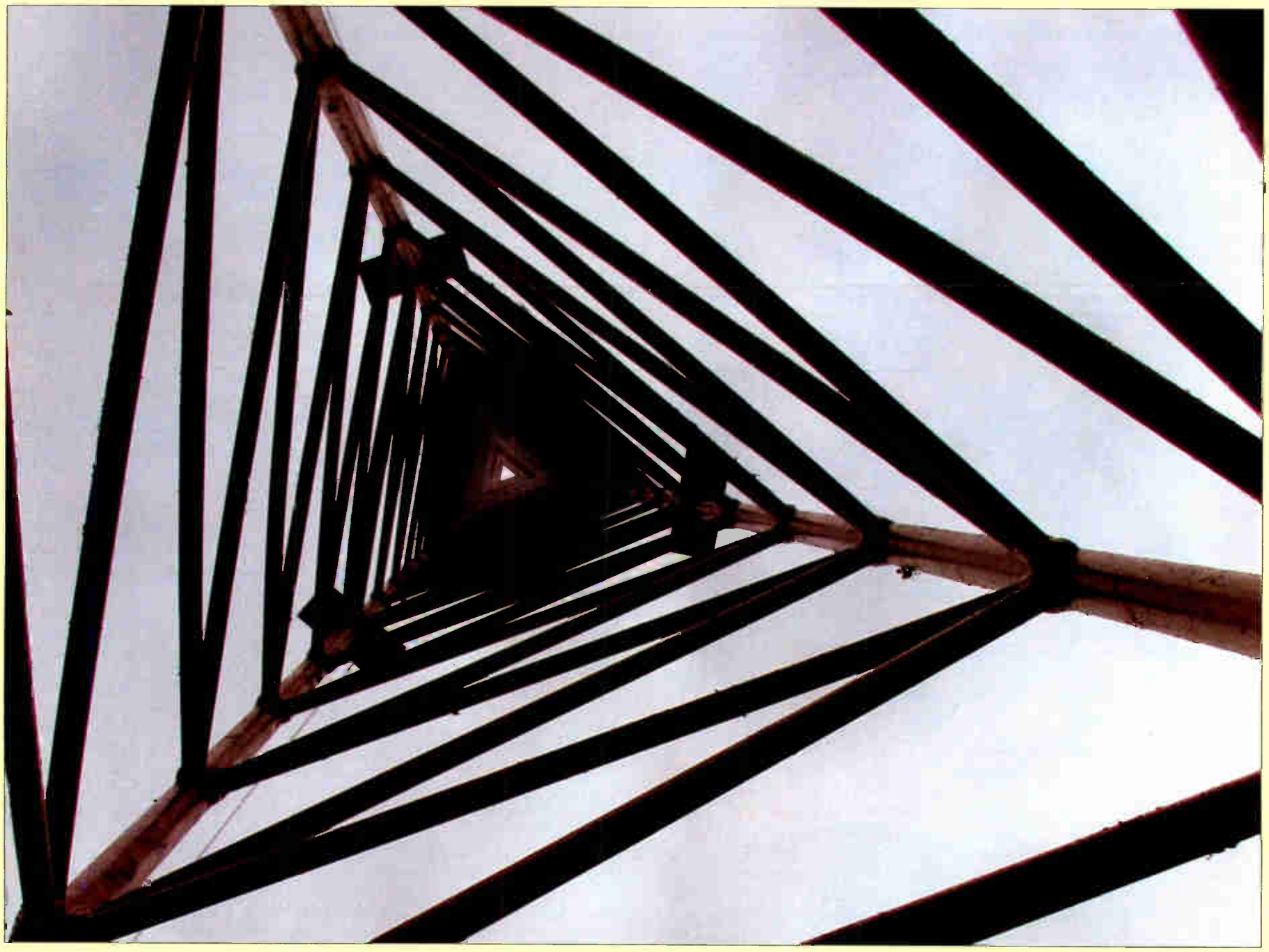
Radio Technology for Engineers and Managers

Radio Guide

www.radio-guide.com

January-February 2008 – Vol. 16, No. 1

DA Construction on a Difficult Site



Inside Radio Guide

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Radio Guide

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January-February 2008

Cover Photo

Looking up the center of WGNY's Tower 1, before the top plate is attached.

Radio Guide

Volume 16 – Issue 1

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Radio Waves

by Barry Mishkind – Editor

No, you did not miss your January issue of ***Radio Guide***.

With this "January-February 2008" issue we are moving to a bi-monthly publication cycle. Our next issue will be March-April, as we get you ready for the Spring NAB Show.

GONE GREEN?

We did not have to go bi-monthly. Our original 2008 schedule was sold out some months ago, since we do not print extra pages just to print ads.

Is this a move to go green? Not really, although we will save about 20 trees an issue. The major reasons relate to our busy lives – and the reduced time that leaves everyone for reading. Many folks have expressed being overwhelmed by the quantity of material published.

Furthermore, the Internet has changed things. News and FCC actions, for example, flow far faster than in any print publication. Still, while it seems appropriate to move some things to the Internet, there is still a lot of information – and even some history – that is best handled in print.

MOVING AHEAD

Our focus continues to be on honest, straightforward articles that help you do your job, in a format that does not overwhelm you. The feedback we get from readers all over the world is that ***Radio Guide*** is the one they reach for first, because it is relevant to their work.

We intend to keep it that way.

Of course, we plan to improve some old features – and introduce some new ones. For example, our ***Hall of Achievement*** (Page 12) was created to recognize the many folks who, while not highly visible or politically connected, have made a real contribution to our industry. You may not even know their names but, as you read their stories, you will see that without their efforts, we would be much poorer for it.

Want to nominate someone for inclusion? Have a comment on another aspect of the magazine? By all means let us know your thoughts at Editor@Radio-Guide.com And be assured of our appreciation of your trust in ***Radio Guide***.

Shark, shown interviewing BERT MCCRACKEN, lead singer for THE USED, says: "When Comrex told me that their internal code name for ACCESS was "THE NEXT BIG THING" I got it right away. This IS BIG – I was live, on the air, in places I could NEVER have gone with regular old technology. THANKS COMREX!"

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COMREX

Slipping a DA into a Swamp in Just 20 Years

by Bill Weeks

WGNY, 1220 kHz in Newburgh, NY, has held a construction permit for a new directional array for, I believe, more than 20 years. For something like the last 15 of those years WGNY has operated at 500 watts (daytime) non-directional from a "temporary site" under Special Temporary Authority (STA).

I shall leave the saga of those years to someone else to chronicle. I mention the time primarily to hint at the degree of anticipation felt by the station staff when it began to be apparent that the new facility would finally be built.

A SLIGHTLY DIFFICULT SITE

The site finally chosen for the new array is quite literally a swamp. More specifically, the site is near the southwestern corner of a large, tree-covered swamp. The site was not the first choice 20 years ago but available real estate changes over the years.

WGNY's site was on the SW edge of a large swamp

Parts of the tower field are often covered by a foot or more of water. The ground was believed to be, typically, three to five feet of muck over a clay-based soil.

The station property includes space for a driveway from a paved road, a corner of solid ground barely adequate for a 10 foot by 20 foot building, and fortunately, something that turns out to have once been a dirt road through the swamp. On the old maps, it had a name: Shunpike Road.

Shunpike "Road" – not quite a major road.

All of this property, including the old Shunpike Road, was heavily forested with trees up to about 70 feet tall and with a heavy undergrowth ranging from pricker bushes to skunk cabbage. There was, of course, plenty of poison ivy.

A challenging construction site, to say the least.

DEALING WITH THE BUREAUCRATS

It would be a challenging site to develop. Construction in the swamp required a permit from the state Department of Environmental Conservation.

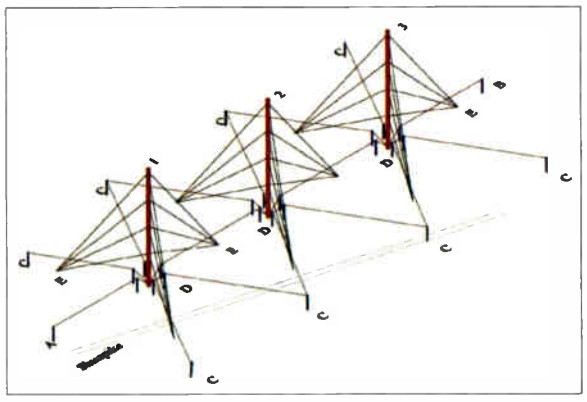
The permit, when obtained, had constraints that were draconian. A relatively large tract of adjacent swampland had to be left undisturbed in perpetuity. On the portion that could be used, only a small percentage could be cleared: in total, much less than an acre could have its soil disturbed or be filled.

No machinery could be used in the wetland areas without protecting the soil, and no permanent paths or catwalks could be left through the swamp to the tower bases.

Clearly this would not end up looking like a traditional AM directional site.

SYSTEM DESIGN

The antenna system was designed by Communications Technologies, Incorporated, using modern computer modeling methods. This made it possible to evaluate alternatives when construction difficulties presented themselves. It also made the final adjustment process very smooth.



The system was designed to use a counterpoise ground system.

The final design was for three towers inline, 5 kW day, 180 Watts night, a DA-2 with different parameters day and night. The system uses an elevated counterpoise, rather than buried ground radials. With this design, six evenly-spaced wires are anchored around each tower base and slope up to 20 feet above ground at 20 feet from the tower, they then extend for 1/4-wavelength – 205 feet. (Where the ends of these counterpoise wires from adjacent towers touch, they are bonded together.)

The towers are relatively short at 170 feet, top-loaded with the top level of guy wires. Nevertheless, the towers were required to be registered, painted, and lit; the swamp, among its other endearments, is close to an airport.

GETTING THINGS UNDERWAY

The very first step was to have the property surveyed. I am not sure how the surveyor did his work under the conditions that we later found on the site – I hope that he found all of his crew when his work was done.

The next step was to clear the driveway as far as the transmitter building and arrange for electric service. It only took about the usual amount of time to explain to the electric company that we needed real three-phase power, with no wild leg. They had to set a new pole to hold the three pole pigs, the feed down the driveway (about 350 feet), was to be underground.

Finding a contractor to clear and prepare the driveway and building location was fairly straightforward. This part was under normal construction conditions.

Physical and electrical egress.

SITING THE BUILDING AND TOWERS

The DEC permit for construction in the swamp allowed for only 10-foot-wide paths where each counterpoise wire would go and 25-foot-square staging areas around each tower. The cut wood had to be removed, rather than chipped.

We were allowed to fill the staging areas to above the water level, but not to leave permanent paths to the tower bases. The fill could not extend beyond the 25-foot square, so it was tapered to a top level of about 17-foot square.

The transmitter was to go here.

The building chosen was a ThermoBond 10 foot by 20 foot prefabricated structure. This was the maximum size allowed by the local building permit. The building size placed constraints on the possible physical sizes of the transmitter and phasor.

We were a little unsure of the final radiation efficiency of the antenna system, considering that most of the tower field would still be tree-covered. Therefore a 10 kW transmitter was specified. The final choice was a BE AM-10A. The phasor and ATUs were built by Phasetek.

CONSTRUCTION ISSUES

Tower contractors would only give estimates at this stage, based on "average soil conditions," and it was clear that the soil conditions were anything but average.

Eventually we decided to explore the possibility of using helical anchors for the guy anchors and tower foundations. This would reduce the time that heavy things would need to move around in the swamp and almost eliminate the need for concrete.

AB Chance manufactures helical, screw-in anchors, designed for all sorts of pull-out or load bearing applications. They have a significant history of holding up towers in less than ideal soils.

Helical anchors were used to overcome the difficult soil conditions

(Continued on Page 8)

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Slipping a DA into a Swamp in Just 20 Years

– Continued From Page 6 –

Ken Van Polen, of Ground Systems Plus, a certified Chance installer, did boring tests on the site. Each test consisted of driving in a helical anchor and noting the torque required at various depths.

Ultimately, Northeast Towers, Inc, was chosen to furnish and erect the towers and elevated ground system. (The Northeast crew that did the work was the same one that had recently cut down Tom Ray's old towers at WOR, although I am not sure that constitutes a solid recommendation for erecting new towers.) Northeast proposed telephone poles for the vertical supports for the counterpoise wires and copperweld for the wires themselves.

When potential clearing contractors were being shown the site in the early summer, the location for the nearest tower base was muddy, the middle tower location was under about a foot of water, and the furthest tower base was under about two feet of water – and four or five feet of very soft muck. (This was according to one contractor, I did not actually try to walk out that far.)

Clearing contractors therefore faced the prospect of wielding a chainsaw while standing in water and muck well past their knees, then hand carrying out the cut trees. They were not enthused.

A QUICK START, AND THEN ...

The driveway was cut and the transmitter building placed during the summer and with relatively little difficulty. Power and telephone were installed. Then the project stalled, waiting for a clearing contractor to accept the project.

The stall lasted until the fall, when hope surfaced that the swamp might freeze so the tree work could be done on ice rather than in water.

That opportunity did finally present itself. There was a hard freeze and little or no snow. On short notice, Steven Cooper & Sons, Inc., the contractor who had done the driveway work, agreed to do the clearing. Ten-foot wide paths were cut up to the sky; considering that many trees were slanted, and all had overhanging branches, the space between tree trunks on the ground was about 20 feet, on average.

The clearing was done while the ground was frozen.

The work of cutting the trees and dragging the wood out to Shunpike Road was done in about three weeks. This hauling was done with a light vehicle (a John Deere Gator). Even so, it is fair to say that the "Sons" were somewhat less enthusiastic about the contract than was the father.

Unfortunately, the thaw ended before all the wood could be removed from Shunpike Road – and it was followed by a heavy rain. Shunpike became, in effect, part of the swamp for a few weeks; that held up the project again.

PUTTING DOWN THE MATS

Northeast Towers elected to place mats to form a temporary road out to the tower bases and to the counterpoise support poles. These mats are 8 feet by 16 feet, and weigh something like 1,700 pounds. The mats were set in place using an excavator.

To protect the swamp, some 100 large mats were installed temporarily.

They interlock with each other, and allow construction vehicles to drive on them without doing damage to the underlying swamp. Unfortunately, the ground in the swamp was too uneven, because of tree stumps and other hummocks, for the mats. Therefore, wood chips were spread first, then mats on top.

When the work was done in each area, the mats and wood chips were removed. Something like 100 mats and five tractor-trailer loads of wood chips were humped around in that swamp.

(Continued on Page 10)

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Slipping a DA into a Swamp in Just 20 Years

– Continued From Page 8 –

Only a small area around the tower could be filled in.

ANCHORS FOR TOWERS

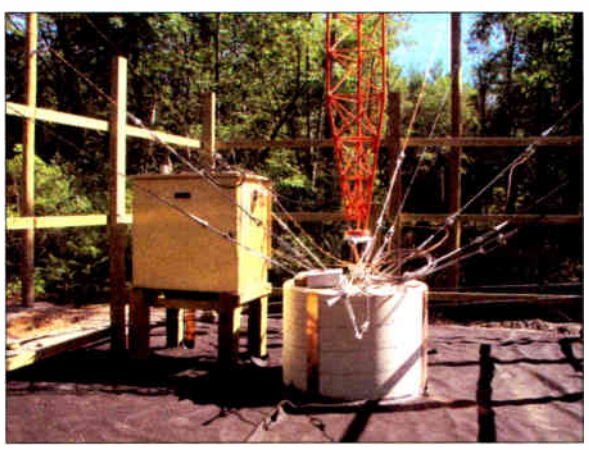
Anchors were set for the far ends of the counterpoise wires, nine guy anchors, and the foundation anchors for the three towers. The various-sized helical anchors are screwed into the ground using a hydraulic motor mounted on a skid steer.

The helical anchors provided the support for the tower foundations and anchors.

The anchors are inserted until the torque reaches a value specified by Chance for the application. So the machine is simply a fairly large torque wrench.

The weight of each tower is borne by a group of three helical anchors. The tops of the three anchors were welded together, and a coarse grid welded on to that. Then a standard rebar cage was formed, and a block of concrete was poured into a three-foot Sonotube. The tower base insulator bolts and the inside anchors for the counterpoise wires were all embedded in this concrete.

From above it looks like a standard concrete base pier, but the bottom only goes to grade level; the weight is supported by the helical anchors.



Sitting upon helical anchors, the finished tower base with the counterpoise ground wires.

INSTALLING THE POLES AND TOWERS

The 28 counterpoise posts were all standard 30-foot utility poles, planted 10-feet deep for stability. They were set in place using an amazingly cute boom truck, with both an auger and a hoist mounted on the same boom. The operator had a wireless remote control for the truck hung on his belt, so setting the poles was essentially a one-man operation.

Setting the counterpoise poles was handled by one man, but was a messy job.

A standard trench was not allowed under the DEC permit, so the transmission lines, sample lines, and control cables were hung from a messenger cable. The shields were bonded down to a copper strap on the ground every 40 feet.

The copper strap ran from the transmitter building to the three tower bases. A number of ground rods were driven along the length of this strap and bonded to it. The ground sides of the ATUs were also bonded to this strap. The counterpoise wires were also bonded to this ground at their common junction around each tower.

Northeast Towers, and their contractors, were on site for around two months – a long time for three 170-foot towers. The towers were partially assembled on the ground and each erected in two snatches by a crane.

The towers were brought into place by cranes.

Installation of the transmitter, remote control, and phasor were very straightforward and trouble free compared to the rest of the project. The BE transmitter came up the first time. Interconnections between the transmitter, phasor, and dummy load were made with 1-5/8 inch rigid line and field flanges.

TUNE UP AND PROOF

The electrical length of each sample and transmission line was checked before they were installed; the characteristic impedance was also recorded. Non-directional operation was set up on the center tower. The network supplied by Phasetek was easily adjusted for a good match.

The completed installation in the transmitter building.

The three Delta sample torroids were also compared by being connected in series at a convenient spot in the phasor and connected to the phase monitor with short jumper cables. The phase monitor was verified by swapping these cables around.

The existing STA site was less than two miles away, on the other side of the swamp. A new STA was applied for, and granted, to run with the same 500 watts from the new site. The old STA tower was removed before the proof measurements were made.

FINISHING ADJUSTMENTS AND PROOF

After the tower and counterpoise system was complete, measurements were made at each of the three tower bases with the other two towers floating and grounded. These results were used by Communications Technologies to compute the final parameters to which the array should be adjusted.

The adjustment went fairly quickly – it was done almost completely by one man working alone. The transmitter was turned on and off by cell phone remote control, the input and output impedances of the ATUs were measured with an OIB, and the phase shifts across the ATUs were measured using a pair of Delta torroids connected to the input and output J-plugs by looping a short piece of wire through them.

The phase shift was measured there using a digital oscilloscope. Then new values for the ATU legs were calculated from these results – and the desired match and phase shift were set. This process brought the array pretty close, and final tweaking went quickly enough.

The three Proofs revealed the array to be in adjustment using the calculated parameters. They also revealed the array to be more efficient than might have been expected with the amount of tree cover left in the tower field.

The completed array, neatly slipped into the swamp with as much clearing as was allowed.

Station management is quite pleased with the coverage and the sound of the new facility. That, of course, should be expected when going from 500 Watts to 5,000 Watts – and from a somewhat deteriorated "temporary" facility to an all new installation.

After all, fifteen years is too long for "temporary."

Bill Weeks is the man behind Hungry Wolf Electronics in Milton, NY, a broadcast contracting firm that specializes in project engineering. Email him at Bill@Wolftron.com

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by Scott Fybush

Hall of Achievement

Recognizing those who have made real contributions to the broadcast profession.

Paul Gregg

Seven Decades in Broadcasting – and Still Going Strong

*For the first individual named to the **Radio Guide Hall of Achievement**, it would be hard to find a better choice than Paul Gregg. From small stations to large manufacturers, he has long been respected in the broadcast community. Those who know him know a true gentleman who is always ready to help others. Scott Fybush spoke with Gregg recently, and profiles him for us.*

For someone in his 67th year of radio engineering, it is more than a bit ironic that Paul Gregg intended his career to take place on the other side of the microphone.

When the eventual co-founder of Bauer Transmitters enrolled in the Northwestern RadioTelevision Institute in Minneapolis back in 1941, he intended to pursue a different line of work in the broadcast field. "My interest, frankly, at that time was in journalism," Gregg says.

FROM JOURNALISM TO TECH

Growing up in Menomonie, Wisconsin, Gregg's first contact with the mass media came when he operated distribution routes for one of the Minneapolis newspapers. But he was also heavily influenced by Menomonie's local college. Stout Institute (now the University of Wisconsin-Stout) had – and still has – a reputation for its technical programs that spread across the community's schools.

"As a kid, you're learning everything from manual training to electricity to sheet metal," Gregg recalls of his teenage years.

Gregg also learned plenty of history in high school, and when he graduated in the summer of 1941, he knew war was looming and, along with it, plenty of choices to make in the year before he would be called up to serve. With visions of radio journalism in his head, Gregg headed 70 miles west to Minneapolis to attend Northwestern, where he quickly developed an interest in the technical side of radio.

"Most of the guys in my boarding house were Hams and, by the middle of December, I thought I was ready to go take the first three elements of the test," Gregg recalls.

THE ROAD TO CALIFORNIA

His classmates scoffed at his ambition, but Gregg took the licensing test on a Friday in early December 1941, then went home for the weekend. By the time he returned to school to learn that he had passed, the Pearl Harbor attack had plunged the nation into World War II. Suddenly radio stations everywhere were calling Northwestern to find replacements for staffers who were being called to duty.

"I had a plan," Gregg remembers. "I wanted to get to California, and I felt I had a year to get some experience." Gregg's first paying job in radio came at tiny KWLM in Willmar, Minnesota, followed three months later by a move west to Great Falls, Montana and a bigger station, KFBB, where he was assigned to morning duty.

"I'd stop at the studio and pick up a big suitcase full of transcriptions, drive out to the transmitter, sign the station on at 6 AM, and play soap operas all morning," Gregg says. With dreams of a journalism career still alive, he volunteered to return to KFBB's studio in the afternoon, where he wrote copy.

OFF TO SEE THE WORLD

After three months in Montana, Gregg sold his car and took his first plane ride, landing in Oakland, California for a $49-a-week job at KLS. He arrived there on the Fourth of July, 1942, and spent five months working the night shift before enlisting in the Army Air Corps.

With a year of experience in the radio business under his belt, Gregg spent most of the war Stateside, serving as an instructor in the first Air Force Radar School in Boca Raton, Florida. It was only after the war's end that Gregg finally got to go overseas, shipping out as a radar operator on the *Taos Victory* out of Newark, New Jersey.

Gregg traveled around the world over the next year, starting by carrying French foreign legionnaires from Marseilles to Indochina and carrying Australian occupation troops to Japan. One of those trips took him to Kure, only 18 miles from Hiroshima, where he had the opportunity to witness the aftermath of the nuclear bomb a few months after it was dropped.

He was sent home in May 1946, getting discharged at Camp Beale, near Sacramento, on a Saturday afternoon.

BACK TO BROADCASTING

"I was back at KLS (by then called KWBR, and today KMKI 1310) working on Sunday morning," Gregg says, and there was soon plenty to do at the growing station. Gregg helped build an FM outlet, KWBR-FM, on a hilltop in San Francisco. That station is still on the air, now as CBS Radio's KLLC-FM.

One of Gregg's last assignments was to build a new KWBR transmitter site in the wetlands at the Oakland end of the Bay Bridge. The three-tower site began with the move of KLS' original broadcast tower from the rooftop of a downtown building and eventually resulted in a 5,000-watt directional facility, one of three arrays in close proximity to the Bay Bridge toll plaza.

The new KWBR plant was outfitted with Gates equipment, which brought Gregg to the attention of Gates management. Before long, he had moved into the world of sales.

INTO SALES AND MANUFACTURING

"I sold [Gates products] in Northern California and Oregon, and had a very active three years doing it," Gregg says. By the late fifties, his work with Gates brought Gregg to the attention of two San Francisco consulting engineers, Robert Hammett and Edward Edison. They saw an opportunity in the FCC's 1959 ruling that allowed most Class IV AM stations to increase daytime power from 250 Watts to 1 kW, and they introduced Gregg to another engineer named Fritz Bauer.

Bauer Electronics debuted the 707 at the 1960 NAB convention in Chicago. The kit version included a tool kit (top right).

"Fritz was building transmitters in his garage," Gregg remembers, but Hammett and Edison had bigger plans. With all four as equal partners, they founded Bauer Electronics Corporation and set to work filling the sudden need for lots and lots of inexpensive 1,000-Watt AM transmitters.

"I went down to San Mateo, to Fritz's home," Gregg recalls. "And while Fritz was working on 5,000-Watt transmitters in his garage, I was building the 707, and he'd look over my shoulder to see if it was OK."

Bauer Electronics soon set up shop in San Carlos, California, just down the road from the factory where Eimac was cranking out tubes. To make sure the 707 lived up to its promise that "anyone could build one" the company hired a Kelly Girl to assemble a 707 right in its booth at the NAB convention in Washington. That 707 is still on the air today in Alabama.

A SUCCESSFUL PRODUCT

Writing the 85-page book of instructions was the biggest challenge, Gregg says. "I would write three pages at a time and then Veikko West, the Chief Engineer at nearby KOBY, would come into the plant and build from what had been written that day. When he would scratch his head we would get together and make the necessary corrections.

"It would take about forty hours to build the 707. Most of the 700 or so sold went out as kits. The kit sold for $3,950 – the assembled transmitter for $4,950."

The 707 was an immediate success, in part because of an unexpected marketing twist. "In the early days, I would go out and check out each 707 transmitter (after the buyer had assembled the kit), but it got to be so many that I couldn't handle it," Gregg says. "So we'd contract the stations' consultant to check it out. They became our best salespeople."

WORD OF MOUTH

"Speaking of salespeople," Gregg said, "Jess Swicegood, who at the time owned WDIG in Dothan, Alabama, was our top salesman. Jess built the first kit and he enjoyed it so much he went out on the road to sell them.

He often joked that the people at the station were glad to get rid of him for a few days a month. Jess enlisted a retired Signal Corps Colonel, Havard Rawlinson, to help him check out the transmitters. Broadcasters throughout Georgia, Alabama and Northern Florida got to know Jess and Havard."

In 1965, Gregg designed the Bauer 910 solid state console.

In addition to many 707s that were sold in the product's first decade, Bauer's product line soon grew to include broadcast consoles, remote and automatic logging equipment, FM transmitters and ATUs.

By the late sixties, the broadcast equipment industry was changing, though, as conglomerates began buying small manufacturers in order to offer full lines of products. In 1967, Hammett, Edison, Gregg and Bauer, sold their company to Granger Associates, which operated the company out of Palo Alto, California. (In 1970, Granger sold the Bauer line to another California conglomerate, Cetec, which then moved the line to Sacramento where it was paired with the Sparta line of consoles and other studio gear, and the Jampro Antennas division.)

Cetec later purchased Schafer Electronics in Santa Barbara and called the three (Sparta, Jampro, Schafer) the Cetec Broadcast Group, with Sparta and Schafer moving to Carpinteria, CA. At that time Gregg consulted to Cetec and radio groups in Mexico and South America. He also assisted Jim Lawrence and his Elcom Engineering Company in his marketing activities.

(Continued on Page 14)

Hall of Achievement

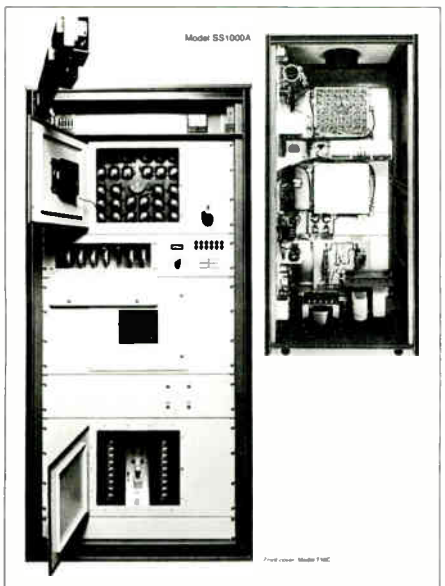
Paul Gregg

Continued From Page 12

ELCOM BAUER

Lawrence had developed the Teletronix line of limiting amplifiers using his patent of light-controlled resistors in the process. Gregg purchased the line from Gretchen Lawrence in 1968 following Jim's untimely death and set up shop in Sacramento, using some ex-Sparta employees. He called this enterprise the Elcom Specialty Products, Inc. Lawrence's widow, Gretchen was a shareholder.

Two years later, Cetec exited the broadcast business and sold the Bauer line of transmitters to Gregg, who moved the company back to Sacramento under the "Elcom Bauer" name. Elcom Bauer continued to innovate. The SS-1000, degined by Richard Johnson, was one of the first solid-state AM transmitters to be constructed, at a time when getting a reliable supply of solid state devices was difficult.



SS-1000 – The first solid state 1 kW AM transmitter to be Type Accepted by the FCC.

At that time the principals of a growing Mexican broadcasting company called Radiorama became shareholders of Elcom. "They were building a network of stations, and they decided the best way to do it was to own their own transmitter company," Gregg says. "It was almost like having our own built-in customer."

CHANGED FOCUS

However, it proved to be a mixed blessing when Radiorama's station-building years slowed in the early nineties. While Elcom Bauer was still selling transmitters to Radiorama for its Mexican stations, it had largely stopped marketing them to other customers.

"We weren't promoting or developing anything new," Gregg says. In 1993, the last transmitters came out of the factory in Sacramento, and Gregg picked up stakes and relocated to West Texas.

"We moved to El Paso not knowing whether we'd set up shop across the border, or what we would do," Gregg recalls.

SETTLING IN ON THE BORDER

El Paso has been Bauer's home ever since. Much of Gregg's work since his move has been for Radiorama, but he has maintained the Bauer name and developed a support network for the hardy transmitters he built and sold for so many years.

In recent years, Gregg has even worked with stations that are retiring their venerable 707s, FB-5000Js, or FB-5Vs from service.

"As they started to phase them out, they'd call me and ask if I had a home for them," he says. Most of the older AM units have ended up in the hands of amateur operators – Gregg maintains a list of Hams waiting to give a retired 707 a loving new home.

STILL IN THE SADDLE

On the other hand, Gregg says some Bauer FM transmitters from the Cetec-Sparta years are still in demand. "I remanufacture our 25 kW FM," he says. "It was a grounded-grid transmitter, very efficient. I strip out the original driver and replace it with a solid-state unit."

Gregg is also still building diplexers and triplexers for stations on both sides of the border. When ***Radio Guide*** caught up with him in early January, he had just returned from a three-day stay in New Mexico, where he was installing a diplexer – the week before his 84th birthday.

Paul Gregg

Today, Gregg says he works on only "three or four" of the old Bauer transmitters a year, parting most of them out so he can help other Bauer owners keep their units running. "It's probably the only company that supports equipment they made in 1960," Gregg boasts.

Gregg says he will continue to support Bauer equipment from all its various incarnations (Granger, Sparta and Elcom) as long as he is around. We trust that will be a while yet.

Scott Fybush is known for his wide-ranging travels around the US, chronicling studio and tower sites. His website is www.fybush.com

simple, but god has bigger
attached a picture in white contact me for more info. big_plans #221542

STEADY SEEKING LADY

I am looking for a male partner (38-50)who is willing to be exclusive with me for a long term relationship. Not asking for marriage. I am of average build, dark hair, brown eyes and am an Indian female. I have a wonderful job and attend some classes a couple of nights a week. I have two kids who stay at home with me. They are very precious to me. And they are not going to be a hindrance to our dating. I have a full and busy life. Therefore, the expectation is to see each other on a steady basis, and at the same time, being flexible. precious_me #331252

I LOVE MUSIC. YOU LOVE ME

I'm an indie/hipster girl who adores music and going to clubs and shows. Some of the bands that I'm into are Interpol, The Arcade Fire, Blonde Redhead, Bauhaus, The Smiths, Morrissey, etc. I'm into indie rock, electronica, punk, pretty much anything. I drink and smoke occasionally. I'm 21, 5'8", light-skin, dark brown hair/eyes. I work, am well-educated, funny, spontaneous, nice. #2215234

299685

HANDSOME RAKE

Out of work leaf raker/bagger seeks whimsical beauty with un-kempt auburn or chestnut hair, cool coarse hands and a penchant for whistling. mellow_mo, 28, #101318

LET'S CONNECT

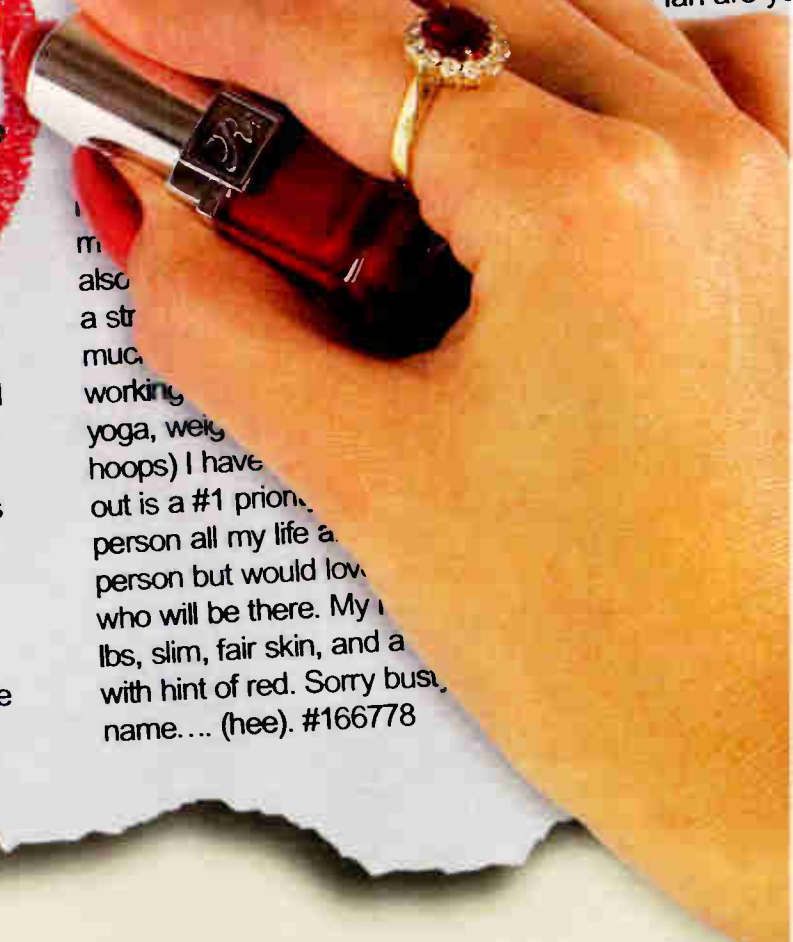
Radio engineer seeks stable long distance relationship. Need to connect immediately. Everywhere I go, I see broadband internet, but I just never hook-up. I need to meet that special someone that will plug me in so I can be heard. Must be reliable, connect easily, forgive errors and adapt to change. Should come from a good family. easy_going #101352

SIMPLICITY HERE

Simply put, I'm looking for a fun, casual relationship with only one person. That means one person for me and one person for you. :-) Every woman wants to feel safe with a partner, whether it's serious or not. It's key to her feeling comfortable to express her more intimate nature. I don't ask for much other than to hang out, enjoy your time with me and be available to chill.

MR. RIGHT

I'm actually posting this on behalf of a friend. Since she's been single she hasn't found the right guy and I'm doing this in hopes of helping her find Mr.Right. After you and I talk, if you are chosen then you will get to go on a date with her and who knows, it could be the perfect date and start of a new



for women 5

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Transmission Guide

by Randy Davis

Power Tube Filament Management

To achieve higher powers at FM and TV, ceramic tubes are still the most effective way to go. But, unlike solid state devices, to get the best service, you have to do more than just plug in the tube. Randy Davis returns to focus on filament management as a practical way to manage tubes and enhance their useful life.

Most medium and high power vacuum tubes used in FM and VHF television service utilize filaments made from a mixture of tungsten and thorium dioxide (thoria). This mixture, however, is not practical for filament use until it is processed.

THORIATED TUNGSTEN THEORY

Once the filament is formed, whether in a hairpin or mesh form, it is mounted on the tube stem and then heated to about 2700 K in the presence of a hydrocarbon. This process, called carburizing, results in a thermo-chemical reaction which forms di-tungsten carbide on the filament's surface.

By carburizing the filament, tube life is significantly enhanced.

Modern thoriated tungsten filament tubes require this carburization process as a way to preserve proper emission under normal operating conditions. Thoriated tungsten filaments that are not carburized are subject to "poisoning" from gas and back ion bombardment, which will significantly reduce the emissivity of the uncarburized filament.

After being properly treated, this type of filament will decarburize slowly over the life of the tube. The rate of decarburization depends on the filament voltage operation. Once the filament has decarburized, the tube will become unable to deliver adequate plate current due to the lack of filament emission.

HOW VOLTAGE AFFECTS FILAMENT LIFE

By regulating your tube's filament voltage you are also regulating the filament's electron production. The resulting pool of electrons created by the filament can be thought of as an electron "reservoir." The ability to produce this reservoir of electrons will deplete more rapidly over the life of the tube if the filament temperature is allowed to run higher than it should in order to generate a given amount of plate current.

The goal of filament management is to reduce this number of unnecessary electrons and save the production of them for use later on. The tube's *rated* filament voltage is the voltage that replenishes the electron reservoir at a rate sufficient to produce *maximum* plate current for that particular tube type. This point must also coincide with the operation of the filament at the proper temperature. *Normal* filament life expectancy occurs when the tube is operated at its rated filament voltage.

A thoriated tungsten filament requires a sufficient amount of thorium dioxide (thoria) to be reduced to metallic thorium during filament operation. Maximum emission from the thoriated tungsten filament can only be achieved when a monatomic layer of thorium covers 100% of the filament surface.

Filament temperature is a factor in the reduction of thoria to metallic thorium as well as the diffusion of thorium to the surface of the filament wire. At temperatures below about 2300 K the rate of diffusion of thorium to the surface exceeds the rate of evaporation from the filament's surface. According to L.R. Koller, Ph.D. (*The Physics Of Electron Tubes,* 1937, p.29), surface migration takes place at an appreciable rate at filament temperatures as low as 1500 K.

A typical "mesh" filament.

This information suggests that metallic thorium will continue to migrate to the surface of the filament with filament voltages approaching 50% that of the rated filament voltage for most thoriated tungsten vacuum tube filaments. Barring filament poisoning from contamination or ion bombardment, this further suggests that thorium will be sufficiently replenished on the surface of the tube's filaments at about one half rated filament voltage. (Lowering the filament voltage to one-half its rated value will not yield emission suitable for normal operation.)

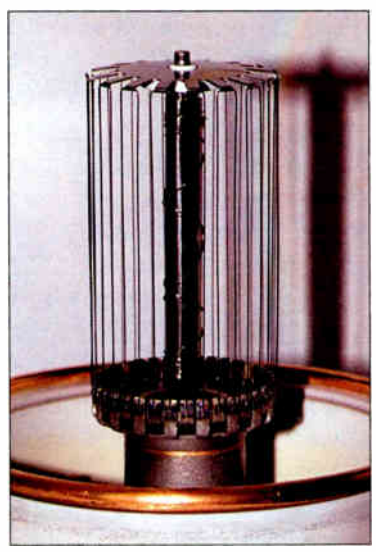
Therefore, thoriated tungsten filaments can be safely operated at filament voltages well below rated, which allows considerable leeway when practicing filament management.

SUFFICIENT HEADROOM

Since most manufacturers rate their equipment with a significant amount of headroom, the vacuum tube is never required to produce its maximum current. This fact allows a reduction in filament temperature resulting in reduced numbers of electrons within the space charge, and this is accomplished by lowering the filament voltage appropriately.

The production of unnecessary electrons by the filament because of operation at the tube's rated voltage results in tube replacement at intervals which can easily be more than double the "managed" rate.

According to Fred Rosebury's 1993 book, a 3% increase in filament current will result in a *decrease* in filament life by 50%. This sobering fact points out the importance of maintaining proper filament voltage.



A typical "hairpin" filament.

Filament management should be practiced as soon as the tube is installed. "Better late than never." However, it also is appropriate for tubes already operating in your equipment.

Tubes which have been shelved for months or longer should also be allowed to "burn-in" at their rated filament voltage regardless of whether or not they have been in service previously. Such filament burn-in is done as a precaution for the same reasons as a new or rebuilt tube – for gas removal.

Since filament burn-in is a precautionary procedure for our tubes, Freeland Products, Inc. may suggest that under certain circumstances the filament voltage be reduced immediately upon installation. This will make it easier for station management to incorporate filament management when having their transmitter serviced by contract engineers.

On occasion, the two week burn-in may be impractical or economically not feasible. Freeland Products, Inc., realizes this and recommends contacting one of our application engineers to discuss special circumstances relating to the operation of our tubes including the omission of the filament burn-in.

START WITH GOOD TECHNIQUE

Proper filament management techniques are the keys to greatly extending the life of a vacuum tube. As we consider the techniques explained below, you will see they are only effective if the tube is operating within its normal temperature and electrical envelopes.

On the other hand, filament management does nothing to increase a tube's life if it is destined for early failure because of anything other than lack of sufficient emission – for example, if the tube is running too hot, filament voltage control will not help.

A tube's filament can overheat very easily. Because a filament has a very low resistance when it is cold, a very low impedance filament supply can easily damage a tube by exceeding its start-up current limit. Also, uneven filament heating will occur as a result of applying too much filament voltage too quickly. Exceeding a tube's start-up current rating will ultimately result in the filament being burned open.

Filament management will do little to extend the life of a tube if filament start voltages are too high. Frequent monitoring of the transmitter's step-start circuitry is advised in order to quickly locate and rectify filament step-start issues.

UNDERSTANDING TUBE FABRICATION

It is imperative that vacuum tube manufacturers and rebuilders make every effort to insure that the tube is clean throughout the construction or re-construction process. A vacuum tube will not operate correctly if the internal parts are not clean; any foreign materials which may have escaped the cleaning process during the original manufacture or re-build could render the tube unusable even after following otherwise normal processing.

Unfortunately, however, we do not live in a perfect world and a perfectly clean tube has probably never been built. Obviously the goal for us and other tube manufacturers or rebuilders is perfection – but the truth is that some tubes do wind up cleaner than others once the tube is finally finished.

Tubes are heated to about 500 degrees Centigrade during processing to dislodge water and vaporize other contaminates that may have been left in the tube. Such moisture and other contaminates which have been vaporized become "gas" within the tube, and this gas is then removed as part of the pumping process while the tube is at temperature.

The tube is ready to be removed from the pump when gas levels drop sufficiently while element voltage and heat is applied. When the tube is removed from the pump, the pumping port on the tube is permanently sealed off and the tube is sent for initial testing.

The operation of the filament will also become more effective following carburization by allowing the thorium time to migrate through the fissures created by carburization. As noted before, a monatomic layer of thorium covering the entire filament surface is the goal for the filament to produce maximum electron emission.

INITIAL TESTING

If contaminates were not sufficiently removed from the tube, the tube may exhibit low emission or leakage caused by gas condensing on the surface of the ceramics or becoming attached to the filament wires. Either of these unwanted occurrences can render the freshly built or remanufactured tube unusable.

(Continued on Page 18)

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Continued From Page 16

Power Tube Filament Management

Some levels of leakage may be tolerable as well as some level of contamination on the filament.

For this reason, filaments that have insufficient emission can sometimes be repaired by increasing the filament voltage above rated voltage by 15% or so for several minutes, then retesting to check for improvement. This process is repeated until the tube comes up to its rated emission level.

CONTAMINATED ENVELOPES

Contamination hinders this process as well. Because some contaminates cannot be removed at normal filament operating temperature, the increased filament temperature hastens the vaporization of these contaminates and the subsequent gas is removed by the getters within the tube's envelope. However, the gas resulting from contaminates being burned off the filament may also condense on any surface within the tube that happens to be low enough in temperature to allow it to attach.

As discussed previously, gas can be created by operating the tube abnormally. Tube envelope and element temperatures exceeding their normal limits can release gas and permanently destroy the filament by effectively decarburizing it.

A tube which exhibits low output or low plate current following some overheating event suggests that the tube may have been damaged in this way. Severely overheated tubes which resulted in significant decarburization can not be brought back without re-processing.

However, tube filaments which have not been significantly de-carburized but have been damaged by abnormal operation which resulted in some filament contamination may be brought back to life by the same method mentioned previously – simply increase the filament voltage by about 15% or so for 15 minutes and check the results of the burn-off attempt. Repeat this process until no further improvement is noted.

LOW EMISSION IN FRESH TUBES

Tubes which are rebuilt by Freeland Products, Inc. have been aged sufficiently and exhibit stable and normal emission prior to shipment. Our tubes are also operated at their rated dissipation levels and subsequently checked for stable emission. For this reason, it is not necessary to burn-in our tubes at higher than rated voltage.

If for some reason the tube has been operated abnormally which results in low plate current because of reduced emission, the tube may benefit from a higher than rated filament voltage burn-in. Please do not hesitate to contact one of our application engineers should you run into this situation. An arc-over which occurs inside a vacuum tube may also create gas which has a poisoning effect on the filament. This condition can usually be reversed by doing the higher than rated filament voltage burn-in as previously discussed.

It is a good precautionary practice to allow new or freshly rebuilt tubes to burn-in at their rated filament voltage for a week or so. This burn-in allows the getters to operate with greater efficiency and this helps remove gases which may have been trapped and not yet removed because of the tube's infancy.

CARE = LIFE

In spite of the failure modes I have discussed, vacuum tubes are really hearty devices. Minor overloads occasionally occur during the normal life of a tube and they usually recover from them quickly. Tubes in general are quite reliable and frequently demonstrate trouble-free operation for long periods of time.

On the other hand, as we have said, how the tube is managed makes a huge difference in its longevity. If all operating conditions on the tube are within normal operating specifications, the tube will benefit greatly by incorporating filament management.

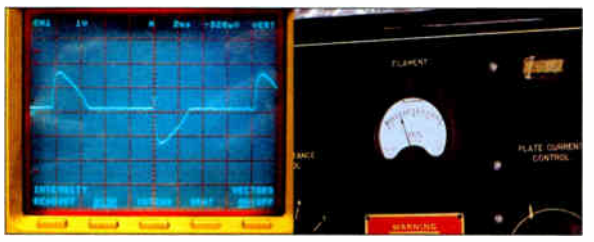
It may seem obvious, but to begin effective filament management first you must know your filament voltage. To make this assessment you will need a voltmeter capable of reading *true RMS voltage.*

MEASURING RMS

A true RMS reading is required for AC filaments in order to insure the proper amount of heating power is being applied to the filament regardless of wave shape.

An iron vane voltmeter or true RMS reading voltmeter is the best instruments to use for filament voltage measurement. Not all transmitters come with such a meter. When measuring AC voltages, waveform distortions can mislead an individual trying to get an accurate measurement with something other than a true RMS voltmeter.

To illustrate, six Volts AC was fed into a transmitter. The voltage is shown on a calibrated oscilloscope and an iron van Westinghouse meter.



6 Volts AC on an oscilloscope. **An iron vane meter shows the same 6 V AC.**

The voltage was then checked using a Volt-Ohm meter (VOM) and two Digital Multimeters (DMM), one being a true RMS reading meter. The variance in measured voltage is clear to see. First, a couple of meters that are not true RMS meters.

A typical VOM shows a little over 4.2 V AC. **An auto-ranging DMM is over 1.5 V AC low.**

Finally, we look at a true RMS DMM. This one is the only one that matched the oscilloscope and iron vane meter readings.

A true RMS DMM gets the correct reading.

Since tube life can be reduced by 50% from the application of only three or four percent additional filament voltage, after reviewing these pictures, you may want to spring for a new true RMS voltmeter. After all: *a decent true RMS voltmeter costs a lot less than most broadcast tubes.*

USING FILAMENT MEASUREMENTS

Obtaining a correct measurement is important in providing a known starting point and for subsequent measurements as well as helping determine where the tube may be at in assessing its remaining life.

Filament management then can be initiated by reducing the filament voltage from its rated voltage to the point where impaired operation is noticed, and then increasing the voltage to the point where normal operation is once again achieved.

This voltage point needs to be measured and the voltage logged at the point where this occurs.

The voltage should then be raised by a tenth of a volt or so to help negate the effects of normal voltage variations. Once the filament voltage is changed, the tube's operating parameters should be checked shortly after the initial change and again in about 24 hours to make sure emission has stabilized. If power output or plate current has dropped since the last measurement, increase the voltage by another tenth or so to compensate and log it.

Similarly, if the tube has not changed its output or plate current, try reducing the filament voltage again and see if even more reduction can be accomplished from the reduction previously initiated – and, of course, log the results.

A new or rebuilt tube can benefit more from this procedure since the emission curve of the tube usually comes up a bit during the first several weeks of constant operation. The upward emission trend can last for more than a few weeks. The tube's filament voltage should be checked periodically and adjusted as required in order to maintain normal operation with minimum filament voltage.

MAINTAIN MARGIN FOR ERROR

Consideration for varying line voltage must also be taken into account. Line voltage fluctuations will show up as filament voltage fluctuations if there is no means within the transmitter to regulate filament voltage. It only takes four Volts change on 240 V AC service to drop (or raise) your filament voltage by a tenth of a Volt.

Because of line voltage variations, the filament voltage should be set higher than bare minimum for proper operation. It is also wise to allow for filament supply heating which may cause a slight reduction in filament voltage once the filament transformer and other components have risen to their maximum operating temperature.

Thus the minimum filament voltage for proper operation usually should be adjusted upward by a tenth of a Volt or so in order to allow for such component heating and line voltage fluctuations.

Filament voltage regulation is strongly recommended for filament voltage management to yield the best results. A properly-sized ferroresonant transformer or line regulator installed in the filament supply is recommended to control most line voltage irregularities.

KNOWING WHEN IT IS OVER

A vacuum tube nearing the end of its emission life will exhibit telltale symptoms. The most obvious is lower output power. We all know that lots of things can cause a transmitter to start losing power. However, the trick is figuring out whether or not the tube is at fault.

To make this determination, these questions must be asked:

1. Is the plate current low?
2. Is G2 (screen grid) current low?
3. Is the G1 (control grid) current normal?
4. Are plate, G1, and G2 voltages close to normal?
5. The most important question: what is the filament voltage?

If the answers to 1 through 4 are "yes" then the possibility of a worn-out tube exists. If the answer to 5 is close to the tube's rated filament voltage then the tube may be getting weak due to lack of emission.

A simple task may be performed at this point to galvanize the suspicion – simply raise the filament voltage by two or three-tenths of a volt and observe the output or plate current.

If the tube is getting weak due to lack of emission the output power and plate current will come up. Similarly, if you lower the filament voltage by two-tenths of a Volt and you see a significant drop in plate current and output power, the tube is probably used up.

Overall, it is a good time to consider replacing the tube when it is no longer possible to obtain proper plate current or output power when the tube is operated at its rated filament voltage. Even if you are able to maintain proper plate current and power by raising the filament voltage a couple of tenths above normal, it is time to call us.

Randy Davis is the Plant Manager for Freeland Products, Inc. in Covington, LA. You can contact Randy at 800-624-7626 or by email at randy@freelandproducts.com

700 ~~500~~ studios already?

Time flies when you're having fun!

Hard to believe, but we passed the ~~500~~ 700 studio mark recently. We're told that it's a major milestone, but we prefer to call it a good start.

In fact, our clients have made Axia the **fastest growing console company** in radio. To you, we say "thanks" for your trust and enthusiasm. And to those of you who aren't yet clients: we're ready when you are.

Okay, back to work now. (Consoles don't build themselves, you know.)

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Digital Guide

by Gary Liebisch

Implications of -10 dB Digital Carriers on Station Implementation

Over the past year, there has been much discussion among broadcasters about the prospect of raising the permissible digital carrier levels of HD Radio hybrid FM signals. The current established level in Standard NRSC-5A (September, 2005) is 20 dB below the reference analog carrier level (or 1% of the analog carrier).

But with the number of stations deploying HD2 or HD3 multicast channels increasing, the integrity of program streams offered as SPS (Supplementary Program Services) has taken on new significance.

RECEPTION CONCERNS

While the Main Program Service has an inherent "fallback to analog" in the event of disruption of the HD1 stream, no such fallback exists for the SPS channels. In addition, attenuation of the received signal due to building penetration can make reception of any digital service less reliable.

Most FM stations who have deployed HD Radio have found that reliable digital coverage can be expected out to at least the 70 dBu (3.16 mV) city grade contour. In relatively flat, unobstructed terrain, consistent coverage out to 60 dBu and further is possible.

But given the amount of real world obstructions a broadcast signal must overcome on its way to the receiver, coupled with the natural disinclination of the average person to use an external antenna, it may turn out that more "work" needs to be done on the signal before it leaves the transmitter.

REASON FOR INVESTIGATION

The impact of elevated digital carriers must be exhaustively studied in the field to determine its effect on adjacent channels. To that end, several broadcasters have undertaken STA operations to study the effects, and inevitably the NRSC will need to get involved.

Of course, it could easily be years before we see a change in the standard level, if any, and there is no way to predict what that final level will be.

It is not the purpose of this article to debate the viability or adjacent channel interference impact of -10 dB carriers. What I would like to address, though, is the natural curiosity that broadcasters have about protecting their existing HD Radio investment in the -20 dB standard, if the permissible level were to be raised. Nautel, as well as other vendors of HD Radio transmission equipment, now is getting questions fairly regularly about avoiding obsolescence if they invest in the technology today.

Since there are multiple implementation methods available to FM stations, is one upgrade path better than another with respect to reuse? And for stations not yet converted, is there an upgrade path that will not obsolete what is purchased today?

DIGITAL VS ANALOG

To begin to understand the impact of implementing raised digital levels, we must first understand a few things about the nature of digital signals, how they pass through a transmitter, and how we calculate and rate transmitter power output.

The first thing to understand is that IBOC signals, unlike FM, are varying amplitude signals. Conventional FM signals are, of course, constant amplitude signals, where only the varying frequency or phase conveys information.

HD Radio transmission employs Orthogonal Frequency Division Multiplexing (OFDM) modulation, where symbols, representing data, are decoded from their instantaneous (and rapidly changing) phase and amplitude. As many as 512 different vectors may represent a frame of data.

POWER LEVELS

Amplifiers used for FM transmission are typically biased in Class C mode, which provides high efficiency but distorts (discard) amplitude variations because their conduction angle is so short. When a digital signal must pass through the same amplifier, amplitude excursions are intentionally created and must be preserved. To do this, the amplifier is "re-biased" to conduct for a greater time during each cycle, at the expense of efficiency, but with higher linearity.

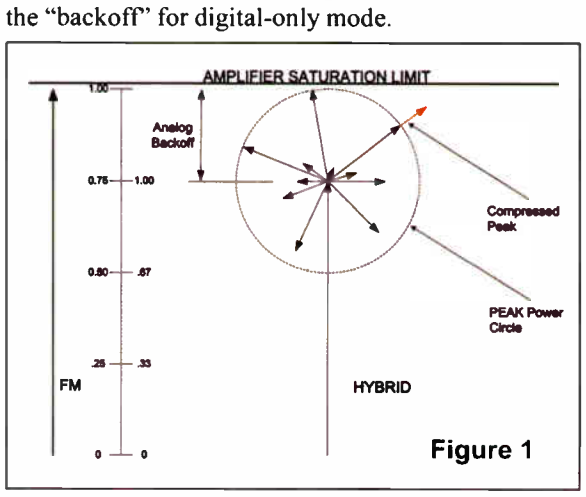
While we could go to a very linear Class A, the efficiency would be unacceptably low. So we typically bias instead at class AB for greater efficiency, at the expense of some linearity and resulting intermodulation products. This re-biasing is one of the reasons why all FM transmitters are "derated" when operated in HD modes. Thus, power output rating becomes a balancing act between efficiency, linearity, and mask compliance.

We now know that a typical 10 kW FM transmitter typically is derated to 8 kW when operated in hybrid mode, and 3 to 3.5 kW when operated in digital-only mode.

PAR CONSIDERATIONS

Aside from the re-biasing for linearization that takes place in the amplifier, it must also be recognized that the digital signal now has a peak and an average component. While we are accustomed to thinking only of the average digital power when sizing a transmitter, the peak-to-average (PAR) ratio plays an important role in determining the maximum power output capability of a transmitter in digital service.

Typical PAR for a digital-only HD Radio signal would theoretically be 7 to 8 dB. But in actual practice, about 2.5 dB of compression is tolerated, yielding an effective PAR of about 5 to 6 dB. To accommodate this, an operating point is selected that is typically 5 dB below its FM nameplate rating, or about 35%. This is the "backoff" for digital-only mode.



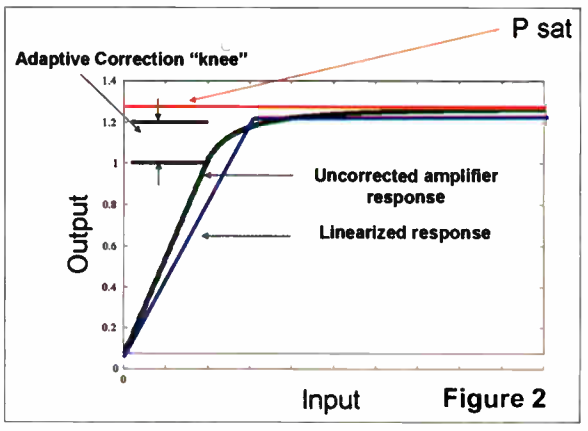
A vector representation of hybrid FM operation.

For common amplification, where the digital component is only a portion of the total signal, the backoff requirement is about 1 to 1.2 dB, resulting in a de-rated TPO that is 75-80% of nameplate rating. **Figure 1** is a vector representation of a hybrid (FM+HD) signal operating at a 20 dB ratio, alongside a vector representation of an analog-only FM signal.

The accompanying scale shows a new normalized analog component power that is 0.75 times the analog-only power. Note that at purely random times (because analog and digital carriers are not correlated), the digital and FM vectors sum together, and the amplifier nudges saturation – defined as the point where instantaneous increases in input amplitude result in no further increase in output, and clipping occurs.

However, just below saturation the transmitter goes into a compression knee and relies on pre-correction to "linearize" its transfer function. Because the non-linear transfer function is predictable, pre-correction, and especially adaptive pre-correction, is a valuable tool in extending the linear dynamic range of the amplifier.

Figure 2 illustrates the non-linear compression point, and the resulting linearization process that allows for a less conservative backoff.



Adaptive Correction prevents amplifier saturation.

MOVING UP TO -10 dB

Armed with this knowledge of amplifier behavior, we now can decide that the hybrid amplifier needs to pass a digital signal that is 10 dB higher.

Clearly, maintaining the required peak-to-average ratio without forcing excessive amplifier compression, forces a further backoff of FM power output capability of the transmitter. Moreover, if we are to maintain the same noise levels at >200 kHz, relative to the analog carrier that we have for adjacent channel protection in the current standard, then we are asking the amplifier for 10 dB *better* mask noise performance.

The price for that performance is – you guessed it – further backoff of the total power output. How much? Very preliminary test results indicate a backoff of 4 to 5 dB may be necessary.

MAKING A BIG TRANSMITTER "SMALL"

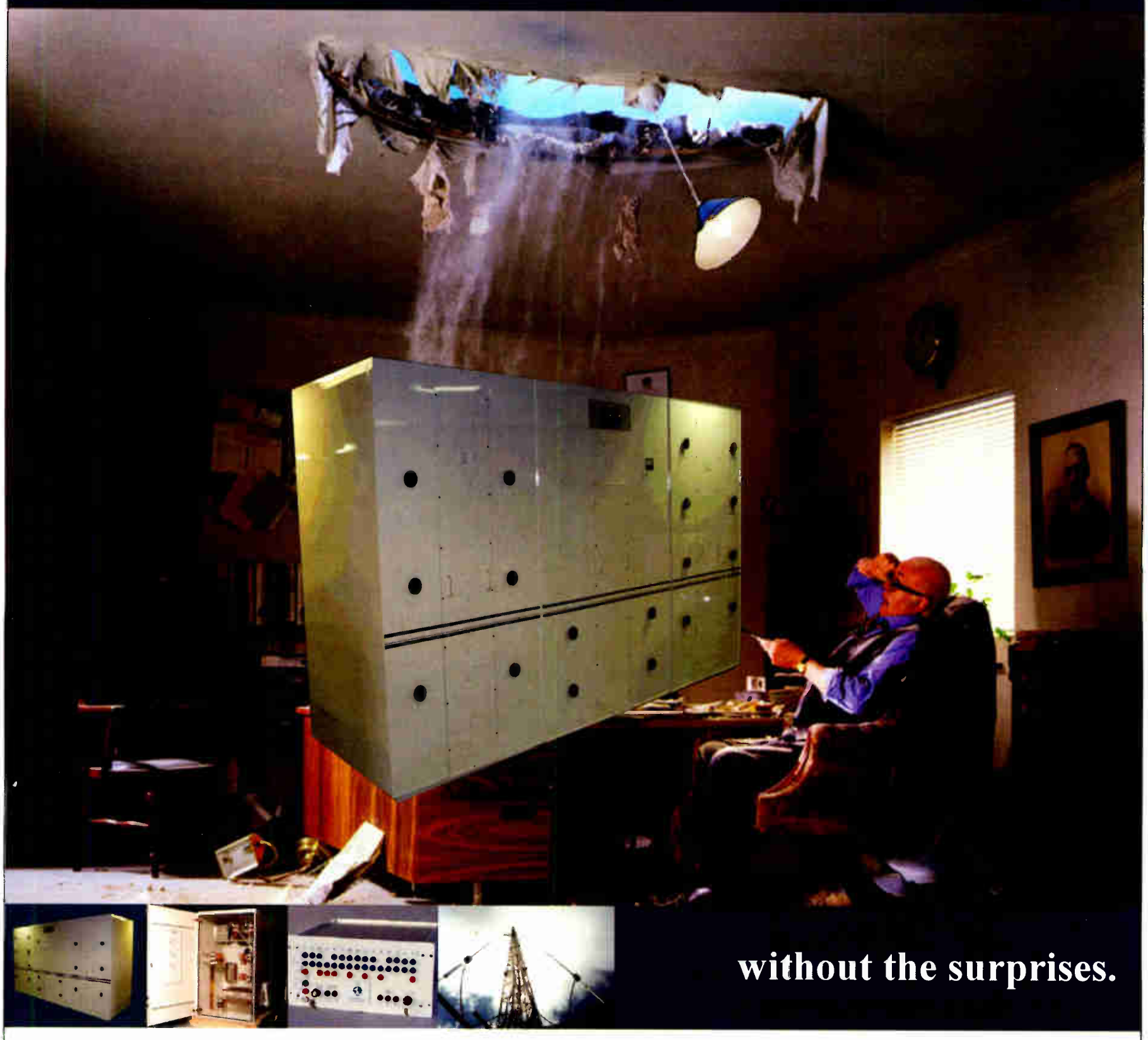
To put that in perspective, your 10 kW solid state transmitter that used to do 10 kW of pure FM was first derated to 8 kW in (-20 dB) hybrid mode, and would be further derated to just 3 to 4 kW of analog power (plus 10% of average power digital) in -10 dB hybrid mode. And your tube rig that started out as a 35 kW FM analog transmitter, will likely top out in the 11 to 13 kW range. In the best case, to maintain hybrid operation, you would be looking at doubling the number of amplifiers, as a minimum.

For non-hybrid systems (high-level, space-combined, etc.) that employ "digital-mode only" transmitters, there will be no change in efficiency or output rating of the digital transmitter. Nevertheless, you still face the challenge of getting 10 dB more RF to the antenna, either through a different combining scheme or larger/more amplification. Transmitter output will be mainly mask-limited.

With the prospect of declining efficiency, higher operating cost, and the expanded footprint to accommodate additional hybrid amplifiers, it becomes readily

(Continued on Page 22)

AM Directional Systems...



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Implications of -10 dB Digital Carriers on Station Implementation

apparent that in many cases, it is worth taking another look at all the combining methods on the table. Methods dismissed in the initial implementation might be more cost effective if the standard is modified.

SPACE COMBINED SOLUTIONS

Space combining has always enjoyed the distinction of having the lowest operating cost of all the combining methods. Stations that chose this method for their initial implementation will have to purchase a larger digital transmitter, but will continue to be able to operate most efficiently.

Space-combined digital transmitters that are currently in the 350 watt (average) or less range (1% of a 35 kW FM transmitter), will need a new box the size of a traditional 10 kW FM transmitter, which will yield up to 3.5 kW of digital-only power. The power handling capability of the antenna and transmission line will need to be reviewed as well, but fortunately many stations have these components already rated in the kilowatts range, since they are licensed as auxiliary (FM) antennas.

Stations that have implemented using high level 10 dB combining can also consider a conversion to space combining, because that extra 10 dB of RF is already being produced – just being sent to a reject load.

While it may not be necessary to purchase a new transmitter, they will require the vertical real estate for the second antenna and transmission line, as well as a ferrite isolator in many cases. This, of course, will be easier where stations own the tower and have the space available, more difficult where the space is leased or limited. In those cases, replacement with an interleaved or dual-input antenna is another solution.

NOISE PRODUCT CONSIDERATIONS

Keep in mind that, when you remove a 10 dB coupler and redirect all its power to a second antenna, the out-of-band noise floor also will come up by 10 dB. Thus, it is important to make sure you have the mask margin to do it before attempting this solution.

Space combining also requires adequate isolation between antennas to avoid intermodulation products. The typical minimum value would be 40 dB. This can be achieved by adequate antenna spacing, keeping in mind the FCC requirement that the "aux" antenna used for digital must be at least 70% of the HAAT of the main antenna. The taller the tower is, the easier it is to meet the FCC requirement and still have adequately spaced isolation.

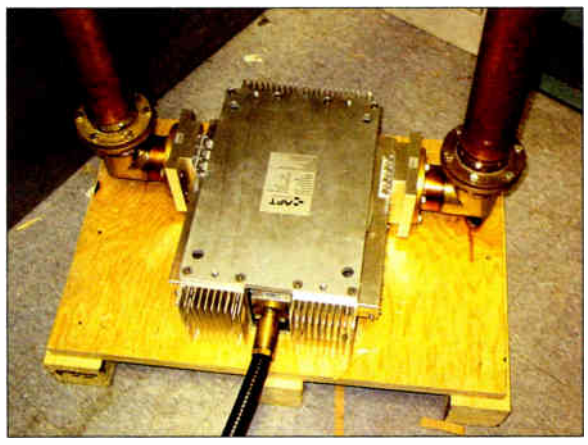
Half-wave spaced antennas offer better suppression of vertical radiation and therefore improve on the isolation figure. Where space isolation is not adequate – and you may not know until you actually install the system – the use of ferrite isolators can improve performance. These are more common in dual-feed or interleaved antennas where the self-isolation tends to be significantly less than widely spaced (vertically) antennas.

HANDLING INCREASED DIGITAL POWER

Where isolators are used, their power handling capability must include the sum of the forward and coupled (reverse) power. If the digital power is raised by 10 dB, it imposes a higher specification on the power handling capability of the digital transmitter's isolator, if used.

In the reciprocal direction, digital to analog, it is quite possible that an isolator will be required on the *analog* transmitter to suppress the (higher) digital power now appearing at the analog transmitter's output.

At Greater Media's WCSX in Detroit, operating under an STA to test the -10 dB concept, an isolator was added to the analog transmitter feedline. The station uses an ERI Lynx™ dual-input antenna, supplemented by AFT isolators on both the digital and analog transmitters.



An isolater installed on the WSCX analog feedline to suppress higher digital power.

It is worth an inquiry to the manufacturer(s) of both the analog and digital transmitters as to what the turnaround loss specification is for that model. A higher number (20 dB is considered good) decreases the likelihood of undesirable intermodulation products. Solid state transmitters generally have better turnaround loss than tube transmitters.

As has been noted in many articles on implementation, space combining is not without its own pitfalls. Close attention must be given to producing, as near as possible, identical radiation patterns. When geometrically different antennas are used for digital and analog, particularly with different bay configurations, the vertical null patterns produced can destroy analog or digital coverage close-in to the antenna. This effect can be minimized somewhat with identical gain antennas, and even more so with interleaved and dual input antennas.

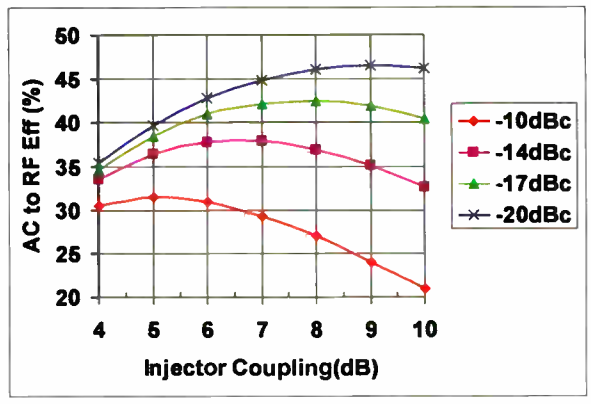
VARYING THE COUPLING RATIO

So far, we have considered only the implications of an increase of 10 dB in digital carrier levels. But it is likely that if authorized, intermediate increases in digital power would also be allowed (staying put at -20 dB should also be an option).

Therefore, if a station could not cost effectively implement a 10 dB increase, they may instead elect to implement whatever increase may be most cost effective for their configuration, *up to 10 dB*.

For a high-level combined station, by replacing a 10 dB injector-coupler with a 6 dB version, for example, 25% of the digital transmitter's power now goes to the antenna, compared to 10% before, an increase of 4 dB. Of course, it also imposes a 25% headroom requirement on the analog side. Some analog transmitters may have this headroom, and others may not.

Other coupling ratios are possible. In fact, an analysis of various coupling ratios indicates best AC to RF efficiency would be in the 5 to 6 dB range for -10 dB HD carrier levels.



Efficiency curves for various HD coupling ratios.

Shively manufactures injectors in 1 dB increments from 6 to 10 dB and can do custom injection levels as well. Dielectric's Dibrid™ coupler also allows for varying coupling ratios. 9 dB injectors are used even today where headroom exists in the analog transmitter but the digital transmitter is "wide open" and near the edge.

You might be led to believe that substituting injectors of less than 10 dB compromises the isolation between the two transmitters. This is not the case. Isolation is purely a function of having matched terminations at the antenna and reject ports. 10 dB was just a convenient coupling ratio selected to keep the analog headroom requirement to a modest (10%) level.

But with any change in injector ratio comes an increase in the overhead requirement of the analog transmitter, and all of that overhead goes to the reject load as wasted heat. So high-level combining may become less attractive.

HYBRID OPERATION

Having looked at space combined and alternate injector solutions, some stations may still be left with only the common amplifier hybrid transmitter alternative.

As noted earlier, the backoff numbers will be changing if the new ratio is implemented. This will require extra attention be paid to how power output specifications are stated and compared. To put power output comparisons in the proper context and compare apples to apples, it should always be stated as "under a [specific] VSWR condition," such as 1.2:1 or 1.5:1.

Also, power output without regard to mask performance margin can be meaningless. Under digital operating modes, a transmitter can go out of mask specification long before its components are thermally stressed, and may happily operate in that condition indefinitely. So the fact that the transmitter can get to 110% or 120% of its rated power may not be of much value. Ambient operating temperature and altitude should also be stated and considered as part of the power output rating.

CONCLUSIONS

It is still too early to predict the exact number for further derating of hybrid transmitters. But a doubling of the number of amplifiers required to achieve a given TPO is a rough estimation.

Clearly, the scales of the implementation method will tilt more toward less lossy solutions, such as space combining, interleaved antennas, and dual-input antennas. Each facility will need to approach any upgrade with an open book, considering and reconsidering all the implementation methods that may have been rejected before.

Large groups may inevitably swap transmitters around to get the most bang for the buck, or even begin considering digital main and auxiliary transmitters. This trend will no doubt gain momentum in the coming months, and some new and innovative solutions may be lurking. So, stay tuned.

The Eastern US Regional Sales Engineer and Manager for Nautel since last spring, Gary Liebisch is a veteran of over three decades in broadcast engineering and holder of a Bachelor of Science degree from Rensselaer Polytechnic Institute, in Troy, NY. A Lifetime Certified Professional Broadcast Engineer, Liebisch has been involved in development and sales of RF products since 1999. His email is gary.liebisch@nautel.com

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Studio Guide

by George Zahn

Maintaining Good Sounding Microphones

There may be a few radio stations that can get through a day without using a microphone but, for the rest of us, if our microphone fails, we are in big trouble. George Zahn has some advice to help you keep your microphones sounding their best.

In this series of articles we have discussed microphone types and their characteristics, buying new microphones, and creating a station sound by using a consistent brand and model of microphone for broadcast. But how do we protect the investment we have made in these vital tools of our trade?

Common sense is a start. But some environmental hazards to which our microphones may be exposed out of habit could shorten the life, or affect the performance, of your favorite transducer. There may also be some services available, about which you may not be aware, for maintaining microphone capsules and bodies.

BASIC CARE

We begin with some basics: proper handling and storage. Obviously microphones are not really made to be used as hammers or power tools, some dynamic microphone demonstrations notwithstanding.

Even the most forgiving dynamic microphones are not made to be dropped or used as a wheel chock when changing a flat on the news department's car. Suffice it to say, proper handling is the most important step toward keeping your microphone as close to sounding as "new in box" as possible. Proper handling includes properly storing the microphones for transport and when not in use.

"For most of our products at least ten years are the minimum," says Ben Escobedo, Associate Product Manager for Sennheiser USA, who points out that Sennheiser's Evolution wired line carries a ten year warranty, "and on the Neumann end, you spend your hard-earned dollars and expect them to last a lifetime. There are still U-47s and U-67s around from decades ago, so it can definitely be done with proper care and handling."

Among the environmental issues Escobedo blames for problems are dust and smoke. And therein lies a problem for some applications, be they in radio stations, recording studios, or stage settings. Dust is one of the hidden problems. I do not know about you, but I have moved enough equipment in enough studios to see not just the occasional dust bunny, but sometimes a whole hutch or two.

ELEMENT-AL PROTECTION

Whether it is dust or smoke affecting it, keep in mind that the element of the microphone is indeed a moving part. Anything that hinders or impedes the movement of the element will adversely affect the fidelity of audio you get from the microphone.

If you are in doubt, imagine the yellowing residue that coats the pictures and other memorabilia in your favorite bar. Now imagine some of that stuck into your remote start buttons on the console – or coating the diaphragm inside your microphones. If you have ever noticed a button that is harder to press than you remember, think about how that same gunk can adhere to and impair the small moving parts of a microphone.

Smoking has become a lightning rod in many communities which have passed anti-smoking ordinances in work places. We are not here to debate personal liberties, but equipment in clean, non-smoking studios does tend to last longer and have fewer problems from the smoke or dust.

A BASKET CASE

Over time, repair to or replacement of the "basket" or mesh grill around the element on many microphones is often needed, at least as an aesthetic matter.

Actually, the basket is one of the easiest places to find evidence of dropped microphones. According to Zahn's Law #37, when a microphone is dropped, the part that hits the floor resulting in a dent will be the part that everyone looks at. The capsule – generally the heaviest part of most microphones – is behind that grill.

Microphone baskets can be replaced easily by a manufacturer, often while repairing or replacing the capsule or element itself. Some may be replaceable in house.

Escobedo offers a quick "do it yourself" tip for cleaning up baskets with odors or debris stuck in them. "With the basket already removed from the microphone, you can take a little Scope or Listerine and a toothbrush to clean up the basket. It kills germs and it smells fresh when you place the basket back on the microphone. Of course, make sure it's dried out before you put it back on."

(Continued on Page 26)

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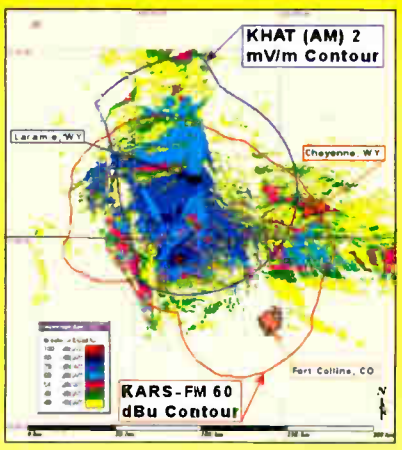

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Studio Guide

by George Zahn

Continued from Page 24

RELATIVE HUMIDITY

Speaking of wet versus dry, keeping microphones away from moisture is definitely a key to their longevity.

As a rule, water can damage microphones (hydrophones are specially encased to allow for underwater recording). On some microphones, notably condensers, indoor or outdoor humidity alone can create problems with the effectiveness of the microphone.

Escobedo points out that newer RF condensers, including the Sennheiser MKH series used for ENG and camera work, are more impervious to humidity issues, "It doesn't really matter. You could have 100% humidity and they're going to work just as well as in a dry environment. It may very different for a Neumann or another high-end condenser microphone that's mainly used for studio use, which shouldn't be used in humid conditions."

INTO THE BODY SHOP

While there are companies which will refinish the bodies of some microphones, such as the field weary ElectroVoice 635A, some microphones keep their "good looks" more easily.

Escobedo notes that "Stage microphones get handled pretty hard, as well as our RF condenser shotgun microphones for ENG and newscast purposes. They get ridden pretty hard, but they can often be returned to aesthetic specs."

On the durability hierarchy, it appears that most microphones have evolved to be more forgiving of mishandling, but the dynamic or moving coil microphones typically remain the most durable family – there is far less to go wrong. Condensers are next in line; they are not quite as rugged and many still have limitations in high humidity conditions. The ribbon microphone family remains the most fragile both in handling from a physical standpoint as well as sound pressure levels.

FACTORY REFURBISHED UNITS

More than one popular microphone model has been discontinued over the years. Finding either available good replacement parts or a vendor that services and repairs microphones with original parts is a valuable source for keeping microphones up to snuff.

The Shure SM5B is an example of a highly popular microphone that went out of production. However, even when they have been repaired aftermarket, many broadcasters have said the microphones did not perform as well as the originals.

Sennheiser's Escobedo say they offer refurbished microphones, generally through their dealers; the refurbished models carry a full warranty. This policy may vary by microphone manufacturer – checking with your regular retailer is a good way to learn more about the pros and cons of refurbished microphones.

I asked Escobedo if microphone manufacturers are ever concerned about making *themselves* obsolete by making microphones that last too long. He assures me that the opposite of that argument would be disastrous, "The consumer is going to purchase the best thing, and it's going to be a safe buy, and they're going to tell their friends who will tell their friends. It's much better than making an inferior quality microphone, just to see it break, and the consumer would be disappointed with the manufacturer." In short, it is about reputation.

I AM REALLY SWAMPED TODAY

We could not let Ben escape without at least a couple of "microphone horror stories." He opened the vault on a couple of "watershed" microphone moments. "One was completely washed out in a hurricane. It was a Neumann studio condenser, and it had all this salt and corrosion on it."

That was one that did not survive. Escobedo said, "It was totally ravaged, all corroded." But for every one of us who has had an "oops" moment, there is hope. Escobedo continues, "A user with an MKH shotgun microphone, which is popular for use outside, because it is pretty impervious to weather, was using it outdoors and accidentally dropped it in a swamp." My heart sank. Another microphone bites the dust.

"Then," continues Ben, "they fished it out of the swamp, unplugged it, shook it out, let it dry, and plugged it back in later – and it worked like new."

Here is hoping that even on your worst tech days, you will be able to stay out of the microphone swamps. And remember: a little love and care for your microphones will go a long way to making them life-long on-air and recording companions.

Next time around, I would like to discuss microphone accessories and whether or not to use windscreens. In the meantime, please take a moment to weigh in with your opinions on whether foam windscreens and external pop filters color the audio your microphones make. The address follows.

George Zahn, Station Director at WMKV-FM in Cincinnati, OH, enjoys discussing new and different techniques to help stations improve their sound. Let him know what works for you at gzahn@lifesphere.org

Operations Guide

by Jim Bender

When GM Means "Good Manager"

A mediocre manager may enrich your wallet, Jim Bender points out, but they will waste your talents. On the other hand, a good manager will bring out the best from his people, building a successful operation.

It was the second meeting with the GM about the new studio construction. My partner and I had arrived at the architect's office exactly on time. This would be our first look at the "finished" architectural plans. From our position as engineers, we knew that these initial meetings would set the tone for the entire project.

A ROCKY START

The GM and the electrical contractor were a few minutes late. With introductions made and coffee poured, Dick and I studied the blueprints. We looked at the floor plan and then quickly flipped the sheets to the electrical design.

Unfortunately, it was obvious our architect had never designed a radio station – he had no idea about the electrical needs. It looked like the power company had brought in three-phase from the next street over – and they were serving us at 480 Volts. "Why?" we asked. *"The previous engineer said we needed it,"* we were told.

As far as we knew, there were no plans for any large transmitters at the new studios. "Is three-phase needed for the elevator?" we asked. *"No. The elevator can be ordered either single- or three-phase."* "What about the HVAC? Is there any advantage to running them on 480 Volt three-phase?" *"No. These units are small enough that they can be ordered either way."*

THE DANCE

We tried to explain that the radio station's electrical needs would not be much different from those of the retail store on the first floor. We had more rooms and more branch circuits, but the studios did not have any Magical Mystical Radio Machine that needed 480 Volts three-phase.

The architect said he was just following orders from "the previous engineer." This was beginning to sound like an indictment of the entire broadcast engineering profession. If allowed to continue, I could see that Dick and I would receive the same flaming brand as "the previous engineer." We could easily be perceived as pompous, whimsical know-it-alls who really knew nothing, but simply wanted things our way.

As I considered how to salvage the meeting and maintain the dignity of the professional broadcast engineer, the GM appeared to be trying to save face in front of these other professionals by repeating the words of "the previous engineer." The general contractor was saying it did not matter, because the service conductors had already been run across the street. The architect was trying to find out if there should be other changes to his design assumptions because of "the new engineers."

Dick and I sat back and waited for the bedlam to die down.

REVERSING COURSE

At that moment, we found out this GM was a Good Manager, because he immediately sensed that we were no longer making progress in the meeting.

Though he respected his general contractor, the architect, and the electrical contractor, he grasped an essential truth about the long-term welfare of his radio stations: These other professionals each had important roles to play in the construction of the new studios, but his engineering staff would be the ones taking the phone calls in the middle of the night. His engineers would also be the ones to take him into the future.

He resumed control of the meeting with a couple of hand gestures and indistinct sounds. Then, looking at us, he said, "I'll shut up now and you tell me how we're going to do this."

This was not the first time the Good Manager had said he "would shut up and listen" as we patiently told him how things were going to be. He already knew we did not raise questions just to badger the others and establish our turf. He also knew that when we brought questions, we also brought solutions.

For the duration of this project, in all of our dealings with the contractors, he firmly established the pecking order. The GM that is a Good Manager also brings Good Medicine.

THE GROWING CRISIS

The process had started months earlier, when corporate had finally approved a major capital budget for new studios. I had worked in this facility in the seventies and eighties when it was a simple AM-FM combo under a different owner. Successive owners had added a third, fourth, and fifth station.

Several different contract engineers had dutifully stuffed the additional studios into any available space, even turning a hallway into a long, skinny studio. The News Guy had to walk through the hallway Alternative Studio to get to the Talk Studio. The Operator-on-Duty had to block the doorway to take meter readings. The Sales people could not all be in the building at the same time, because there were not enough desks or chairs.

At one time, engineering had a small room and workbench, but the floor space now held racks of satellite receivers, automation computers, servers, switches, and routers. The workbench and every other bit of floor space were used to store the remote kits and retired gear.

With the passage of time, the hodge-podge of equipment assembled from the previous owners was becoming a maintenance nightmare. A production room had been built around an unbalanced consumer-type console. Every new widget or change triggered other, cascading problems in the rest of the plant.

RETURN TO THE SCENE

The enormous project to build new studios eventually defined itself into a long-term lease on the upper floor of a yet-to-be-built retail building on the busiest street in town. The immediate past contract engineer, now in another town over a hundred miles away, had given some general guidance to the architect but offered little in the way of planning, saying he was too busy to handle the project and suggesting they find someone else.

This presented the GM with two problems. First, and foremost, he needed someone to handle the day-to-day engineering needs of the cluster. Second, he needed someone to plan and manage this immense studio move project. The GM called Dick, and Dick called me.

Though we also were based more than a hundred miles away, we assured the GM that we would not let him down. I started making regular trips to keep the existing studios and transmitters on the air. Dick started working with the GM and Corporate on a detailed budget for the project. The project began moving along.

MUTUAL RESPECT

The engineer deserves the respect of the Good Manager for an important reason. As Dick put it in one of our early meetings, "I can talk into the microphone. I might not be as good as Mike in the Morning, but I could make the songs and commercials play, and give the time and temperature. I can sell radio ads. I might not be as good as Susie the Selling Machine, but I could visit clients and fill out sales orders and write ad copy.

"I can produce ads and promos. After all, I'm the one you call when you want to know how to do something with Cool Edit. I can schedule commercials to play. Heck, I wrote one of the first commercial traffic programs to run on a computer. I don't like wearing a suit, but I could sit behind a big desk to hire and fire people. I may not be really good at any of these things, but I could do every one of your jobs. On the other hand, there isn't a single one of you that could do my job – even poorly."

The hush in the room was deafening. It was not that the jocks or the sales weasels were at a loss for words. Rather, they were all looking at the GM, who had an intense, penetrating look on his face, as one-by-one, he scanned the others at the table. They all respected the Good Manager – and it was obvious that the Good Manager respected the engineer.

At that meeting, a sense of order had been established. No one had to draw an organizational pyramid to show the chain of command. The importance of the engineer had been unambiguously settled for all to see.

KEEPING IT ON THE AIR

If you are an engineer, you already know that normally no one else in the station knows how to keep the facility operating smoothly. If you are a Good Manager, you also know that your engineer is the one person who stands at the ready to take care of unexpected problems; he is often the only one who is watching out for the station licenses.

Indeed, since Deregulation there are very few inside the radio station who know that the FCC still regulates this industry. Even if they are vaguely aware there are FCC Rules, most have no idea about what is regulated or how large the fines can be for non-compliance. When you mention "FCC fines," they think "the F-word," rather than "EAS log."

The GM also knows the engineer is the one to whom he can turn when the Escalade needs a jump start. In the same way he performs preventative maintenance to keep the stations on the air, the engineer always has a rig that starts – and he always has jumper cables at hand.

NURTURING THE ENGINEER

We were well along in the construction of the new studios when the Good Manager told us he had found and hired an engineer for the cluster. It turned out that the new guy had worked in major markets and was happily looking forward to a little slower pace and a much better quality of life by moving to a small market.

Because the cluster had a Good Manager who understood the value of a good engineer, the new guy would be getting a good salary for the market size, but more importantly, the new guy would be getting a heap of respect.

By the way, if you are a manager with a fulltime engineer, do you give him the same consideration you would extend to your other department heads? Have you ever seen a Sales Manager make do with a hand-me-down metal desk from the Traffic Department? How long would you keep your new Operations Manager if he had to work with the server blowing papers around the closet you gave him for an office?

In the years that followed, we watched the new guy take on additional responsibilities and receive raises, privileges, and authority beyond that of the Sales Manager and Operations Manager. When he spoke, the Good Manager listened. The jocks and sales weasels trembled. He was a good engineer who worked for a Good Manager.

And of course, yes, the station prospered fiscally *and* as a good place to work.

Out on the range at Three Forks, MT, Jim Bender is an experienced contract engineer who has seen good managers and some not so good. Contact Jim at jabender@imt.net

Future Proof Console

"We need to add two streams for HD programming."

"We're changing our format again."

"We just bought another station. They move in next month."

It seems change is the only constant in this industry. Fortunately, your console doesn't have to change every time something new happens.

Logitek

Console Router Systems

Logitek Electronic Systems
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With Logitek, you have the flexibility to handle whatever gets thrown at you. Systems can be expanded; 5.1 audio is no problem; even adding an all-talk channel to your new HD lineup can easily be accommodated with our built-in delays and superb mix-minus support. Call our Sales department today to arrange a demo of the flexible Mosaic console.

Survival Guide

by Rich Wood

Loyalty vs. Value

My Father's generation expected – and usually got – company benefits and retirement. Employees often stayed with the company their entire working life. They were loyal to the company and the company was relatively loyal to them.

As was common among well-run companies, the original General Electric Broadcasting believed it was much cheaper to keep key employees than to have to constantly train new ones. They tended to keep their experienced and most productive people.

A BRAVE NEW WORLD

Today, loyalty is at best a one-way street. Companies expect it as they always have. Yet employees usually see their employment as a temporary thing and therefore have no qualms about jumping ship every few years.

This phenomenon has become so pervasive that an entire industry of "culture consultants" has sprung up to advise companies outside of broadcasting how to make the workplace such a paradise that valuable talent will stay. A few provide everything from day care to recreation and health clubs to gourmet chefs on duty all day long – on site. Employees can almost live at work.

Unfortunately, in most industries, the trend is toward reducing any such amenities.

ADVERSARIAL RELATIONSHIP

For a number of years, primarily in union shops, companies gave gotten around many of the terms of their contracts by employing people for hours just short of full time. Usually 35 hours still qualifies as part time and requires no benefits, sick days or vacation time. Originally, it was for temporary work. Now we have an entire category of employee who works nearly a full week year round and gets no benefits – shafted on a technicality.

Company loyalty was strained during the recent holidays, which brought unusually severe employee bloodbaths as major companies fought hard to please Wall Street. How tender it is to fire large numbers of people just before Christmas and on one's return from vacation.

Worse, there is often a big hammer over the heads of the employees. Non-compete agreement and exit-agreements that have to be signed before an employee can get his severance pay have become common.

LOYALTY REDEFINED

A Vice President of one very large corporation with a habit of firing very large numbers of people – and fighting their rights to unemployment benefits – labeled me a "disloyal employee" because I advised my new hires not to sign the company's non-compete agreement.

The company was in Telecommunications and Broadcasting with both stations and a network. Since eventually being fired was almost guaranteed, it meant those ex-employees would have to find new careers for at least a year. If the non-compete only affects employment in a specific market, the fired employee is "free to move to another market." But, in the case of a network, the entire country could be off limits for the duration of the non-compete.

In engineering this began many years ago with the Contract Engineer. If you had a good facility all was well. If not, you might work nearly full time for a flat fee. At least Consulting Engineers can charge an hourly or project fee.

MOOD SHIFT

The result is that the natives are more restless than ever. Of course, Management has usually considered them revolting even before they became uppity and wanted a bigger piece of the rewards of their work.

Hence, we have a writer's strike for a bigger share of non-broadcast use.

As I write this, MTV is being picketed by "permalancers," the new label for hard workers the company considers expendable. So far as I know these are not Independent Contractors because the company can specify their work schedules and locations. That would be an IRS violation for an Independent Contractor.

TROUBLE IN BROADCAST CITY

With all the complaints about dull programming, deteriorating facilities and falling stock prices, the question becomes how long can this last? Broadcasting is one of those rare industries that cannot be outsourced to India.

We seem to be cutting our own throats, and it appears to be taking its toll. The next generation is abandoning radio. Boomers are too, as is the generation just behind. Logic would have it that bad times require extra effort – more creative people to improve the product and devise ways to deliver it in ways that fit contemporary life-styles. Instead we downsize and cheapen the product – not unlike cutting back on advertising when sales are slow.

If we think voicetracking gives us mispronounced street names, wait until someone decides the bottom line requires program origination from a country where English is a fourth language. Or tech support from the Czech Republic.

I find it hard to accept that broadcasting is becoming a lost art because of new gadgetry (iPods, etc); that is only an excuse. I believe companies are killing it by responding to Wall Street's demand for pounds of flesh and the trend toward taking public companies private. Only a select few at the very top will make a killing as the product moves to the back of the bus and those who create and deliver the product are run over by it. The new mortgage on the private company will demand ever more cuts.

VALUING THE PRODUCT

People have always been our most important product. Without the showbiz qualities performers and staff bring to the radio we have nothing to entice listeners to pay attention. We should take a lesson from the record companies who are cutting back with very clear consequences. The lack of great new material drives people to devalue their product enough to justify stealing it. Broadcasters rely on their product.

Nowhere is that more evident than with on-air talent. As cold as it may sound, talent are not people, but product. If the product no longer sells it gets replaced. I feel a little less sympathy for talent because they know – going in – that they are only as valuable as their last big number rating book.

Our industry will suffer a double whammy as we reduce the value of our product by devaluing our people at the same time outside creativity dries up. Silicon Valley companies have developed driven employees who create relevant products. So relevant that Internet advertising has just passed traditional media.

We need to figure a way to rekindle employee loyalty, otherwise we lose any incentive to take pride in our work. Maybe we need a few of those "culture consultants" to turn this trend around.

THE TECH CHALLENGE

Engineers operate in a different climate. Often it seems a worse one than talent. Talent's visibility is, usually, their greatest protection from arbitrary termination. (I say that with a little trepidation as I watch large companies terminate high billing (and expensive) people to appease the bottom line. Their willingness to risk losing highly-rated talent to bump short-term profit is frightening.)

Engineers deal with things that are much less subjective than programming. That lack of subjectivity often leads very good engineers to equate their good work with the expectation of management appreciation. It rarely works.

Profit centers and cost centers are the lifeblood of bean counters. Very few look at the numbers deeply enough to show that a creative engineer has actually brought in or saved far more than his or her salary or department budget.

THE ENGINEER'S SOLUTION

Engineers need to rightfully argue their importance to the organization, and not just temporarily.

We need to figure a way to inspire engineers to step up and make their case loudly to management in a way they understand. The SBE comes to mind. How about a course or seminar that teaches engineers who know their value to document their contribution to the organization?

When you create a profit center shout it from the rooftops. One has to veer away from linear thinking a little bit to accomplish that goal.

Rich Wood has a long history of experience in programming and station operations. Contact him at richwood@pobox.com

the professional broadcaster's choice for

IP STLs

WorldCast Eclipse

At last! An IP audio codec that offers a reliable, DSP-based platform and automatic back-up for 24/7 reliability.

APT's WorldCast Eclipse is the ultimate in flexibility and choice offering IP, X.21/V.35 and ISDN interfaces and a selection of popular coding algorithms including Enhanced apt-X, MPEG Layer 2/3, MPEG 4 AAC, G.711 and G.722

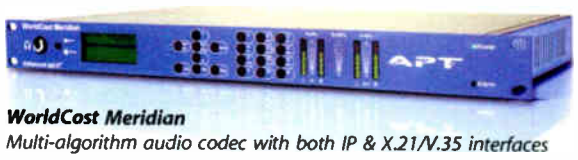
All the features you expect from a professional broadcast codec are supplied as standard: analog and AES/EBU I/Os, adjustable silence detection, alarm ports, contact closures, speed dials, embedded auxiliary data and many more...

Configuration and control of the WorldCast Eclipse is straight-forward and simple thanks to APT's powerful and intuitive Codec Management System (CMS). Offering extensive real-time management of multiple codec units, the CMS enables alarm monitoring, logging and performance monitoring as well as configurable user and audio profiles.

To see the full functionality of CMS, download a trial version from www.aptx.com.

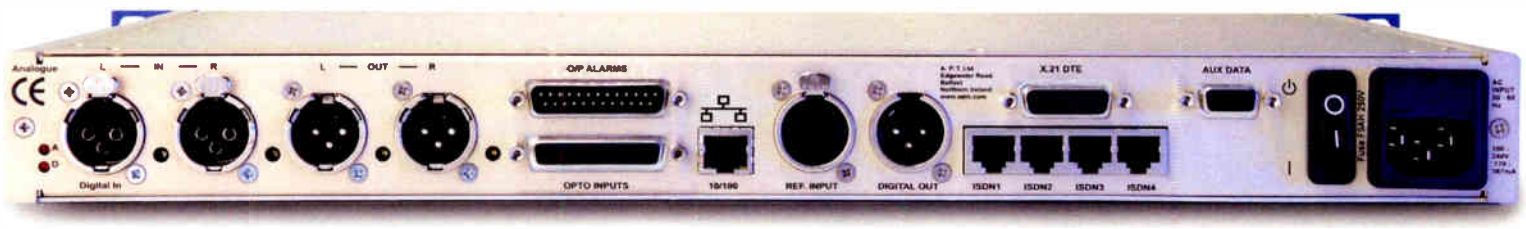
Also Available:

WorldCost Horizon
Bidirectional stereo audio codec offering Enhanced apt-X over IP



WorldCost Meridian
Multi-algorithm audio codec with both IP & X.21/V.35 interfaces

WorldNet Oslo
Professional, Modular Audio Multiplexing Platform offering up to 14 stereo channels over T1/ E1 or IP links with Enhanced apt-X or linear audio. Built-in redundancy, automatic back-up and hot-swappable cards ensure round the clock reliability for multi-channel STLs.



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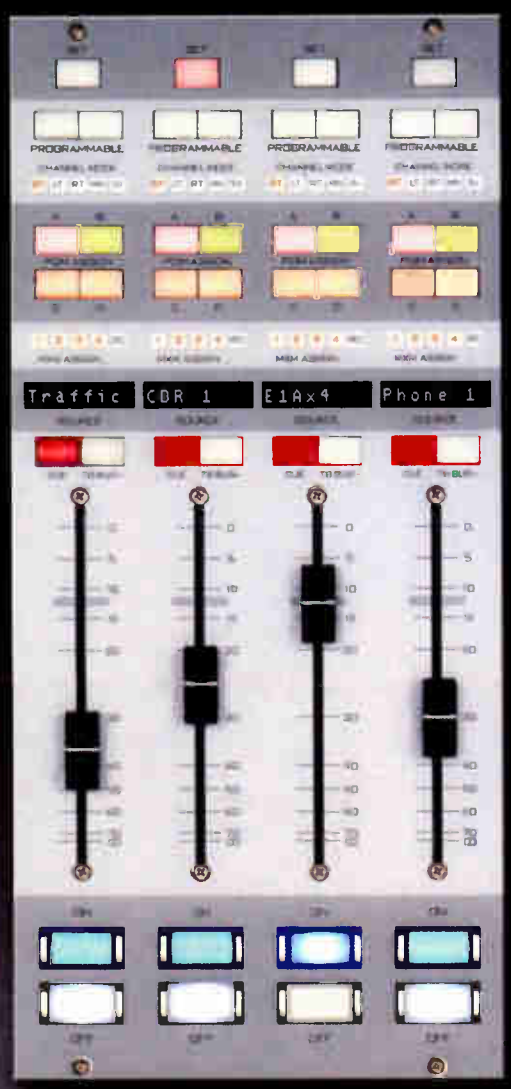
EVOLUTION-6

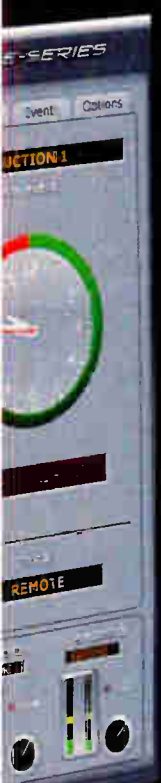
The E-6 is a powerful, compact and cost-efficient networked audio control surface with built and a powerful set of PRODUCTION TOOLS for each input channel, allowing a single surfa reconfigured for different talent, studio and format requirements.



E-6 INPUT CHANNELS can access networked audio sources with the press of a button. All sources are displayed right above the fader. Each fader has its own mix-minus output (in addition to the console's own 4 MXM busses). SET buttons at the top of each channel can access a powerful array of production tools individually tailored for each input strip. These include four bands of parametric EQ, compressor/limiter, expander, pan, mode, HPF, LPF and phase reverse. These EQ /DYNAMIC functions allow powerful per channel mic processing. The console has four output busses (can include 5.1 surround), 4 mix-minus busses and 4 aux mixes (all with TB). Each input channel also has two programmable buttons for customized functions, as well as ON/OFF switches with built-in machine control (logic follows source).

The Wheatstone Evolution-6 Digital Audio Control Surface

in EVENT RECALL
e to be instantly



THE REALTIME HI-RES GRAPHIC DISPLAY keeps operators up to date and completely informed concerning all surface functions. Metering, bus assignment, channel status and sources, event recall, monitors, EQ and dynamics—all appear here via the mouse/trackpad driven GUI. Note the surface drives the VGA monitor with built-in circuitry (no external PC required).

THE MONITOR/SET PANEL (right) has Control Room, Headphone, and two independent Studio outputs. It also allows the operator to program input channels via the SET function: aux mix and mix-minus assign (4 each; all with talkback), input source select, and pan. The panel also has fourteen programmable buttons which can initiate custom functions like remote setups, intercom, machine commands and salvos.

Available in 4, 8, 12, 16, 20, or 24 channel mainframes

The **E-6** audio control surface interfaces directly with Wheatstone's E-Series network switch and associated studio satellite I/O cages. Wiring between components is via single CAT-5 cables, eliminating point-to-point multi-pair runs. **Each studio surface operates independently, yet can share all network sources and mixes with others.**

Wheatstone

www.wheatstone.com/E6.htm | sales@wheatstone.com | tel 252-638-7000

From the Transmitter Shack

by Clay Freinwald

Adding Phase Protection to the Plant

Using three-phase power solves many problems, but all three phases need to be working. For that reason, most modern equipment incorporates phase-loss protection – not all. As Clay Freinwald shows, protecting the plant is very important, but not that difficult.

A number of years ago an AM station I was maintaining lost one phase of the power feed from the Public Utility District. Remarkably the station stayed on the air, although at reduced power and with some hum in the audio, probably due to its Nautel Ampfet 10 – a transmitter that seems to be immune to such things.

SMOKING IN THE TRANSMITTER ROOM

The problem is that very few things which operate with three-phase power are as forgiving. In fact, it is well known that a great deal of smoke can be released from heavy and/or expensive inductive devices when your three-phase goes bad.

A few years back we were building an addition to a transmitter plant. My design called for a variable-speed fan, one whose output would change with the temperature, thereby providing a more constant temperature in the building. In the HVAC trades the device that performs the variable speed, or proportional speed control is referred to as a "Frequency Drive."

An XFC Frequency Drive unit.

One might have thought, considering my experience over the years, that phase-loss protection would have been in my design specifications for the new supply fan controller. But not in this case – at least at first. It was my reward for assuming.

Fortunately, a little bird told me up there on the mountain top, where losing a phase was a common occurrence, that I had better look in the paperwork that came with this device to make sure that the big blower motor would be protected. The instructions were not much help, so I called the manufacturer and was informed that *no*, phase-loss protection was *not* included. Now what do I do?

FULL PROTECTION

Most station facilities are not going to be able to withstand the loss of a phase, usually due to what it does to electric motors, power transformers etc. This is the reason why most equipment comes with three-phase loss – and rotation protection – built in. Still, once in a while you will run across a situation where such protection is not included in the design of the product.

As mentioned, the XFC Frequency Drive was not phase-loss protected. You can well imagine that, running with a 7.5 horsepower motor, loss of a phase could get pretty "exciting." Furthermore, as this system resides on a mountain top, one of Murphy's Laws comes into play: Murphy dictates that any failure shall occur at a time when you cannot get there from here!

The good news is: it is easy to roll your own phase loss protection.

PLUG-IN BRAINS

For the heart of the system, I turned to my trusty ATC/Diversified Electronics Catalog to find the needed phase-loss module. (It sure beats rolling your own on a bread-board.) The item needed was indeed there.

The Diversified Phase Loss Relay.

The module is a model SLA-230-ASA, running a nominal 240V AC. Those of you with Continental Electronics transmitters will recognize this item as it is used inside the 831G and 816R series for the same purpose: to sense a lost power phase.

The top of the Phase Loss module. Note the adjustable trip point.

It is worth noting that these modules come in a range of currents, voltages, features and form factors from various manufacturers. The reason I use the Diversified unit is my long and satisfactory experience with their products.

Measure the current of the motor you wish to protect and select a contactor that will handle the current. For my project, A GE CR305D0 proved to be the right size. Do not forget to make sure that the controller module is able to handle the coil current of the contactor.

MAKING IT LOOK PRETTY

You may be tempted to mount these components in or on something from under the bench. Resist that temptation and do what most electricians do: mount the parts in a Hoffman enclosure (my favorite) and connect the protection system between the supply and the unit you wish to protect. (One of the goals on a project like this is to build and install it in a manner that will make your electrician say "Wow! Where did you buy that?")

The contactor and Phase Loss module mount inside a 12 x 12 x 6" Hoffman enclosure.

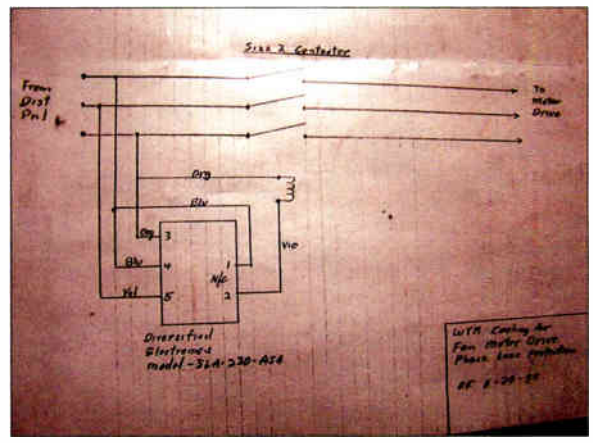
The Phase Loss Module monitors the supply and holds the contactor closed. If it senses a loss of one or more of the electrical phases, the module drops the contactor and protects the motor.

Phase protection on Top, Frequency Drive unit in the middle, and power disconnect on the bottom.

DOCUMENT IT!

And one more thing: Put a schematic of the system inside the enclosure door so that others (or possibly even yourself, some years hence) will know exactly what you have done. They (and you, yourself) will think better of you for it.

This same method can be used to protect a variety of otherwise un-protected equipment. It is just a matter of choosing the correct module and contactor for the job.



The schematic diagram for the system is mounted inside the door.

PROBLEM SOLVERS THAT WILL WORK FOR YOU

Do yourself a favor: from time to time sit down with a catalog of electronic control modules, or ECM's. You will find a whole slew of problem savers – timers, sequencers, monitors etc. And in the process, you will soon be looking for ways you can put these devices to work.

If you are looking for some on-line resources, here are some good places to start:

- www.atcdiversified.com
- www.ssac.com
- www.rockwellautomation.com.

Clay Freinwald has been an RF Systems Engineer in the Seattle area for over 40 years. A member of the SBE Board of Directors, you can contact Clay at k7cr@blarg.net

MINSTRUMENT MATRIX

Sophisticated Minstruments from NTI give you comprehensive test capability... and these flexible audio instruments fit in the palm of your hand

DL1 Digilyzer
Digital Audio Analyzer

A handheld digital audio analyzer with the measurement power & functions of more expensive instruments, the DL1 Digilyzer analyzes and measures both the digital carrier signal (AES/EBU, SPDIF or ADAT) as well as embedded digital audio. In addition, the DL1 functions as a smart monitor and digital level meter for tracking down signals around the studio. Plugged into either an analog or digital signal line, it automatically detects and measures digital signals or informs if you connect to an analog line. In addition to customary audio, carrier and status bit measurements, the DL1 also includes a comprehensive event logging capability.

- AES/EBU, SPDIF, ADAT signals
- 32k to 96k digital sample rates
- Measure digital carrier level, frequency
- Status/User bits
- Event logging
- Bit statistics
- VU + PPM level meter for the embedded audio
- Monitor DA converter and headphone/speaker amp
- Audio scope mode

DR2 Digirator
Digital Audio Generator

The DR2 Digirator not only generates digital audio in stereo & surround, it is a channel transparency and delay tester as well, all condensed into a handheld package. Delivering performance & functionality challenging any digital audio generator made today, it produces all common audio test signals with sampling frequencies up to 192 kHz and resolution up to 24 bit. The Digirator features a multi-format sync-input allowing the instrument to be synchronized to video and audio signals. In addition to standard two-channel digital audio, the DR2 can source a comprehensive set of surround signals.

- AES3, SPDIF, TOSLink, ADAT outputs
- 24 bit 2 channel digital audio up to 192 kHz SR
- Sine wave with stepped & continuous sweeps; White & Pink Noise; Polarity & Delay test signals
- Dolby D, D+, E, Pro-Logic II, DTS and DTS-HR surround signals
- Channel Transparency measurement
- I/O Delay Measurement
- Sync to AES3, DARS, word clock & video black burst
- User-generated test signal files

AL1 Acoustilyzer
Acoustics, Audio & Intelligibility Analyzer

The AL1 Acoustilyzer features extensive acoustical measurement capabilities as well as analog audio electrical measurements such as level, frequency and THD+N. With both true RTA and high resolution FFT capability, the AL1 also measures delay and reverberation times.
With the optional STI-PA Speech Intelligibility function, rapid and convenient standardized "one-number" intelligibility measurements may be made on all types of sound systems, from venue sound reinforcement to regulated "life and safety" audio systems.

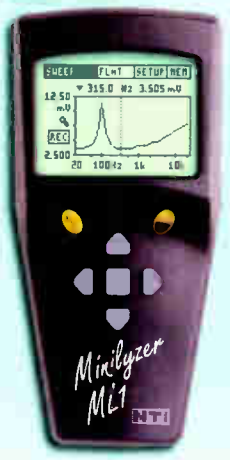
- Real Time Analyzer
- Reverb Time (RT60)
- Delay measurements
- High resolution FFT with zoom
- Optional STI-PA Speech Intelligibility function
- Automatic Distortion analyzer (THD+N)
- Frequency, RMS Level, Polarity measurements
- Requires optional MiniSPL microphone
- Includes MiniLINK USB interface & Windows PC software for storing tests and PC transfer

MR-PRO Minirator
High performance
Analog Audio Generator +
Impedance/Phantom/Cable measurements

The MR-PRO Minirator is the senior partner to the MR2 below, with added features and higher performance. Both generators feature an ergonomic instrument package & operation, balanced and unbalanced outputs, and a full range of signals.

- High (+18 dBu) output level & <-96 dB residual THD
- Sine waves & programmable swept (chirp) and stepped sweeps
- Pink & white noise
- Polarity & delay test signals
- User-generated custom test signals & generator setups
- Impedance measurement of the connected device
- Phantom power voltage measurement
- Cable tester and signal balance measurement
- Protective shock jacket

ML1 Minilyzer
Analog Audio Analyzer



The ML1 Minilyzer is a full function high performance audio analyzer and signal monitor that fits in the palm of your hand.
The comprehensive feature set includes standard measurements of level, frequency and THD+N, plus VU+PPM meter mode, scope mode, a 1/3 octave analyzer and the ability to acquire, measure and display external response sweeps generated by a Minirator or other external generator.

Add the optional MiniLINK USB computer interface and Windows-based software and you may store all tests on the instrument for download to your PC, as well as send commands and display real time results to and from the analyzer.


MiniLINK

- Measure Level, Frequency, Polarity
- Automatic THD+N and individual harmonic distortion measurements k2 – k5
- VU + PPM meter/monitor
- 1/3 octave analyzer
- Requires optional MiniSPL microphone for SPL & acoustic RTA measurements
- Frequency/time sweeps
- Scope mode
- Measure signal balance error
- Selectable units for level measurements

MR2 Minirator
Analog Audio Generator

The MR2 pocket-sized analog audio generator is the successor to the legendary MR1 Minirator. It is the behind-the-scenes star of thousands of live performances, recordings and remote feeds.

- Intuitive operation via thumbwheel and "short-cut" buttons
- New higher output level (+8 dBu) & low distortion
- Programmable Swept (chirp) and Stepped sweeps
- Sine waves
- Pink & White noise
- Polarity & Delay test signals
- Illuminated Mute button

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503-684-7050
www.minstruments.com
info@ntiam.com

Tech Tip

by Tom May

Cooling Fan Replacement Fixes DexStar Problem

I ran into an interesting problem with a Harris DexStar exciter. What appeared to be a software problem turned out to be a hardware issue.

The symptoms were that every day or two the delay between the analog and the HD-1 program would slip about 100 ms, the digital lagging behind the analog. Simultaneously, some receivers that were set to HD-2 would revert back to HD-1.

IDENTIFYING THE PROBLEM

It took some time to figure out the problem, especially since a line in the exciter Fault Log was quite misleading. The exciter would report the following condition: "DUC HW is very low on Symbols. 4 Symbols Dropped"

This would indicate a problem with the digital up-converter board in the exciter. After contacting Harris about the condition, we could not determine that there was, in fact, anything wrong – especially since it seemed to act up intermittently. The only thing we could come up with was to re-seat all the cards and connectors inside.

Two fans are required to cool the CPUs. Here, the bad fan has been removed.

Upon opening the cover to the exciter, the problem became obvious. The DexStar uses two CPU processors, and the fan had seized up on one of them.

This caused the chip to become very hot and throttle back on speed to prevent burning up. This, in turn, caused the DexStar software to under-run the buffer to the digital up-converter.

FAN REPLACEMENT

The CPU fans on my DexStar utilized sleeve bearings. I have never liked sleeve bearings on brushless fans since they have a tendency to gum up over a short period of time. I have since replaced the fans with ball bearing units and the exciter has run flawlessly ever since.

Make sure to replace your fans with something of equal or better performance. In my case, the processors appear to be first generation Pentium 4s (your hardware may vary). A trip to your local computer retailer should be able to provide you with the right replacements. *Make sure to specify ball-bearing type.*

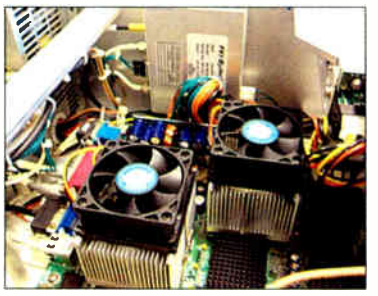
Buy a ball-bearing type fan and use only the fan in the replacement process.

Usually the computer store will sell you a fan with a brand new heat sink attached. I recommend unscrewing the fan from the old heat sink, and replacing it with the fan off the new heat sink.

This way you avoid disturbing the thermal interface between the heat sink and CPU chip. Use care not to strip the threads in the soft aluminum.

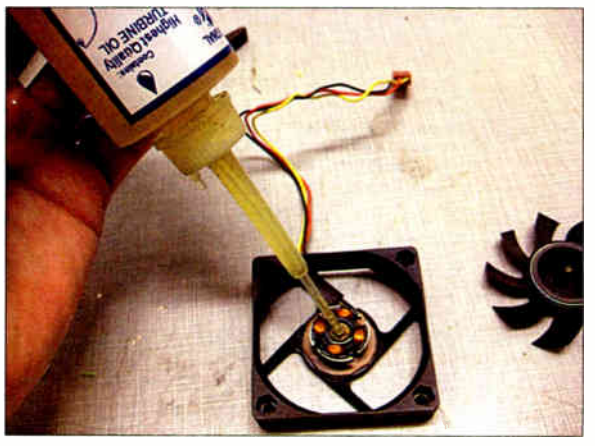
If your old fans still work, keep them as spares.

TEMPORARY FIX



With both fans replaced, the unit has not failed since.

If you cannot get a new fan right away, you can take the old fan apart, usually by removing a retaining clip with a spanner or needle-nose pliers. Place a single drop of machine oil in the sleeve bearing and reassemble the fan. This will buy you some time until you can find a proper replacement.

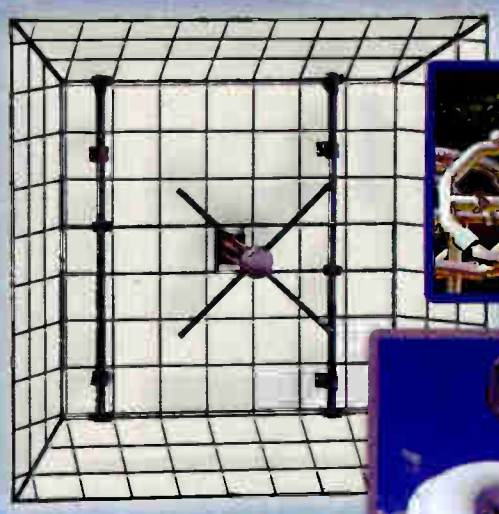


***One* drop of oil can temporarily get the fan running.**

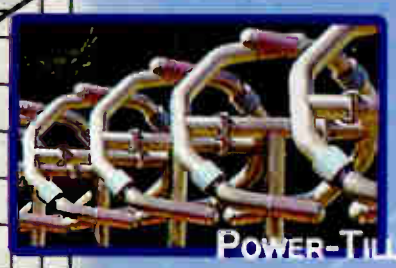
While you are thinking about the fans, consider ordering a spare hard drive for the exciter as well. The best way to ensure you get one that works with your system is to order it from Harris. Image the hard drive with the same software version and settings as you currently use. That way it is ready to go if you ever need it.

Tom May is the Chief Engineer of WUWM-FM in Milwaukee, WI. He can be reached at tmay@uwm.edu

Quality FM & TV Antenna Systems



FM Panel



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Heavy Metal

by Stanley Adams

Westinghouse – Part 2

Our self-described "old radio duffer," Stan Adams, dusts off his Royal Typewriter and continues our survey of the companies involved in developing the radio and communications industry. This month we cover the later history of the Westinghouse Electric Company.

In our last installment, we showed how Westinghouse was allied closely with the General Electric Company. They participated in the total success of the RCA (Radio Group) until the spring of 1930 when the Federal Government was able to force divestiture using the Sherman Act, thus allowing RCA to stand on its own.

GE, Westinghouse, and RCA would still work together closely for many years, including during the construction of the two 500 kW transmitters they built together: WLW and what would have been WJZ (the latter remained un-commissioned until later becoming Radio Aspidistra in the UK).

REACHING LISTENERS AND PROFIT

Of course, all the transmitters Westinghouse and the others built were of little use without good receivers. Even better, the companies could smell the potential profits.

Some may recall the vision of David Sarnoff when, as a mid-level manager, he told the board of the RCA and GE companies that, if allowed, he would be able to sell 100,000 radio sets in the first year of production, 300,000 sets in the second year, and 600,000 sets in the third year. Even better, by the time that the overall RCA management did make and sell these sets the profit estimates were $50 million more than he predicted.

Much of the early production fell to Westinghouse. They quickly built three models that were also sold by RCA, but not until long after many sold under the Westinghouse name, to help build a listening audience for their small but effective radio chain. Their original set was a crystal one, but there quickly came regenerative detectors with separate audio amplifiers. (Westinghouse was the original owner of the Armstrong patent on regeneration. However, by agreement all companies within the Radio Group were allowed to use it.)

"Courtesy: www.vintageradio.nl"

A 1923 model Westinhouse Aeriola Sr.

Westinghouse built their early sets because they knew people would buy them to listen to their local Westinghouse stations. So, just as KDKA caught WGY off guard, the Westinghouse Aeriola Jr, Aeriola Sr., RA, DA combinations and the later RC, RT and RA building units caught everyone else off guard. Westinghouse made many of the sets up through 1922-3.

GOOD TIMING

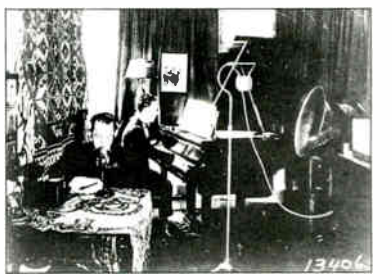
This was good for Westinghouse because after World War I much of their work collapsed. During the war, they were making a large number of Navy transmitters (500 Watt to 20 kW) and, while they would continue with this relationship for many years, the birth of broadcasting after the war is what kept Westinghouse "afloat."

During the wartime Dr. Frank Conrad (8XK) was able to invent several wind-powered generating systems that would power airborne radio gear. Moreover, there was one extremely important project that only became declassified a number of years ago – his work as lead engineer on the SCR-69 and 70 radio equipment, which proved to be very stable and operational from the seat of a plane.

After the war Conrad was able to resume his work on broadcasting, modulation, and like subjects. Just as he helped in the development work of KDKA, WJZ (operated by RCA but owned by Westinghouse Electric until 1923), and KYW in Chicago, he was also instrumental with the development of American shortwave broadcasting. This was his "small" accomplishment for 1921.

WESTINGHOUSE ON THE AIR

The beginnings for broadcast operations at WJZ in New Jersey were rather modest. A 1921 picture notes that the station was originally set up in the Ladies bathroom.



Getting WJZ started in the Westing Room.

WJZ was responsible for broadcasting much of the early sports in the New York market, so it was not long before things changed. Finally getting off of the roof as KDKA later did, WJZ built some beautiful studios at the Waldorf-Astoria Hotel in New York City. Thomas Cowan, an employee in the Westinghouse factory, lept into the limelight of the time, being one of the very first widely known radio personalities.

(Continued on Page 40)

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Heavy Metal

by Stanley Adams

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Chicago outlet KYW became known as the "Operatic Station," where good taste was stressed in all broadcast efforts. It seems really peculiar compared to today's radio programming formats, but they broadcast the full 1921 - 1922 Chicago Civic Opera, afternoon and evenings, six days a week.

Thomas Cowan (shown with Marion Davis) was among the first radio personalities.

It seems, as with many of today's engineering departments, the Westinghouse engineers were kept busy: WBZ was to be added at Springfield, MA in October of 1921. While the studio/transmitter room was not particularly spacious, there was no OSHA around then.

WBZ in 1921. Notice the transmitter was located immediately behind the performers.

WBZ shared time and programming for many years with WBZA until Group W turned in WBZA's license to the FCC so they could buy KWFB in Los Angeles.

LINKING THE STATIONS

The Westinghouse stations were linked with Western Union lines. While somewhat inferior to the telephone company circuits, these few stations, strategically placed, would allow for what can arguably be called the first national radio station network – the total system using wire and shortwave pre-dates WEAF and AT&T's trials of multiple station "hook-ups."

In addition, adding a shortwave transmitter to each station allowed them to provide wireless hook-ups over the vast distances of America.

There is a marvelous article written by Frank Conrad in the June, 1924 IRE. It described his shortwave technology by using his amateur radio equipment at home, finally deciding to build shortwave equipment at most of the Group W stations.

One memorable evening was March 7th, 1924. Alumni of MIT were holding a banquet in New York City, with the main address broadcast locally by WJZ. It traveled by shortwave (3 MHz) to KFKW, Hastings, Nebraska, as well as KDKA, continuing via shortwave to KDPM in Cleveland and to an Oakland, California station. It just so happened that the KDKA transmission on 3 MHz was also picked up in England and broadcast on several of the BBC stations.

CHANGE OF DIRECTION

At the end of World War I, Westinghouse still was in all of the major lines of business in which it had always operated: electrical, locomotive, home electrical items, radio development and broadcasting development. It was producing 40% of the RCA line of radio equipment after becoming a part of the RCA group. In 1926 Westinghouse took a 20% stake in NBC (with 30% held by GE and 50% by RCA), as the 1920s "radio boom'" gathered pace, subsequently buying radio stations WGL and WOWO.

But, as the breakup of the Radio Trust and the Great Depression approached, Westinghouse began to whither on the vine. Production of radio equipment was falling, although new areas were found to explore along with the core businesses: shortwave and early research into television. While the profits were not what everyone wanted them to be during those early and mid-thirties, Westinghouse was still a busy place to be.

Scientists found themselves being assigned to other projects and jobs. Frank Conrad was put to work on electrical switches; his close assistant Donald Little (who had previously designed much of the RC series of tuners and detectors of which Westinghouse had sold about 900,000 between 1920 and 1923, when it became the RCA Aeriola Sr.) was assigned to lightning arrestors.

The new kid on the block, Vladimir K. Zworykin, had served the Czarist army as a Communications Officer and also had experimented with fundamentals of light, timing and possible means of arriving at some form of televisor. He invented the cathode-ray tube called the kinescope in 1929. The kinescope tube was sorely needed for television. Zworykin was one of the first to demonstrate a television system with all the features of modern picture tubes.

Zworykin also invented the iconoscope in 1923 – a tube for television transmission used in the first cameras. The iconoscope was later replaced with the image orthicon, but it laid the foundations for early television cameras. Ultimately, Zworykin took one of his greatest inventions, the image orthicon, and went to the RCA Research Laboratory. Along with his work, and the work of many others, including the purchased patents of Philo T. Farnsworth, electrically-based television became a reality by the late 1930's.

CRANKING UP THE RESEARCH

As WW2 came closer, Westinghouse, GE, and RCA drifted further apart; each enlarging their individual research departments. However, there still was a great deal of cooperation, especially during the war years.

NBC and RCA used General Electric and Westinghouse Electric to build a large shortwave system at Bound Brook, NJ that they could all share in; these transmitters and receivers carried the trans-oceanic daily news and command messages to and from the European theater of war in the coming few years.

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Heavy Metal

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Westinghouse – Part 2

To meet the growing demand for radio service, Westinghouse and the other companies built research centers like this one in East Pittsburgh, PA.

Besides this location, there were other locations in Chicago, New York and Massachusetts; a total of about 12 transmission systems, variable in frequencies, were built. One of the main design engineers was a young R. J. Rockwell, who would also make a name for himself in building the 500 kW WLW radio and the Bethany, Ohio Voice of America transmission systems while working for Mr. Powel Crosley.

Most of these transmitters were new designs, not using the old TBH series used since the late 1920s. Here we show an example of a late 1930s station that was based at Inuvik in the far north in the Northwest Territories of Canada. They were also shipped to South America cities and into sections of what was becoming a hot bed of political unrest in European countries.

A 3 kW Westinghouse transmitter in Canada.

JUMPING TO HIGH POWER

This now brings us to Westinghouse's work in high power broadcast radio. Beginning in the 1930's radio transmission systems were more of a true engineering nature than the "cut and try" methods used earlier. The development engineers were trained in both mathematics and practical radio matters.

To start our high power discussion, we consider the famous UV-862 which we have mentioned before as being used by the WLW transmitter and in several other rigs that Westinghouse helped to produce. But the technique of constantly paralleling tubes to build bigger modulation and RF systems had both its good and bad points. The bad points included parasitic issues, the physical space used, etc.

Westinghouse developed a new tube, one that would be used in the famous Radio Aspidistra. This was the AW-220. It would easily produce 100 kW in class C, or Class B-push pull (two tubes). If pushed, the tube would produce 150 kW, so the number of tubes could be reduced in both the modulator and RF PA.

In the 1930s, the dreams of corporations were about very high powered rigs. Parallel to Westinghouse's AW-220, RCA along with GE improved the 862 with the newer 892. Only several stations actually got to try it; WGY, KDKA and WLW. WJZ was the development station for NBC/RCA but as far as I have studied, this station never experimented with power of this magnitude.

By the end of the 1930's Westinghouse began to produce a new line of transmitters, and these would produce programming for many stations over the next 30 years. The first step was a rock-solid 5 kW transmitter, the model 5V.

The Westinghouse AW-220 high power tube.

The Westinghouse 5V, used at WIRL, Peoria, IL.

(Continued on Page 44)

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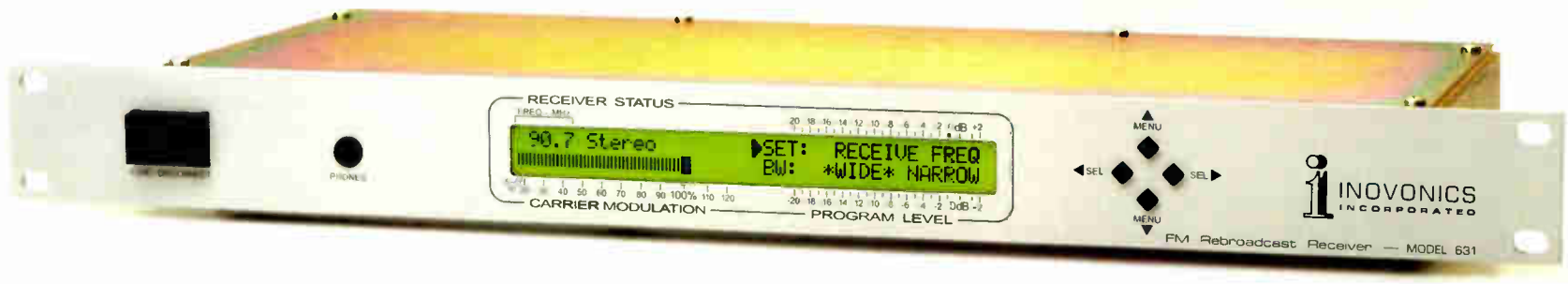

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Heavy Metal

by Stanley Adams

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Notice the décor, including the drop-down metering shelf. These would be features on the rest of the transmitters that they were to build until the end of their era.

A REAL CLASSIC

And now, we present a real transmitter, arguably the finest one ever made, the Westinghouse 50HG. The 50HG was a decorative as well as an operational beauty. The "HG" is said to stand for the designers of the transmitter - Harden and Goodenow.

The 50HG1 installed at KEX, Portland, OR.

We cannot give you a list of all the stations that used this transmitter but it was a large one, including KMOX, KXEL, WBAL, WOWO, WNEW, WQXR, WHAM, WTAM, WHDH, WKBW, KGO, WPTF, KFAB, KABC/KKYX, WRVA and many others. Westinghouse also built a 10 kW version, used by many of the 50 kW'ers as standby transmitters, as well as by many 10 kW regionals.

According to Mel Check, long time engineer at KDKA, the transmitter was completely designed and assembled from the ground up at KDKA. All design changes were made at KDKA and introduced into their system first, much like things happened at WGY for General Electric.

The second generation 50HG2 at WOWO, Ft. Wayne, Indiana.

Check spoke very highly of the radio system that lasted for just over 30 years. There were 31-year-old tubes that were never replaced, yet still working in service. By cycling spares into the unit, KDKA ran that way year after year.

WESTINGHOUSE CONTINUES DEVELOPING

As we bring this chapter of Heavy Metal to a close there are still are a lot of things related to Westinghouse and its pioneering designs that deserve mention.

For one thing, Dr. Conrad worked right up to the late years of his life, even doing some work in the solid-state field. In the late 1930's he designed and perfected the famous SCR-270 radar system for the US Navy; it was the kind in use at Pearl Harbor when the world made a major change in 1941.

Also about that time, Westinghouse made a 500 kW transmitter that was to be installed at WJZ radio. It had some tube changes over the 1934 WLW version. And it ended up in England. Or so they said.

ASPIDISTRA

Nevertheless, this was a true story. There was this radio, slightly modified by RCA, and it put out a consistent 600 kW. If you look at the styling, it shows its Westinghouse origin.

From the US to the UK, this was the Aspidistra.

The WJZ-bound transmitter had quite a life. Purchased by British Security Officer Harold Robin for £523,000 (a lot of money now; in 1941 it was a small fortune), this huge transmitter (the biggest in the world) was nicknamed Aspidistra after a song by the famous wartime singer Gracie Fields. *The Biggest Aspidistra in the World* was about an Asian plant in the lily family.

Aspidistra was supposed to be installed in the newly-built studio at Milton Bryan, but Harold Robin wanted it to be installed as near to Europe as possible (to get a stronger signal there). So, Aspidistra was moved to Crowborough in Sussex.

It was used in what was called Black Propaganda where it would broadcast mis-information on the regular German regional radio channels. It was successful and there are a few web sites that talk about it.

FM

The 1950's were the peak for the Westinghouse Electric Company. Large war profits and a new introduction of commercial products to a pent up American economy allowed Westinghouse to fund continued research into commercial and new power stylings. For example, Westinghouse was one of the first commercial companies to work on the Nuclear Power systems that were beginning to appear in various rural areas of America.

FM development was another source of income for Westinghouse, both as manufacturer and as a broadcaster. Late in the 1940s, Westinghouse moved on to develop FM and television stations as the FCC began to issue permits for those services. Westinghouse built FM sister stations

(Continued on Page 46)

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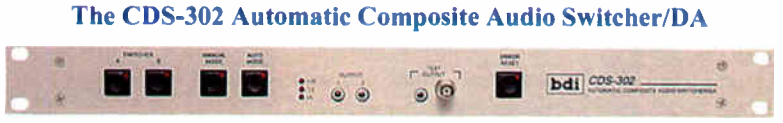
The ***CDS-300*** is a basic two input composite audio switcher distribution system. The unit switches between two composite base band signals. Features include D.C. coupled signal path, low impedance output drivers that can drive long capacitive lines without instability. Another exclusive feature is an RBDS loop through to lock 57 kHz sub carriers to pilot and distribute to all outputs simultaneously. The ***CDS-300*** also has an accessory port for adding the **CTD-1** ***Composite to AES output module*** providing two AES3 outputs derived from the incoming composite signal. The CDS-300 is great for upgrading composite STLs and processors to digital output. Feed composite in and get AES3 output in addition to three composite outputs.

The CDS-302 Automatic Composite Audio Switcher/DA



The ***CDS-302*** is a two input composite audio switcher distribution system with silence sensor for automatic switchover operations. The ***CDS-302*** has all of the features of the ***CDS-300*** above including accessory port for adding the ***CTD-1 Composite to AES output module***. Provides complete confidence that audio will get to the transmitter in the event of a link failure.

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The ***CMP-300*** provides a means of combining up to three base band signals such as FM stereo, SCA, and RBDS signals. Each input has provision for level control and each of three outputs has a level trim too. Applications include combining signals to feed to exciters with only one base band input or for feeding a common base band signal to up to three locations. The ***CMP-300*** allows you to manage base band audio signals in one convenient package. Each input features a high quality D.C. coupled instrumentation amplifier and each output features a 50 ohm impedance line driver suitable for driving long capacitive cables without instability.

The CTD-300 Composite to AES Converter

The ***CTD-300*** converts base band composite FM stereo into two AES3 pairs suitable for application to digital input exciters. Whether you are adding IBOC or upgrading to a digital exciter, like its CDS series cousins the ***CTD-300*** becomes a cost effective alternative to replacing a composite STL or processor. Or use the ***CTD-300*** as a high quality stereo decoder for studio applications. Connect to your base band modulation monitor and the ***CTD-300*** can output AES3 or with a simple jumper selection, balanced left and right stereo suitable for driving an air monitor system.

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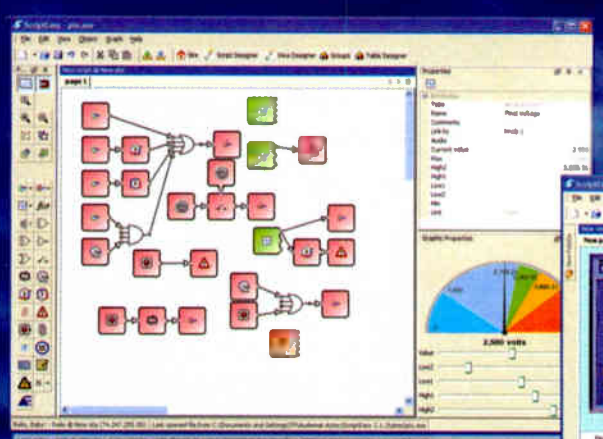

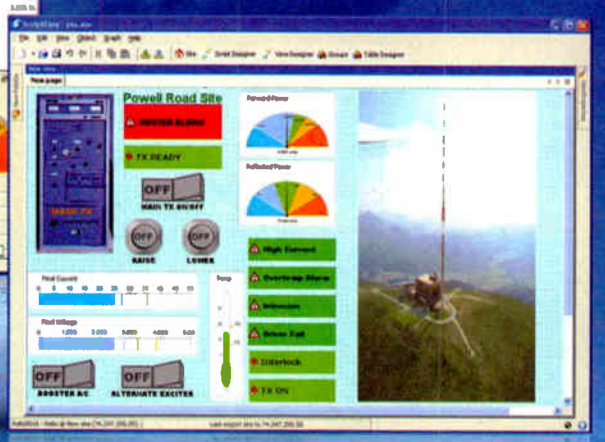

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SEALEVEL

Heavy Metal

by Stanley Adams

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for WBZ/WBZA, KDKA, KYW, and WOWO, all of which were on the air by the end of the decade. FM radio was, initially, an unsuccessful venture for Westinghouse, and the company would sell all of its FM stations by the end of the 1950s, with the exceptions of WBZ-FM and KDKA-FM (which were sold in the early 1980s).

GROUP W

Group W Radio division really came to the fore during the period of the 1950s. It is clear that they had talented people and administrators. However, as noted, most of the FM operations were not successful. Similarly, Group W purchased cable TV system operator TelePrompTer in 1981 and renamed it Group W Cable the following year. However, Group W would leave the cable TV system business within five years.

The Group W logo.

The AM stations, however, remained a strong chain with an emphasis on news – Group W had news bureaus in a number of cities – until Westinghouse eventually becoming the owner of CBS in 1995, with Westinghouse and CBS merging broadcast operations under the CBS Corporation name in 1997.

CONTINUED INNOVATION

During the year 1946, Glen Martin Airplane Manufacturing and the Westinghouse Company proposed to the FCC the use of airplanes fitted out with a VHF-TV transmitter and an FM radio transmitter. Westinghouse electrical engineer Charles E. Nobles developed Stratovision as a way to transmit television and FM radio programs to a wide audience. They would serve markets by flying in a slow circle around the city of interest.

The Stratovision transmission system.

Stratovision had one brief shining moment: On June 23, 1948, the system's airplane-borne TV transmitters rebroadcast the Republican National Convention in Philadelphia to the nine-state area around Pittsburgh; a demonstration for reporters was held in Zanesville, Ohio. "Stratovision is a reality with future unlimited," cheered the Martin Star, a publication of the Glenn L. Martin Company, which, in a partnership with Westinghouse, had backed the system.

After the convention transmission, Martin and Westinghouse representatives trumpeted Sratovision's future. Westinghouse estimated a fleet of 60 Martin 202 airliners would suffice. Obviously, it did not happen.

SOLID STATE PIONEER

There was one major success during early transistor circuit development in the newly-built research section designed for solid state work. Dr. Robert Noyce was able to cut multiple circuit elements out of the same element and thus develop the first integrated circuit.

This work eventually would wind up at Fairchild semiconductors, and the rest is history. Transistors, microcircuits, and the start of Silicon Valley.

Along the way, Westinghouse developed the first solid state 5 kW transmitter. However, this came at a time when the company had decided to stop broadcast manufacturing. It sold the designs to RCA, which built about 20 units before it, too, stopped making radio transmitters.

IBOC

Finally, it may come as a surprise but Westinghouse had a definitive role in the development of what is known as the "in band - on channel" form of digital and analog combination on the American AM/FM broadcast bands.

Glynn Walden of Westinghouse developed the initial core compression techniques under the name of USA Digital Radio (USADR). The development was operated out of the Westinghouse Wireless Solutions offices in Linthicum, MD. In 1998, Westinghouse spun off USA Digital Radio to a group funded by 10 of the top 12 broadcasters.

By then, the framework of the AM and FM digital systems was established. All that was left were the details, systems that remain essentially unchanged to date. The first successful, fixed AM IBOC reception test was held on July 9, 1992, on 1660 AM from the Xetron facility in Cincinnati. The first fixed FM IBOC reception test was held Sept. 29, 1992, from WILL-FM in Urbana, IL.

Historical plaques at the original site of KDKA.

We leave the Westinghouse part of the story with a view of two plaques put up at the location where the original factory stood. The plaques commemorate Westinghouse's KDKA as being one of the pioneer broadcasters, with regular operations since 1920.

Assistance provided by the University of Maryland Library of American Broadcasting, Wayne Miller (WIRL), Scott Fybush, Glen Clark, and John T. Lyles.

Stan Adams' family has been involved in broadcasting since the 1940s. If you have information on the men and manufacturers who produced the "heavy metal" or questions on this series, Stan appreciates the feedback he has received from our readers and would love to hear more from you. Email Stan at: stanleybadams@yahoo.com

A Brief Summary of CES 2008

by Barry Mishkind

The annual Consumer Electronics Show is, at the same time, the NAB and then some.

You want statistics? 140,000 attendees, all three convention centers were full (LVCC, Sands, Hilton), 1.7 million square feet of exhibits, hundreds and hundreds of booths devoted to virtually anything electronic that you can name, and more walking than you are likely to do at two or three NAB shows – plus the time on the shuttle buses in molasses-style traffic.

Everywhere you looked there was a forest of High Definition televisions – hundreds of new models vying for the eye, including LCD, Plasma and the newest tech, Sony's OLED screens. If you are interested: Panasonic took the honors this year for the largest HDTV on display – a gigantic 150-inch (11 foot wide) Plasma TV with 4000 x 2000 pixel resolution. Yes, 2009 is the Year of HDTV.

KEY RADIO INTEREST

Let me quickly get to HD Radio: Yes, iBiquity was there. Yes, there were HD radios on display. However, I cannot say car manufacturers have "jumped on board" any more than in previous years. Ford did announce (again) that they would start production of HD radios in all cars in 2009 (2010 model year). I wanted to get more information, but the PR person walked away from me virtually in mid-question – and never returned.

It would not be surprising to see GPS become "standard" in many cars before HD Radio. Various GPS models were everywhere. DeLorme (www.delorme.com) showed several high quality mapping products, including their new Earthmate GPS PN-20, a handheld GPS product with the latest version of Topo USA (7.0) built in.

Over at the C.Crane booth, they showed their new CCRadio-SW and a very nice Internet Radio. Both feature excellent sound output, the CCRadio-SW lets the listener control signal sensitivity and selectivity. The expanding C.Crane line is also moving heavily into LED lamp replacements and other products. Sangean, which has worked closely with C.Crane in the past, also had their new models of Internet radios, along with their latest HD Radio receivers.

A GIANT TOY STORE

At the biggest toy store in the world, portable products were the rage. Flash drives, LCD picture frames, iPod accessories, and more. Equally important is getting those portable products easily connected; home media servers were a big item. Being able to get your data from where it is to where you want to use it was the goal for many new products.

A number of companies, including D-Link (www.dlink.com), featured servers to broadcast your music, video, and data around the house. D-Link gets special mention because they have designed a simpler setup scheme, using web pages, so users do not have to wade through all sorts of arcane directions to make the connections.

Some of the home servers also were designed to connect to the Internet, so you can retrieve your files wherever you are. In some packages, they were combined with automatic backup protocols (because most people do not do backups, according to studies). Axentra (www.axentra.com) showed a nice little backup server that, connected to the Internet, makes you at home anywhere.

Getting information or controlling things from various locations is a broadcast need. D-Link also showed a package with web-cams suitable for various uses. And Logitech (www.logitech.com), a well-known peripheral manufacturer, had a nice modular security system featuring selectable motion detection. The system can be started inexpensively, and modules added as time (and budget) allow.

Since I always seem to leave something "on" when leaving a site, the Belkin (www.belkin.com) surge protector outlet strip with remote control is a great idea. With one remote pulse you can turn on or off several lights and other pieces of gear.

ON THE ROAD

For those who are "on the go" all the time, and need to have input and output from their computers, it is worth checking out the Wi-Fi printers from Lexmark (www.lexmark.com). Along with that, perhaps you might like to acquire the Eye-Fi card (www.eye.fi), a wireless SD card that connects your camera to the computer, without wires.

Two input solutions for scanning everything from receipts to archiving documents were shown. Fujitsu's (www.fujitsu.com) ScanSnap S300 is a small, portable, USB-powered scanner than can be carried where needed. DYMO File (www.dymo.com) software also streamlines the scanning of documents; this product attaches a barcode that helps the computer file and retrieve the documents (which can be scanned in any order).

Interested in the CloudBook, a loaded, fully open source Wi-Fi notebook for under $400? Everex (www.everex.com) and gOS (www.thinkgos.com) showed several new notebooks, both energy efficient and in a small form factor – both physically and price-wise.

IN THE STUDIO

I saw a couple of products you should consider for the studio. For example, the d_Skin by Norazza (www.dskin.com) prevents surface scratches that destroy CDs and DVDs. Zoom Corp (www.zzounds.com) had their H2 and H4 Handy Recorders on display. The compact units produce excellent digital stereo recordings.

P3 International's Kill-A-Watt now has a big brother – not only can you measure power, but you can see the cost of the power used. Innovative Office Products (www.lcdarms.com) introduced their new Cricket laptop holder, adjustable at different angles for typing or for display purposes.

And your production and imaging folks will want to look at Synesthesia (www.synesthesiacorp.com). Transcending audio sampling and manipulation by keyboard, this high-def drum and synthesizer starts by emulating an acoustic drum, but then goes way beyond that.

SOME OTHER IDEAS

Maintenance folks might consider an infrared camera from Flir Systems (www.flirthermography.com). Their cameras and software are capable of doing a complete heat inspection of the entire physical plant.

For stations wanting to provide Internet access to guests, but do not want to expose their LAN, the GuestGate Internet Access Device (www.guestgate.com) is a quick, secure solution - it even protects the guests by automatically isolating each user from the others.

Now – back to that 150-inch plasma screen. Videolicious!

The Worst I've Ever Seen

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

You Need to Visit Your Transmitter Site

It is a theme we run up against repeatedly: whether due to consolidation or reliance on an engineer who is hired to come out only after "smoke" happens, many transmitter sites sit for weeks – or months – waiting for a visitor. In the meantime, stuff happens.

Have you ever watched your satellite or STL signal strength slowly erode – and wondered what was happening? As we have seen in the past, wasps could set up a nest or snow could change the focal point. But, in many cases, the obstruction is just the natural product of time.

A RATHER OBSCURE DISH

In this picture shared by Glenn Finney, we see "a C-band satellite antenna almost totally overgrown over by trees." It is almost as if the dish were trying to hide from something!

The "jungle" was getting pretty close to swallowing up this dish.

Although, Finney assures us that the dish was still in use, and was operational when this picture was taken, he points out "that the center feed horn assembly is many inches away from the focal point." It might even have been that some of the foliage "helped" the problem, by stressing the dish and causing the feed to move.

Obviously, the stations could have avoided the major expense to bring in a crew to remove the trees and bushes by having kept the foliage under control. It would not even have taken an engineer to do this, but some regular attention to the physical plant.

TRANSMITTER OR AVIARY?

As you might imagine, inside the transmitter building was not a whole lot better. Without proper attention and maintenance, the result was a room was filled with dust, dirt, and little critters.

In the following picture, Finney shows us "the PA cavity of an old Harris FM-20H."

Interestingly, he notes that "the dead bugs you see in the photo are only one month's worth." Since it only takes one bug in the wrong place to short something out, or disable an air-flow switch, this was a real warning sign that attention was required at the site. In addition to the flying critters, larger animals like a rodent or a snake seeking warmth could sacrifice itself on the high voltage transformer, causing unnecessary downtime.

A CLEAN SITE PREVENTS PROBLEMS

Fortunately, the station in question "is now under new ownership and management, and neither of these problems exist any longer," according to Finney.

Warm equipment can prove irresistible to critters.

Nevertheless, a picture like this is a good reminder to check not only the filters and seals on the transmitter, but the entire transmitter room. A clean building with regular pest control is instrumental in preventing problems. Regular visits to the site by the station engineer also are a key part of that preventive maintenance.

As usual, the exact station and location remain unknown to protect the silly. Please share with us some of your pictures of the strange things you run into out your way. Just send them to: editor@radio-guide.com

IT Guide

by Chris Tarr

Wi-Fi Security

Wi-Fi, Hotspots, Wireless Access – in England they call it "wiffy." However you say it, wireless networking is here, and it is becoming an important part of IT life. And, like other aspects of computing, security is an issue. Chris Tarr explains:

Up until a few years ago, the only computer in your building likely was in the bookkeeper's office.

Today, it is not uncommon to find six stations crammed in a building originally designed for two – full of computers driving all sorts of things, including air programming, voicetracking, production, news, traffic, sales, research, bookkeeping, and engineering.

HANDLING THE LOAD

Now you are faced with setting up network access to this growing number of computers. And, in many cases, it seems that a wireless system in the building is an easy way to get everyone up and running.

Well, like everything else in life, there is no free lunch. In the end, you are just moving the labor from one aspect (fishing CAT-5 through the walls) to another (setting up and maintaining security). The big question about wireless networks is pretty simple and straightforward: "How safe are they?"

The simple answer is: Pretty darn safe, *if* you take the time to set it up correctly.

THE OPEN DOOR

Bandwidth theft is big in the news nowadays, especially something called "Wardriving," where a person armed with a laptop and wireless antenna drives around looking for open wireless networks.

The key phrase there is "open wireless networks." Those are networks running with absolutely no security, allowing any computer to join it. That is the default state of an "Access Point" right out of the box – and a surefire way to expose your company to a huge amount of risk. If your network is open, you might as well throw a big sign on your front lawn that says "steal our bandwidth" – you have provided the wardrivers with the Motherlode.

Is it possible to have the convenience of "anywhere" connectivity without exposing your company to risks? Easy – never connect any computer to anything else!

Obviously, that will not work for most facilities. But what we can do is put up enough barriers that anyone wanting to connect to your Wi-Fi network gets bored and moves on. The truth about garden-variety hackers is that they only reach for the low-hanging fruit.

CLOSING THE OPEN DOOR

The simplest way to thwart them is to place the most basic security – WEP, or Wired Equivalent Privacy – on your network. WEP is a very simple encryption scheme that uses a hexadecimal key to decrypt the wireless traffic. Most of the time, as soon as they see that a network has encryption, they move on; there is a chance that the guy down the road has an open network, and they do not want the hassle of trying to get into yours.

Now that basic security has protected you from wardrivers, what about someone who really wants to take a look inside your network? After all, a radio station has to have a ton of MP3s on their network, right?

Well, WEP is pretty easily cracked. It is hard enough that the casual wardriver will not bother, but easy enough that someone who wants to get in will certainly be able to do so.

ENTER WPA

WPA, short for Wi-Fi Protected Access, is a much better encryption scheme – one that is infinitely more difficult to crack. If you are running a wireless network in your building, this should be the bare minimum level of security you should run. With WPA, you are really telling the bad guys to "go away."

While WPA can be cracked, the person wanting to get in would have to spend a substantial amount of time trying to get into your system. Most would probably just give up after a while.

Both WEP and WPA are built into all wireless hardware. Read the manual thoroughly and be sure to set up the highest level of security that your access point will allow (usually WPA). An added side-benefit is that if anyone in your building wants to use the wireless network, they will need to ask you for the key or password to access it, and you will know who they are.

SECURITY MYTHS

You may have heard or read about things like turning off your "SSID." A network's SSID is sort of a beacon that identifies your wireless network. When you turn on your wireless network card, your computer lists the SSIDs of all the networks it sees.

People think that by turning off the SSID of their network, they are practicing "security through obscurity," since you do not immediately see that the network even exists. The truth is the bad guys have software that can see your network – with or without an SSID.

The only thing that becomes more difficult is your job, since it is much harder to manage a wireless network that does not broadcast an SSID. I do recommend using a word such as "private" in the SSID name, just so that there is no potential ambiguity about whether or not you want people accessing your network.

MAC ATTACK

Another common myth is that you should only allow access to certain MAC addresses. MAC addresses are the hexadecimal addresses – supposedly unique – assigned to every individual networking device. The problem is that those numbers also are easy to detect, and spoof.

Furthermore, it means that in the future you will then have to go in and manually add the address of any new networking hardware that comes in the door. It just ends up being lots of additional work, for little additional real benefit.

GUEST ACCESS

It is not uncommon these days for guests or clients to come into your building and ask for network access to check their email or download a presentation from the Internet. If you are like me, the answer has always been "sorry," I do not allow "foreign" computers on my network, period.

Well, as you can imagine, that only works for so long. The number of visitors passing through a multi-station complex now often reaches the point where you just cannot afford a blanket "no." Some hospitality seems necessary. So, what is the answer?

BUILD A DIGITAL DIVIDE

My solution was to set up an entirely separate network. There are several ways to do it; I will give you two examples.

The first is a new end-to-end network. Our station's streams have their own network on a second DSL line, since we do not want to burden our corporate network with that traffic. However, that DSL line was very under-utilized. We were only running three 32K connections on it.

So I purchased a wireless router, set up WPA, and connected it to that DSL line. Now when a client or guest wants to get on the network, we give them the password to our "guest" network (which frequently changes, but is always something fun) and they get net access without touching our corporate network.

The other way is to "piggyback" on your current network. Take a second Wi-Fi router and have it assign IP addresses from a different private IP block. While it can be hacked to access other machines on your network, it is usually beyond the skills of an average user to do so. Most routers offer the ability to aggressively firewall traffic, so you could easily restrict access to everything but web and email.

The debate rages on about wireless networking. While the absolute truth is that the only way to be 100% secure is to not use it at all, the reality is that with the help of smart network planning, and the quirks of human nature, you should be able to offer the convenience of wireless networking without having the fear of unintended consequences.

ROAD ACCESS CONCERNS

Another wireless concern relates to when you are on that important business trip. You need to keep in touch, so you diligently search for a hotel that provides free Wi-Fi. Upon arrival, you set up shop, fire up the laptop and, perhaps, wonder if your data is really safe.

The answer is: no, not really. Since most open Wi-Fi networks do not use any security, any information you send across them can be sniffed easily by bad guys.

Most security experts do agree that if you are just checking email or hopping around the web looking for a place in town to eat, you are probably OK. They all agree, however, that you should avoid using sites that need user names and passwords – and you should absolutely not send sensitive data.

Some suggest you are OK if you use secure sites (with URLs that start with https://). You are – *if you can guarantee* that the site you reach is the site you think it is! This is due to a common spoof called "the man in the middle" attack, where a request to a web site is redirected to an identical looking site, run by identity thieves. You enter in your information and, mysteriously, the site reports that it is "down for maintenance" or something. If so, there is a good chance you have been "had."

PROTECTION ON THE ROAD

There are a few ways to protect yourself.

First, try to use a wired connection. Even though they are not guaranteed to be 100% safe, the technology is such that it is much harder for the bad guys to steal your information undetected.

If you are fortunate enough to have a VPN connection to your office, ask your IT administrator if it is OK for you to connect to it while you are out of town. A VPN creates a secure tunnel between your computer and your office network; the data is encrypted as it leaves your computer, so your data is secure.

Finally, there are third party "safe browsing" services available. Obviously, you need to trust the third party provider to do no evil, so do your homework. These services generally provide you with a VPN connection to their servers and, in exchange, place ads in your browser.

A TRULY PRIVATE SOLUTION

Finally, if you do not want to use a public network at all, many cell providers now provide wireless data cards, or cables to connect your computer to their cellular data network. There usually is a monthly charge for this service, making it somewhat impractical if you only take an occasional trip. But for true road warriors, it is a secure, convenient way to surf the net.

Wireless connectivity is a major convenience, but by implementing careful practices can you protect yourself from having it turn into a nightmare.

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

JK Audio's Daptor Three Completes Sports Broadcast Setup

by Gregory Trobridge

In the early summer of 2007, WNIL (1290 kHz in Niles, MI) assembled a new play-by-play team for high school sports coverage. At the same time, the Federated Media Engineering Department began searching for new solutions to replace the aging sports broadcast equipment.

LEAVING POTS BEHIND

In years past, WNIL would broadcast via plain old telephone service (POTS). Of course, the cost and time involved with the installation and testing of a POTS line is not so attractive when the broadcasts originate from a different high school each week.

The engineering staff decided to investigate the feasibility of using a cell phone to transmit the broadcast audio back to the studio. After testing revealed ample cellular signal at all of our planned broadcast locations, the search was on for a cellular interface. We quickly determined that we had two basic options from which to choose.

One option was to use a device with the mixer and cellular telephone combined in the same unit. The concern with this option was that the ever-changing technology in the cellular telephone industry may leave this type of device without an upgrade path and completely obsolete. This was not a risk that we desired to take.

The second option was to use a standard cellular telephone. With this option, we could stay up-to-date with the changes in the cellular industry and have the phone repaired or replaced, if needed, at our cellular carrier's local store.

WORKING WITH CELLPHONES

This second option was preferred, but was not an ideal situation. A reliable interface to couple the audio between the mixer and the cell phone was necessary. In the past we had used a wired interface device designed for this purpose but had problems with the connecting wire acting as an antenna – causing the cell phone's RF signal to create a buzzing sound in the audio.

Furthermore, the connection to the cell phone itself had often been a point of failure from the repeated plugging and unplugging of the interface wire.

I remembered reading some information about a new cellular telephone audio interface from JK Audio that uses Bluetooth wireless technology, the Daptor Three.

The JK Audio Daptor Three

Additional information on this new device was readily available on their website: www.jkaudio.com

CONNECTED BY BLUETOOTH

The Daptor Three connects balanced and unbalanced signals in and out of a cell phone – wirelessly – connecting to a Bluetooth-enabled cell phone just the same as any Bluetooth-enabled headset. The Daptor Three seemed as though it would answer the concerns that we had with our two options.

First, Bluetooth is being integrated into many devices, leaving one to predict the technology will be a standard for many years. Even better, each Bluetooth revision to date has been backward compatible, so as to not make equipment using a previous version obsolete.

At the same time, a standard Bluetooth-enabled cell phone can be used, and easily repaired or upgraded if necessary. The interface to the cell phone is wireless, so the RF from the phone is less likely to interfere with the audio. This also removes the potential for failing connectors on the cell phone.

I placed a call to Steve Ellison at Broadcast Connection. He indicated the Daptor Three would be available beginning in August of 2007. I immediately placed an order to be sure it would arrive prior to the start of the high school football broadcast season.

BUILDING THE SYSTEM

The Daptor Three arrived one day before our first scheduled high school football play-by-play broadcast. This did not give us much time to set up the Daptor Three and the other broadcast equipment, so we could test the system for reliability before we handed it all over to the station's Sports Director.

After a trip to our cellular provider's nearest retail location and some investigating and discussion with a "Blue Shirt Advisor," I settled on a particular phone that seemed rugged and reliable. As a bonus, our cellular plan includes free incoming calls. As long as the studio places the call to the team doing the broadcast, the station does not incur any phone charges for the broadcasts!

Upon returning to the radio station, I mounted the Daptor Three on our existing sports broadcast mixer and made the necessary cables to connect the audio into the Daptor Three.

The Daptor Three has both balanced XLR and unbalanced 3.5 mm stereo inputs.

CONNECTING

Pairing the Daptor Three and the new cell phone turned out to be a little more challenging than I had expected. The manual for the cell phone was, as usual, less than thorough in the Bluetooth section. Also, the original Daptor Three manual was not so clear on the difference between Idle Mode and Pairing Mode. The Daptor Three manual has since been updated to make this process much easier.

The good news is that the pairing process only needs to be performed one time. Once the Daptor Three and the cell phone have been paired, the phone and Daptor Three automatically handle the handshaking (negotiation of communication parameters) as long as the Daptor Three is turned on, in Idle Mode, and within range of the cell phone.

The Daptor Three can also be paired with any other Bluetooth enabled device, such as a laptop in the wireless headphone mode, which provides a stereo connection with full audio bandwidth. When used this way, the Daptor Three becomes a wireless sound card for the computer. We have not had the opportunity to use this feature to date but I can see how our broadcast team can use the Daptor Three with a laptop computer to record and play the pre-game/post-game interviews without the need to change any wiring on the mixer.

POWER CONSIDERATIONS

The Daptor Three has been designed to operate strictly on a nine-Volt battery. This was done to allow the Daptor Three to be completely portable.

A standard alkaline nine-Volt battery will typically last for about 18 hours as long as the Daptor Three is within three feet of the cell phone. The way Bluetooth works, you can expect the battery life to be reduced as the distance between the Daptor Three and the cell phone grows greater.

When compared to an alkaline battery, a lithium battery will extend the run time of the Daptor Three by three to four times, but be prepared to pay three, four, or more times the amount for the lithium. Our solution has been to purchase alkaline batteries from a local retail store in quantities that are discounted. The play-by-play team simply replaces the battery after every third game to prevent a battery from discharging completely during a broadcast.

INTO THE FIELD

Our sports broadcast equipment setup is very simple: two headset microphones, one additional microphone (for crowd noise), the remote mixer, cellular telephone, and of course, our JK Audio Daptor Three. The remote mixer also includes a headphone amplifier.

With the output of the Daptor Three connected to the monitor input of the mixer, the play-by-play team can hear the IFB from the studio. The normal delay of a digital cell phone is present but as long as the mix-minus feed is set up properly at the studio, the delay does not cause a problem for the broadcast team.

The balanced and unbalanced inputs and outputs are all simultaneously active. When both inputs are used at the same time, the audio signals are mixed together. (We only use the balanced XLR type connectors for input and output on the Daptor Three as our mixer has balanced I/O connectors.)

GOOD SOUND, RELIABLE OPERATION

During the initial testing I expected to hear typical distorted and over-compressed cell phone audio. This was not the case. Actually, I have been very pleased, even surprised, at the quality of audio passed by the Daptor Three and the cell phone.

I was concerned about the learning curve for the play-by-play team with the new broadcast setup. Fortunately, our Sports Director had worked with the mixer before. So, the only thing that was new to him was the cell phone and Daptor Three interface. The training session lasted less than fifteen minutes.

Since the original setup, I have not even seen the Daptor Three – it works that well. The play-by-play team had a problem with the handshaking between the Daptor Three and the cell phone before the third game of the season. They simply turned everything off, and then back on – the Daptor Three and the cell phone then performed the handshaking procedure and the broadcast started on time.

HAPPY USERS

I recently asked the WNIL Sports Director what he thought of the Daptor Three. He responded, "This has obviously made our broadcasts much easier and allows us to basically setup anywhere."

While he did report RF from the cell phone has occasionally caused interference in the audio, I do not believe this to be a shortcoming of the Daptor Three but most likely an unshielded audio cable. Fortunately the Daptor Three wireless transmitter/receiver has a range up to 25 feet. This is more than enough distance to eliminate any RF interference from the cell phone. As a side note, the RF interference only seems to be a problem with certain cellular carriers.

The Daptor Three has proven to be a valuable addition to the equipment setup for WNIL's high school sports broadcasts. As for other uses, I have concerns with the portability of the Daptor Three as it still needs to be connected to additional equipment (mixer/headphone amplifier) since the inputs and outputs are line level. I understand, however, that JK Audio is working a device similar to the Daptor Three that would not require the use of outboard equipment.

Gregory Trobridge is the Market Chief Engineer for Federated Media in South Bend, IN. His email address is: gtrobridge@FederatedMedia.com

END2END Solutions From SCMS

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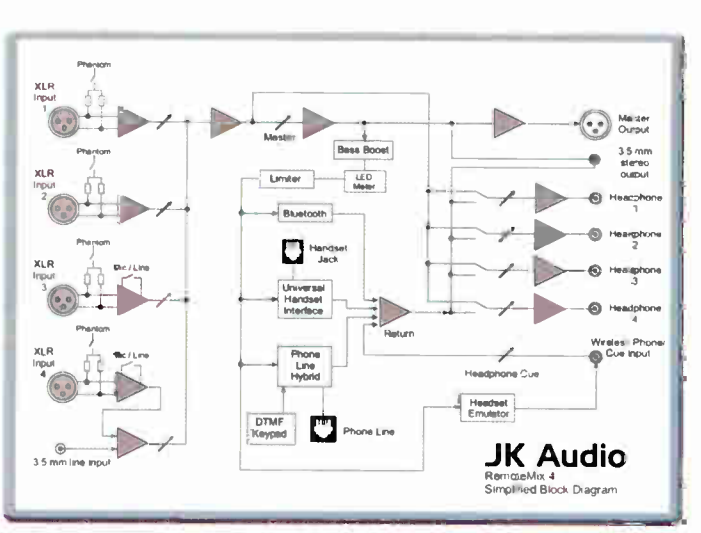
JK Audio RemoteMix 4
Portable Broadcast Mixer

RemoteMix 4 from JK Audio is the common denominator for live remotes. The long list of features and intuitive design make RemoteMix 4 the one interface that goes to any live remote. Use it as a phone line hybrid, calling into your studio talk show hybrid. Use it as a front end mixer for your POTS, ISDN or IP codec.
Out in a field with no power and no phone lines? RemoteMix 4 uses Bluetooth Wireless Technology to connect to your cell phone for breaking news or sports coverage.



Rack Room

Studio

STL

RF Site

Internet Remotes Using the New Telos Zephyr/IP

by Tom Hansen

I do a lot of remotes. Between WRLT(FM), where I am Chief Engineer, and PE Audio, my location production company, I have personally set up over 1,200 remote broadcasts during the last 10 years. Many of them are from live performance venues in Nashville, but I also manage the radio broadcast compounds for the Vegoose and Bonnaroo Music Festivals.

FROM ISDN TO IP

For most broadcasts, we use Telos Zephyrs and Xstreams to transport audio back to the studios. ISDN digital phone lines have been the primary connection for these broadcasts. Over the years, I have had pretty good luck with ISDN lines, but now several IP codecs have emerged for broadcasters, promising good to high-quality audio, transported over commonplace IP connections – even over the public Internet.

My early experience, though, has shown that, without some technology in place to mitigate the unpredictable behavior of common IP connections, remote broadcasts done over the public Internet could not live up to the same quality and reliability that ISDN lines deliver.

Even so, the thought of being able to eliminate ISDN lines – going to IP connections – and still maintain live broadcast audio quality and reliability is very exciting to me. I could save money as well as time by having a "plug and play" audio transport solution if it works with existing IP networks.

MOVING PAST ISDN

These days, IP connections are usually easier to obtain than ISDN circuits. At last year's Bonnaroo and Vegoose Music Festivals, I began experimenting with coded IP-audio using Telos Zephyr Xstreams. However, you must have have well-provisioned IP links, preferably with Quality of Service (QoS), as part of the IP link provisioning.

Unfortunately, since QoS is not available over the public Internet, we would have to build our own private network to distribute audio programming that way. Moreover, I had to make sure that NAT routers at each end of the IP path were properly configured to forward the needed ports to the static, private IP addresses of my Xstreams. (All this configuration for a traditional IP codec is similar to that required for ISDN.)

At the April, 2007 NAB show, I learned about a new IP codec from Telos dubbed the "Zephyr/IP" (Z/IP). It is designed to work easily behind NAT routers and firewalls, and it is supposed to mitigate the ever-changing latency and bandwidth available across public Internet connections.

The Telos Zephyr/IP

The Zephyr/IP makes it possible to do remotes and one-time events cost effectively while maintaining the same level of audio quality. The Z/IP also lets me do high quality remotes using available WiFi or EV-DO wireless broadband connections.

KEY FEATURES

The big idea behind the Zephyr/IP, its new, standards-based codec, and the Z/IP server is that a user can take the Z/IP out to a remote site and connect to most any broadband Internet connection.

Once plugged into an Internet-connected network it is easy for the user to connect to any studio they are authorized to dial. It works just like an instant messenger program, as the user is shown a list of the other Z/IPs to which he can connect. To establish a connection, he just highlights the name of the Zephyr/IP he wants, and then selects "Call."

One of the cool features is how the Zephyr IP actually makes its connections. Most IP broadcast solutions require a public IP or a private point-to-point network – not the Zephyr/IP. It uses a free Z/IP "rendezvous" server provided by Telos. When you configure your Zephyr/IP, you simply pick a name, password and group name for your Zephyr/IP's. Once you enter the information, you authenticate with the Z/IP server at Telos. It works much like Skype or many of the Instant Messaging services.

KEY FEATURES

The Zephyr/IP is really what professionals like me have been waiting for in terms of transmitting high-quality audio over commonly available IP links. Three reasons:

1) The Z/IP uses a new standard audio codec that incorporates real "elasticity" in terms of bit rate. It always seeks the best performance, but keeps working fine at lower bit rates.

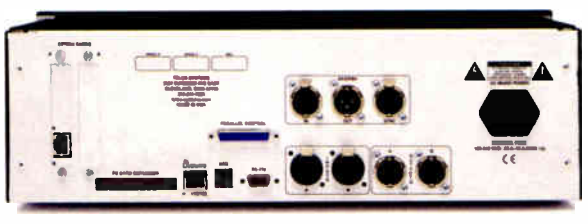
2) The Z/IP incorporates "Agile Connection Technology" (ACT). ACT monitors the IP link data budget and latency twice each second and responds instantly to varying bandwidth and latency across the link. It does not matter if the link is across the street or around the world, as long as you have an IP connection; it will monitor the link and make the necessary adjustments automatically for you.

3) Telos has set up some permanent rendezvous or Z/IP servers. These are servers that allow a given Zephyr/IP to login and make its presence known to other authorized Zephyr/IP's on the public Internet. Just as an instant messaging service would do, these Z/IP servers track IP addresses of logged-in Zephyr/IP units, and group them according to private users and their groups.

A FAMILIAR FEEL

The first thing I noticed about the Zephyr/IP was the slick, clean look of the unit. Front and Back panel layouts are similar to the Zephyr Xstream, making hook-up very easy for existing Zephyr Xstream users. Also, there is no fan. The unit has an interesting heat sink design that insures adequate natural air circulation.

The WRLT-FM studios use Axia for audio routing and mixing, so when I saw the "Livewire" port on the back, I knew how easy it would be to supply audio to the unit; a simple plug and play – and 30 seconds to configure it via web browser and you will be hooked up. Of course, balanced stereo analog and AES3 inputs and outputs appear on XLR connectors.



The Z/IP can handle all the connections necessary.

Other rear-panel connections include an Ethernet port for wired IP connections, a parallel contact closure port for end-to-end closures, a USB port for supported EV-DO and UTSM wireless data cards, another USB port for supported WiFi cards, and a PCMCIA slot for future expansion. There are also two PCI card slots for future expansion as well.

CLEAR, DETAILED MENUS

After powering up, I scrolled through the configuration menus quickly to familiarize myself with the available options and see where I would need to refer to the Zephyr/IP documentation.

The Zephyr/IP has a big color screen to show the user information about the IP link, dropped packets, buffer size and packet latency. Years from now, when IP remote broadcasts are commonplace, this deep, graphical information may not be so necessary. But, as we are still figuring out such things as NAT traversal, dropped packets, error concealment, and bandwidth/latency, I am glad that Telos brought all this information out on a color screen.

The configuration menus are broken up into sections: Audio, Network, Codec, Status, Settings, Auto, and Connect.

- The Audio menu is for configuring selection of audio input and output parameters (Analog, AES/EBU inputs, sync, and nominal audio levels).
- The Network menu requires basic networking knowledge if you are manually configuring the Zephyr/IP. If you are letting your DHCP server assign the IP address, then it is plug-and-play. When configuring the Z/IP identity and Server, I would create a custom group to assign all of your Z/IP identities too. This will make the connection process easier and more straightforward later.
- The Codec allows you to set parameters for your Z/IP's codec connection. There is also a compatibility mode for streaming audio to/from a "legacy" codec such the Telos Xstream.
- The Status screen is very cool. It shows all the hops that your connection takes, and even displays the names of cities along the path when the connection is established. You can flip to a histogram screen showing the IP connection quality over time, or a text screen showing updated connection stats.
- Auto Connect and Connect menus are straight forward as well. This is how I establish all of the Z/IP calls. You can dial an IP address directly, but usually you will pick from a list of other Z/IP's that you are authorized to call.
- The Settings Menu is used to control the basic user settings, including a web interface for remote access.

All the menus listed are available not only from the front panel, but also from any web browser connected to the IP address of the unit. This feature implies that I can administer the Zephyr/IP from my desk, home, or even from my cell phone/PDA.

TESTING IT OUT

I made connection and audio tests using three different Internet service providers – all behind firewalls – and all were successful. The audio quality of each connection is directly dependent upon how much bandwidth is available.

At each end of the two-way audio connection, the buffer size is managed automatically by the Z/IP's ACT function. The Zephyr/IP manages both the bit rate and the buffer size, using the maximum bandwidth available (up to your set point) and employing the minimum buffer size possible.

The result is you always get the lowest possible latency and the highest possible audio quality over a given IP connection. If the latency or available bandwidth should change, the Z/IP is designed to instantly react, using up what is in the buffer, and adjusting the bit rate as seamlessly as possible.

Telos is now shipping the Zephyr/IP. I received two early production units, but they seem ready for action. Although a couple of Wi-Fi and EV-DO cards are supported now, expect more to be supported through software updates in the future.

I expect that ISDN codecs will be around for a while longer. After all, ISDN is a regulated, tariffed service – state laws require it to work properly in the places it is sold. As we move into a new era of IP communications, though, broadcasters are looking for a reliable way to get high-quality audio from a remote site back to the studio. The Zephyr/IP now has all the tools to get that done in a professional, radio-friendly package.

Tom Hansen is the Chief Engineer for Tuned-In Broadcasting, Inc's WRLT(FM) in Nashville, TN. Contact Tom at: thansen@wrlt.com

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Comrex ACCESS - A News Reporter's Dream Come True

by Gary Smith

When the KTAR-FM News Department made the decision that a mobile remote studio was needed – one that could act as an instant response operations center and double as an emergency remote studio – a reliable and versatile link was required.

The requirements were complex. The mobile platform would be used for remote broadcasts, station promotional events within and outside of the market, and emergency operations center for the news department, or out-of-market stations from within the company. Furthermore, a means of accessing the station or transmitter site directly on sort notice was needed, from anywhere, anytime, without complex setup.

THE OLD WAYS

Our first solution involved the traditional use of an RPU transmitter and a telescoping mast. This provided a clean local market link to both the studio and the FM transmitter site.

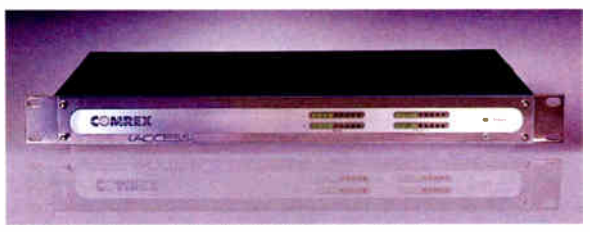
With a simple remote control switching arrangement and an A/D converter, audio could be switched to the FM and HD transmitters from the RPU receivers at the transmitter site. This however did not solve the problem of working outside of the market area nor provide a solution for other stations in the company that may in an emergency need to utilize such a vehicle. This solution also only provided for a link to the studio and did not provide for IFB or any return audio.

The next step was to provide an alternate transmit link and resolve the IFB return problem. Several options seemed obvious. An ISDN-based system was considered and rejected because it required advanced installation and the locations where service could be provided proved to be somewhat limited.

Additionally, a radio (TSL) type link was out of the question due to the restrictions placed on us by the landlord. South Mountain in Phoenix is a very congested site. TSL is also a point-to-point solution and would not work in a mobile environment. The use of our two-way repeater system was also out of the question from both a type-of-usage and availability standpoints.

THE NEW WAY

The obvious solution was the Comrex ACCESS. This device, available at the time only as a rack-mount, was perfect. The ACCESS has the ability to interface on a dialup phone line and could talk with POTS-based devices already in the building.



ACCESS Rack Mount

The quality was good for voice and news operations. When communicating with a similar ACCESS unit at the studio, the audio quality was the best POTS-based audio I had ever experienced. The next option was even better: the ACCESS could also operate over an IP connection. This connection would be via an onboard RJ-45 connector and NIC that is a standard part of the system.

The encoders used in the box allow for mono and stereo send and receive audio on low or high bandwidth IP connections over the public Internet.

Standard DSL can be provided to the mobile studio or, as in our application, a laptop computer was utilized along with a cellular-based broadband access data card. The particular card used has a typical download bandwidth of 400 to 700 kbps, and in some areas can exceed 1 Mbps. A cellular repeater was added to the remote vehicle which extended the reach to approximately 50 miles from a cellular tower.

The ACCESS would provide a link to the studio and the return audio from anywhere that we could get a cellular broadband signal. It could be interfaced thru a DSL, a client's network, or even outfitted with a satellite IP connection. It was time for the acid test.

PUTTING ACCESS TO WORK

With growing national concern over the crossing of undocumented immigrants along our southern border, the news department assigned talk show host Darrel Ankarlo and a small team to do 3-1/2 hour shows for an entire week from inside Mexico and from the Altar Desert in south-central Arizona. This would be an unprecedented event in the history of broadcast journalism. There would be no room for mistakes.

For two days in Mexico, and for three days at a location in the Altar Desert (which is undisclosed for reasons of security), our team stretched the capabilities of the ACCESS system. We were located in the desert well beyond the reach of cell service but, with the aid of the cell repeater, we were able to obtain a usable broadband signal.

The system performed very well. There were tradeoffs, which included audio performance for latency (higher audio bandwidth can be achieved at the cost of buffering time). This is great for a music station, but our use – doing a live call-in talk show from the desert – did not allow for significant delays in the audio link.

This was partially solved in the field first by selecting the ULB setting and, in the advanced mode setup, changing the frames per packet setting to four frames. Since the studio and the field units can be addressed via the IP connection and fully configured on-line, the remote engineer can handle all setup from any location with IP connectivity.

Since returning from the desert trip, the Comrex people have made significant advances in reducing the latency to under 900 ms. Typically on a good data card I see 350 to 500 ms. If the ACCESS is used as an IFB link only and the RPU is used to send audio, the latency is reduced to half.

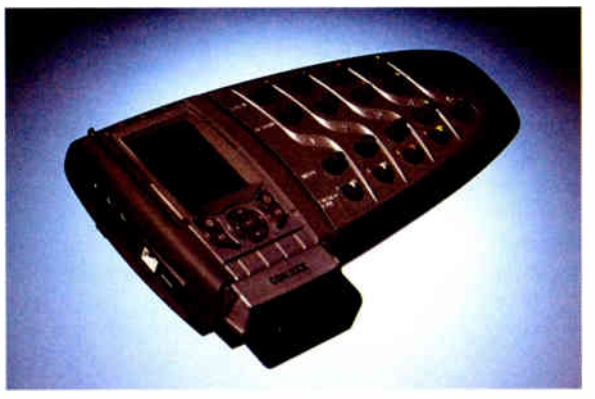
The next problem was to be able to do a remote broadcast and play a real-time program feed to the on-site listener. This was easily accomplished, since the ACCESS provides full stereo in both directions. The A channel on the receive was utilized for the IFB and the B channel for real time program, thus eliminating all of the problems associated with the diversity delay from the HD radio transmitter.

THE ACCESS PORTABLE AND MIXER

With this success – and confidence high – I placed an order for the ACCESS Portable unit with its associated five-channel mixer module. This module, in association with the inputs already in the base unit, provides for six channels of input audio and six headphone outputs. The ACCESS portable unit can be worn on a belt and can access the studio via POTS, WiFi, a Data Card or a hard-wired Internet connection. We get four hours of on-air time on a charge.

Each of our four news vehicles has been equipped with a portable unit, a spare battery, and a charger. With an hour of training for the news department we were on our way. The technical directors also loved what they were seeing and interest was high. A simple hand-held device was doing what traditionally required a whole travel case full of complicated wires and equipment.

On Friday July 27, 2007, the news team was provided with, and trained on the use of, the ACCESS Portable. Three days later, July 30, 2007, disaster struck in Phoenix. Just two blocks from our studios and clearly visible from the news room, two news helicopters struck each other, killing all on board. Kevin Trip from the KTAR news team was the first reporter on the scene and, for the next 24 hours, Kevin and the KTAR News Team utilized the ACCESS Portable to provide constant coverage from the scene of the disaster and ensuing cleanup.



ACCESS Portable with mixer module.

Today, as this article is being written, our news team is again on the road – in Iowa and then New Hampshire – to cover the presidential primaries. They have with them as the broadcast link of choice, the Comrex ACCESS Portable with the five-channel mixer option.

AUTO-CONFIGURATION

The ACCESS is based on a solid Linux platform and with a virtual on-screen keyboard that actually works. Many data cards are supported and typically are automatically configured when the unit is booted with the card installed.

There is a chat window built into the interface that allows communications for up to five users at any given time by logging in to the ACCESS unit on either the studio or the remote location. The interface offers statistics and all of the setup options. It has a web browser allowing for easy login via the hotel Internet system, and using the local Starbucks for a remote is no big deal. You can even check your email.

The latest update for the portable unit, 2.3p8, provides USB support for a mouse and a remote keyboard. Updates are available at http://www.comrex.com/updates/

A POTENTIAL BACKUP STL

The product is currently being evaluated by Bonneville International Corporation as a means to provide audio to transmitter sites across the country as an emergency link if the studio feed fails. Convenient switching of the audio can be accomplished by using any of the four contact closures provided on the rear panel of the rack unit, which can be activated from the remote unit.

AES/EBU audio I/O is available as a standard feature and with the encoding scheme selected that meets the stations needs, a viable IP based STL is provided. This link can be accessed from anywhere and can even be utilized over satellite IP to provide service in the absence of a terrestrial IP connection.

I have discovered the ACCESS system is versatile and quick to configure and set up. Connection time over an IP link is seconds, sometimes faster than you will notice. Comrex Corporation is committed to the product and already has upgrades in progress that will make the unit more versatile and powerful than ever.

Gary A. Smith is the Director of Engineering for Bonneville in Phoenix, AZ. You can contact him at: gsmith@bonneville.com

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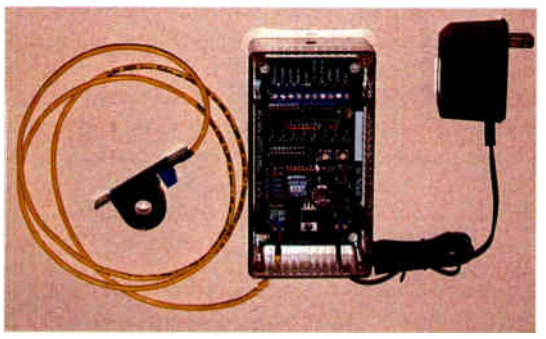

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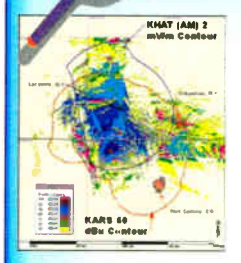

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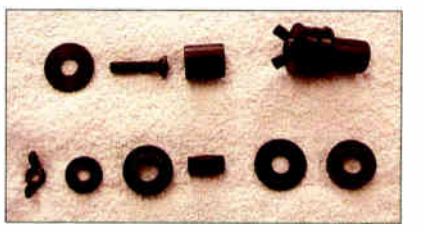
We now have SM-5B hanger hardware as shown in the photo.



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Customer Driven Enhancments in RCSnews 3.1 RCS Releases NexGen Digital 2.7.4

RCSnews 3.1

RCS continues to enhance its full-featured newsroom product RCSnews. The comprehensive, stand-alone newsroom software enables reporters to write newscasts, receive and revise wire copy, and digitally record, edit and playback audio.

New to RCSnews 3.1:

- Improved performance with a revamped tool bar.
- Customized toolbar so that user can customize to only show tasks commonly used.
- Docking/undocking of windows has been made easier.
- New messaging when key mappings are applied.

RCS NexGen Digital 2.7.4

RCS has released its newest version (2.7.4) of NexGen Digital. NexGen 2.7.4 includes Opto Masking, which enables the audio server to only respond to specific optos (electronic light-controlled switches). This customer requested feature gives the engineer more control over what, when, and how each event is triggered.

Additional feature sets include more options on the Control Room Display size and Button Bar/Cart Deck/Wall of Carts buttons. Configuration has expanded with user based logout options, archive window deletions, and enhanced spot block communication between stream and master stations. NexGen 2.7.4 now includes status of any events in XML exports.

For a complete list of enhancements please visit www.rcscommunity.com

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Balsys Technology Group and SystemsStore Moving to Larger Quarters

Balsys Technology Group and SystemsStore have relocated to larger spaces to accommodate their growth in both systems integration and product distribution.

According to Larry Lamoray, CEO of The Balsys Companies; "We are reacting to increased demand for our studio and RF integration services, as these activities require considerable space and utilities to be performed efficiently. Due to diversification we have also outgrown our wood shop, and the space that was used for systems integration is now being converted to additional shop area.

Balsys Technology Group, Inc. is a Systems Integration Company based in the Orlando, Florida area, providing complete Studio and RF Services on a nationwide basis to the Professional Radio Broadcast Industry. Known for both their Custom Studio Furniture and "Plug & Play Transmitter Buildings," Balsys also provides complete Prewiring and Site Installation services.

SystemsStore is a premium source for the various supplies required to create and maintain a technical infrastructure, including Wire, Cable & Connectors, Racks, Punch Blocks, Tools, Test Equipment, and a variety of "Problem Solver" devices.

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Henry Engineering Introduces SixMix USB Broadcast Console and Mixer Mate

SIXMIX

Henry Engineering has introduced SixMix, a compact and comprehensive USB broadcast audio console.

SixMix is the "missing link" that turns a PC or laptop computer into a complete broadcast studio.

SixMix is a 10-input, 6-channel broadcast console that is about the size of a laptop computer.

The most important (and unique) feature of SixMix is its integral USB digital audio interface. Just connect a USB cable to any PC or laptop, and it is ready to record, edit, and play digital audio with superb audio quality. This makes SixMix ideal for use with radio automation, digital production, news editing, webcasting, or as a self-contained emergency studio.

Other features include a Cue bus with Cue speaker, Monitor system with mic-on muting, a Mix-Minus output, and Guest headphone facilities with full Talkback.

SixMix offers the best of both worlds: the reliability of an analog console with the convenience and sound quality of digital audio. **List price: $1,195**

MIXER MATE

Mixer Mate is the solution to the problems encountered when using a "live music" or PA-type audio mixer in a broadcast environment.

Mixer Mate adds three important functions to the mixer: it provides convenient ON/OFF control of up to four microphones; it MUTES THE MONITOR when a microphone is in use, and it provides CONTROL of On-the-Air studio warning lights.

Mixer Mate provides Mic ON/OFF control for up to FOUR microphones.

Its Monitor Mute Programming feature allows the user to program which microphones will activate the Monitor Muting function, and it also interfaces to a Superelay, to control On-the-Air tally lights.

Mixer Mate is compatible with mixers by Mackie, Behringer, Tapco, Yamaha, Alesis, Soundcraft.... virtually any mixer that provides a "Process Insert" facility on the microphone channels. **List Price: $195.00**

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Fifty Thousand Watt Software Ships Shoehorn™ Time Stretch Software and Listen4me™ Software

SHOEHORN

The new Shoehorn™ program from Fifty Thousand Watt Software is a time stretch program made specifically for use in radio production work.

Shoehorn is simple and easy to use. In its most common application, Shoehorn can make recordings fit into a specified time slot without changing the pitch. For instance, ads can be made to fit into 30- and 60-second time slots, and entire radio shows can be made to fit into half-hour and one-hour time slots. Shoehorn can also be used to create the fast-talking "fine print" at the end of some ads, such as the legalese of a car lease.

Shoehorn can additionally perform pitch shifting, without changing the recording length. Time stretching and pitch shifting can be done independently, or both can be done at the same time.

A dual transport allows for auditioning both the "before" and "after," so that it is easy to compare the two.

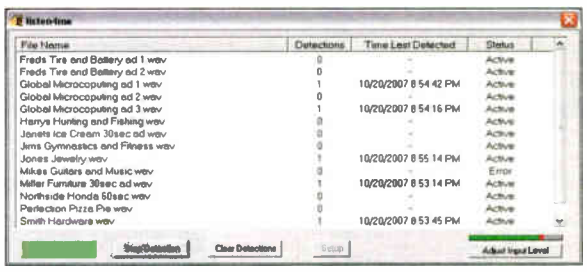
Shoehorn uses ground breaking DIRAC™ technology for natural sounding time stretch that is surprisingly free of artifacts.

Shoehorn runs under Windows. A free, fully functional 30-day trial is available for download at www.50kws.com **Price: $39.00**

LISTEN4ME

The new Listen4me™ program from Fifty Thousand Watt Software can listen for ads, music, jingles, promo's, or any other recordings. The program can listen to audio from any source including radio, TV, or Internet streaming.

Listen4me is extremely simple to use. You give it a sound file sample of any recording you want to it listen for. Listen4me listens to the sample recording to "learn" what it sounds like, then listens to the audio stream to detect plays of the recording.



Listen4me can keep a log of all occurrences of detected recordings, including recording name, date, and time. The log file can be imported into a spreadsheet.

Listen4me can also save a sound file copy of the detected recording, for later review and verification. In addition, it can keep a snippet of the preceding sound, so you can determine what was playing right before the detected recording.

Listen4me can listen for up to 20 recordings at once.

Listen4me runs under Windows. A free, fully functional 30-day trial is available for download at www.50kws.com **Price: $99.00**

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Final Stage

RADIO ROUNDUP

The Radio Guide Event Register

Email your dates and info to: ***radio@rconnect.com***

National Assoc. of Tower Erectors (NATE)
February 11-14, 2008
Orlando, Florida
www.natehome.com

National Religious Broadcasters Convention (NRB)
March 8-11, 2008
Gaylord Opryland Resort, Nashville, Tennessee
www.nrbconvention.org

Great Lakes Broadcasting Conference & Expo
March 10-11, 2008
Grand Rapids. Michigan
www.michmab.com

NAB 2008 Convention
April 11-17, 2008
Las Vegas, Nevada
www.nabshow.com

NAB 2008 Radio Show
September 17-19, 2008
Austin, Texas
www.nabradioshow.com

NAB 2008 Radio Show
October 2-5, 2008
Moscone Center, San Francisco, California
www.aes.org/events/125/

Broadcasters Clinic
October 14-16, 2008
Madison Marriott West Hotel, Madison, Wisconsin
www.wi-broadcasters.org

Radio Guide Advertiser Info – Jan/Feb 2007

Advertiser - Page	Website
AC Transformer - 48	www.actransformer.com
Altronic - 37	www.altronic.com
AM Ground Systems - 49	www.amgroundsystems.com
APT - 31	www.aptx.com
Armstrong Transmitters - 49	www.armstrongtx.com
Arrakis - 47	www.arrakis-systems.com
Audemat - 45	www.audemat-aztec.com
Audion - 41	www.audionlabs.com
Axia - 19	www.axiaaudio.com
Bay Country - 47	www.baycountry.com
BEXT - 49	www.bext.com
BGS - 50	www.bgs.cc
Broadcast Devices - 45	www.broadcast-devices.com
Broadcast Software Intl. - 4	www.bsiusa.com
Broadcast Warehouse - 23	www.broadcastwarehouse.com
CircuitWerkes - 25	www.circuitwerkes.com
Comet - 24	www.comet.ch
Comrex - 5	www.comrex.com
Continental - 42	www.contelec.com
D&H Antennas - 53	www.dhsatellite.com
Davicom - 30	www.davicom.com
Deva - 36	www.devabroadcast.com
Econco Tubes - 53, 60	www.econco.com
ERI - 50	www.eriinc.com
Fanfare - 51, 53	www.fanfare.com
Freeland - 48	www.freeland-inc.com
Google - 13	www.google.com/radioautomation
Gorman Redlich - 51	www.gorman-redlich.com
Henry Engineering - 2, 39	www.henryeng.com
Inovonics - 43	www.inovon.com
Jampro - 44	www.jampro.com
JK Audio - 9	www.jkaudio.com
Kintronic Labs - 9	www.kintronic.com
Larcan - 46	www.larcan.com
LBA Technology - 21	www.lbagroup.com
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Logitek - 29	www.logitekaudio.com
Micro Communications - 51	www.mcibroadcast.com
Moseley - 26	www.moseleysb.com
NAB - 59	www.nabshow.com
Nautel - 11	www.nautel.com
Nott Ltd. - 40	www.nottltd.com
NTI - 35	www.minstruments.com
OMB America - 51	www.omb.com
Omnia - 17	www.omniaaudio.com
Orban - 64	www.orban.com
Pristine - 8	www.pristinesys.com
PSI - 37	www.psibroadcast.com
Radio Systems - 39	www.radiosystems.com
RAM Broadcast Sys. - 43	www.ramsyscom.com
RCS - 14	www.rcsworks.com
SAS - 27	www.sasaudio.com
SCMS Inc. - 55, 57	www.scmsinc.com
Shively Labs - 41	www.shively.com
Staco - 38	www.stacoenergy.com
Telos - 15	www.telos-systems.com
TFT - 47	www.tftinc.com
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Wheatstone - 3, 32	www.wheatstone.com

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