit. Multiplying 144 BTU/lb by 2000 lbs (one ton) results in 288,000 BTU. Divide this by 24 hours to arrive at 12,000 BTU/hour to make one ton of ice in one day.

Determining cooling capacity for a specific application is dependent on many variables, including the recommended capacity required for the climate and insulation quality of the building. This information is commonly included with air conditioning system documentation. Improving the insulation of the transmitter shack is an important component to consider. It is paid for only once, but saves money month after month.

FIGURING THE TONS

One BTU/hour is equivalent to 0.2931 watts. Calculate the heat rejection of the transmitter by measuring the wattage drawn less the RF output. The energy has to go somewhere. If it is not RF, then it is heat.

Multiplying 12,000 by 0.2931 results in 3,517 watts of heat energy moved out by the air conditioner. Thus a one-ton air conditioner tosses overboard approximately 3,500 watts.

For example, a transmitter running 50% overall efficiency with a transmitter power output (TPO) of 3,500 watts is blowing 3,500 watts of heat out the stack and from other components. You will need a one-ton air conditioner for the transmitter heat load and perhaps the same for the heat load coming in through the walls and ceiling of the shack.

One of X-Star's sites has a 10' x 15' shack, a transmitter with a TPO of 3,500 watts and two 1-1/2 ton (18,000) BTU window units for redundancy. There have been instances of one unit being down in hot weather. The interior temperature climbed perhaps 20 degrees above the set point inside to compensate for the heat load from the structure, but did not rise to dangerous levels.

Another X-Star site has a transmitter running a TPO of 9,100 watts. Dividing 9,100 watts by 3,500 watts results in a 2.6 ton heat load (or 31,000 BTU). A 36,000 BTU air conditioner in that room just kept even with outdoor ambient on hot days this past summer when the redundant unit was inoperative.

Theory has been borne out in practice!

REMEMBER THE FILTERS

A closed, air conditioned transmitter environment renders filtering less important, but does not eliminate it completely.

Transmitters must still move good quantities of cooling air. The air conditioner condensing coils must be protected from inevitable, if less abundant, airborne dirt. Additionally, should the air conditioning fail and the emergency exhaust fan begin running, excellent filtration is now required.

The common fiberglass 1" flat furnace filter is preferable to nothing, but it will not filter small particles effectively. Its smaller surface area will plug up more quickly.

More effective are pleated filters. A 2" thick pleated filter has more than four times the surface area than a flat filter. Also, a pleated filter is stiffer and less prone to becoming plugged, reducing airflow or collapsing into the equipment. The best filters use 12-pleats per linear foot with a wire backing for strength.

Jeff Johnson was the Network Engineer at Xavier University's X-Star Radio Network and WVXU. He can be reached at Jeff.Johnson@goodnews.net.

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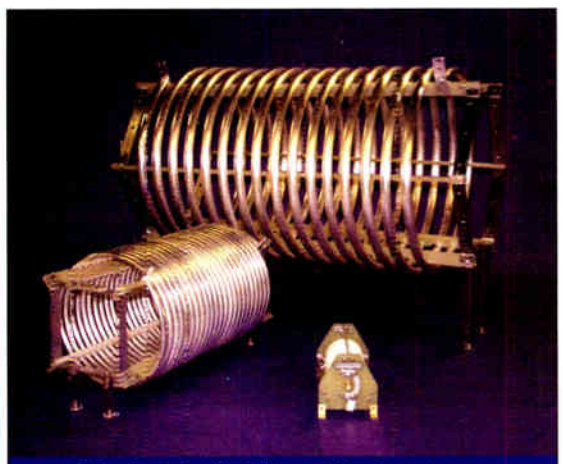
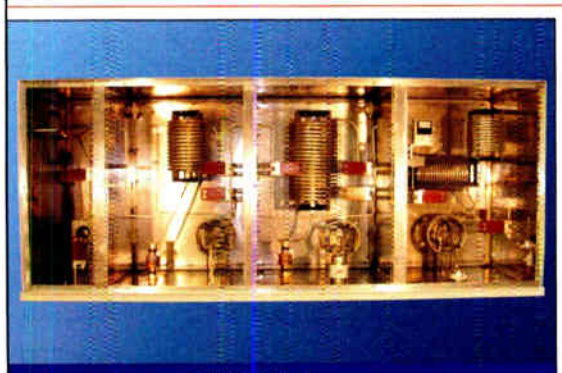


Variable & Fixed Inductors



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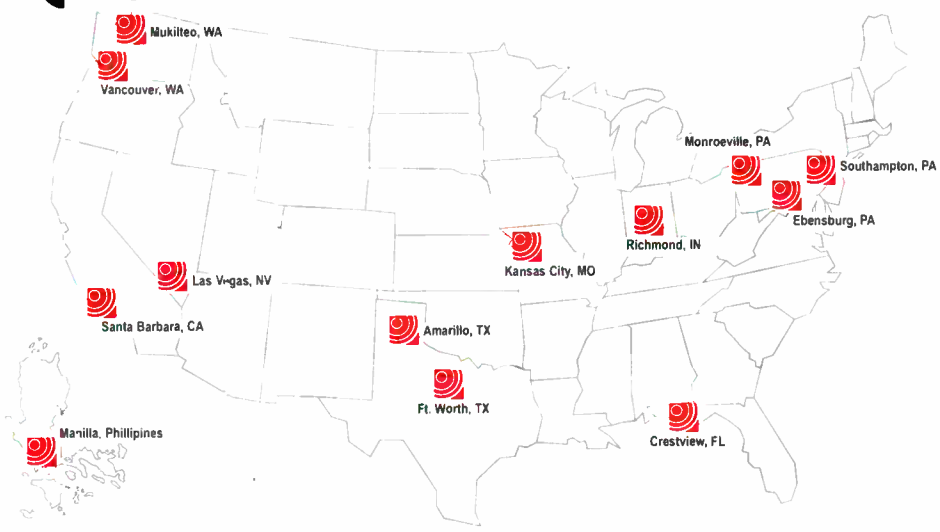

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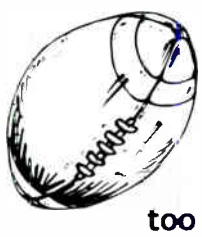

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Transmission Guide

by Barry McLarnon

IBOC: The Long and Winding Road – Part 1

Everyone has an opinion on digital transmission, and then some. Put N engineers in a room, you will get N+1 opinions – perhaps even more! Many ask: "Why didn't the FCC approach digital radio in a better way? Don't they understand the technical problems inherent in what they are doing?"

Indeed, since the move to digital transmission started, a whole new generation of technology – not to mention engineers – has come along. Some want to stop the rollout of digital radio and return to the drawing board. Others point out that the delay such a process would likely entail might be disastrous to the industry.

To better understand the why's and how's of the current status of digital radio, it is helpful to have the historical background and political context of the way things happened. Barry McLarnon, who has been involved with the various digital transmission systems for nearly 20 years, has the qualifications and perspective to explain it all for us.

McLarnon begins by summarizing the current technical/legal status of the digital systems.

YOU ARE HERE

On August 17, 2005, the window for reply comments on the proposed NRSC-5 standard closed.

If iBiquity and the NAB have their way, this will have been the last opportunity for public input concerning AM and FM IBOC (In-Band, On-Channel) implementation in the USA. The next milestone will be a second Report and Order from the FCC, adopting NRSC-5 and setting the final Rules for IBOC operation.

There are, however, still a couple of flies in the ointment that stand in the way, and it remains to be seen how much they will delay this process.

THE NRSC-5 ISSUE

Running up to the vote to adopt NRSC-5 by the NRSC DAB Subcommittee on April 16, it became evident that some of the subcommittee members were not too happy with the proposed standard, and felt that it was not ready to be put to a vote.

Their reservations were mainly concerned with some glaring omissions from the standard, most notably the audio codec. This problem resulted from iBiquity's steadfast refusal to disclose sufficient technical information about their HDC codec to enable it to become part of the standard.

They claimed that to do so would violate their licensing agreement with Coding Technologies, but we only have iBiquity's word for this. The HDC codec is widely believed to be almost identical to the aacPlus codec, and Coding Technologies has had no problem with disclosing information to allow that codec to become part of the MPEG-4 standard. Their technology is, after all, protected by patents.

COMPROMISE OR CAPITULATION?

A compromise was struck: so the codec would be left out of the standard completely (though this was not so much a compromise as a capitulation to iBiquity).

There was great pressure to complete NRSC-5 and present it to the FCC, and to do so with a show of unanimity from the industry. The dissenters on the subcommittee were thus persuaded to stand aside and abstain rather than casting negative votes that might cast aspersions on the suitability of NRSC-5 as a standard for broadcasting.

When the FCC opened a comment period on NRSC-5, however, some of the dissenters could no longer hold their silence, and came forward to voice their concerns about the holes in the standard. Most of them would be willing to settle for the inclusion of a codec identifier in NRSC-5 that would allow the use of codecs other than the proprietary HDC one.

The hard-liners went further than this, and stated that it was unacceptable for any proprietary technology to be used for IBOC audio services.

THE INTERFERENCE ISSUE

While the FCC mulls over this debate, they must also have some concerns about that other problem that just refuses to go away: IBOC interference.

A sizeable number of people used the comment period on NRSC-5 as another opportunity to point out that IBOC can cause serious problems for existing analog AM/FM operations.

Some of the comments were based on IBOC fundamentals, along the lines of my recent series in the May through August issues of ***Radio Guide***. As IBOC deployment increases, however, more and more reports of real-world interference problems are surfacing, especially on the AM side, and these formed the basis of several comments.

To these naysayers, the NAB has a simple retort: you are too late to object. Their position is simply that the die was cast back in 2002 when the FCC issued its Report and Order selecting the iBiquity IBOC systems as the sole means for digital radio broadcasting.

By doing so, the Commission accepted any interference problems that came along with IBOC (one exception was AM IBOC nighttime operation, about which additional comments were invited in 2004).

In the face of mounting complaints about these problems, some are now asking the question: how did we get into a situation where the FCC seems to be condoning interference? Before attempting to answer this, it is useful to examine the history of IBOC development thus far.

HOW IT BEGAN

It may come as a surprise to some, but IBOC now has been in the making for more than 15 years.

Its formal history starts in 1990, when USA Digital Radio (USADR) was formed as a partnership between CBS (then a wholly-owned subsidiary of Westinghouse) and the Gannett Company, a media conglomerate. Technical development of an IBOC system actually started a year or two earlier, under something called Project Acorn.

Despite this activity closer to home, however, the NAB was becoming infatuated with a development that was taking place in Europe, known as the Eureka 147 project. In those days, the NAB had a much more significant engineering capability than it does today, and their engineers recognized a tremendous potential in the nascent Eureka DAB technology.

Canada helped this process along by jumping in with both feet. I was part of the Canadian team that brought over Eureka DAB prototype equipment in 1990 and performed tests and demos on it in four Canadian cities.

Not to be outdone, the NAB became the champion of the Eureka system in the US, and arranged for demos at the Las Vegas convention in 1991.

THE FLY IN THE OINTMENT

This enthusiasm was, however, short-lived. Some of the NAB's membership became very alarmed at the prospects of having digital radio broadcasting in some new band.

The Eureka system called for the multiplexing of multiple audio streams onto a single wideband transmitter, a concept that was anathema to some owners. It could, for example, level the playing field by erasing the differences in coverage that currently exist between stations.

Perhaps more significantly, it could open the floodgates for new competition. The IBOC concept, on the other hand, allowed owners to maintain the status quo while undergoing a transition to digital. After some intense lobbying within the organization, the NAB abandoned its courtship with Eureka and jumped into bed with its new flame, IBOC.

MOVING AWAY FROM EUREKA

Although the NAB's endorsement of IBOC strongly tilted things in that direction, it was far from a done deal yet. There remained serious doubts about the viability of the IBOC concept, and other approaches, including Eureka DAB, still had their proponents.

AT&T put forward what it called an IBAC/IBRC (In-Band Adjacent-Channel or Replacement-Channel) system that would put an all-digital signal into a separate FM allocation rather than coexisting with an analog signal, as in the hybrid IBOC scheme. However, they had some difficulty explaining where all these allocations would be located.

The VOA touted a completely different approach: transmission from a geostationary satellite at S-band (2.3 GHz), supplemented by terrestrial repeaters. And USADR no longer had the IBOC arena to itself, as AT&T teamed up with Amati to develop an alternative FM IBOC system.

SHIFTING SUPPORT

The NRSC now enters the picture. A DAB Subcommittee was formed to study and evaluate these different approaches to digital broadcasting.

However, the NAB made it very clear that it could not support anything other than IBOC, so it was decided that this subcommittee would focus only on IBOC technology.

The Consumer Electronics Manufacturers Association (CEMA), on the other hand, was unconvinced that IBOC was the best approach for digital radio broadcasting and argued that it was premature for the NRSC to exclude the other systems from consideration at this time. As IBOC had yet to prove itself, the possibility still existed that it could fall flat on its face and something else would need to step up to the plate.

A solution was found: CEMA would form its own group, known as the Digital Audio Radio (DAR) Subcommittee, that would evaluate all comers.

The two subcommittees agreed to collaborate, and began planning a series of laboratory tests of the various systems, to be followed by field tests. An extensive lab test facility was constructed at the NASA Lewis Research Center facility in Cleveland. Testing got underway in 1994, and carried on into 1995. There were three FM IBOC systems tested: in addition to the AT&T/Amati system, USADR submitted two different systems, called FM-1 and FM-2.

REMEMBERING AM

But what about AM? The NAB made it clear that its concept of IBOC as a means of transitioning to digital *must* include an AM system as well as one for FM. There was no way its membership would accept a system that only allowed some of their stations to move forward into this brave new world of digital radio.

USADR initially developed only an FM system, since doing IBOC in the AM band posed some even more formidable challenges. For a host of reasons (greater inherent susceptibility to interference, the complications of nighttime skywave, etc.), AM was less amenable to the IBOC approach. Moreover, the audio codec technology of the day appeared to preclude achieving good audio quality within the narrow bandwidth available.

Given the NAB mandate, however, something had to be done, so USADR began (reluctantly, one imagines) development of an AM IBOC system. Most of the technical work was actually subcontracted to an aerospace company called Xetron. This was the only AM IBOC system included in the NRSC tests.

FIELD TESTING THE SYSTEMS

The testing of all these systems was a long and arduous process, but it was very thorough. With many proponents and interested observers involved, there was little chance that details would be overlooked or that the process be biased in any way.

Preliminary results of the tests were unveiled in August 1995, but some flaws in the test procedures were subsequently discovered, causing another round of tests to be done. Proponents were allowed to make changes to their systems before the re-testing.

There were also field tests done in San Francisco, but they were incomplete, since none of the IBOC systems were included. USADR declined to take part, and AT&T/Amati was unable to make arrangements with a suitable FM station to act as host.

THE TEST RESULTS

It took a long time for the dust to settle. The DAB Subcommittee issued a report on the IBOC system lab tests, and then suspended its activities. The DAR Subcommittee did not issue its final report until close to the end of 1997. The major conclusions (reproduced from the executive summary of the report) were as follows:

(Continued on Page 18)

Transmission Guide

by Barry McLarnon

Continued from Page 16

1. The IBOC systems are not feasible at this time due to deficient performance in the areas studied: audio quality, performance with channel impairments, RF compatibility and extent of coverage.

2. The IBAC system cannot be deployed due to interference with the current spectrum occupancy of the FM band.

3. The VOA/JPL system at S-band frequencies is subject to continuous and/or repeated outages due to blockage. It is not clear that this could be totally remedied.

4. Of all the systems tested, only the Eureka-147 DAB system offers the audio quality and signal robustness performance that listeners would expect from a new DAR service in all reception environments.

Concerning the effect of FM IBOC systems on analog receivers, the report said, *"Test results show first adjacent interference up to 25 dB worse than the FCC FM RF protection ratios and second adjacent interference up to 22 dB worse (with narrowband car receivers). This measured performance will not allow satisfactory operations of in-band systems under the present table of allocations when both digital and analog systems are contemplated to be used."*

For the AM IBOC system, first adjacent digital interference was generally masked by the analog interference, but *"the second adjacent digital signal increased the analog reception interference by 15 to 20 dB over the reference analog second adjacent interference at the strong desired analog signal level."* The report's authors concluded that further improvements to the IBOC systems were possible, but it was unlikely that all of the deficiencies could be addressed simultaneously. In other words, there were fundamental tradeoffs involved.

Despite this setback, the NAB remained steadfast in its devotion to IBOC and strongly encouraged IBOC development to continue.

SOME NEW PLAYERS, SOME CHANGED PARTNERS

The existing players joined forces in May 1997, when the AT&T group, which had by then morphed into Lucent Technologies, reached an agreement with USADR to jointly develop IBOC systems.

Then, in early 1998, a new player appeared on the scene when a start-up company called Digital Radio Express (DRE) announced it was also developing IBOC systems.

The USADR-Lucent marriage lasted only a year, and in May 1998, Lucent returned to independent IBOC development under the Lucent Digital Radio (LDR) banner. Now, suddenly there were three proponents, and IBOC seemed once again to be rising from the ashes.

RULE MAKING TIME

In October 1998, USADR got the ball rolling on the regulatory front by petitioning the FCC for a Rule Making to adopt AM and FM IBOC designs (theirs, of course) as the only terrestrial DAB system.

The FCC response came in November 1999, with its NPRM entitled "Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Radio Broadcast Service." This opened the proceeding (MM docket 99-325) which remains in effect today.

In the NPRM, the FCC did not restrict the field to IBOC.

They noted the adoption of the "new band" Eureka-147 in other countries, including Canada, and floated the idea of re-allocating TV channel 6 (82-88 MHz) to a new digital radio service. It was also noted, however, that this could not happen before 2007, and thus could delay the introduction of such a service considerably.

Moreover, these new band approaches did not appear to have any active proponents in the USA at that time. While encouraging IBOC developments to continue to move forward, the Commission made clear that they were aware of the risks:

"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", and "it is our objective to foster 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."

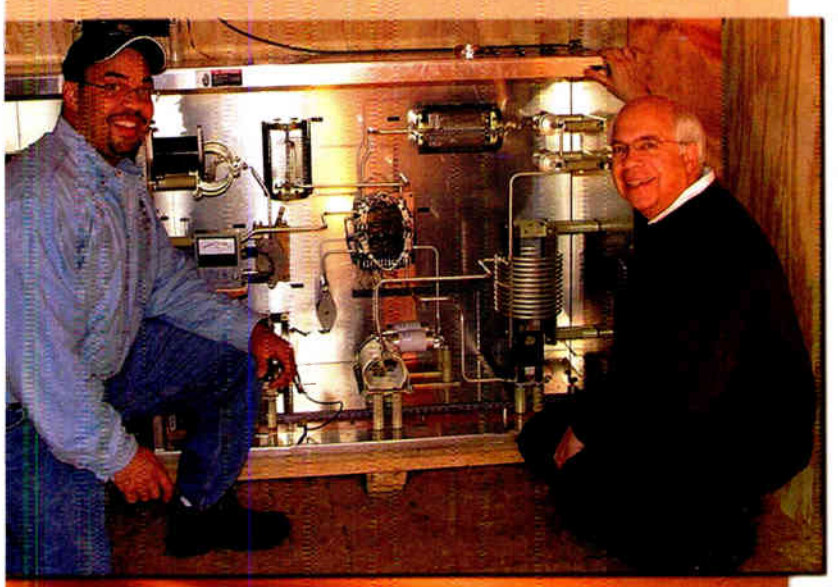
Significantly, the NPRM also quotes this position statement from the NAB (from their filing in response to the 1998 USADR petition): *"The implementation of an IBOC DAB service that causes significant impairment to existing analog service would raise serious doubts as to the suitability of the system."*

A TWISTING ROAD AHEAD

In the concluding part of this review of the key events in the history of digital transmission, we will describe another, abrupt change in the players leading to the emergence of iBiquity and how the testing protocols were modified more to keep momentum than to solve problems.

Barry McLarnon holds a B.Sc. degree in physics and an M.Sc. degree in electrical engineering, both from the University of Alberta. He held the position of 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@bdmcomm.ca

"Unless we could quickly build out new studios and antennas, our station would go silent."



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Studio Guide

by Mark Shander

Heil Microphones

Recently, I had been following some conversations between friends who do production and work at radio stations. The topic was Heil microphones.

The claim was that these dynamic microphones perform like studio condensers and they add more punch and presence than anything with which we were accustomed to use in outfitting a studio.

DIFFERENT USES, DIFFERENT MICROPHONES

Broadcasters must deal with a variety of situations, from DJ studios to talk studio environments to production studios to recording studios to remote locations. The optimum microphone for use in each case will also vary.

Thus far we have discussed recommendations based on our own personal experience and what we have always done in the past.

This time we are going to think a little more progressively. There are five microphones in the Heil product line, and if you are thinking that does not offer enough diversity to cover the variety of studio situations we must handle, you may want to think again.

PR SERIES

The first microphone I tried, the PR-20, is a hand-held microphone uniquely positioned for use on live remotes.

The PR-20 reminded me of the Sennheiser MD-431 – sister to the MD-421 – which I had used for a live remote at a recent telethon. Compared to the performance of the MD-431, the Heil PR-20 sounded like a condenser microphone in a recording studio.

Not only is the PR-20 an outstanding vocal performer, at $160.00, its street price lets you acquire several for the cost of a single MD-431.

Two other microphones in the Heil product line demand audiophile attention: the PR-30, priced just under $300 and the PR-40, priced just over. These are dynamic microphones, but have the look and feel and performance of microphones costing three to four times more.

Both microphones are excellent for controlled use in a talk studio or FM production studio, athough they look very modern and are almost intimidating. The PR-40 specs have a slightly greater frequency response on the low end, although the PR-30 seemed to have slightly greater presence. Imagine the sound of a high-end condenser microphone without the background noise; that describes the PR-40.

HERITAGE AND CLASSIC PRO

Heil's Heritage model was a complete surprise. Here is a microphone that looks like a Shure-55S, but sounds like a Beta 57. I think even Elvis would even have approved of this microphone.

I expected it to have a huge proximity effect – that is, there would be more bass and presence as I moved closer to the microphone. To my surprise, the frequency response and presence was much more consistent than I anticipated.

This microphone does not quite perform at the same level as the PR-30 or PR-40, but it is a great microphone to have on the desktop at an oldies station. At about $150, it will be a surprise to your budget as well.

Reaching back even further in time, Heil has a model looking like an RCA microphone from the 1930s. It is the Classic Pro and at about $200, it is a really neat way to create a feeling of nostalgia for jocks and hosts – yet it does not sound like an old microphone. In fact, it sounds very crisp, yet warm and clean. Imagine the performance of a Shure SM-7 and you will have a hint at the sound of this microphone.

A SOLID LINE

This is a tough product line to compare to the microphones we usually see in broadcast studios. They are all fairly new, and they are very aggressively priced. Heil also stocks booms, wire and connectors and everything you need for a great looking, as well as sounding, facility.

Heil's product line has captured a lot of attention from the recording industry. At a recent music studio recording session I attended in Hollywood, Heils microphones were being used to record every instrument as well as the vocals.

I had expected the PR-30 and PR-40 to dominate, since they sounded high-end and expensive to me. But the Classic Pro provided a very true (and affordable) reproduction as a microphone drum kit. The mix-and-match hodgepodge of microphones suprisingly came together with a professional sound you would expect from microphones priced much, much higher.

John Devecka, Operations Manager for WLOY at Loyola College in Maryland, recently installed five new Heil microphones in his studios.

WLOY Studio with Heil Microphones

John said that while shopping, he considered the room environment, which was a bit too "live" for a big condenser. He also knew most of the users there are not professionals and handling of microphones is an issue for him.

After trying the AT4040, MD421-II, BCM104, SM7-B as well as B1 and C1 Studio Projects models, he selected four Heil PR-40s and one PR-30. John says there is a noticeable difference between the two models, and he prefers the PR-40s.

Best of all, Devecka reports he was able to purchase all five microphone positions for about the cost of one Neumann.

Mark Shander has spent a good part of his life talking into microphones and comparing their output. Mark would like to know which microphone is your favorite. His email is mark@shander.com

Survival Guide

by Rich Wood

Triage in the Culture Wars

The country is divided. Red states vs. Blue states. Religious vs. Secular. Rush Limbaugh vs. Al Franken. Never, since the Civil War, have we been so separated in so many degrees.

RECIPE FOR CONFLICT

Now we have a new kind of "culture wars" on our own turf. One result of consolidation has been the bringing together of a critical mass of incompatible format "cultures" in a single building. The rallying cry should be "Remember New York."

Hip Hop artists have entourages packing heat. Twice now there have been shootings on the street in front of a New York cluster. Picture the panic in the hearts of the Smooth Jazz and AC jocks.

The classical folks would understand. Their music was often born of killer Kings, prurient Popes and evil Emperors; times when slaughter was a hobby. To the Smooth Jazz guys Kenny G is the biggest threat – not to be taken lightly, but not life threatening – just deep sleep.

TOGETHER BUT NOT

Picture a cluster of eight stations, all in the same building, their studios separated by little more than wallboard and a narrow hallway. You are the engineer; there used to be eight of you but the new mortgage on the stations required a little downsizing.

Bear with me now. All stations are live and local; we have no voicetracking. All right, the Talk station might have a network newscast at the top of the hour and might break tradition and carry Limbaugh. The rest is produced within their walls, 24/7. Suspend your disbelief.

The AC station is number one in the market. Hip Hop is number two and Talk is number three. The company is lucky and each station is high in the ratings.

A STAR CLUSTER

We have a few of problems here caused by our success. They are: high ratings, huge egos, high sales ... and one engineer.

To be very efficient, everything is electronically consolidated in a single digital audio system serving eight studios and two production/spare studios. All audio is available everywhere – though you have partitioned the system so Mozart cannot meet Marley.

The Urban spots will never run on the Talk station. As I asked, suspend disbelief.

As it should be, each format is considered by the individual staffs to be top priority. Each format is made up of Stars to whom great reverence must be shown. Each individual is the single reason the format is dominant in its market.

Remember that radio at its best is fantasy and entertainment, so we deal with the egos because they create the entertainment out of their fantasies.

BEWARE THE SUPER NOVA

Then, somewhere in our non-redundant system (mortgage, remember?) something has failed. We are in morning drive, every format is sold out and the day is Thursday. (Arbitron diaries begin on Thursday, so any down-time is like being shot in the head, even for Smooth Jazz.)

All of us are us are used to seeing everyone who wears a suit invading Master Control milliseconds after the beginning of dead air "to make sure the engineer knows we have dead air."

As with most failures, this one affects each studio differently, so there are multiple problems. Now we have eight against one. Actually ten against one. The General Manager and the Sales Manager have appeared to help coordinate repairs.

You, the Chief (and only) Engineer don your bulletproof vest and wade into the crowd in fix-it mode.

SNOOP FOR THE TOP DOGG

The fun begins here. Since there are multiple symptoms, who gets priority? The biggest biller? The most heavily armed? The format to which the GM listens?

This is where your public service volunteer experience comes in handy, preferably from EMS. You know the problem has cascaded because all the format clocks are wrong. The Classical station is playing Baroque Gangsta Rap and Mozart is in "da Hood." Kenny G is now a Republican on the Talk station.

You, my dear engineer, have a problem that transcends mere electronics.

Since you probably designed and installed the system you have a reasonably good idea where the initial failure happened. If you were the only person at risk things would be easier.

TRIAGE ON THE FLY

Each jock and manager sees his or her life flashing before them. Hopefully, you have mastered triage and human interaction sufficiently to explain to the very top dog, the GM, what you need to get everything up and running.

Passing the buck is a very helpful trait. No matter where you choose to start, someone is going to get bent out of joint. Then too, some formats can more easily bend your joints than others.

This is a job for the always strong General Manager. Explain to him or her what needs to be done and which formats you can get up and running fastest. Since he will not have the vaguest idea what language you speak, the directive will be to "get it working again."

Assuming no one has deleted thirty terabytes of data, you can now determine which formats can be brought up without appearing to play favorites.

SAFETY VALVE RELEASED

The GM has gotten you off the hook and delayed a mob contract on your head. The rest is easy. You do what you were trained to do.

Without the pressure, you quickly have three formats up and running and the remaining five are just about there. The triage took more time than the repair.

You still start your car remotely but are pretty sure of a quiet drive home.

Both fomenter and victim of culture wars for forty years, Rich Wood watches the industry from Rich Wood Multimedia headquarters in Western MA. Contact Rich at: richwood@pobox.com

Field Guide

by Bob Burnham

Comrex Mix-Minus Bridge: One of Radio's Best Kept Secrets

On the air, telephone or remote audio is an essential ingredient to making the programming immediate and important. Through this technology we can take the listener just about everywhere.

To achieve this, the Chief Engineer is always looking for that "magical box" that can make life less stressful during those critical broadcasts and to configure his studios so they are as foolproof and bulletproof as possible.

EARLY PHONE PATCHING

The early days of mixing telephone audio with broadcast audio usually involved connecting a line transformer to the output of a Bell System-provided speakerphone. The caller could hear the audio through a small Bell-provided switch with a built-in microphone that picked up ambient studio audio. If you remember them, they rather felt like a paperweight with a padded bottom.

The clunky device usually sat somewhere near the audio console; the on-off switch on top seized or dropped the line selected on a mechanical phone control panel. If you worked with these prior to the 1980s, you even may have experienced the version with a rotary dial.

Some engineers would tap the output of a microphone pre-amp of the console and feed that audio into the telco speakerphone, but that did not resolve the annoying automatic gain riding of the phone equipment.

Advanced broadcast hybrids would soon solve the problem of separating single pair, bidirectional audio into separate and isolated "send" and "receive" audio. The trick was to feed these hybrids correctly to avoid creating a feedback loop within the phone system.

LESS THAN OPTIMAL

The basic problem with the old speakerphone system basically was that audio could travel in only one direction at a time, or simplex. They were also voice-operated devices (VOX).

In a hot talk format, that could be an advantage because the host of the show simply talked (or shouted) and the phone system automatically and effectively (and abruptly) muted the audio from the caller. However, with the bothersome manner in which these primitive devices rode gain, an extended telephone segment could be very tiresome to execute, and even less pleasant for the listener. The word "fatigue" comes to mind.

As talk radio became the mainstay of the AM broadcast band, better methods to improve the quality (notably, to interface the broadcast studio with the telephone company) were needed and developed.

MIX-MINUS

The concept of Mix-Minus is a technical term mostly thrown around by broadcast engineers. It usually is discussed only during studio design or construction, or on the day that all-important remote occurs in the midst of a sports play-by-play ("and by the way so-and-so guest is going to be calling in"). Meanwhile, the traffic guy is going to be on the ISDN line as usual.

This type of situation demands the availability of multiple Mix-Minus feeds. The typical board operator or on-air talent does not have the time, inclination or understanding to be forced into manually setting up Mix-Minus feeds for each of these situations. Ideally, the station would have assigned their most experienced board operator to handle the task.

In some stations, the Chief Engineer may have to make a special effort to be available during those crucial moments. On the other hand, as we all know, sometimes those "moments" come unexpectedly. Then what happens? Embarrassing over-the-air problems everyone would prefer to avoid.

The ideal solution is to design the studio so all the needed Mix-Minus feeds are available on all the right inputs *all* the time! The Mix-Minus Plus from Comrex makes this easily achievable and simplifies the design process for a new studio.

Comrex Mix-Minus Plus

KEEPING THE AUDIO FEEDS SEPARATE

Traditionally, the talent at the remote site would use one phone line to send audio, monitoring the station via a radio or other receiver, and communicate with the studio via separate phone line or a business band two-way radio. However, the newest generation of remote equipment makes this method of executing a remote somewhat obsolete.

On the other hand, the complexity of modern talk shows requires a lot of effort and planning to produce a glitch-free program that sounds good to the listener.

For example, in the case of a connection to a telephone hybrid, the caller or phone guest obviously needs to hear the host or other callers during the course of the conversation. It may seem logical to merely feed the straight program audio back to the caller. If this is done, however, due to the nature of the phone system, feedback or at minimum, very distorted or hollow audio will occur due to the feedback loop created in the phone system itself.

In the case of a remote broadcast, the host at the remote site needs to get off-air program cues, as well as a possible feed for a PA system at his remote. Over an ISDN codec and especially over POTS line codecs, there are transmission delays by milliseconds. Without a proper Mix-Minus feed, those pesky delays turn into over-the-air echos which will drive both drive your talent crazy and listeners away.

WHAT IT IS

A Mix-Minus feed essentially is return audio to a remote source containing what is being fed over the air except the audio being sent from that remote source. The engineer who fed the microphone pre-amp output into the speakerphone was in fact employing a form of Mix-Minus.

If all remotes, phone calls and program segments could exist as one way feeds, there would be no need for Mix-Minus.

In the control room, however, the importance or necessity of a Mix Minus feed, and in particular, *multiple* Mix-Minus feeds, is critical.

USING THE CONSOLE

A typical broadcast console can easily be set up for a simple, single Mix-Minus if it has the capability of feeding both Program and Audition busses at the same time.

The Mix-Minus feed is taken from the Audition bus. Both Program and Audition are selected for all inputs *except* the channel from which the phone or remote audio is being fed. (Some consoles also have a Mono or Alternate bus; this can also be used.) Other consoles have special configuration options for Mix-Minus feeds.

The complications arise when more than one Mix-Minus is needed and moves beyond the capabilities of the console.

One solution is an inexpensive Mackie mixer. There are least two "send" feeds normally used for effects boxes which will also work well when setting up Mix-Minus. But what if you need *three* Mix-Minuses?

One of my solutions for the third Mix-Minus was to use a product from Henry Engineering which inverts the phase of the caller audio. The success of this product, however, is very dependant on the phase stability and other characteristics of the console itself. It is not foolproof. Mackie mixers may be great for remote sites, but not for broadcast control rooms for this very reason.

ANOTHER APPROACH

A very basic Audioarts R-17 console is installed in my syndication control room. The audio from the host always arrives via an ISDN codec. The callers and guests are conferenced through an older Gentner TS-612 system. Any additional feeds are set up on an as-needed basis.

The host hears the callers and other program elements via the return audio on his ISDN connection. This situation is the same whether it is a sports play-by-play, a standard remote or any other out-of-studio event.

Many syndicated talk show hosts originate their programs from home, on the beach or just about anywhere using this method.

I use the Comrex Mix-Minus Bridge to tie everything together. Everyone can hear everyone, and the Talk-Back button on the console is wired to control a relay in the Mix-Minus bridge to communicate off-air with the host or anyone else on the system, either individually or as a group.

In an existing studio, it may be more cumbersome to wire the Mix-Minus Bridge, but in any well-organized studio, it is straightforward. Comrex recommends someone with experience do the installation, but they imply if you wire it exactly as they suggest, it will work just fine.

A SOLUTION ON HAND

I found this to be true. The feeds from each device to the console are looped through Molex connectors on the back of the Mix-Minus Bridge. Another connector takes the feed from the console Audition bus. More Molex connectors for additional functions are also provided.

The Mix-Minus Bridge may be best located in a rack room, although it can also be situated in a control room. The front panel is not flashy, but very functional. There is no power switch and that is probably a good thing. It features a series of buttons that control which sources are fed the audio.

A small screwdriver adjustment individually controls the level of each feed. (During set-up, it might be more convenient if they were actual small rotary knobs rather than require a "greenie" screwdriver, but this is a fairly minor whine.)

A front-mounted microphone jack can be used for a gooseneck mounted IFB microphone. A button feeds the microphone audio to all of the sources. Depending on how it is wired, the previously mentioned hard-wired Talk-Back can feed any of the sources individually or collectively.

The problem with putting the Mix-Minus Bridge in a separate rack room (which the gooseneck mounted microphone invites) is there is no "built-in" means for the tech person using that microphone to hear the talent at the remote site (off air). A headphone jack, or even a tiny panel-mounted speaker would be a welcome addition with a rotary selector to control the monitored source. In the control room, those sources could easily be monitored through the console by putting the associated channels in cue.

I found installation completely straight-forward. A slender but well-written printed manual expedited matters. Thank you, Comrex, for not forcing me to print out the documentation from a CD. I realize that we tend not to bother with manuals until the equipment breaks, but on the more complex – or at least trickier – designs I enjoy not having to run to a computer just to see what makes it tick or how to make it work with other equipment.

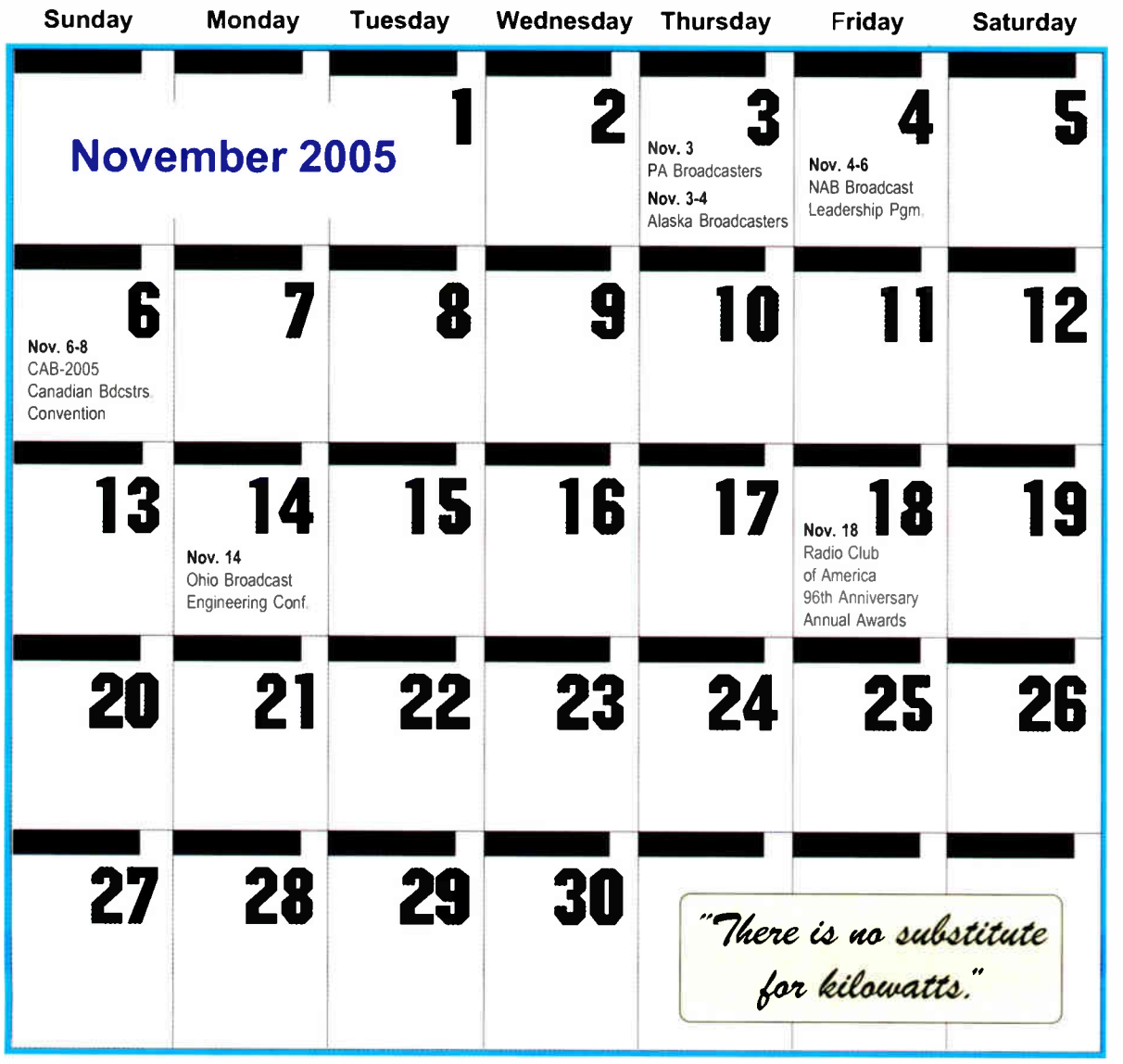
The Mix-Minus Bridge is not an inexpensive piece of gear. Yet, if you compare what you save in time and costs relative to cobbling together some sort of home-brew contraption you may well find the Mix-Minus Bridge worth the investment.

Bob Burnham maintains and evaluates broadcast equipment on a daily basis at the Specs Howard School of Broadcast Arts in Southfield, MI. He can be reached at bburnham@specshoward.edu

RADIO ROUNDUP

The Radio Guide Industry Date and Event Calendar

List your radio dates, events, meetings and conventions here.
Email your information to: ***radio@rconnect.com***



Pennsylvania Assoc. of Broadcasters Eng. Conf.
November 3, 2005
Hershey, PA – Hershey Lodge & Convention Center
Phone: 717-482-4820 – www.pab.org

Alaska Broadcasters Association Annual Convention
November 3-4, 2005
Anchorage, Alaska – Hilton Anchorage
Phone: 907-258-2424 – www.akbroadcasters.org

Broadcast Leadership Training Program
November. 4-6, 2005
Washington, DC – NAB Conference Center
Phone: 202-429-5424 – www.nabef.org/BLT

CAB-2005 Canadian Assoc. of Broadcasters
November 6-8, 2005
Winnipeg, Canada – Winnipeg Convention Center
www.cab-acr.ca

3rd Annual Ohio Broadcast Engineering Conference
November 14, 2005
Columbus, Ohio – Airport Marriot
Phone: 614-228-4052 – www.oab.org

Radio Club of America's 96th Anniv. Annual Awards
November 18, 2005
New York, New York
www.radio-club-of-america.org

State of the Art

Radio Industry News

by Chip Morgan

Senators Want to Bring Back EBS style WARNings

Senators Jim DeMint and Ted Stevens (R-Alaska) of the Senate Commerce Committee joined a bipartisan group of senators to introduce a bill that would establish a network for transmitting alerts for all emergencies across cell phones, handheld devices, TV and radio stations. The Warning, Alerts and Response Network act would provide information about where to find food, water and life-sustaining resources.

The bill would also provide federal, state and local emergency managers with tools to send out geographically targeted alerts only to those communities at risk, and establish a grant program to help remote communities install sirens and other devices because of the lack of quality telecommunications infrastructure.

More info:
http://demint.senate.gov/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=287

Griffin Technology iFM Radio Remote Recorder for iPod

Griffin Technology has introduced a new iPod controller that receives and records FM radio, has a built in microphone for monophonic recordings and provides seamless integration of FM radio in a small aluminum enclosure.

More info:
http://www.griffintechnology.com/products/ifm/index.php

iBiquity Accelerates Conversion of Over 800 CPB-funded Stations

iBiquity is selling a group license to the Corporation for Public Broadcasting that will convert 400 additional stations to HD Radio. CPB had previously provided funding to an initial 400 local public radio stations for their digital conversions. The new group license will include costs associated with advanced services such as multicasting and datacasting.

The announcement was made at the recent National Association of Broadcasters Radio Show in Philadelphia.

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

A New Copy Protection Plan for HD Radio?

The RIAA, along with 19 other industry groups, is asking Congress to put in place a copy-protection scheme for HD radio. The groups propose that the FCC prevent redistribution of recordings onto the Internet, removable media or to other devices. The proposal would also limit searching and automated copying so that individual recordings can't be separated from surrounding content.

More info: http://p2pnet.net/story/6201

Space Weather Causes Radio Blackout

A recent solar flare was the fourth-largest in the last 15 years, and intense radio emissions caused a complete blackout of HF and LF on the day-lit side of the earth, including the entire US. This event rated an R-4, or severe, on NOAA's space weather scale for radio blackouts.

Portable radar stations are used to monitor and measure space weather. The Advanced Modular Incoherent Radar Scatter system, or AMISR, is designed for rapid deployment and contains eight reflective panels that can be re-arranged as needed for the task at hand.

More info: www.sri.com

FM Broadcast Auction No 62 Delayed Until January 12, 2006

The FCC announced a delay in the start date for auction 62 in order to provide more time for bidder planning and preparation after Hurricane Katrina. The auction was delayed from its original start date of November 1st and affects 171 FM broadcast station construction permits. The auction is delayed until January 12, 2006.

The FCC reminded applicants that the rules prohibit applicants for any of the same geographic license areas from communicating with each other about bids, bidding strategies or settlements unless they have identified themselves as having agreements with each other under section 1.2105(a)(2)(viii) of the Rules.

More info:
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-2478A1.pdf

DRM Radios Available for Consumers

The first Digital Radio Mondiale (DRM) consumer radios were introduced at IFA and IBC, including three multi-standard, tabletop consumer models with DRM, DAB, FM - RDS, LW, MW and SW capabilities. These radios all use RadioScape's RS500 module and Texas Instrument's DRM350 multi standard digital radio baseband.

DRM Chairman and Deutsche Welle COO Peter Senger said, "The arrival of a range of consumer-priced, DRM-capable products at IFA marks the European launch of DRM.

More info:
http://www.drm.org/pdfs/press_release_118.pdf

XM Expected to Reach Six Million Subscribers by Year End

XM Radio has more than five million subscribers and expects to reach 6 million by the end of the year. Hugh Panero, Chief Executive of XM, said "Consumers are choosing XM because we offer the most choices, including the most commercial-free music and live sporting events, and the most advanced technology."

More info:
http://www.xmradio.com/newsroom/screen/pr_2005_09_27.html

HD Radio Testing Scheduled in Switzerland

Swiss station 88 Radio Sunshine will conduct testing of the FM HD Radio system over a period which could last as long as two years. Initial testing will focus on main channel audio and additional testing may include supplemental audio channels and synchronous digital broadcasts on boosters.

Switzerland is an interesting test area due to the mountainous terrain and the fact that many European countries have 100 kHz frequency spacing.

More info:
http://www.ibiquity.com/press/pr/Switzerland2005.htm

Remote Broadcast Solutions

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- Outputs & Inputs for telephone handset, cellular phone or balanced line level at up to +10dBm.
- Operates up to 36+ hours on two 9V alkaline batteries.
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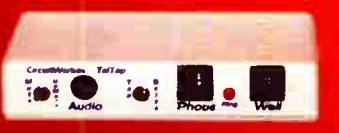
- Use the DPDT relays to insert the phone audio directly into the program path when necessary, especially for emergencies.



TelTap Pocket-Sized Manual Telephone Coupler

- Can be used as a phone tap or a passive manual telephone coupler.
- Send or receive telephone audio.
- Compact size & low cost makes the TelTap a great addition to your remote kit for main or backup capabilities.

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www.circuitwerkes.com

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Radio.edu

A Non-Comm View

by John Devecka

Interview Recording Tools

WLOY hosts both a lab for Communications students and a student organization that keeps it on the air, in theory, 365 days a year. That actually is my job, but it is nice to think that the students will eventually take up the load.

SOMETHING FOR EVERYONE

As a schizophrenic operation, one of the hardest things we have to do is meet the needs of everyone *and* have enough gear to go around.

For example, students in the radio classes need to produce pieces for class and the students running the station have to get out and do interviews. All of them get to share the gear and that is where it gets fun. Nothing can be retired because we need more gear than we have. Hence we have a variety of formats and options for them.

More importantly, *you* have those same options to consider. You want to be able to go out and get that one shot at Olympian Michael Phelps when he comes to campus – but you need usable audio, not something to transcribe to print like those newspaper folks do.

ACHIEVING GOOD RESULTS

Furthermore, you need equipment a beginning student will be able to use easily – so they do not come back and discover they did not get anything recorded – *and* bring back in relatively functional condition. There are many choices, but here are the three that we have settled on – and why.

Generally speaking, these are the kind of decks that one uses to bring back decent interviews and some ambient sound, but not live music events. (You can do that too, of course, but it is generally recommended that you use higher-end equipment for those events, or at least use soundboard audio rather than hand-held interview microphones.)

What we want to focus on this time is good, solid, reliable, affordable equipment for interviews and simple field work.

AUDIO CASSETTES: NOT DEAD YET

We started out with Marantz cassette decks and I think we will always have them.

Marantz PDM222 Field Kit

The PMD222 is a simple, if slightly heavy, cassette recorder with all the features and functions (except stereo) that you could really need in the field. It sounds good, has easy to follow connections, switches and a real meter with a needle. It is a classic, but not in that E-Type-Jaguar-that-you-only-drive-on-sunny-weekends kind of way – more like that Dodge Power Wagon that will never die and looks good with its war wounds in the rain kind of classic.

The Marantz styling is good, simple and obvious. Even the students who wonder what a "cassette" is (yes, really!) figure it out quickly and appreciate its ease of use.

Cassettes still are cheap, fairly easy to find, and reusable. Students can buy a couple at the beginning of the semester and reuse them all year. Or, you can buy them in bulk from a tape warehouse and give them out for the class. Since we want the better audio quality for our field interviews for the station, I bought high quality tapes for the station to use.

PICKING THE RIGHT MACHINE

There are several variations on the PMD cassette series, depending on your needs and budget. Consider your uses when buying: do you plan to do a lot of music recording or is stereo unnecessary? Will you use this for playback as well or do you have another deck in the studios for that purpose?

If it is a record-only deck, you can save more money and stick with the two-head base model (PMD201). The best thing about the PMD series is it was designed for professional use, so it has XLR connections, VU meters, telephone taps and more – ready to go, right out of the box. At a street price of about $300, the two or three-head models are inexpensive, easily found and heavy duty.

Although some of the students look at cassettes as though they were some form of ancient transcription cylinder, most of them quickly figure it out and have had no trouble with using the decks or getting blank tapes. The decks also have a nice carrying case which helps make them look more professional when the students are using them, and (I think) makes them feel a bit more confident.

MINIDISC: MAYBE YES, MAYBE NO

MiniDisc is one of the most debated formats to hit educational radio. Since it came on the scene as a cheap alternative to cartridge machines, it has been a controversial consumer-oriented format playing in "professional" leagues.

One side sees the value in easy track control, long storage times and compact size, while the other complains about compression algorithms and whether you really can reuse them.

It is true the compression does compromise the audio for some things, but it is not that big a deal for a field interview recorder and for similar non-musical issues. If you want to make music recordings in the field, we again will assume you are going to bring more serious gear and so we will move onward.

ADAPTING AND IMPROVING

Basic portable MiniDisc (MD) recording machines are available from lots of manufacturers, virtually all under $200, but they really were not designed for professional demands.

Mini-Disc recorders typically do not have XLR connections, have poor preamplifiers, and are a bit difficult for making quick recordings. They are generally very small and you can buy stereo microphones for them or even pick up some of the professional interfaces designed to make them more serviceable.

The MD Report! Jr. that we use is just such an animal, with 9V batteries to power its dual XLR interface, phantom power, selectable headphone monitoring; with a more sturdy construction, the lightweight consumer MiniDisc is converted into a real field unit.

Sony MZ-R55 MiniDisc with upgrade kit.

Of course this approach adds bulk, weight and complexity, and it appears the company that makes it may no longer be in business. But there are other companies offering a variety of "professional converters" for MD and DAT machines. For a truly mind-numbing amount of resources and data on units, accessories and more, check out www.minidisc.org.

Sony MZ-R55 MiniDisc – Rear View

As with the cassette portables, you can use the MD portables for playback decks as well, but it is cheap enough to get a regular rack mount MD deck to use, and you can take advantage of its features via buttons of a more convenient size. If you are using an audio editor with digital I/O, you can also import digitally from the MD units.

Probably the only downside we have had with the MiniDisc is finding them on the fly. It is a hit-and-miss proposition to find them in local electronics shops and the prices are still a bit higher than cassette.

The other issue is with the decks themselves and the difficulty students have had in monitoring their work. We had one pair of students get a great interview with The Roots, only to find when they got back that they had failed to connect the microphone properly.

COMPACT FLASH: I FEEL HAPPY!

Marantz again has found its way into our collection of field units with the new PMD660 portable flash recorder.

Marantz PMD660

A simplified, shrunken and cheaper cousin to the PMD570, the PMD660 offers a lot of professional features, and a street price of under $500.

(Continued on Page 28)

Radio.edu

A Non-Comm View

by John Devecka

Continued From Page 26

The expansion of compact flash card system use in a range of electronics has finally dropped the media price to affordable levels.

The selectivity of recording styles on the PMD660 lets you load huge amounts of audio onto one card. With settings for 16-bit PCM (.wav) recording at 44 or 48 kHz, and 64 kbps mono or 128 kpbs stereo mp3 recording (again 44/48 kHz), you have a lot of storage choices.

Throw a 1GB flash card in the unit, and you have over 17 hours of 128 kbps recording time. And thus far, the four AA batteries manage to last for the full duration without a problem.

A GOOD FEATURE SET

XLR connections for the microphones, level metering, L/R level adjustments, user presets, internal microphones, and many more features make this an awfully easy choice for field work. Again, it is not necessarily what you want to use for music recording, unless you have a soundboard line connection, but it is very nice for interviews.

The unit's internal preamplifiers have come under some criticism, and reasonably so: when used with dynamic microphones they introduce some hiss. When using the unit with louder condenser microphones and the built-in 48V phantom power this does not seem to be an issue.

One of the nicest features for us is that the unit can be made to look like a USB drive to your computer with an included cable and a special mode power-up. This means the collected field recording can get dumped to a computer for editing in seconds and the deck can be back out in another student's hands immediately. It also reduces the file clear-out time, improves the circulation speed and saves on blank media costs and storage space.

Overall, we have found the PDM660 to be just fine for field grabs of interviews and on-the-fly event sound bytes. The students like the easy operation and I have set up the presets so that they can easily pick the right one, based on their "mission." So far, it is the most popular unit for the students in the field.

80 minutes, 90 minutes, 17 hours. Your choice.

MAKING THE CHOICE

Of course, there are drawbacks to each format and there are standardization issues if you are using several different types of media. Thus far we have found the students are most happy with the PMD660.

If you are limited in your options, consider the cassette first. It is considerably less expensive, cassette media is readily available at a low cost to the students, and you really can hammer the decks in the field and they keep working.

If you can afford the luxury of a couple formats, your students will be better served by gaining knowledge of as many as possible.

Our students have managed quite well with all types of sound recorders, but they are clearly most happy with the new PMD660. Now if only they were as cheap as a MiniDisc.

John Devecka prepared this article even as his third child prepared to enter the world. It is not yet known if he took his interview tools to the hospital to record the arrival. Send your congratulations to John at wloy@loyola.edu

FCC Focus

by Cary Tepper

Protecting Your Full-Time Spot on the Dial

In today's fast paced world, people rely upon radio day and night for news, entertainment and companionship. It is virtually assumed that whenever you want to hear your favorite radio station, it will be there for you.

Most radio stations are licensed by the FCC to operate twenty-four hours per day, every day of the week.

However, some noncommercial radio stations licensed to schools and universities do not operate full-time due to budgetary constraints or staffing shortages, especially during summer recess or holidays.

This could lead to problems for some stations.

REQUIRED OPERATION

Section 73.561 of the FCC's Rules establishes certain minimum operating requirements for noncommercial FM broadcasters – namely, that they must operate at least 36 hours per week, and they must operate at least six days per week for a minimum of five hours each day. Radio stations licensed to schools and universities are not required to operate on Saturday or Sunday, or during official school vacation or recess periods.

Although the FCC's Rules permit noncommercial radio stations to cease operating during certain times of the year, the failure to operate the station non-stop all year long some day could result in the involuntary sharing of the station's broadcast frequency.

Since broadcast frequencies are scarce in most areas, the FCC permits time-sharing as a way to maximize the efficient use of broadcast spectrum. Any noncommercial FM broadcaster not operating twenty-four hours per day, every day of the year, runs the risk of having their FCC license renewal application challenged by another party desiring to impose a time-share of the frequency.

FACING DOWN CHALLENGES

Two of my clients were the subject of license renewal, time-share challenges. One, a high school in New Jersey operating only part-time, had its 1998 license renewal application challenged by a local church group.

In response to the renewal challenge, the high school commenced full-time operations for the radio station in late 1998. The FCC did not take any action on the matter for about six years. But, in late 2004 the FCC issued a hearing order for the sole purpose of determining what time-share schedule should be imposed.

We filed an appeal, arguing that the FCC must consider the station's full-time operations since 1998, and that the FCC is not required to automatically approve of a time-share. We submitted that prior FCC rulings required an analysis of all the facts and circumstances, including the high school's full-time operations since 1998, and whether a time-share arrangement in this instance would be in the public interest.

Recently the FCC issued a new hearing order, agreeing that a time-share arrangement is not necessarily automatic.

However, the challenger withdrew its application before the hearing, and the high school was awarded an unconditional renewal of its license.

A prominent college in Ohio also had its license renewal application contested earlier this year by an entity that filed time-share proposals against more than a dozen noncommercial radio station license renewal applications throughout the country.

In this instance, the FCC found that the challenger failed to follow proper procedures, and all of its renewal challenge applications were dismissed. Nevertheless, the Ohio college is now operating its radio station full-time so as to avoid the risk of another challenge in the future.

PROTECTING YOUR "RENEWAL EXPECTANCY"

Traditionally the FCC has held that incumbent broadcasters have a "license renewal expectancy" if they have done their job reasonably well, and have served the interests and needs of their community of license.

With regard to noncommercial broadcasters that do not operate full-time, the FCC recognizes four important factors: (1) Whether the broadcaster systematically ascertained the local needs and problems of its community of license; (2) Whether the broadcaster established a reasonable procedure for responding to local needs and problems with pertinent programming; (3) Whether the broadcaster has served as an electronic outlet for local self-expression for the school, its students and others; and (4) Whether its operating record is free of FCC Rule or policy violations.

PREVENTING PROBLEMS

In consideration of FCC policy and recent events, it would be prudent for all noncommercial stations to operate full-time. If you have budgetary constraints and cannot employ a full-time manager then you should consider a "management rotation" among several volunteers so that a legitimate manager can be on duty during all regular business hours, Monday through Friday, from approximately 9:00 AM until 5:00 PM. The station may be automated at all other times, so long as the transmitter can be turned off remotely if required by circumstances.

The FCC does not require your manager or managers to be paid employees. Volunteer managers are sufficient so long as each manager is knowledgeable of the FCC's day-to-day operating requirements.

At a minimum, the station's Public File should be accessible to each manager and the public during regular weekday business hours and each manager should have a good understanding of the regulatory requirements outlined in the FCC's Self-Inspection Booklet.

All in all, a little bit of day-to-day diligence on your part will keep your FCC license in good standing.

Cary S. Tepper is a principal of the law firm Booth, Freret, Imlay & Tepper, PC in Bethesda, Maryland. Mr. Tepper represents hundreds of commercial and noncommercial radio and TV stations. He can be reached at (301) 718-1818 or tepperlaw@aol.com

Full Duplex

by George Nicholas

Setting Personal Goals

[CEDAR RAPIDS, Iowa] I want to share an insight. When I prepare my column, I look for an interesting quote or story that relates to the topic and gets the creative juices flowing.

This month, I found a quote from a gentleman named C. Neil Strait. It goes like this: "Time is ours but once. Waste it, and it's gone forever. Invest it, and it has not passed in vain."

While it might be a little bit of a stretch to tie that with setting goals, it is the rest of the story – as Paul Harvey would say – that ties this together.

C. NEIL STRAIT

By the time you read this, it will be the second anniversary of the passing of Clifford Neil Strait, of Indian Lake, MI. Born at New Lexington, OH in 1934, Strait lived what appears to be a fairly normal life, ultimately attaining a BA in Religion and Philosophy in the late 1950's, and a Masters in Divinity in 1961.

Strait had several pastoral callings throughout the Midwest, including Illinois, Wisconsin and Michigan. A scholar possessed with an impeccable vocabulary and a commitment to continual learning, he wrote 13 books, edited three texts, and was a contributing writer for eight books and over 70 different periodicals.

Now here comes the goals part: as an avid reader, he pledged to read 100 books per year. That is *two books* a week, folks – a fairly aggressive goal if you ask me. Yet he did not do it for merely a year or two. Over his life, Strait read well over 5,000 books.

This is a man of whom I had not heard until today. I still do not know everything about him, but from my short research it is very clear his goals were important to him – and that he met them.

TEN POINTS YOU CAN USE

In the excellent book *The Power of Focus*, authors Jack Canfield, Mark Victor Hansen and Les Hewitt outline a Top Ten Goals Checklist.

Of course, there are many "Top Ten Goals" lists out there (we may outline others in future columns). What is important is that *you* determine what fits you best, then roll with it. Having said that: the drum roll and card, please.

1. Your most important goals must be yours. Sure, it goes without saying – but there are a lot of unhappy people in the world because of goals set to please others, not themselves. If you do not believe me, go to any soccer game and watch the parents!

While I do not remember many discussions as a teenager with my dad, I vividly remember the day I told him I was going to have a career in broadcasting instead of going into the family nursing home business. But it was *my goal* to do so, and as a good father, he ultimately supported it.

2. Your goals must be meaningful. When you prepare to write down your future goals, ask yourself, "What is really important to me?" What are the rewards and benefits of that goal? What do you wish to be doing one year, five years, twenty years from now?

BE SPECIFIC

3. Your goals must be specific and measurable. This is where most people fail in their goal setting. "I want to spend more time with my family" and "I want to be financially independent" are too vague. Be more specific.

4. Your goals must be flexible. OK, if you are an airline pilot, the goal of a safe landing is *mandatory*, especially if I am on the flight! But broadcast engineering normally is not life and death, at least in terms of goal setting. Set a somewhat flexible goal so you will not be suffocated by it – a plan that allows you to change course if a genuine opportunity presents itself.

5. Your goals must be challenging and exciting. After a business developes a habitual pattern,owners lose the early excitement that originally had been fueled by uncertainty and risk. No pain, no gain. It is okay to push yourself.

THEY ARE YOUR GOALS

6. Your goals must be in alignment with your values. This goes deep into your inner being. What are your core values? Determine that; then make sure your goals are not in opposition to them.

7. Your goals must be well balanced. If you had to live your life over again, would you spend more time in meetings, at a transmitter site, or would you have spent more time with your friends, family, pets or hobbies? No rocket science here – the key is making sure you have fun along the way.

8. Your goals must be realistic. Does the goal seem to be realistic, and are you giving yourself enough time to achieve it? Some might argue there are no such things as unrealistic goals, only unrealistic time frames. However, if you are 4'-11" the NBA will not be calling anytime soon. Instead of Mount Everest, how about Knob Hill?

GOALS NEED TO BE SHARED

9. Your goals must include contribution. Share the wealth of your goal, whether it be giving in the form of time, expertise or financially. Giving back means your rewards are guaranteed!

10. Your goals must be supported. Selectively share your dreams with a few people you trust. These are the same people who will support and encourage you when the times get tough.

And to C Neil Strait, wherever you are: Thanks!

An experienced engineer, both on the local and regional level, George Nicholas goal is to help others be effective in all aspects of their job - technically and personally. If you have an experience to share, or an idea you would like to explore, email George at: georgenicholas@csi.com

Tech Support Forum

by Ted Alexander

Tech Support is a Teamwork Effort

Radio Guide often features discussions about the role of tech support in our industry. Reading the September column from Jeff Welton of the Nautel customer support team, it seemed uncanny to me how similar the customer calls to Nautel were to those to us here at Telos/Omnia/Axia.

Of course, both Nautel and Telos/Omnia/Axia probably communicate with many of the same people in similar situations: people needing help when the radio stops playing.

UNDERSTANDING THE CALLER

When the tech support phone rings, customer and company begin a dialog. Immediately, our tech support representative tries to figure out if we are talking with an experienced engineer or a non-technical station employee.

We may need to begin the chat by having to interpret what "zorched" means or decipher a scribbled note duct-taped to a problem unit saying, "It's dead." For some reason whatever occurred happened when the only witness was some non-technical person charged with setup and teardown.

Once we are speaking the same language, we can go back and try to find out what happened just before the gear died or got "zorched."

GETTING TO THE PROBLEM

We start with the basics: Have they read the instruction manual?(!) Have they tried to reproduce the problem on the bench? Does it even appear to power up? Are they sure their cables and cords are OK?

What does the front panel indicate? Is there any meter indication? Any smoke? Is anything heard from the output?

Did they open the top and check for any obvious signs, like something burned? Are the power supply rails close to nominal? What about the ancillary equipment and line(s) to which it is connected?

YOUR PART IN TECH SUPPORT

Before you call tech support, it helps to be sure the obvious things are not to blame.

If you know what each control does, with a bit of experience and expertise, you may find the problem to be simple enough (and much more economical) to repair in-house.

While looking for obvious signs of trouble, be sure to record the symptoms. Then, if you determine the problem lies deep within the circuitry or you are puzzled by an unfamiliar symptom, call the tech support line. Factory tech support is there for you *after* you have tried to solve the problem locally. Your preliminary bench work will pay off.

Have the unit's model and serial number ready along with the information you have gathered. Do not forget to mention any conditions of use that may have contributed to the failure. For example, was it accidentally submerged, left in a hot sun, or did it absorb a cup of coffee or pizza grease?

At that point, we may ask some of what you might consider "elementary" questions in "first grade-level tech talk." This is partly because, as our industry changes, many customers are not all that experienced in technical matters. Furthermore, while the support person was not there when the failure happened, he may recognize something you might have thought unimportant.

SOLVING PROBLEMS TOGETHER

Depending on the problem (especially intermittents), it may take some time to track down the answer. Be patient. When the tech support person gets to the deeper technical questions, it may take some time to correlate your responses and figure out what is causing the problem.

If there are two similar pieces of equipment available, try swapping them. For telco equipment, try a different, known good line or a different port if a phone line malfunctions.

For POTS lines, connect a butt-set to the line and listen for battery and dialing sounds. For ISDN lines, refer to the error codes that come back.

Have a small battery power amplifier/speaker handy to listen to a line-level output jack. Keep a known good set of headphones and a multimeter nearby. However, without a basic audio generator, multimeter, scope, butt-set or signal tracer, it is futile to try and troubleshoot much of anything. If you do not have time or test equipment, just ask for a return authorization and be done with it.

WHEN THEY SEEM TO TAKE FOREVER

At Telos/Omnia/Axia good tech support can be time consuming. The support engineer may be on a line helping someone else when you call, or answering a complicated e-mail inquiry in detail.

We have a real live person answering the phones during all our business hours, and we check our e-mail 24/7. If you are experiencing a dire emergency, tell that to the receptionist and you will get first priority from the next available engineer. But please do not "cry wolf."

Be patient in expecting the return call, but be ready for it – keep your call-back number open!

Factory tech support is something we all occasionally need to use. It is a "no charge" resource available to everyone who uses our products. Use that resource wisely.

Ted Alexander, Telos/Omnia/Axia tech support engineer and national voiceover talent, is well experienced as chief engineer for many Cleveland area radio stations. Contact Ted at AMFMTV@aol.com

Contract Engineering

Using the GM as an Assistant Engineer

by Kevin Kidd

Many station managers have never seen a transmitter site. While some might feel the GM does not need to know anything about the transmitter and antenna, in many small markets the real challenge is helping the GM fix small transmitter problems without getting fried.

In the small market world where I live – and love working – the manager/owner is still the big picture guy but he has to be able to zoom in to handle specific situations when needed. My job is to help him do just that.

SPREAD OUT

I do engineering work for over 30 stations, plus I do a ground system build or repair every month or two in some far, far away place.

A few regular clients receive a visit from me (or my assistant, Jeremy) every week; some I visit a couple times per year. Some have a full time staff engineer, but most have no more than a semi-technology-challenged manager or owner. We usually are the only source of real "take it apart and fix it" technical assistance they can get.

I have always tried to keep my regularly-maintained stations within 80 miles (two hours driving) of Lawrenceburg, TN. Most of my best clients are within 50 miles; others are scattered as far as 400 miles from Lawrenceburg. Ground system work may be anywhere in the country.

BALANCED RESPONSE

If I am in West Tennessee working on a station and a station in North Carolina goes off the air, I do not want to drive six hours to reset a breaker *even* if it is billable and the house payment is due. (Actually my home is paid off, but I digress.)

At the same time, the client (manager or owner) certainly does not want to pay me twelve hours travel for five minutes' work. Furthermore, they can usually be at the transmitter in minutes. So, why be off the air while I drive like a maniac for hours?

The solution is for them to know *where* the transmitter is located *and* have keys to it. Not only that, they had better know where the breakers are located. I am familiar enough with most of my stations to quickly and safely determine if there is a minor problem that can be cleared by a non-engineering type. I keep pictures of most of my sites' equipment and as many PDF manuals as I can acquire on my laptop.

What if the problem is not a bad phone line or locked up 9200? I am on the way.

QUICK DIAGNOSIS BY PHONE

Both of those situations occurred recently. A lighting strike took one of my FM clients totally off air and – *at almost the same instant* – sixty miles away an AM client lost transmit audio. I was a hundred miles away working on yet another station and Jeremy was building a production room about eighty miles from the closest site.

The owners of both stations were at their respective sites *within minutes*. I quickly talked one through checking the telephone and remote control and discovered the remote control and telephone line were toasted. Then I had him put the transmitter in local control, hit "Plate On," and up it came.

The other had a scrambled display on his 9200 and no audio on the carrier. I talked him through locating the power plug and unplugging it. We chatted for a minute or so and then he plugged it back in – and he was back on the air.

Both owners had a warm and fuzzy feeling because they had done something to help themselves, and I was a hero for being able to tell them how to do it. Both faced more danger driving to the site than anything they did or touched.

NOT ALL GMS ARE CREATED EQUAL

I have other clients who are able to tear up an anvil with a rubber mallet. I do not ask them to do anything other than see what lights might be on or off. "No touchee the buttons!"

On the other hand, a few clients are reasonably good troubleshooters in their own semi-logical way. One in particular is a female station manager.

She has a ton of common sense and is very observant and accurate in her descriptions of problems. I have talked her through resetting breakers, resetting overloads on transmitters, determining that it is an SEP (Somebody Else's Problem), manually swapping to the backup transmitter, and a plethora of other non-cabinet-opening repairs.

IN THE STATION'S BEST INTEREST

Could I make a station wait for me to arrive to reset that breaker? Sure. Would it be in my and my client's best interest? No. Would I try to talk a client through changing a tube (or other open cabinet procedure)? Noooo!

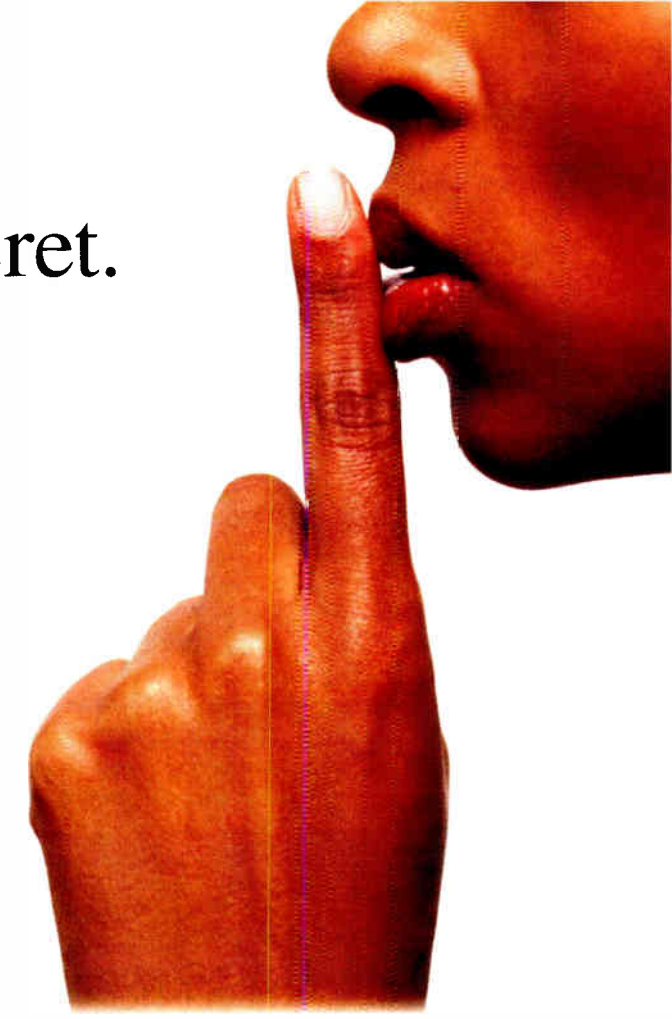
Unfortunately, I have arrived at sites to do non-client emergency work where they needed a burglar more than they needed an engineer. One time, after a two-hour drive, it took more time to pry a window open, then climb in, re-secure it and exit the front door than to reset the breaker.

I suggest each of my clients have three complete sets of keys to the transmitter site: one with a manager or owner at all times, one accessible to staff (not necessarily hanging on the studio wall, but can be found with instructions) and a third set accessible only to station management.

In the very real world of small to smaller market radio it is an absolute must that someone other than the engineer has access to the sites.

Kevin Kidd is a contract engineer based Lawrenceburg, TN. His company also specializes in AM ground systems. Email Kevin at kkidd@kkbc.com

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.)

Telos

AUDIO | NETWORKS

www.Telos-Systems.com

Tech Tip

by Richard Rudman

Making A Dummy Work for You

Those of you who maintain Harris MW-1 transmitters know that this series sports a built-in one kilowatt dummy load. But it is not the easiest tool to use.

USEFUL TOOL

Switching the dummy load in and out for testing requires you first disable the transmitter for safety (including turning off the AC main breaker), then take the top grille off, check for residual voltages, disconnect the output RF connection from its path to the antenna and move it to the dummy's input lug.

After testing, reversing those actions is suggested if you want to get the rig back on the air. Inconvenient? You bet!

Meanwhile, if you have another transmitter without an internal dummy load, and you are on a tight budget, you have an added complication that stands between you and easy load testing. Here is a solution: remove the dummy load from the Harris MW-1.

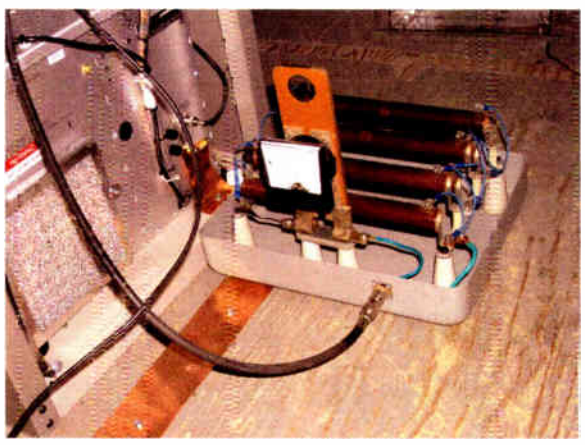
MAKE IT HANDY

Once liberated, it can be built as a freestanding test tool, mounted and wired into a shielded box with J-Plugs for manual switching or with an RF contactor as a reject load.

The photos show what the finished product freestanding configuration looks like, complete with a J-Plug insert for an RF ammeter.

Finding the right chassis to remount the wirewound resistors might involve some creativity, especially if you are budget-challenged. I literally tripped over my solution – a removable cover from a Tellabs wall-mounted audio interface in the "never to be used again" pile in the storeroom.

A large and deep aluminum chassis of the type in which we used to build tube ham rigs and audio amplifiers would suffice as well if one happens to be lying around in your pile.



A one kilowatt dummy load, now portable.

CAREFUL REMOVAL AND REASSEMBLY

Carefully remove the resistors, their ceramic standoffs, and all hardware from the transmitter. This next line is out of respect to Murphy and his Laws: *Please be very careful not to drop any hardware inside the transmitter.* If you do drop anything, the right thing to do is to find whatever it is and remove it immediately.

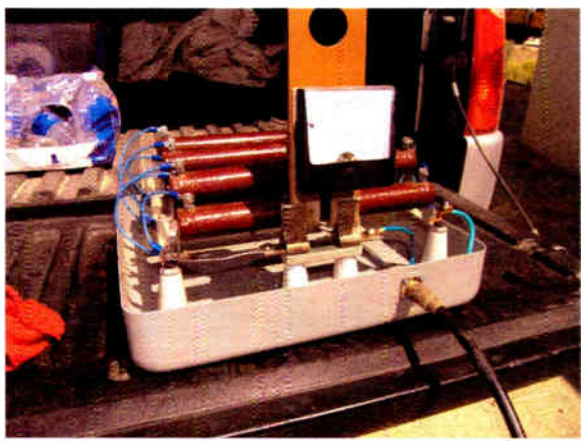
Next, carefully reassemble all the large wire-wound resistors on your chassis using the mounting hardware you removed from the transmitter, including those little soft washers that help keep ceramic insulators from cracking. Note how the resistors are connected so your transplanted load comes out to the intended and vital 50 ohms.

Of course, never over-tighten the screws going into the ceramic threads. As you build it, check your work with an ohmmeter for the sought-after 50-ohm result, as well as for any shorts or opens in your wiring. Better yet, use an RF bridge to check out the finished product.

Although the load was built with wire-wound resistors, it bridged out to be very close to 50 + j0.

A SAFETY WARNING

If you act on this tip, please make sure you check all internal wiring to ensure everything will work before you button the transmitter rig back up and apply AC power.



The dummy load goes mobile easily.

Check to make sure all the RF connections are clean and tight if you have not visited this part of the transmitter recently. And while the grille is off, the transmitter is cold and you are enjoying the view from the top, why not clean things up a bit?

You will probably see an assortment of dirt, dead insects and possibly some livestock since the grille is far from impervious. In my case, it was the proverbial dead mouse.

Another important caution: Although this load was never intended for lengthy use with 100% modulation, or anything close to it. Although a fan aimed at the resistor bank or mounting the load in a freezer might help, either reduce transmitter RF output power or keep the modulation down if you run a long test on the load. Furthermore, never leave the immediate area while using the load and always watch for smoke!

Richard Rudman has over forty years of engineering experience, from Remote Producer to Engineering Manager to Past President of the SBE. You can email Richard at Remote Possibilities at rar01@earthlink.net

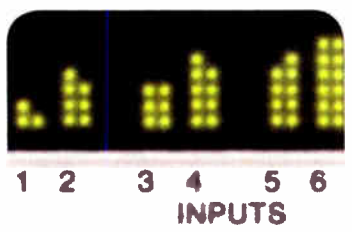
"IP-Audio in New York City? Not on my station."

"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

AXIA
A TELOS COMPANY

www.AxiaAudio.com

SBE Focus

by Alan Alsobrook, CSRE AMD
& Phil Alexander CSRE AMD

A Look at a Certification Test

Many folks have questions about the SBE certification tests. Early this year, Alan Alsobrook and Phil Alexander both took the same test – "AM Directional Specialist." Their comments about the test and its contents – from two viewpoints not always in agreement – are interesting reading for any considering taking the examination.

READY

Alan Alsobrook: When I decided to take the test at the NAB in Las Vegas, I was thinking that if I did not pass it, at least I would have a chance to take a look at the test and be fully ready for it on my next opportunity to take it. I do not know how many people were also taking the AM DA specialist at that sitting, but I do not think it was very many.

I am not sure why I am drawn to take this and other tests. Working as a contract engineer the point looked at by most stations who ask for my services is my reputation. I have always enjoyed the challenge of a test and I look at it as a chance to prove myself, although I seriously doubt I would have been asked to serve as the Alternative Inspector for Florida had I not had my CSRE at that time.

Phil Alexander: There seems to be a wide gap between the discipline of directional array design and operation that grows with each passing year. If we look at the SBE AMD as a way to begin narrowing this gap, then it is a useful beginning.

SET

Alsobrook: I did not bring any reference material with me, although a copy of Jack Layton's "*Directional Antennas Made Simple*," along with a copy of Part 73, would have been wonderful material to have.

A review of the Rules sections is highly recommended. Sections 73.45-73.69 and 73.150-73.158 would definitely be on the review list along with the directional section of the AM Self-Inspection Checklist.

Alexander: The SBE exam for AM Directional Specialist is not intended as a test of advanced knowledge about directional arrays, but rather as a review of knowledge a directional array operator should have readily available.

GO!

Alsobrook: Once I dove into the test I was surprised to see how well the test was making me think about the Rules regarding directional arrays.

As an Alternative Inspector I know the Rules pretty well, and yet I was having to think hard about them. Had it not been for my familiarity with those Rules I do not know if I would have made it through the test without any reference materials. As it was I did pass the test on the first sitting.

Alexander: As I took the exam in a long conference room at the Las Vegas Hilton, I found myself at odds with quite a few questions. They were not bad questions, but with only fifty on the test, it seemed a waste of time to test the ability to look up Regulations over and over.

To be sure, the operator of a DA should know how to find the Rules that govern directional operations, but Rules change, and much too frequently as different ideas come into vogue at the FCC. It might have been more useful to test the extent of knowledge about the physical principles governing DA operation that cannot change.

IMPRESSIONS

Alsobrook: This test will probe your knowledge of directional arrays as well it should, but it is not written to require you to be a consulting engineer.

A station engineer with a good knowledge of directional antennas should be able to get through the test without many problems. The test will prove to be very difficult for anyone who does not have a good understanding of AM RF and a working knowledge of the Rules.

Alexander: On balance, I thought the AMD should have covered more advanced ground, while they wanted a test that would determine if the applicant knew when to call in a consultant. I honestly cannot say which view is correct – I think both have merit.

It seems to me the AMD should know enough to fix minor problems and have the knowledge to determine the difference between major and minor. One of the things I have found useful over the years is knowing (more or less) what each crank on a phasor is intended to do and the actual effect it may have on an array or how to calculate the values of a satisfactory replacement part in an older array, given the operating parameters of the network.

Thus the practical aspects of phasor and transmission system design are – to my way of thinking – more valuable than Rule-finding in an open book test. While the AMD exam did explore some topics in this area, more with greater detail might have better tested the applicants range of knowledge.

CONCLUSIONS

Alsobrook: As I was taking the test I made many comments about the questions and answers on the test so the certification committee could review it. After the test I was able to check back on the questions I pondered over and found I was in error on my thinking on a few of them.

Once the certification committee reviews the comments who knows what the test will look like the next time someone sits down to take it.

Alexander: As IBOC deploys throughout the industry, a good understanding of AM directional arrays will become more important than in the past. Perhaps what the industry needs is a second level of the AMD – a Senior AMD – certifying one has the knowledge needed to bring an out-of-tolerance DA back to operation as designed. If IBOC succeeds in elevating the value of AM properties, this will become a much needed skill.

Alsobrook: In conclusion, I was very happy with the AM Directional Specialist exam. I think it will show employers who should and should not be taking care of the directional antenna at the station. This, of course, would be especially true when bringing in someone new. – *Radio Guide* –

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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

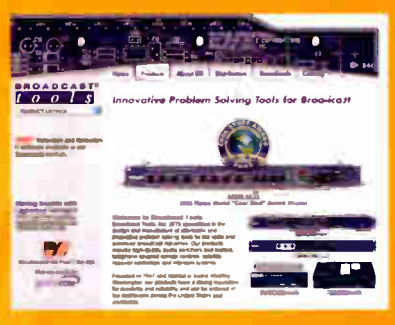
The ACS 8.2 provides matrix audio switching of 8 stereo inputs to 2 stereo plus 2 mono outputs. Any input assigned to output one has fading capabilities. Matrix switching allows any/or all inputs to be assigned to any/or all outputs. The ACS 8.2 may be controlled via front panel switches, contact closures, 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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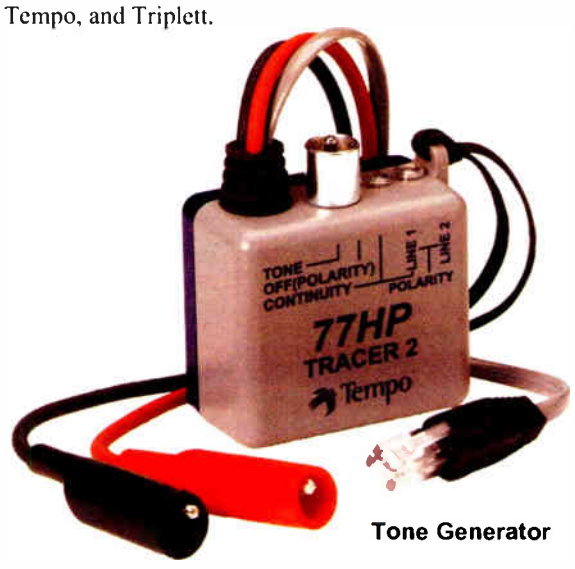
Tool Guide

Test, Tools, Tips and Applications

Tempo 701K Tone Generator and Probe

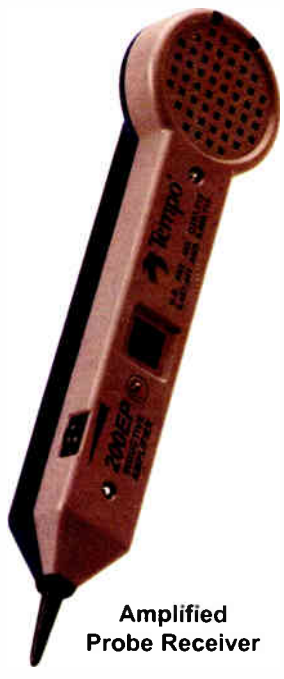
One of the absolutely "must-have" items in the tool bag of any engineer working on analog audio circuits is a Tone and Probe Kit, also commonly referred to as Fox and Hound (a product name copyrighted by Triplett). There are many variations of this tool made by diverse manufacturers such as Eclipse, Extech, Greenlee, Ideal, Jensen, Seren, Tempo, and Triplett.



Tone Generator

For this analysis we are going to focus on the Tempo (previously known as Progressive Electronics) Model 701K. The tool consists of two parts: a Tone Generator and an Amplified Probe Receiver, each powered by a 9V battery with a rated use time of 50 hours.

The Tone Generator (or in Tempo parlance "High Power Tone Generator") emits a selectable continuous 900 Hz steady tone or a 900/1100 Hz warble tone via both a RJ-11 pigtail and color coded alligator clip leads at a healthy +7 dBm. The Tone Generator becomes the Source for most troubleshooting, and also provides Talk Battery Supply of 4.5 VDC for use in troubleshooting telephone systems. Alternatively, it may be plugged into a telephone jack to sense ring voltage as displayed by a three-state LED indicator.



Amplified Probe Receiver

The Probe (Tempo refers to it as an "Inductive Amplifier") is the Sleuth part of the tool. It is a compact handheld, inductively-coupled amplified speaker with handy thumbwheel operated gain control – up to 26 dB. There are also jacks and tabs to provide an interface for headphones or a buttset, if desired. The fact that it has an inductive plastic covered sensor with 100 Megohm impedance and no ground lead required assures that there will be no loading of the circuit under test.

The 701K and similar products are intended to be used troubleshooting wiring infrastructure continuity and telephone systems. Placing the Probe anywhere in proximity of where the tone is expected to be will provide an audible indication and it is then easy to home in on the specific wire or circuit being traced. Manipulation of the Generator clip leads can even be used to detect crossed connections.

But what the book does not mention is that the Probe is also an invaluable tool in troubleshooting active analog audio circuitry, even at the PC board level. It is quick and easy to trace where signal is present and where it is not and judicious use of the volume control will ascertain whether there is bleed-through from adjacent circuitry or not.

The price range of these products varies anywhere from about $60 to $180, dependent on features and quality of construction. There are also variations intended for use on LAN's, with additional features and indicators of hub, switch, router, and/or PC activity. Which one is right for you depends on budget, frequency of use, and assessment of the fact that this item will be bouncing around in the tool bag for a long time. When needed – it is invaluable.

Consultant Guide

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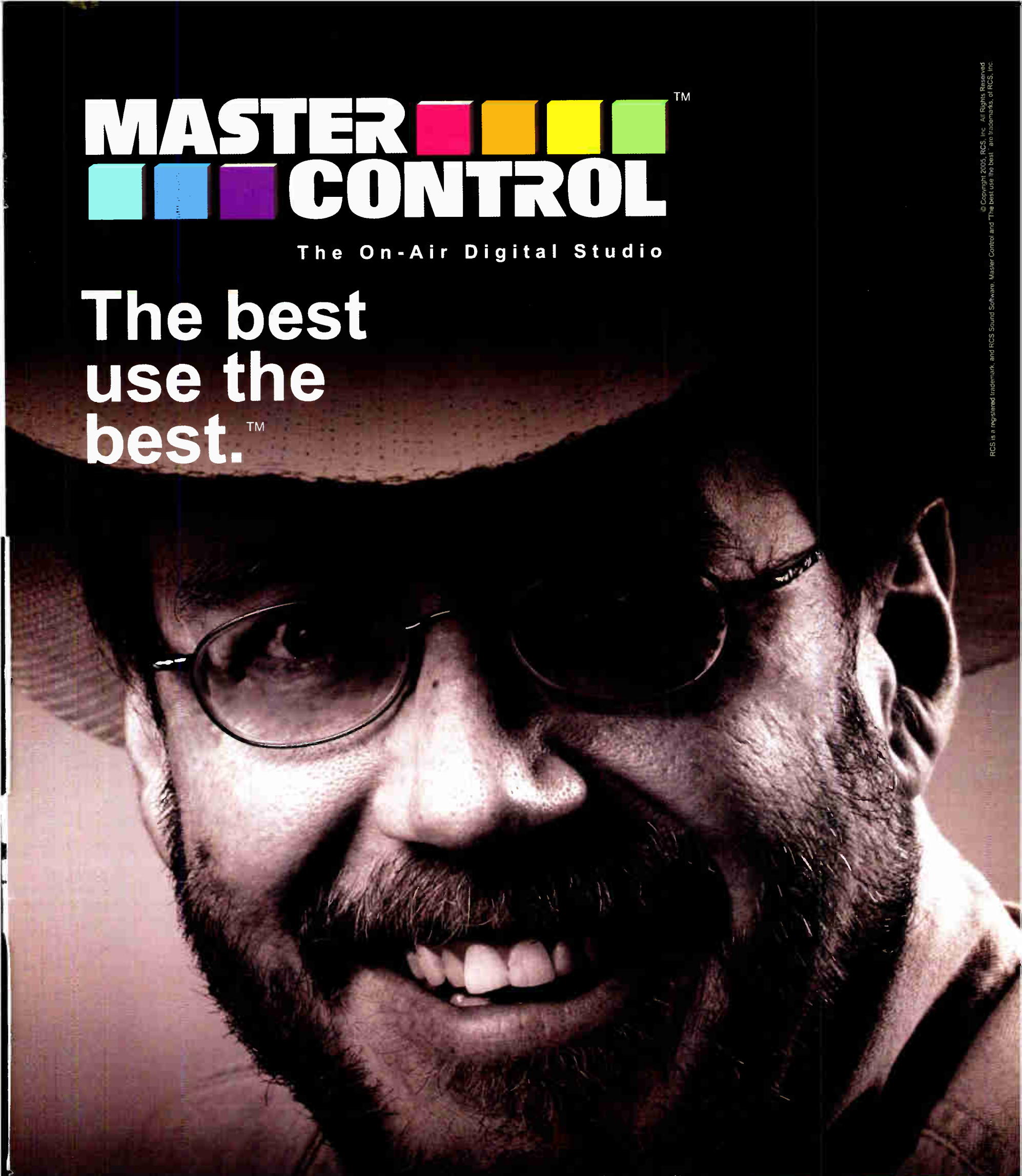

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Gear Guide: Towers, Antennas, Coax RF Switchers and Phasors

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Armstrong has FM Solid State transmitters from 10W to 20KW. Single Tube FM transmitters 3.5KW to 35KW. Analog and digital STLs. And the award winning X1000B Solid State HD Radio Ready AM transmitter.

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The Bext line of RF Combiners has grown to 63 standard production models.

With Broadband FM Antennas becoming more common these days, it makes great sense to combine several FM Stations into a single antenna.

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Power levels in the Bext line of RF Combiners go from a few hundred Watt models designed for low power applications all the way to multiple high power Class C Stations.

Star Point and Constant Impedance models are available, and Bext can custom build special Combiners beyond the standard production models.

Dielectric Communications

HDR – Dibrid Combiner

www.dielectric.com • 207-655-4555

The Dielectric HDR Dibrid Combiner facilitates in-band on-channel (IBOC) radio broadcasts that combine analog and dual sideband digital signals. Because the Dibrid does not use switches, it permits "hot switching" that keeps broadcasters on the air as functions are changed.

Dielectric delivers the Dibrid as a stand-alone unit with two inputs and two outputs, which gives it the versatility to be utilized with a variety of transmitter combinations. Depending on the function, one transmitter or a combination of the two can be connected to the combiner's inputs, while one output is attached to an antenna and the other to a station dummy load. Transmission modes can be set up to direct either the analog transmitter, digital transmitter, or a combination of both in a variety of different ratios to the antenna, with the residual power directed to the station load.

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LYNX™ Dual Input Side Mount Antenna for FM IBOC Operations. From the beginning, ERI has been a leader in the research and development of IBOC FM technologies.

The Electronics Research LYNX Dual Input Side Mount Antenna is designed specifically for FM IBOC applications. This new antenna is capable of transmitting both the analog and digital FM signals without requiring a high loss hybrid combiner, and maintains high isolation between the digital and analog transmitters.

The design meets the current Federal Communications Commission requirement for informal notification of implementation. In addition to the LYNX, ERI provides other solutions to broadcasters' needs including the iBOX™ low, medium, and high power Hybrid Combiners and the Mask-960 IBOC Spectral Compliance Filter.

Jampro Antennas

JMPC-2+JMPC2-HD – FM Antenna Arrays

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The JMPC-2+JMPC2-HD array uses a special design which has proven to have good isolation (typical 29 to 32 dB). The two sections offer almost mirror images for band pass and takes up less tower space than some other approaches. The interleaved array allows stations with rented tower space to hold down costs and keeps the weight and wind loads to a minimum. The digital bays could be used as a back up should there be a problem in the normal analog transmission line or bays.

This JMPC-2 + JMPC-2-HD is shown installed on a 24" triangle tower. This array will most often have lower weight and wind load than a dual input panel or side mount antenna. Additionally, some recent Penetrators might be retrofitable. Contact the factory about your Jampro antenna model to see if this works for you.

Jampro's also offers other HD FM antennas: dual input, separate elevation side mount models; dual input panels; dual input side mount models; low level combined, wide band arrays; mid level combined systems and high level combined antennas.

Gear Guide: Towers, Antennas, Coax RF Switchers and Phasors

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WFDF in Detroit, Michigan

Kintronic Labs has invested significant internal R&D funds to develop state-of-the-art AM antenna system network optimization design software to yield maximally flat input impedance characteristics, minimal deviation pattern bandwidth and linear group delay for the current hybrid analog + digital HD radio modulated waveform.

These new design tools are enabling Kintronic Labs AM antenna systems to produce a received sound quality better than ever before. An example of this is Radio Station WFDF in Detroit, Michigan that was designed to accommodate the AM HD digital audio for Radio Disney with 50kW into separate eight-tower day and night patterns.

Kintronic Labs is making every effort to lead the way in providing top quality AM radio broadcast antenna systems for the digital revolution.

LBA Technology Inc.

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LBA Technology is your one-stop source for complete AM directional antenna systems at all power levels. You get precise coverage patterns at a price that makes sense. LBA has over 40 years experience worldwide!

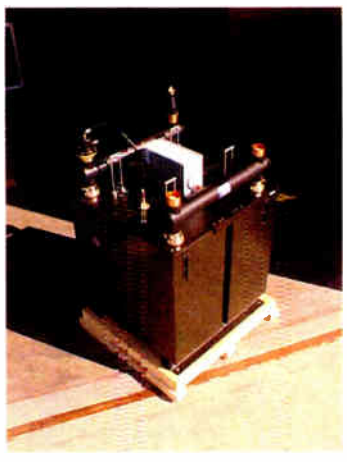
LBA directional antenna systems are computer designed and custom built by experienced craftsmen to assure maximum cost-efficiency while minimizing adjustments and providing long term stability to minimize maintenance costs. Front panel access, ergonomic layout and digital counter controls provide for operator safety and convenience. Wide network range for easy tune up, factory adjustment, and compatibility with HD Radio broadband matching requirements are supported.

LBA Technology manufactures AM antenna systems that include antenna tuning units, diplexers and triplexers, mobile antenna systems, inductors, and other radio frequency products. They can provide complete AM RF system integration including engineering, installation, towers and cables.

MCI – Micro Communications Inc.

FM Channel Combiners

www.mcibroadcast.com • 800-545-0608



Micro Communication Inc. offers a full range of FM Channel Combiners in a variety of constant impedance configurations.

The combiner module consists of a number of precision bandpass cavities and coaxial hybrids that ensure excellent performance. In a multi-channel combining system one module is dedicated to each channel.

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- *High Isolation – Stand Alone Filter*
- *Constant Impedance Design*
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Optional equipment may include provisions such as patch panels or switches, input test load ports, custom framing systems, N+1 systems, etc.

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Nott's Gila-Stat systems remove the tendency of lightning to strike a tall structure by eliminating the static charge built up by the atmosphere.

Nott Ltd is a Nello Tower distributor, stocking 25N (Rohn 25G copy) through 55N (55G) towers, and other mounts, masts, and guying materials. We are also a Sunwize renewable energy (solar, windpower) dealer.

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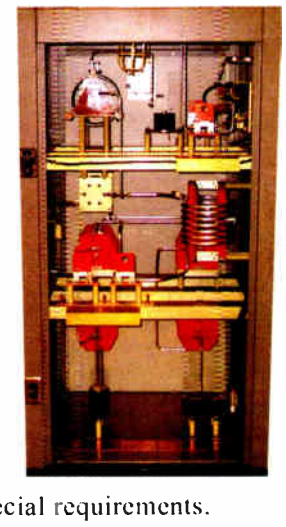

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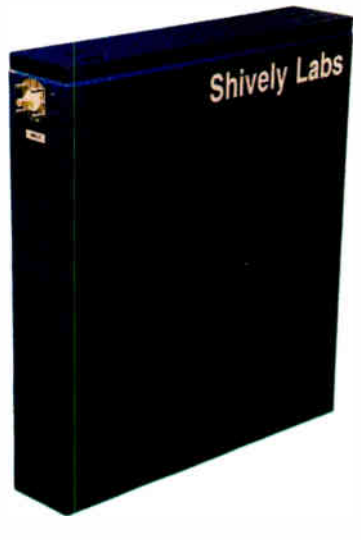

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Products include the new **2600 Series Bandpass Filters**, featuring a footprint 1/3 the size of filters with comparable performance.

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Operate/test AM/FM transmitters to determine compliance with broadcast standards, published ratings, and customer requirements. Duties: test control system for correct voltage of filament supplies, low voltage and high voltage supplies; troubleshoot, correct, and verify deviations; test/tune Radio Frequency circuits; perform "Truth of Performance Tests" using electronic test equipment (Audio Signal Generators, Audio Distortion Meters, Spectrum Analyzers, and Vector Impedance Bridge); test transmitter response to audio frequency spectrum; test operating frequency of the transmitter, center frequency, side bands, bandwidth, and harmonics generated at proper modulation levels.

REQUIREMENTS: Bachelor's degree in Electronics Engineering or related discipline.

Please send resume and cover letter to Energy-Onix, Inc., Attn: Bernard Wise, 1306 River Street, Valatie, NY 12184

Balsys Purchases SystemsStore

Balsys Technology Group, Inc. is pleased to announce that it has purchased the assets of SystemsStore from RDA Group, Inc.

www.SystemsStore.com has been operational since 2000, and has established itself as a premier online source of technical tools and supplies for the broadcast, professional audio, video, telecom, and IT industries.

Presently offering products from manufacturers such as ADC, AllenTel, Belden, Flextray, Gepco, Krone, Leader, Lowell, Middle Atlantic, Neutrik, Panduit, RDL, Siemon, Switchcraft, Wheelock, Whirlwind, and others, additional products will be added in the near future.

According to Balsys CEO Larry Lamoray, "SystemsStore.com was a pioneer of the webstore concept and has carved out a unique niche as a single source for the specialized tools and supplies required in a myriad of industry niches. They are the only convenient source for 'cable by the foot,' and the expansion of product lines will position it as an improved source for technical products."

"To have SystemsStore.com meeting customer needs as a Balsys company is a great asset to the broadcast and communications industry," said Rick Dearborn, President of RDA and founder of SystemsStore.com.

"Balsys has built a solid reputation for service and I'm confident they will serve the store's legacy customers well." Recently, Rick has moved to the other side of the microphone and now hosts technology programming for radio stations across the country.

Other Balsys companies include Balsys Technology Group, Inc., a Systems Integration Company providing complete Studio and RF Services on a nationwide basis to the Professional Radio Broadcast Industry, and Balsys Wood Arts, Inc., a Custom Studio Furniture fabricator.

SystemsStore
Phone: 407-656-3719
Website: www.systemsstore.com
Email: sales@systemsstore.com

Orban Announces Optimod-AM9400

Orban, a subsidiary of Circuit Research Labs, Inc. has announced its new flagship DSP-based AM audio processor, OPTIMOD-AM 9400. The 9400 contains two processing chains for AM analog broadcasting and netcasting/digital radio broadcasting. The only processing common to the two channels is the AGC and stereo enhancer.

Beyond this front-end processing, each processing chain has its own equalizer, five-band compressor/limiter, and peak limiter, each optimized for its intended transmission channel. The analog chain peak limiter uses Orban's exclusive multiband distortion-canceled clipper and overshoot compensator, while the digital chain uses an advanced, low-IM look-ahead limiter to make the most of low bitrate codecs like the HDC codec used in the iBiquity® HD AM system.

Moreover, both processing chains are stereo, making the 9400 appropriate for CQUAM® AM stereo installations. In this application, it replaces Orban's popular OPTIMOD-AM 9100B analog processor, which has been in continuous production for 23 years.

Bob Orban, Vice President and Chief Engineer, commented, "We realized early in the 9400's design process that AM stations need more than just AGC and peak limiting on their digital channels. Particularly because of the preponderance of talk on AM, these stations also need Orban-quality five-band compression and limiting to ensure spectral consistency and smooth source-to-source continuity on the digital channel.

"However, the analog and digital five-band compressor/limiters require very different thresholds and time constants. Appropriate equalization settings and peak limiting technologies are very different as well. That's why the 9400 is essentially two processors in one."

Charles Jayson Brentlinger, the Company's President and Chief Executive Officer, continued, "This is truly one AM processor that does it all. Finally, HD AM broadcasters can obtain a single-box solution that allows them to deliver the best possible quality on both their analog and digital channels."

Thanks to its unified design, the 9400 costs substantially less than a two-box configuration and is easier to control. The company expects deliveries to start in January 2006, at a MSRP of $7,990.00.

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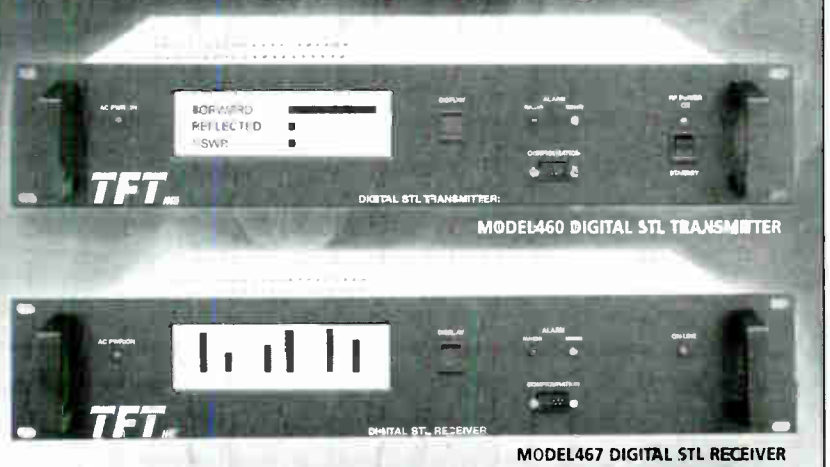

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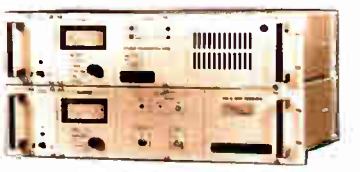

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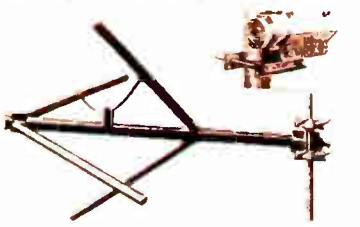

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