Radio Guide

Radio Technology for Engineers and Managers

March 2005

From Digital Input to Digital Output

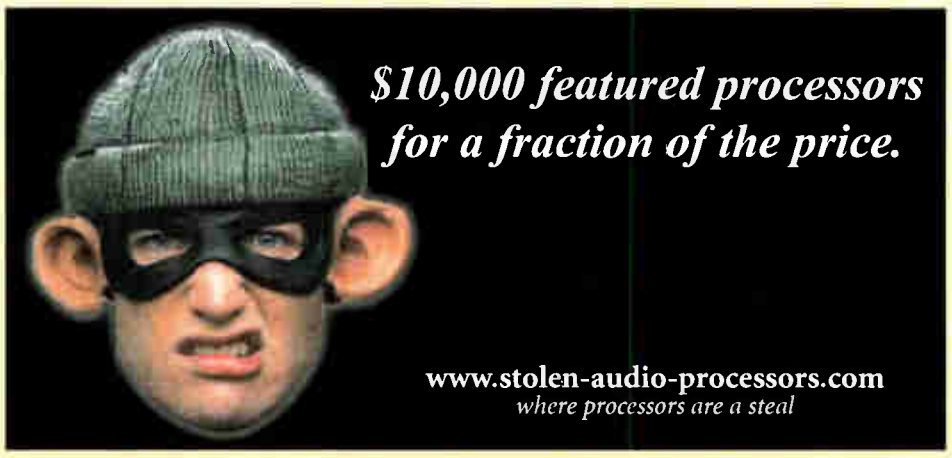
Inside Radio Guide

A Digital Processor for Digital Transmission

Page 4

Over the past year or two, manufacturers have raced to deliver processors taking full advantage of the new digital transmission environment. Now moving beyond adapting digital processors to the IBOC environment, the latest offerings – including the 8500 from Orban – are taking processing to a new level.

It is an evolutionary, not revolutionary, product: the 8500 is born from the 8400HD, and includes added functionality (primarily for HD radio) that is integral to the unit and not an extra cost option. There are no add-on plug-ins necessary as with the 8400HD, making the 8500 a single box, state-of-the-art HD/analog FM processing solution.



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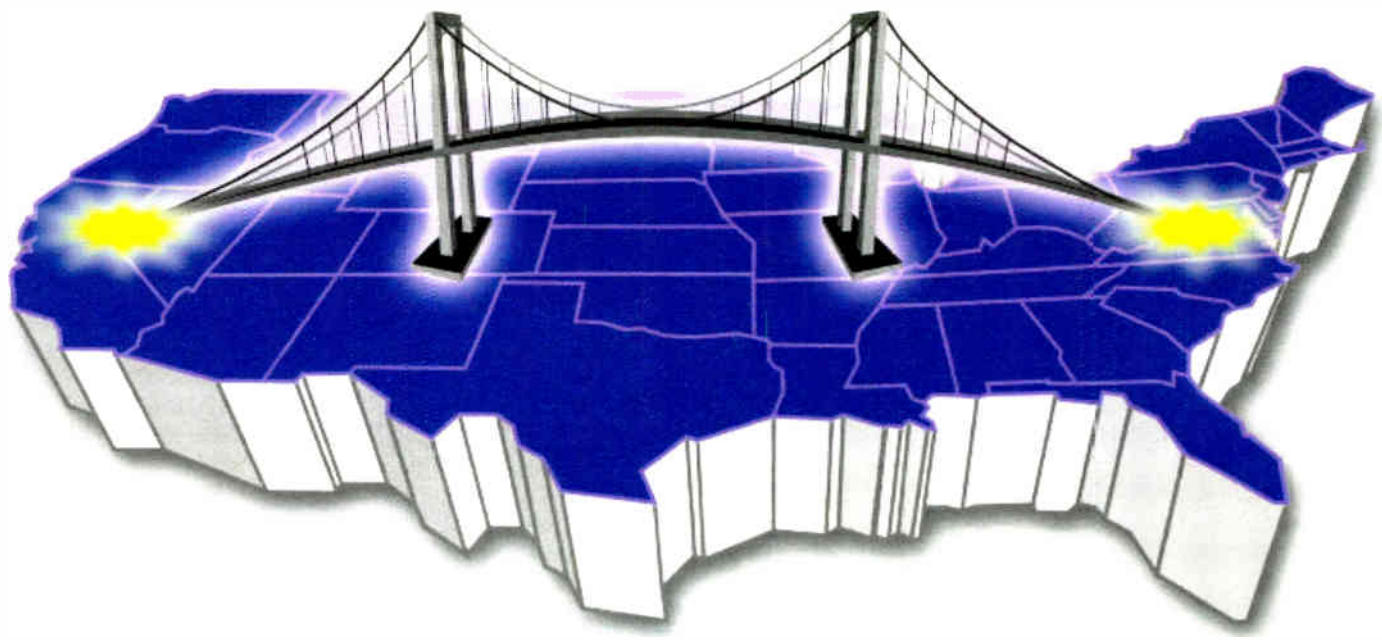

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Radio Waves

by Barry Mishkind – Editor

Will We See You at NAB?

From April 16-21, a fair amount of the Radio industry will decamp to Las Vegas for the annual NAB Spring Convention.

You should be there. It *is* an important opportunity for learning and networking. And with the current ramp-up in digital technology around the country, from audio handling to transmitter installations, this year might be one of the most beneficial for attendance by those desiring to see and touch the gear they may well be installing and using in the near future.

True, you can read about all the products and technology – and **Radio Guide** will be helping you make sense of it all – but it is not quite the same as being there, able to ask questions in "real time." Free access to the exhibit floor is available – if you register *now*. Do it at www.nab.org; use **Radio Guide**'s VIP Code: **AC54**. If your budget can handle it, attend the Sessions. Alternatively, buy a copy of the Proceedings.

We hope to see you at NAB. Stop by our booth, N2134 in the Radio Hall. And make space in your calendar to join us at the Annual Lunch Gathering at Noon on Tuesday (19th). But, even if you cannot make it to Las Vegas, communicate with us – let us know what are your concerns and needs.

This year it is even more urgent that station management "gets it." GMs: send your engineer to the NAB Convention. Give him the time and opportunity to find out about the technology and the challenges ahead. Educate him, because even minor mistakes in implementing digital radio can cost you a lot more than sending him to Las Vegas for a few days.

The right choice will benefit the entire station.

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Simian 1.6 is the result of input from numerous BSI users. Thanks to their input, Simian now includes an on-screen weather display that updates from the internet.

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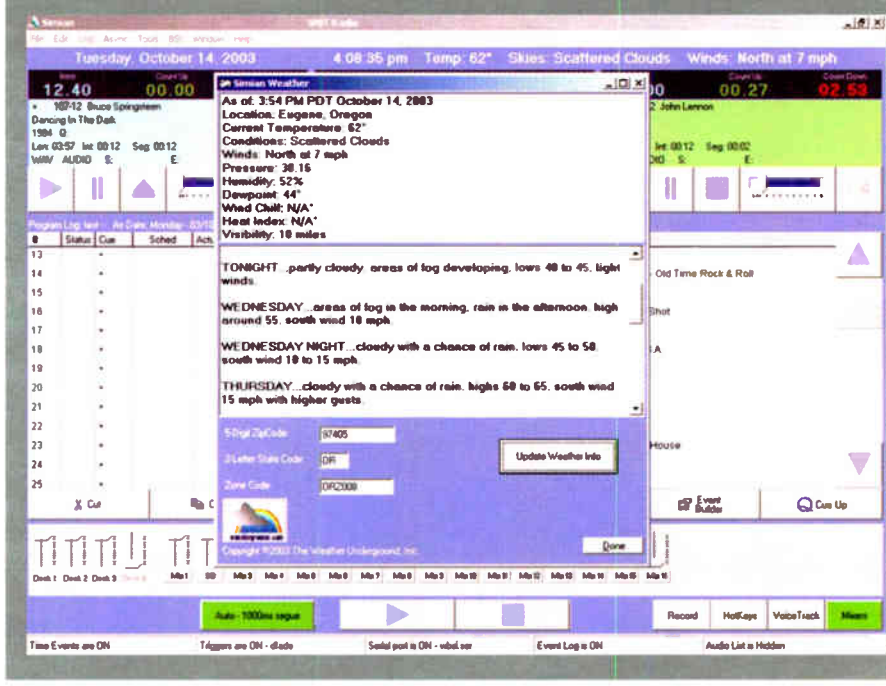

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Orban 8500

by Gary Blau

A Digital Processor for Digital Transmission

Over the past year or two, manufacturers have raced to deliver processors taking full advantage of the new digital transmission environment. Now moving beyond adapting digital processors to the IBOC environment, the latest offerings – including the 8500 from Orban – are taking processing to a new level.

[MIAMI, Florida] At first, the new Orban Optimod 8500 appears almost identical to the 8400, except for the new navy blue and gray color scheme. However, underneath is a complete redesign with additional, and faster, DSP power inside.

A COMPLETE PROCESSOR

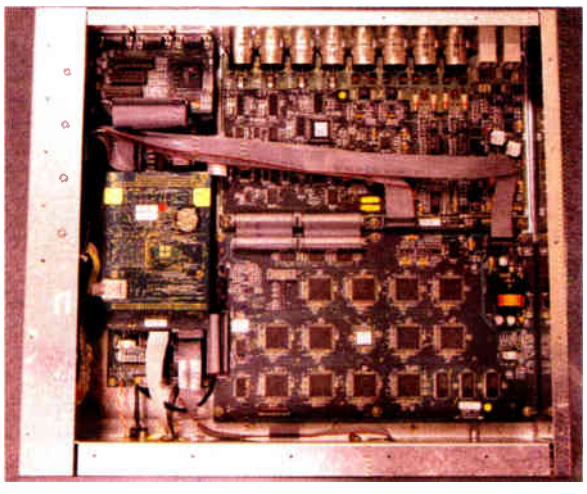
It is an evolutionary, not revolutionary, product: the 8500 is born from the 8400HD, and includes added functionality (primarily for HD radio) that is integral to the unit and not an extra cost option. There are no add-on plug-ins necessary as with the 8400HD, making the 8500 a single box, state-of-the-art HD/analog FM processing solution.

Appearing only about five years after the 8400 was introduced, Bob Orban said the design goal of the 8500 was "to build on the very well accepted sound of the 8400, version 3, and to include enough DSP power to provide the headroom to develop future improvements." Orban expects to announce the first set of enhancements around NAB time.

"Since it does not share any boards with the 8400, the 8500 circuitry is new, designed to incorporate the latest and most-available parts," he said. "This avoids relying on some parts that are getting hard to find."

MORE POWER UNDER THE HOOD

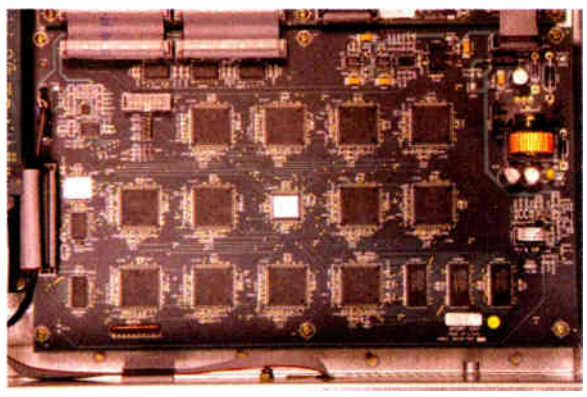
There are now twelve 150 MHz DSP chips on board, compared to nine 100 MHz chips in the 8400HD, almost doubling the DSP horsepower and leaving substantial design headroom for future improvements and features.



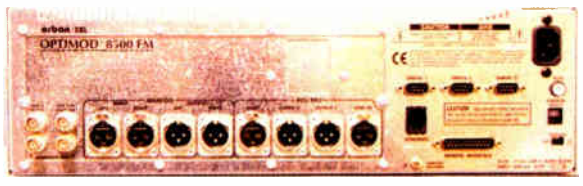
This is the top view of the 8500. Clockwise from the lower right, DSP board, Base board (with plug-in CPU board), Serial Interface board, and the Audio Input/Output board.

This permits keeping a minimum 64 kHz sample rate (instead of 32 kHz in the 8400) at all times, resulting in the bandwidth exceeding 20 kHz. Since they are shared between analog and HD channels, the AGC and multi-band compressors now run at the full 20 kHz HD rate. The complete analog channel signal path now has a stopband at 17.5 kHz, versus 16 kHz in the 8400. While few listeners will be able to hear all that "top end," allowing the internal audio bandwidth to go higher than needed also results in better conditions for processing.

According to Orban, this DSP power in the 8500 results in "a key feature – a separate band mix for the HD and the analog audio." This is an important step from the 8400HD, which had outputs that required a compromise, in that it produced essentially the same sound for both analog and HD.



8500 DSP board closeup. The 12 Motorola 150 MHz DSP56367 chips surround a PLD, which acts as a crosspoint switch to route the various signals from one DSP to the next. The three memory chips in the lower left are to implement the 8-second audio delay. One can also see the switching power supply (the components surrounding the toroidal inductor) that provides the operating voltage for the DSP chips.



INTERNAL DELAY CONTROL

A major change from the 8400HD is the built in adjustable 8-second delay in the analog channel to allow synchronization of the analog and HD channels.

This eliminates the need to pass the analog channel audio through the HD exciter to achieve the delay, and thus allows the use of the onboard stereo generator and composite limiter for direct composite feed to your analog exciter. Using both coarse and fine adjustments, the delay is adjustable in 15.62 microsecond sample step increments, up to a maximum of 8.12 seconds.

Not only does this restore the entire competitive processing capability of the unit to the analog transmitter path (compared to the 8400HD), it also prevents dead air on the analog channel should the digital exciter lock up or require a reboot.

Speaking of booting, the 8500 now sports a much shorter boot-up time, down from around fifty seconds on the 8400 to less than ten seconds.

CUSTOMIZING FEATURES

Among features allowing each station to customize its sound, the HD channel now offers full 20 kHz bandwidth, adjustable from 15 kHz to 20 kHz, in 1 kHz steps.

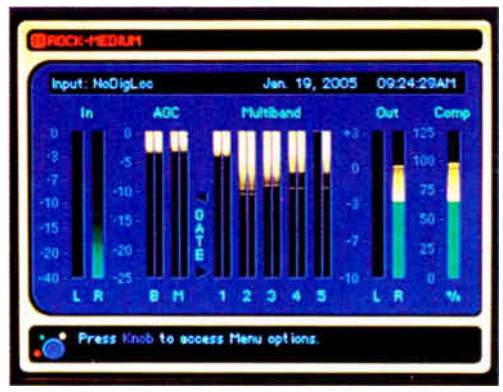
For those needing the minimum possible latency for programming reasons, a small reduction has been achieved, bringing the total latency down to 3 milliseconds (if certain presets similar to those on the 8200 are selected), at the expense of a somewhat less competitive sound. This, of course, assumes the 8-second delay is disabled!

There are eight new factory presets, and the parameter menu system has been rearranged a bit. However, Orban noted the goal was "to retain the familiarity of the 8400 menu. We saw no need to introduce a different menu structure." Furthermore, he said, "we spent a fair amount of time to ensure the presets sound much as in the 8400."

It was also nice to see a built-in Ethernet interface, so a separate PCMCIA card is no longer necessary.

EVALUATING THE OUTPUT

We began by setting the 8500 to the same custom settings as the 8400 now used on our A/C station, and comparing the two. The result was as expected, with no immediately apparent difference.



We tried a couple of the new presets, which were quite loud without too much edge, but we thought they were not quite appropriate for our female-friendly Lite-A/C station. We listened for significant differences that might result from the increase in sample rate and bandwidth through the compressor sections, but if there was anything there it was certainly not obvious.

We then tried it on our Oldies station. We liked the very smooth texture of the 8500, and it seemed to easily handle the extremely challenging wide range of source quality endemic to Oldies. It produced very good consistency, while retaining a sense of openness and good dynamic contrast.

One minor anomaly that surprised us was an apparent calibration difference between the composite output controls on our 8400 vs. the 8500. For instance, with identical processor settings the 8400's output control ended up at 3.1dBu, where the 8500 read 4.4 dBu for the same peak modulation level. Otherwise we could not tell a difference switching between the two. (Likely this will be resolved in the upcoming Version 1.1)

Not having an HD station to test with, we tried the next best thing, feeding the HD processor output to an OpticodecPC aacPlus streaming encoder. (Using an AES splitter a station can run both HD and streaming from the digital output.)

Even down to 48 kbps the aacPlus stream sounded very musical and consistent. Although the 8500's HD output could be used like this as probably the best streaming processor on Earth, the need for most US

(Continued on Page 6)

World Radio History

Indecency Processor

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

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World Radio History

Orban 8500

by Gary Blau

A Digital Processor for Digital Transmission

Continued From Page 4

broadcasters to strip out rights-restricted content from their streams might derail that idea.

Listening to the HD output directly, comparing it to the demodulated analog, the difference is striking. The HD output is obviously brighter, but much more open and musical at the same time. Not having to work against pre-emphasis, and using look-ahead limiting instead of clipping, makes a dramatic difference.

The total lack of any clipping distortion and unnatural high frequency density is a real pleasure to hear. Formerly lost detail and definition in the music is immediately apparent. If only we could get away with running analog FM like this!

WISH LIST

Overall, the 8500 performs essentially exactly like the 8400 on the analog side, but with significant improvements for HD capability and performance.

What we would like to see, if the added DSP power inside would support it, is the ability to totally split the analog from the HD processing systems. Some users might want to maintain an especially aggressive sound on their analog channel, but really back things off on the HD. And as Tomorrow Radio approaches, having a third processing channel will become necessary.

Also, perhaps an optional third band for the otherwise excellent window-controlled AGC might be useful for some of us who have to fight against inconsistent Oldies or other troublesome sources.

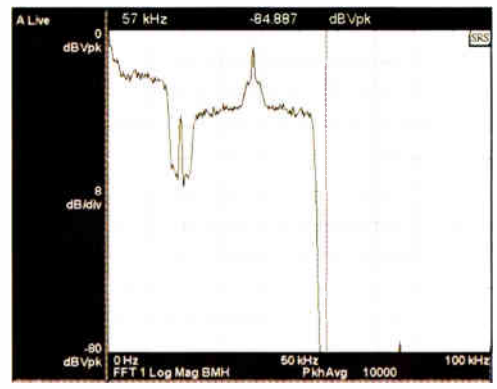
Finally, it would be helpful to have an indication on the main metering screen of the total analog channel latency as it changes with different settings, especially now that there is the variable eight second delay to keep track of.

We are anxious to see what the future holds for improvements using the additional DSP power now available to the system.

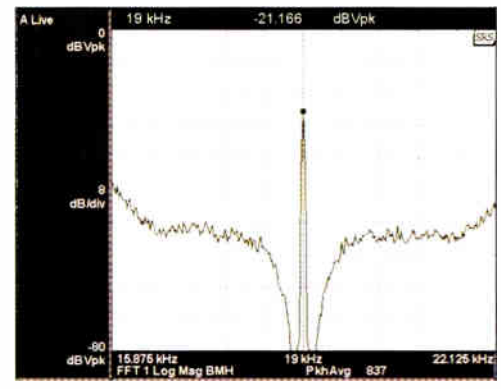
SPECTRAL PLOT

These two photos show the 8500's excellent baseband spectral control even with 1 dB of composite limiting. According to Orban, they are "maximum peak hold" measurements – the most stringent possible measurements because they show the absolute worst-case; there is no averaging to smooth over spectral problems.

For each of the 801 FFT frequency bins, the graph shows the highest value that occurred in 10,000 measurements. Source is track 53 of the NAB Test CD, and consists of stereophonic pulsed USASI noise (NRSC noise). The preset is "Edge," one of the 8500's new presets for competitive popular music formats. This preset is aggressive and presets providing lighter processing would produce even lower levels of spectral contamination.



The 0 to 100 kHz baseband.
The cursor is placed at 57 kHz, which is the center of the RDS subcarrier. The 8500's excellent spectral protection of the RDS is readily visible.



Zoom in around the 19kHz stereo pilot.
This shows the 8500's pilot notch filter, which effectively protects the pilot tone.

Instrumentation is Stanford Research Systems SR785 Dual-Channel Dynamic Signal Analyzer, an FFT-based instrument. In both measurements, 0 dB (the top of the graph) = 100% modulation. The bottom of the graph is -80 dB.

Gary Blau is the South Florida Director of Engineering for Jefferson-Pilot Communications. He can be reached at gblau@jpc.com

Tech Support Forum

by Mike Pappas

Demand Good Technical Support

[DENVER, Colorado] I have a major problem with manufacturers of "mission critical" gear that do not provide real support.

MISSION CRITICAL

Let me define "mission critical." Any device that cannot be easily bypassed – or be instantly replaced by an inexpensive spare sitting on the shelf – is "mission critical." A quick list of "mission critical" gear includes the transmitter and the digital plant. (KUVO has a Logitek NuMix system into a Nautel V-10 with HD Radio.)

Here is the KUVO definition of *proper support:* a 24/7/365 phone number to page technical support for a return call in 30 minutes or less, or a tech's personal cell phone number. Both of our mission critical vendors provide this kind of support; we know because we have had the need to use it and it has worked.

Some prior equipment vendors did not provide that level of support, and it really is a major pain to be sitting at the transmitter site or studio dealing with a fault that put you off the air – and not be able to reach someone with answers.

TESTING THE WATERS

Before buying any major, potentially mission critical gear, we call the technical support department at the "vendor-to-be," and see what kind of reception we get.

1. Do they answer the phones after hours?
2. Do they have a tech on call via pager or cell phone?
3. What is the estimated response time at night, weekends and holidays?
4. If no one is immediately available, do they return calls during working hours in a timely manner? (My limit is one hour.)
5. Are manuals available via PDF from their web site?
6. Can they answer your technical questions (i.e., do they have a clue)?
7. Do the technical support folks speak English?
8. Does this product use any esoteric parts that, if discontinued, render the device unsupportable before the end of its expected service life?

I will not buy mission critical equipment from vendors who cannot answer "yes" to all these questions, and for the life of me cannot understand how a vendor would expect you to put your livelihood on the line if they are not willing to support their product.

Frankly, the quality of technical support from some professional broadcast manufacturers is appalling. I have had a litany of bad experiences from vendors of mission critical broadcast equipment, and I am not going to take it any more.

Manufacturers: if you are building mission critical gear that, if it goes belly-up, would more than likely take a station off the air, and you cannot answer yes to the eight questions above, you should seriously consider another line of work.

UNACCEPTABLE

Want an example of horrific support? Here is one of my all-time most-galling technical support failures:

While evaluating a mission critical device, I called the technical support number. I was told all support personnel were on the phone and someone would call me back. I left my cell phone number.

Two days later I had not received a call back, so I called back. Again, I was told all technical support folks were on the phone and I was assured someone would call me back. That was in June of 2004 – and I am still waiting for my call to be returned.

That vendor lost an $11,000 order as a result. The saddest part of this vendor's failure is that for many, many years they had world-class technical support. When you called, you either got someone immediately or a rapid return call. I recall driving to their facility in the 1980's with a belly-up device, and they fixed it *on the spot.*

Today, the ravages of several takeovers, leveraged buyouts and management changes result in a focus on maximizing profitability at all costs (pun intended). It has reduced them to not having sufficient technical staff to answer the phones, or apparently, to call you back – ever. Would you risk your radio station by buying gear with this level of support?

SPARE UNITS AND PARTS

I am willing to pay more to buy a product with real support because it is cheaper than having to buy two units (one as a spare). In fact, should I reward a vendor too cheap and stupid to properly support their equipment – by buying two of their products? Not on my watch!

Another issue is the use of exotic parts. Some devices use exotic parts that are no longer made and as a result I cannot fix them. This renders gear obsolete well before the end of its expected service life.

Manufacturers: rein in your designers! Just because a part looks cool on a spec sheet does not negate the fact it is made in very low quantities by monks in Ulan Bator – who next spring may decide to make fruitcakes instead.

KUVO has a raft of microphone processors no longer supported after only five years – way too short a time for the amount of money I spent on them. As a result, this vendor will not be the recipient of any more orders from us.

MISCELLANEOUS POINTS

A couple of other issues: Do the schematic diagrams supplied with the gear bear any resemblance to the unit? Are there schematic diagrams provided at all? Can you read schematic diagrams or are they so small that you need an electron microscope to see them?

Are the PCBs silk-screened with component IDs, and do these IDs bear any resemblance to the supplied drawings?

If the answer is "no" to any of these questions, it is time to look for another manufacturer. Why encourage bad support – vote with your Purchase Orders. The hair-pulling and head-pounding you save will be yours!

Mike Pappas is Chief Engineer of KUVO in Denver, CO. You can contact him at mpappas@qwest.net

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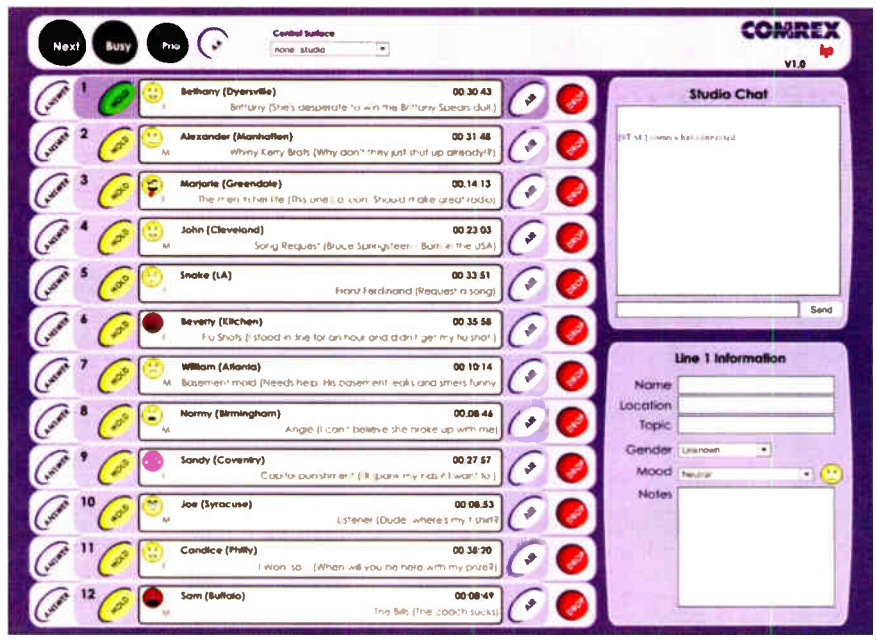

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The Radio Guide

2005 Technical Initiative Awards

Last spring, we announced our Technical Initiative, an effort to encourage folks to share their experience and knowledge with the industry by submitting articles and technical tips to us here at ***Radio Guide***.

At first, we were a bit nervous about the program. After all, so many engineers are busy today – busier than ever before, with more stations to care for with fewer staff available. Add that to the way some major corporations actively discourage – or prohibit – the sharing of technical information; everything has become "proprietary information."

Therefore, it was highly gratifying to see the number of submissions received over the past months since then. More than a few engineers were worried about writing; they thought they could not do it. However, three things became clear as the Technical Initiative progressed: (1) we have a lot of folks out there with a lot to say, (2) once you get started the words add up real fast, and (3) we had a lot of fun putting some of these together.

GOOD SUPPORT

In the end, the problem was not whether we would get enough submissions, but which submissions were the best of the lot. Our Technical Initiative was a greater success through the kind generosity of some of the best manufacturers in the industry. We owe them a great debt of thanks for seeing the benefits of encouraging engineers and others to reach out and share what they know. In all, over $15,000 worth of equipment was provided for the Technical Initiative.

We had some sharp judges from the industry: some Group Engineering Managers, some manufacturers, and some working engineers at the station level. This anonymous group spent a lot of time recalling those articles that were especially effective in their eyes.

The judges all mentioned the difficulty in picking among many fine articles from Tech Tips to historical items, to discussions of technology. We also received many letters from you, our readers.

THE AWARDS

In this month's ***Radio Guide*** we will announce the first group of awards. The rest will follow in time for the NAB show.

First, we would like to thank John Stortz for really taking to heart the concept of sharing his tips. Several of the ones he sent in were mentioned, but oddly enough, the one that got the most pointed praise was the one about reaching into the old parts bin and using an old bulk tape eraser to find conduits.

For his contribution, we are pleased to award to John Stortz a DH-20 Digital Phone Hybrid from the good folks at Comrex.

Comrex DH-20

A topic that always draws a reaction among engineers and programmers alike is how to deal with the realities of modern broadcasting without losing your mind. Sometimes it seems like communication is the last thing we do inside our facilities. Between various examples of corporate mania and station politics, folks can often feel like they are swimming among sharks.

For that reason, Rich Wood's Survival Guide articles on "How Not to Get Eaten Alive in Radio's Food Chain" were picked as favorites by several of the judges. One said that he wished he had received that information years ago, as it would have given him a lot better understanding of what goes on.

Henry Engineering Studiodrive

Thanks to Henry Engineering, we are pleased to award a Studio Drive mixer to Rich.

LOOKING BACK TO LOOK FORWARD

Rounding out the awards for this issue, quite a number of readers pointed to Don Kimberlin's account of his trek through the European telecom system to stack enough phone circuits so the video from the Apollo 11 Moon Landing could be sent to the US for Mission Control and broadcast to the world.

Don's tireless efforts that week, as well as the spell-binding way he related them, will keep the events of the summer of 1969 alive in our memories for a long time.

Thanks to Prophet Systems, we are pleased to award a complete NextGen 101 automation system to Don Kimberlin. Don, in turn has announced that he is donating this to a non-commercial school station. We will let you know where the system ends up as soon as it is finalized.

Watch for the rest of the awards, which will be named in the April issue of ***Radio Guide*** and at the Lunch Gathering at NAB on Tuesday, April 19th, 12 Noon, at the Riviera Hotel Buffet Restaurant. See you there!

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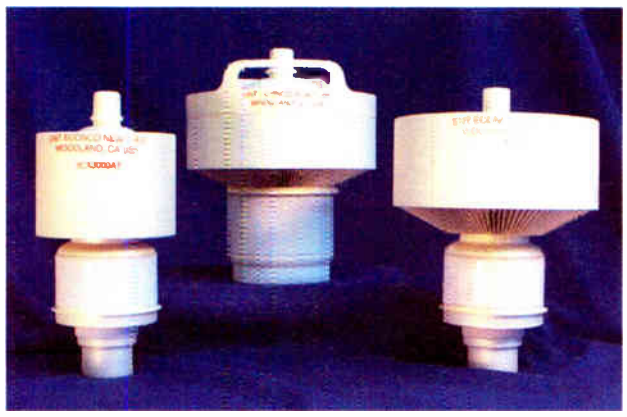

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World Radio History

Transmitter Shack

by John White, CBRE

Facilities Protection

Before and After the Fire Department Arrives

[PORTLAND, Oregon] We all dread those late night calls. Late night calls are *never* good.

Probably the worst is the call reporting: "the transmitter building is on fire." The next few hours become a blur – rushing to the transmitter, adrenaline flowing, running every light red, frustrated by that car in front of you that appears to be going only 5 MPH.

Meanwhile the mind races as you think of the off-air time, the need to emergency-order equipment at premium prices, and the hours that will be spent on the telephone hotline making it happen.

GREATER EXPOSURE

The modern trend of collocating two or more stations at a common site increases the potential loss in the event of a fire. Now, before the fire, is the time for the first step in reducing the risk of fire – a tour around your facilities to evaluate what can be done to prevent fires and minimize damages in the event of a fire.

With a clipboard in hand, walk around your transmitter building taking notes. Look with a fresh eye.

For example, what about that pile of boxes in the corner? When was the last time you *really needed* to save a cardboard box to ship something? Eliminate all unnecessary flammable materials wherever possible. How about that extension cord running across the floor?

Then, once you have done a "fresh eyes look," make a second tour using any of the numerous checklists, which are available from the resources I have included at the end of this article.

WIRING CHECK

Transmitter facilities have lots of wiring. Power, RF, control, and audio wiring are plentiful and potential sources of a fire.

Start by making sure all power connections are installed following the National Electric Safety Code (NEC). Breakers ratings must be sized to load and wiring size recommended by the equipment manufacturer. All wiring should be installed in Electro/Metallic Tubing (EMT = conduit). Not only does such an installation look much nicer, it is much safer and the conduit provides additional RF shielding.

If your facility is more than 30 years old, it would be a good idea to have breakers checked for sufficient fault interrupting current. As the area around our transmitting facilities becomes built up and urbanized the available fault current is probably much higher than older breakers can handle. New breakers are cheaper than a fire – or breaker fragments protruding from your transmitter when a breaker explodes.

PREVENTION AND PROTECTION

Over the years most of our facilities have been upgraded to modern solid state and computerized equipment, which is sensitive to overload and surge problems. Surge suppression now is a common accessory in our transmitter buildings ranging from large high power protectors to small point of connection protection.

For large suppressors, check that the installation was done in accordance with the NEC and manufacturer's instructions. Note the large 2/0 gauge surge ground in the following photo. This surge ground is in addition to the circuit neutral and safety grounds.

Small, point of connection surge suppressors, are both a protective device *and* a potential source of fire. All plug-in protectors should have an Underwriters Laboratory (UL) 1449 label. The surge current these devices are able to handle is limited and they often can fail in a shorted or partially shorted condition. Use only surge protectors or power strips that have an internal circuit breaker or fuse. Do *not* install them with restricted air flow or close to flammable materials.

The punch down wiring method is efficient and effective in the modern broadcast facility. The punch down blocks conveniently and easily route audio, computer, and control wiring between equipment. It is a very safe arrangement when properly installed. Punch blocks are a class 2 wiring method, no high voltage or high power connections are allowed. The voltage must be limited to 30 Volts or less and power to no more than 100 VA.

FIRE CONTAINMENT WITHIN THE BUILDING

Segmenting and isolating the transmitter building space into separate rooms is a very effective strategy for limiting fire spread and damage. In larger, multi-tenant facilities individual transmitter suites are often feasible. If separate suites are not available consider installing separation walls for space protection and fire isolation. Typical metal stud drywall is easy and inexpensive to install. The result will be a much nicer looking and safer installation.

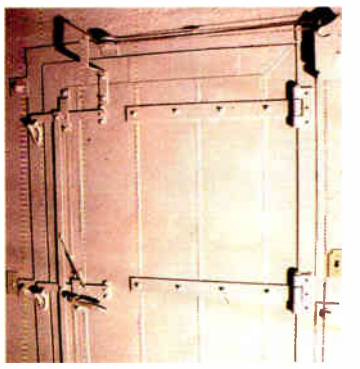
Firewalls are only effective when wall penetrations are properly done. Whenever possible all power and control wiring should be in conduit.

Still, conduit is only practical for the smallest cables. Since most coax jackets are flammable, such jacketed coaxial cables and dehydrator pressurization hoses represent a potential breach of firewall effectiveness when they penetrate walls.

Start by changing out the dehydration hoses to nonflammable materials. The larger coax cables have limited flexibility and require larger wall openings to allow installation of the cable. Even when nonflammable jacketed coax cable is used, these large wall openings will propagate fire from room to room. For these penetrations, the solution is to pack the opening using fire stop pillows or beanbags.

The material is easy to install and in the presence of fire will expand and fill the penetration, choking off the spread of fire through the wall. In the example shown the penetration is encased in six-inch electrical raceway held in place with carpentry framing angles. The raceway holds the pillows in place.

Flammable materials, solvents and cleaners are common in most transmitter buildings. At the Crawford Broadcasting, Mt. Scott facility flammable liquids, including the generator fuel tank, are contained in a concrete-walled, steel-doored vault.



Originally the vault housed the high voltage and modulation transformer vault for the vintage RCA transmitter. If your facility does not have a vault available, cabinets intended for solvent storage should be used.

FIRE DETECTION AND PROTECTION

In 1985 the Mt. Scott transmitter building was destroyed by a fire. During reconstruction fire-protective features were added to the facility. Two of the major features added were automatic fire sprinklers and a fire/security alarm system. Since they were installed they have easily paid for themselves with reduced insurance rates.

While the classic water sprinkler systems are inexpensive with new construction they are very costly to retrofit into an existing structure, and impossible when a high volume water source is not available. A reasonable alternative to consider is one of the dry aerosol fire suppression systems, Aero-K aerosol generators for example. These products are easily installed, highly effective, non-toxic, non-corrosive, and low maintenance.

When these systems are installed, it is important to maintain a clear space around the sprinkler/aerosol heads to allow proper disbursement of the suppression compounds. Allow several feet of clearance around and 18 to 24 inches below the fixture.

In today's vandalism and theft environment a security system is a must. Fire monitoring can be inexpensively added to the system. In addition to smoke detectors, if your building has an automatic sprinkler or aerosol suppression system, connect the activation tally into the alarm system to report activation.

If you do not have a security and fire alarm system because monitoring is not available, consider connecting a system to your auto dial transmitter remote control as an alarm input.

REGULARLY INSPECT ALARMS

Once a fire monitoring system is installed, check it frequently. Your Quarterly Tower Lighting Inspection time is a good time to also test the safety systems. Deactivate the alarm system and test with canned smoke or similar test materials. While you are testing the alarm system, take a few moments to check the fire extinguishers. Is the pressure indictor in the normal zone? Is the next inspection due soon?

During the inspection, check for proper clearance around safety equipment. A smoke detector will not work properly when it is obstructed. Clearance is also needed for fire extinguishers, marker signs and electrical panels. Leave at least 30 inches clearance in front of electrical service panels and fire extinguishers.

DO NOT FEED THE FIRE

Most transmitter buildings have large air handling equipment installed. While these systems maintain the temperature and the environment during day-to-day operation, they also will provide a rich source of oxygen for fires, especially when outside air is brought into the building.

(Continued on Page 12)

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World Radio History

Transmitter Shack

by John White, CBRE

Continued From Page 10

The solution to this problem is to connect the alarm system fire detected tally to a series of control relays. which interrupt power to air handling equipment.

Should a fire be detected, air handling will be shut down to limit spread of the fire. Be sure *all* air handling is under alarm shutdown control, including any central HVAC systems.

PROTECTION OUTSIDE THE BUILDING

Most broadcast facilities are located in semi-rural or high elevation locations with natural vegetation environments. The Crawford Mt. Scott facility, for example, is located on ten acres of mixed meadow vegetation and older growth forest. These locations are susceptible to wildfire loss. Proper planning will reduce this kind of potential loss.

For new construction, choose non-flammable materials such as concrete or metal construction. For existing buildings, develop and maintain a fire safe landscape around your transmitter building, tuning houses and out-buildings. Create a "defensible space" by removing all flammable vegetation at least 30 feet from all structures.

Green space is not only environmentally desirable it is also a good wildfire defense. Remove dead leaves and needles from your roof and gutters. Maintenance and cleanup are the watchwords. At Mt. Scott the level areas are field-mowed to limit wildfire potential.

Other areas of the Crawford facility are steep and not accessible for field-mowing. In these areas hand clearing can be difficult or even unwise, as vegetation is an important component of slope stability. In these circumstances consider using intumescent fire barrier coatings (fire paint) such as FireFree 88 or Flame Seal FX-100 to protect tuning houses and cable raceways. These products expand many times the applied coating thickness forming of an extremely thick insulating barrier when exposed to fire

BEFORE THE FIRE DEPARTMENT ARRIVES

Unfortunately, all the planning in the world will not prevent all fire hazards. So, the first step in preparing for the Fire Department arrival is making sure that fire and law enforcement can find your transmitter facility.

Many broadcast transmitter facilities are located in obscure locations. Of course, if your transmitter is at the end of a ski lift, do not expect a quick response or large turnout. In that case prevention and protection efforts are even more important.

The first step is to develop a concise and specific set of instructions and map describing how to get to your facility. Start with the closest identifiable known point and describe step by step how to reach your building. If the route is obscure, it is often helpful to have a person unfamiliar with the route do a ride-along telling you what to do using your instructions.

In other words, test your instructions so the fire department will not have to test it for you while your building is burning.

Once the instructions are complete, provide a copy to the appropriate authorities. Some good choices would be central emergency dispatch, often combined with the 911 center, fire department, law enforcement and the fire/security monitoring company. Your alarm monitoring company must indicate special access instructions are needed or are on file when they report an alarm to the authorities.

All fire departments maintain records of hazards and special information relating to properties they protect. Many departments maintain the files at the local Engine Company and others may use a central registry. Police and Sheriff departments often do the same. Taking a few minutes to call the fire and law enforcement business numbers will answer questions and get the information to the appropriate files.

WHEN THE FIRE DEPARTMENT ARRIVES

The current vandalism and theft rate has encouraged improved security efforts. However, once the fire department is at your gate, your security efforts can become a problem. If the fire department is stopped at your gate, your building can be burning and they cannot get in. The delay, until they break in, can cause additional damage.

The solution is a rapid entry key lock box system. The system is an armored vault-like key box that contains keys to the property, to allow access to fire fighters – and *only* them – for use in case of emergency.

Knox and Supra are the two most common lock-box systems in use today. They are strictly controlled and will only be sold with approval of the local fire department. The fire department will meet you to install the box, put the keys in it, and initialize it. Any lock changes must immediately be reported to the Fire Chief. Only they can remove or replace keys in the box. Contact your local fire department to determine which system is used in your area.

In addition to the building keys, include keys to any locked drive and walk-through gates, as well as any access codes that may be needed.

Once the fire department has gained entry, the first thing you want them to see is the alarm enunciator panel and sight information. The alarm panel will tell the fire department which monitor points have been activated. The site floor plan will aid them as they work to investigate and fight a fire. Instructions on the operation of the alarm panel should also be posted.

The site floor plan should show all rooms, doors and floors of the building. Use the floor plan to note the location of important features. Some of the items that should be included are:

- Fire sensor locations.
- Light switches.
- Air handling systems.
- Door location and lock status.
- Sprinkler control.
- Fire extinguisher locations.
- Electrical panels.
- Volatile storage.
- Equipment shutoffs.

IDENTIFY CRITICAL ITEMS

To quickly make important items stand out, take a walk through your transmitter building and look for key items that should be labeled. Some items include Fire Extinguishers, Electrical Disconnects and Emergency Shutdowns. Use easily visible signs and make sure they are visibly unobstructed.

Mark all emergency items such as water sources. Mark danger areas such as high voltage and high RF areas.

Warning signs should include areas outside the building. Your safety signs at the tower fence are up to date are they not? Check for safety situations at other locations that may not be obvious.

For example at the Crawford Broadcasting Mt. Scott transmitter facility, the communications tower is detuned for both AM frequencies. Because of the close proximity, the induced RF voltage on the detuning skirt is quite high. At Mt. Scott this location is marked in addition to the required tower signs.

PREPARATION SAVES COSTS

The basic principal is anything you can do to reduce risk, improve protection, or increase access for firefighters will pay off. In many cases, the things you can do are simple and inexpensive. Other steps may well result in reduced insurance rates.

One last comment: To use an old saying, "a fire fighter's life is long periods of boredom punctuated by short moments of terror." Fire engine companies are always on the lookout for training opportunities to meet ongoing professional training requirements.

You might want to consider contacting your local engine company to make your facility available for a training session. Two years ago Crawford Broadcasting hosted an aerial rescue training session for each of the three engine companies shifts. My observation is that the increased familiarity with my facility by the people who would be responding to emergencies is a real plus and will pay off handsomely should there be a need in the future.

Additional Information and Product Resources

National Fire Protection Association
http://www.nfpa.org/

U.S. Fire Administration
http://www.usfa.fema.gov/

Aero-K Aerosol Generators
http://www.standbymonitoring.com/aerok.htm
http://www.firecombat.com/

FireFree 88
http://www.firefree.com/

Flame Seal FX-100
http://www.flameseal.com/

Knox Rapid Entry Lock Box
http://www.knoxbox.com/store/

Supra Rapid Entry Lock Box
http://www.geindustrial.com/ge-interlogix/supra/
(now part of GE industrial)

Rapid Entry Lockbox General Info
http://www.capitalock.com/suprasafe.pdf

Hazard Signs
http://www.radhaz.com/rfsigns.htm
http://www.rfsafetysolutions.com/rf_safety_signs.htm

Informational Signs
http://www.graphicproducts.com/smdlabels/smdlabels001.html

John White is Chief Engineer for the Crawford Broadcasting stations in Portland, OR, and manages their hilltop site, which includes 3 self-supporting AM towers for KKPZ and KDZR. You can contact him at jdwhite@teleport.com

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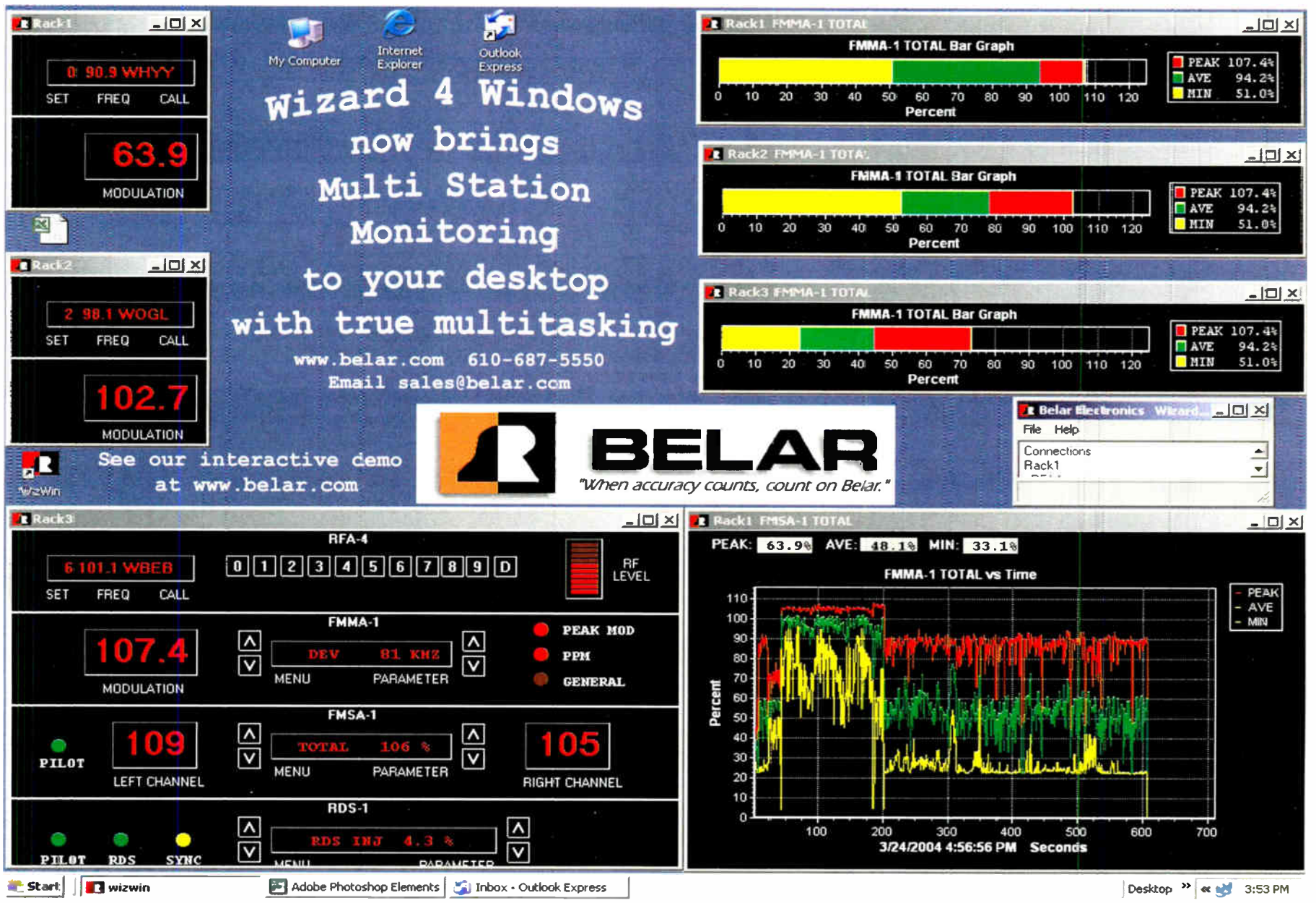

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World Radio History

Transmission Guide

by Phil Alexander

Measuring AM Power

Part 3: Getting Back to Normal

[INDIANAPOLIS, Indiana] A primary goal for any AM station operating on the Indirect Power Measurement method, aside from fixing the problem, is getting back to the normal Direct Power Measurement. But, is it automatic? That question came up after the second part of our article about AM Power Measurement last month.

The answer is yes ... and no. If the reason you went to the Indirect Method was temporary and/or the base impedance did not change more than 2%, then you can immediately go back to the Direct Method. However, if the resistance shows a change of more than 2% from the licensed value, Section 73.45(c)(1) of the FCC Rules says you must file an application for Direct Power Measurement on Form 302AM, and you need to wait a bit until the FCC grants your application

While you might get away with resuming direct measurement immediately after taking resistance measurements, it probably violates Sec. 73.45(c), and clearly violates the spirit and practice of that Section. At least I think that is the way the FCC staff will see it.

WHAT THE RULE SAYS

The problem is Sec. 73.45(c) is not too clear. It says: *"The licensee must make a new determination of the antenna resistance using the procedures described in Sec. 73.54. Operating power should then be determined by a direct method as described in Sec. 73.51."*

Some have interpreted "should then be determined" to mean immediately determined, but the Rule goes on to say you must file form 302 if the change is greater than 2%. You need to ask yourself, "Why do they need an application if, in reality, it is only a notice?" The answer is, it is *much* more.

In fact, it is a change in your license, and only the Commission itself can do that. That is the reason you must use Form 302AM; technically you are applying for a modification of your license, and is essentially same thing as a license to cover a construction change. That is the purpose of Form 302AM, and its other use is as an application for license to cover CP.

If you follow the daily summary of Broadcast Actions by the FCC you will see the "AM STATION APPLICATIONS FOR DIRECT MEASUREMENT GRANTED" heading nearly every day. It is hard to imagine the Commission would waste their time checking and granting Form 302 applications for direct measurement unless they expect you to wait for your approval and then resume direct power measurement.

WHY THE RULES CONFUSE

You might ask how the Rules became so confusing when they were rewritten in 1992. You might ask, but finding the asnwer may be difficult.

Fifteen or twenty years ago, nearly all stations had engineers. The Rules and usual practice were well known. Today, things are a bit different. Many of the AM oldtimers have retired, and there is not enough time to become an expert on all the Rules. Furthermore, many of today's engineers and technicians have spent most of their careers working in FM where there is nothing similar to the base impedance measurements that are common in AM.

One answer is the folks at the FCC who do the work are ordinary human beings just like the rest of us. They can be baffled by what was done 40, 50 or 60 years ago too. It is difficult to be sure, but it looks like that may have happened with the Rules for returning to direct measurement. It appears they may have scrambled the cross-references at some point as changes were made.

If you compare the current (2004 ed) of Section 73.45 with 73.54 they do not match up. It appears one was updated without updating the other. It also appears there may be a cross-reference error predating the 1997 on-line edition of the Rules; it may date to changes made in the mid-1980's, or perhaps before that.

In this environment, other errors are also possible.

SORTING IT OUT

Never-the-less, the operative Rule states:

"Sec. 73.45(c) Should any changes be made or otherwise occur which would possibly alter the resistance of the antenna system, the licensee must commence the determination of the operating power by a method described in Sec. 73.51(a)(1) or (d). (If the changes are due to the construction of FM or TV transmitting facilities, see Sections 73.316, 73.685, and 73.1692.) Upon completion of any necessary repairs or adjustments, or upon completion of authorized construction or modifications, the licensee must make a new determination of the antenna resistance using the procedures described in Sec. 73.54. Operating power should then be determined by a direct method as described in Sec. 73.51. Notification of the value of resistance of the antenna system must be filed with the FCC in Washington, DC as follows:

(1) Whenever the measurements show that the antenna or common point resistance differs from that shown on the station authorization by more than 2%, FCC Form 302 must be filed with the information and measurement data specified in Sec. 73.54(d)."

However, it does not appear the 73.54(d) reference is correct. Look at what it says:

"73.54(d) AM stations using direct reading power meters in accordance with Sec. 73.51, can either submit the information required by paragraph (c) of this section or submit a statement indicating that such a meter is being used. Subsequent station licenses will indicate the use of a direct reading power meter in lieu of the antenna resistance value in such a situation."

Clearly, this refers to using a direct power meter, and was formerly Section 73.54(e). Thus, it appears that the reference probably does not refer to 73.54(d), but actually should refer to 73.54(c) which says:

"73.54(c) A letter of notification must be filed with the FCC in Washington, DC, Attention: Audio Division, Media Bureau, when determining power by the direct method pursuant to Sec. 73.51. The letter must specify the antenna or common point resistance at the operating frequency. The following information must also be kept on file at the station:

(1) A full description of the method used to make measurements.

(2) A schematic diagram showing clearly all components of coupling circuits, the point of resistance measurement, the location of the antenna ammeter, connections to and characteristics of all tower lighting isolation circuits, static drains, and any other fixtures connected to and supported by the antenna, including other antennas and associated networks. Any network or circuit component used to dissipate radio frequency power shall be specifically identified, and the impedances of all components which control the level of power dissipation, and the effective input resistance of the network must be indicated."

It is also possible that it once referred to an earlier version of 73.54(c) that described the exact manner of measurement over a 50 kHz bandwidth, centered on the operating frequency, which was dropped from the Rules a few years ago.

Regardless of the correct reference, it is clear there is an error, and that fact lends less credibility to the integrity of the entire section.

THE MAIN POINT

The key fact is there are times when the governing Rule, 73.45(c)(1), *requires* an Application for Authorization on Form 302AM.

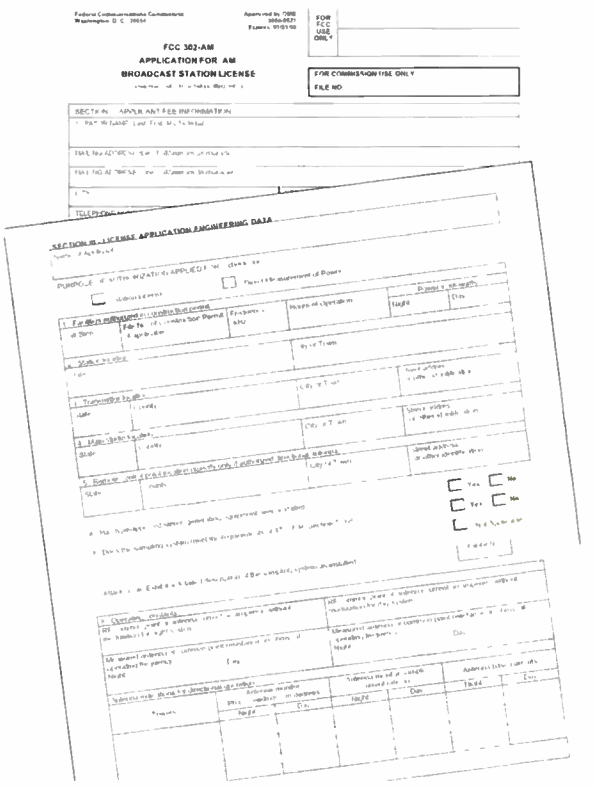
While these applications are *(if correctly filed with supporting exhibits in proper order)* routinely granted by Commission following clearance by the Audio Division, their granting is a reported Commission Action. That point is important, because it must come from the Commission itself. In the case of a change that is less than 2%, the license is *not* changed and technically the previous resistance is the licensed value because there has been no action by the Commission.

Notwithstanding the ambiguous language of the Rule where it states: *"Operating power should then be determined by a direct method as described in Sec. 73.51,"* it does not seem appropriate to use an authority *before* it is granted by the Commission, because, until they grant it, that authority does *not* exist!

THE BEST COURSE

When this question arose, I spoke with a respected member of the FCC Bar who is in daily practice before the Commission, and he concurred that, although the language of 73.45(c) is ambiguous, "It would be prudent to await the Commission's grant of the 302AM Application before resuming direct power measurement."

It is doubtful the language would support a Notice of Apparent Liability. It is likely any action would stop with supervisory review of a Citation issued for "premature return to direct measurement," or, at worst, following a correct response to a Notice of Violation. Still, I would not want to be the one to test the alternate interpretation. Inspectors tend to have long memories, and I have always felt it is better to be sure they are good memories of an easy inspection.



FCC Form 302-AM

Perhaps it would be better if the entire group of Rules pertaining to AM power were re-codified to clarify them more precisely for the occasional user. As IBOC deployment proceeds, base impedance re-measurement will probably become more common; and confusion about correct paperwork is something we do not need.

I am not prepared to say positively that those saying the Rule permits immediate direct measurement are in error, but I will say that on the surface, it appears to be a wishful interpretation. Neither the communications attorney I consulted, nor I, have ever heard or seen such an interpretation; and the attorney said he would advise any client to file the 302AM application and wait for Commission action.

NO REAL DIFFERENCE

Something else: when a measurement is made, a true efficiency factor can be determined and the transmitter calibrated at that time. Thus, except for transmitter to antenna coupling-unit line-loss, the difference in radiated power is nil. Therefore, a rush to return to Direct Measurement is essentially hair-splitting for no real gain in output.

The moral to this story is to take good data. If it shows a change over 2%, present it in a report as the exhibit required by Form 302AM, and wait patiently for the Commission to grant your authority to use the new value.

A long time engineer, with experience in manufacturing and technical support, Phil Alexander is based in Indianapolis, IN. You can email Phil at: dynotherm@earthlink.net

World Radio History

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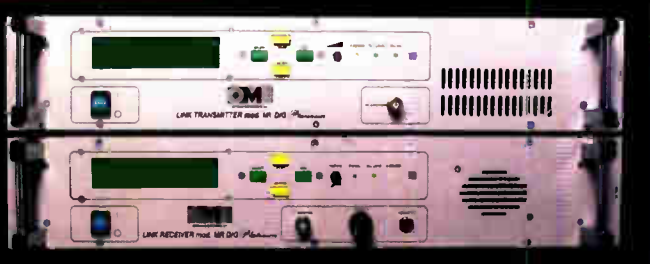

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World Radio History

Power Supply

by Ronald J. Dot'o Sr.
KWBY/KCKX

EMP Protection
What? Why? How?

[WOODBURN/STAYTON, Oregon] Why should you be interested in EMP protection? Give me a chance and I will tell you why. It will extend the life of your solid-state equipment as well as provide lightning protection, and it is inexpensive.

BACKGROUND

During the '80's, the Federal Emergency Management Agency (FEMA), wanted all of the Emergency Broadcast System (EBS) stations hardened against a possible high altitude nuclear burst. The worry concerned the induction of high voltage pulses, termed Electromagnetic Pulses (EMP), into power, cable and phone lines and long conduit runs.

Such a voltage spike would jump contacts after the breakers pop and start fires over a wide area of the U.S. while knocking out communications to first responders, just to add to the general mayhem.

EMP spikes happen a lot faster than lightning spikes, so conventional lightning protection devices are not fast enough to save equipment. But EMP suppression is fast enough for both EMP and lightning, and protects equipment from voltage transients that most voltage regulator circuits and UPSs are not fast enough to handle.

LEARNING ABOUT TRANSIENTS

Each time a spike enters your equipment it stresses the solid-state components and low voltage capacitors until the device eventually gets tired of being hammered and fails. After all it only takes one chip to ruin a computer motherboard! Now, how valuable would you consider EMP protection?

FEMA put on schools for engineers and technicians to install suppression devices in order to harden the EBS stations and Emergency Operating Centers (EOCs). What I propose to share with you is a condensation of what was covered there.

Many have learned the hard way how one lightning hit can fry a whole station. Towers, being the wonderful lightning rods that they are, can attract pulses which can play havoc with the output stage of solid-state transmitters, not to mention RF Ammeters left in the circuit (shame on you!).

Actually, if you hang a fast enough scope on the power line you will see frequent voltage spikes riding the 110 VAC every time an electric motor in your facility, or home (air conditioner, refrigerator, shop vacuum, etc.) kicks off and the field collapses causing a back EMF to induce a healthy voltage spike back into the wiring all over the building.

As an added bonus, if you and your next-door neighbor are fed from the same pole transformer you get to share transients. Cool huh? In addition, many spikes may also come courtesy of the electric company.

Fortunately, for the cost of one professional solid-state unit such as a CD or Mini-Disk unit, you can buy all the components that you need to suppress the continuously occurring voltage spikes on the power line and occasional lightning hits on power, cable and phone lines.

Adequate protection consists of attention to two areas: Grounding and Surge Suppression.

GROUNDING

In order to get rid of a voltage spike you need to give it someplace to go – and that place is *to ground.*

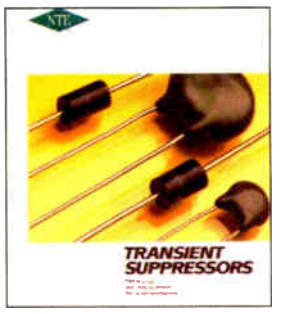
We hope your facility's primary power wiring is up to code and the ground receptacle in the wall outlets really goes to a ground instead of being blank, the receptacle being fed with old two-conductor Romax. If it is two-conductor Romax, then you are going to have to run some external grounds. Every breaker box has a ground. If all else fails, you can use the breaker box ground as a last resort..

In running an external ground, try to keep the bends to a minimum as the inductance of the bend slows down the path of the spike to ground. While you are at it, find the ground rod for your facility and make sure that the ground wire from the breaker box is physically connected to it. I found the one for my home broken off, so it can happen.

The same goes for the transmitter plant equipment. The better the ground the better the suppression. Consider the bonus on-site if you have an AM station: you should have a really good ground in the antenna ground system!

SURGE SUPPRESSION

Surge suppression should be done in several stages: At the breaker box, with multiple outlet surge protected power strips, phone line surge protectors, individual surge protectors and, in extreme cases, wiring protective devices like Metal Oxide Varistors (MOVs) into individual wall outlets, with disk type MOVs from the hot terminal to the neutral terminal, as well as from the hot terminal and the neutral terminal to the ground terminal.



Next time, we will discuss more about MOVs, as well as other suppression devices: Zener Diodes and Gas Gaps.

Ron Dot'o was a contract engineer in the '80's handling sixteen stations and barely making a living. Today he is semi retired and barely making a living. You can reach this "Nutz and Boltz Engineer" at: ron_doto@msn.com

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World Radio History

Leading POTS Codecs Compared.

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

Maintenance Guide

by Gary A. Minker

Line Sweeping

Part 3: When Should You Do It?

[LAKE WORTH, Florida] Be honest now; the Managing Engineer of any transmission system should know the answer. The previous two articles (**Radio Guide** May 2004/February 2005) should have given you the really big clues.

Answer 1: Annually or at least semi-annual line sweeping sessions often will warn you of any impending problems that could affect your system, provided they are the slow growing type due to age and not some EMP related nuclear event like a lightning strike.

Answer 2: Whenever the last set of corroborative transmitter readings, your most recent line sweep results, and your eagle eye on your reflectometer tell you: "Houston, we have a problem."

From lecturing around the country on this topic, I know some of you are sitting there saying: "I've been in this business since I had lunch with Marconi and I know when I'm in trouble." Good for you. But some of the guys out there do need a little help.

ANALYZING THE SITUATION

Consider some of the trouble signs: Does your Wattmeter do the Watusi with varying modulation levels or black levels? Do your ammeters wander inappropriately? Does your reflectometer dance? Do you have a new ghost in your recovered in-line sampled video? Did your stereo separation suddenly go south? Are you having trouble making AM synchronous noise specs? Is your DTV signal "invisible?"

And then there is the really big one: did someone call you, and ask you when you added a little red light at the top of your tower when you just finished installing that new white strobe system?

Yes, these are dramatic examples, but I see them every day.

Fortunately just like backing up your computer (you do, right?), you have the copy of your last line sweeping event and can make an informed decision to bring in an inspection crew and your favorite Line Sweeper before your suspicions turn in to an expensive unplanned outage.

The technical symptoms that can arise may be subtle at first. Diligence and accurate monitoring equipment are your closest allies here. The subtle changes are the tough ones. Seasonal changes having to do with temperature and icing, small flying creatures living inside the antenna or radome en masse, or humidity are often tough to see coming.

Slow growing problems like bullet connections and other joint issues can be insidious. On the other hand, a sudden loss of pressure, or the confirmation that you used to flow 0.2 cubic feet per hour up the pipe and *now* you are flowing 2 cubic feet per hour, is a much more sure sign that something is amiss.

DECISION TIME

You have choices at this point. You may see the need to be proactive, or you could dawdle, allowing a cost cutting issue to become a seriously sore point between you and your Manager and ending up as an expensive reactive issue. Yes, I *am* trying to get your attention!

There is a patent out there for a Transmission Line Safety Monitor that claims to be able to observe a line failure before it becomes a reactionary event, but like the 100 mpg carburetor, it is not on the market. So you need to really have your decision-making wits about you and decide to be proactive.

GOING INTO ACTION

I do not know about you, but I would rather a problem in my plant be anything except the antenna system. Referring back to the graphical Time Domain Reflectometer traces from last month, you can see the line sweeping event you just called for can reveal many issues for you.

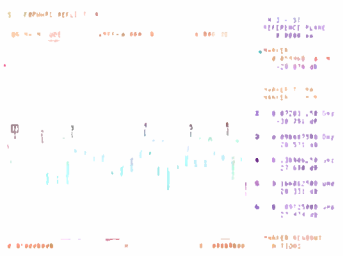


Figure 1: Healthy Return Loss

In **Figure 1**, we see a return loss trace shot in Log Mag that gives the warm fuzzy feeling of a great antenna system with the average return loss hovering around 30 dBm.

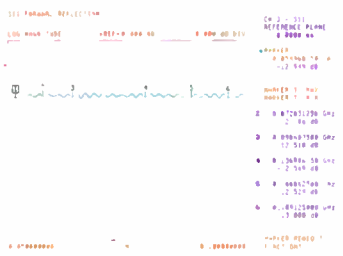


Figure 2: Poor Return Loss

This translates out to a nominal 1.05:1 VSWR. This is a great return loss in just about any arena. Your problem would be located somewhere else in your system. Perhaps a simple metering error.

Figure 3: Healthy TDR/FDR

Figure 2 unfortunately confirms your worst suspicions. You have a transmission system failure and the Wattmeter, though usually not a clear indicator, comes through in this case.

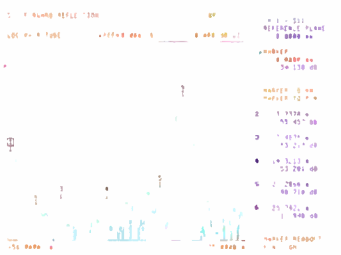


Figure 4: Damaged TDR/FDR

Veterans of this industry can attest to the fact that a charcoal briquette that used to be your flange 17 bullet can handle tens of thousands of Watts before it gets to be an issue that the Wattmeter will ever see.

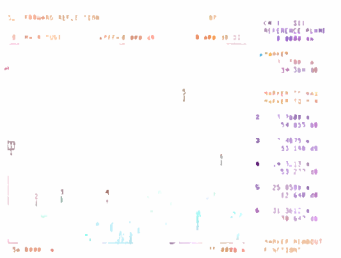


Figure 5: Line Problem Anomaly

Now, where is this pesky problem? You have 2,000 feet of line and a 12-ton pylon up there. Some tower crews will have you just break the line open here and there, take a whiff and – providing the accompanying air leak has not migrated all that soot, smoke and toxic fluorine gas out some gaping hole – look for charcoal parts.

I do need to add a note here and state that anyone who opens up a transmission line for no good reason (i.e., there was no problem at that location) will probably create one for the future. In short, do not just open your line whereever and whenever you want.

LOCATING THE PROBLEM

I defer to **Figure 3**, which pops out of the Vector Network Analyzer, operated by someone in whom you have faith. This is the TDR trace of a healthy line. Coupled with **Figure 1**, **Figure 3** will be telling you that the problem is not in the transmission system. A good input-coupled connection along with a good-looking load usually equal **Figure 1**. Today is not your lucky day. You are the proud owner of **Figure 2**, which is the *very* poor fire-prone return loss.

Now you have a sinking knowledge that your upper complex or your antenna has bit the dust. It is time to get a crew up the tower with a mating reducer to N-type female and a precision load, remove the last element of the complex and cap the line. Whew, what a relief, the return loss trace settles in again to look something like **Figure 1**. A cry of joy rings through the room, until it suddenly dawns on you that if the line is fine, the 12-ton pylon is the culprit; your next 60 days look pretty bleak.

A DIFFERENT OUTCOME

OK, let us change things a bit, and make the news better. You are the unhappy recipient of the poor result trace of **Figure 2**. The TDR/FDR trace that pops out of the Vector Network Analyzer looks like the one in **Figure 5**. Up the tower goes the crew armed with the reducer and load. Off comes the complex and on goes the cap. The return loss in **Figure 2** changes just a skosh but essentially stays the same. The TDR trace of **Figure 5** stays essentially the same.

In this scenario, you can breath a sigh of relief, realizing the pylon is fine and you just lost a bullet – or perhaps you found the one your neighbor just shot at you. At this point whether it is an age failure or a simple case of lead poisoning, the rest is no big deal: two inners, a bullet, an "O" ring and some new bolts, perhaps an outer, and silicon grease for parts. Do a serious disassembly session to wipe out any resulting soot, and you are back in business on your terms, for minimal monies and as a planned outage.

Congratulations, you are a hero.

Looking back to the thrust of this article, ask yourself again: "When should I Line Sweep?" The answer is easy to justify. Data is good. You can reassure your Manager that *more* data is better, and now that you made a potentially devastating and expensive problem into a cheap and managed one, no one will argue this point with you ever again.

That is a much better outcome than your manager finding you with a deer-in-the-headlights look when you are off the air and that extra little red light is flickering at the 3/4 elevation of the tower.

LEARNING FROM THE DATA

Just like learning how to read schematics, it is not too difficult to gain some ability to interpret the graphical traces from the Network Analyzer. It is important to be familiar with these graphs; the interaction between you and the Line Sweeper is critical.

It is not sufficient in this case to simply leave the driving to the technician, and stand and smile when he points to various markers on the screen and attempts to tell you what is going on here. As Managing Engineer or Chief Engineer, you need to have this informed interaction with the technician in order to promote efficiency in the diagnostic and repair process.

There are many great primer books on these theories that are available from the NAB and the Amateur Radio Relay League. Some of the information is petty rudimentary, but the notes will get you thinking. This new information, added to the before and after traces provided by your Line Sweeper, you can add a new item to your list of skills.

Gary Minker is the Owner of Radio Works R.F. Consulting in Lake Worth, FL. He can be contacted at gary@radioworksrfconsulting.com

World Radio History

The routing switcher gets a new twist.

(About five twists per inch, actually.)

Everybody needs to share audio. Sometimes just a few signals — sometimes a few hundred. Across the hall, between floors, now and then across campus. Routing switchers are a convenient way to manage and share your audio, but will your GM really let you buy a router that costs more than his dream car? Unlikely.

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

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

Scalable, flexible, reliable... pick any three.

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

Are you still using PC sound cards?

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

Livewire

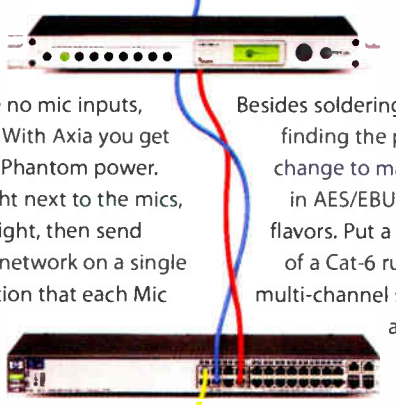
< · > 100/1000

There's a better way to get audio out of your PC. No more consumer grade ¼" connectors — with Axia your digital audio stays clean and pristine.

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

Put your preamps where your mics are.

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



Put your snake on a diet.

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

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

ENCO SYSTEMS INC.

Scott Studios

radio systems

BALSYS TECHNOLOGY GROUP INC

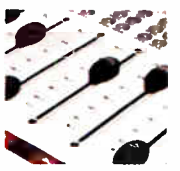
Axia is already working with some great companies. Like Enco Systems, Scott Studios, Radio Systems, Balsys Technology Group, and of course Telos and Omnia. Check AxiaAudio.com/partners/ to find out who's next.

With a little help from our friends.

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

Would you like some control with that?

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



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

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

AXIA

A TELOS COMPANY

World Radio History

Digital Guide

by Rob Meuser

Digital Transmission

Part 2: OFDM

[NEW YORK CITY, New York] In discussing digital transmission, we start by considering the various methods of encoding a digital signal into a practical RF channel. We find that by using various RF phase and amplitude states, we can encode more than one bit at a time on a carrier. In other words, we really have converted the digital signal into an analog value.

Our discussion left off with a basic QAM system that can represent the value of 4 to 6 bits at one time. QAM (Quadrature Amplitude Modulation) is also sometimes called constellation modulation. It refers to a signal that can represent certain digital values by a specific value of amplitude and phase.

The system described so far would not really work for terrestrial broadcasting for the following reasons:

1. The signal would be very sensitive to multipath and fading.

2. The signal would also be sensitive to phase irregularities across the pass band.

3. The higher the QAM order, the higher the required signal to noise ratio

4. Other factors, including the real necessary bandwidth, that also complicate the situation.

BANDWIDTH VS THROUGHPUT

Remember those first digital Morse signals mentioned last time? They have certain relevance here. Morse transmissions generally are capable of being received under very adverse conditions. This is accomplished by sending data at a low speed through a very narrow channel. If we can somehow narrow the channel, we can reduce the amount of noise and possibly interference.

Of course, it seems like it is an apparent conflict of physics if we want to send the same amount of data since we can only pass so much data in a given channel. Using a higher QAM value would help, but that takes us back to the overall fragility of high order QAM signals.

In the computer industry one way to move data faster is to send it in parallel. A good example of parallel data transmission is the PCI buss that exists in every desktop computer. How could we do this with RF?

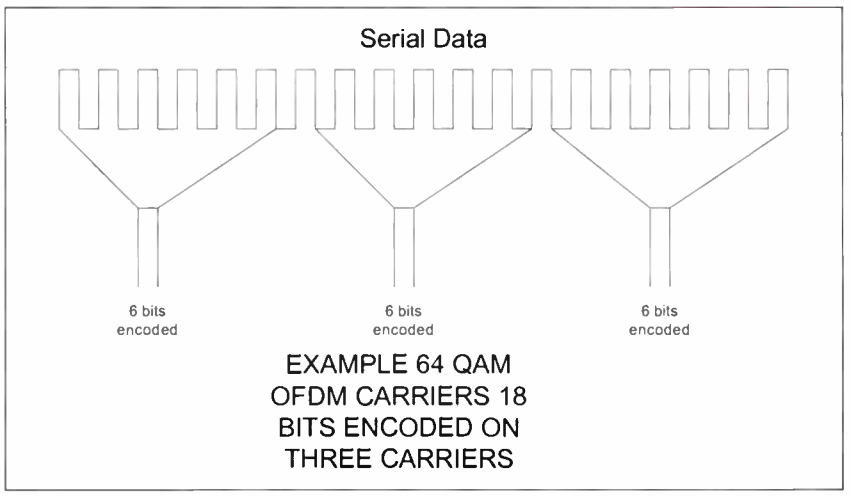
RF MULTIPLEXING

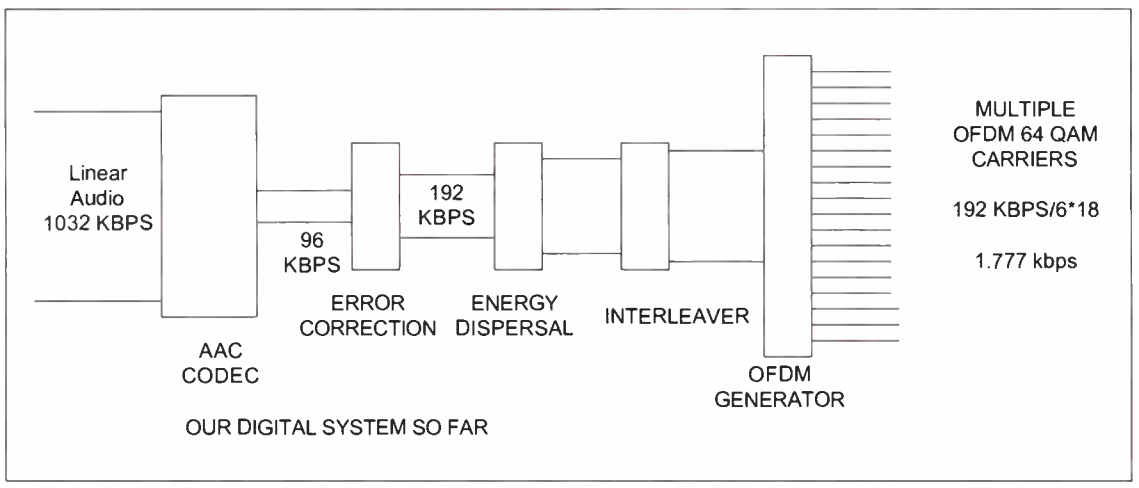
OFDM (Orthogonal Frequency Division Multiplexing) was developed to address this issue. Using the power of DSP, we can generate a large number of carriers, each carrying a portion of the data.

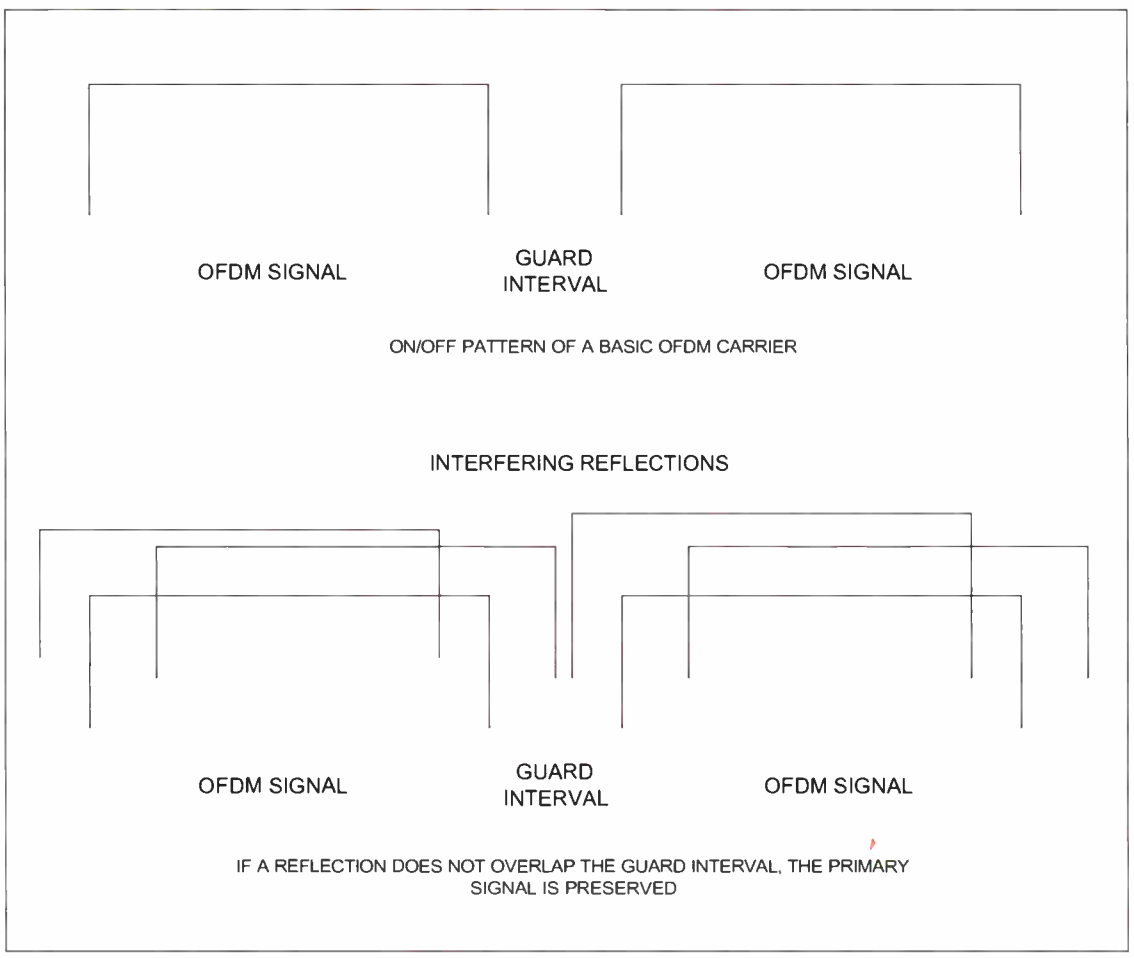
If we are clever, we can space them so the spectrum from the carriers interleave, thus making more efficient use of the available channel. In medium wave broadcasting, this spacing can be between 40 Hertz and just over 100 Hertz. This gives us a relatively large number of narrow channels.

Instead of transmitting data at its normal rate, we can divide that rate by 25 to 50. This provides a means to deal with some of the problems of transmitting a QAM signal. We now have a number of individual digitally defined channels each carrying a portion of the data.

One point to consider: all these individual carriers must pass through the transmitter's final output stage. If there is too much intermodulation distortion the carriers will interfere with each other.







MOVING SYMBOLS

Nothing is perfect, yet. Any of the individual carriers could be subject to destructive interference or possible multipath cancellation.

If we take the next step and assign the individual symbols to different carriers each time, we now move the data to carriers that are in the clear. In conjunction with error correction, the missing data can be recovered. With the low symbol rates, it is much easier to contain the Fourier series of sidebands each of the digitally modulated carriers create. (The symbol rate is a term that applies to the QAM.)

Instead of individual bits being encoded, several bit are encoded into a specific state. With 16 QAM there are 4 bits encoded. With 64 QAM there are 6 bits encoded and with 256 QAM there are 8 bits encoded. The number of QAM states determines part of the ultimate symbol rate and that is then divided across the number of OFDM carriers.

There is another benefit with OFDM transmission. We have reduced the symbol rate to a very long duration. This might range from 5 milliseconds to something over 20 milliseconds. This means the receiver has a long time to determine if the signal contains valid data.

WHEN MULTIPATH IS GOOD

There is also a remedy for handling multipath. If there is a dead space between symbols, we can accommodate any reflections that are delayed in time. This dead space is called a guard interval. If the guard interval is engineered to match expected propagation, multipath reflections can actually enhance rather than damage the signal.

The long symbol rates also offer a means to deal with impulse noise, long a major problem at AM frequencies.

We now have the basis for a functional digital broadcast system. The principles so far pertain to IBOC, DRM, Eureka 147, and at least one form of digital television. Not all these systems use the QAM building block, as there are other forms of modulation that can be applied to OFDM coding. We will investigate that further next time.

For over three decades, Robert Meuser has focused on the latest technologies for broadcasting. He welcomes your comments at robertm@broadcast.net

World Radio History

MORE PRODUCTS... MORE APPLICATIONS

TT-1

The tiny TOOLS™ TT-1 is more than just an ordinary telephone line coupler. The TT-1 is a rack-able compact telephone line powered auto-answer and auto-disconnect hybrid. The TT-1 utilizes dual-hybrid transformers providing full duplex audio at a plain old coupler price. We provide a rear panel multi-turn hybrid NULL trimmer to allow the user to achieve 20 plus db separation figures. TT-1 features include: Front panel Line Seize button; call Drop button; Auto-Answer/TAP switch; Audio Mute switch; Off-Hook and Ring indicators. The rear panel is equipped with a RJ-11 jack for the telephone line and a second loop-thru RJ-11 that may be configured to disconnect attached devices when the TT-1 goes off-hook. Screw terminals are provided for balanced send and caller audio; remote optically isolated seize and drop functions and one SPDT off-hook dry relay contacts. The TT-1 may be set on a desktop, mounted on a wall or up to four units mounted on the RA-1, Rack-Able mounting shelf.

The TT-1 Telco Tool

The DTD-16 DTMF Tone Decoder

The tiny TOOLS™ DTD-16 is a full-featured DTMF tone/sequence decoder that is user programmable to decode up to six tone sequences or a single tone and assign it to any one of four relays, twelve open collectors and/or the RS-232 serial port. The relays/open collectors may be programmed to close for the duration of tone, pulse immediately after completion of detection, latch/unlatch or exclusive operation.

The DTE-16 DTMF Tone Encoder

The tiny TOOLS™ DTE-16 is a feature rich DTMF tone/sequence encoder that is user programmable to encode up to 15 tone sequences or a single tone via any one of 16 contact closure inputs and/or the RS-232 serial port. Each input may be programmed to generate a tone for the duration of the closure or tone burst immediately on command. A passive mixing network is provided to mix both the program and encoder audio if required.

The VAD-2

The tiny TOOLS™ VAD-2 is a user programmable two-input multi-number voice/pager auto dialer with integrated stereo silence sensor, designed for dial out paging and/or voice message notification. Two SPST relays are included for remote control functions.

More products added monthly. Be sure to check our web site frequently.

The DC-8

The DC-8 Plus Dial-up Remote Control allows the user to control and monitor external devices from any touch-tone, telephone. The DC-8 Plus when called, will answer the phone line after a user programmable number of rings (up to 20), accept an access code (none to eight digits) and if valid, allow the control of six SPDT, two 2PDT relays and the monitoring of eight logic level status inputs. The DC-8 Plus is equipped with an adjustable audio hybrid, allowing the user to send and/or receive external audio, while controlling the unit

The STI-II

The STI II provides a hybrid interface between a single POTS line and a users PC COM port. The STI II is equipped with a programmable serial port, allowing control and monitoring via the users PC application software. This product makes those remote call-in recordings a snap while eliminating the DTMF tones. Various LED's, relays, pushbuttons, dipswitches and serial port comprises the user interface to the STI II.

The TS-6 Telephone 6 Six-Line Telephone Call Director

The TeleSwitch Six call director offers a low cost solution to interfacing up to six telephones lines to almost any hybrid. The TeleSwitch Six is supplied with one Switch Console and Controller. The units are interconnected via CAT 5 cable. A total of four Switch Consoles may be attached to the controller. The TeleSwitch Six is a dual-buss device, meaning that calls can be answered on the telephone set, while calls are active on the hybrid. With TeleSwitch Six, lines can be answered, placed on hold (MOH audio input), busied out and routed to a telephone set and/or hybrid.

The STA III Smart Telephone Autocoupler III

The STA III provides the interface between telephone line and user equipment. The STA III provides a self-null hybrid with balanced input and outputs. The STA III monitors the telephone line for CPC calling party control and long dial tone hang up signals, allowing use behind PBX telephone switches and POTS lines

The AVR-8 Voice Remote Control

The AVR-8 is a voice remote control system that automatically reports changes detected on any of its eight status inputs to a remote telephone and/or pager. After speaking a greeting message that may identify the source of the call, the AVR-8 then speaks a unique message for each status input. The user may customize each factory-recorded message. Additional features include; four SPDT control relays, balanced telco audio, access codes, eight phone numbers per input.

The DEC-16

The DEC 16 may be used as a dial-up; dial-out or direct connect DTMF decoder. The DEC-16 is capable of automatically calling out, answering calls or connecting to an ENC-16, DTMF encoder or other DTMF encoder

The ENC-16

The ENC-16 may be used as a DTMF encoder, dial-up, dial-out or direct connect interface. It is capable of automatically calling and connecting to a DEC-16 either on a dial-up telephone line or a direct wire connection. There are 16 input lines. Each input can be used to generate DTMF tone strings from 1 to 16 digits long. The ENC-16 can operate as a master or slave device. Set as a master it will it will automatically establish a connection to its slave encoder. If the connection is lost, it will re-establish contact automatically. Contact closures and/or its RS-232 serial port may control the ENC-16.

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World Radio History

Full Duplex

by George Nicholas

Resource Management 102

[CEDAR RAPIDS, Iowa] This is a continuation of our discussion in last month's Full Duplex, a sort of "Engineer's Guide" to finding answers from books, magazines and on-line. Since last issue, we have received some great ideas! Please keep them coming.

MORE BOOKS

One old friend of mine since my college days is the aptly titled *AM-FM Broadcasting* by Harold E. Ennes. Its first printing by Howard W. Sams & Company was in 1974, and it is now out of print, but copies can be acquired on the Internet from used booksellers such as Amazon.

As we have mentioned before, books on broadcasting published in the 1970's can be very "dated" on some things like equipment pictures and FCC allocations. However, Mr. Ennes' theory and historical information is timeless. Used book prices range from $38 to well over $70, depending on seller and condition.

The *Electronics Pocket Handbook* by Daniel L. Metzger is a great little pocket book. It is similar in size to the Pocket Reference we discussed last issue, only Metzger is able to cram over 325 pages of electronic formulas, IC pinouts, electronics math and a decent electronics dictionary in one small book. The latest edition is from 1998 and will cost around $20 at most bookstores.

While we have mentioned several books out of print or in limited supply, there are plenty of recent publications worth your consideration. A good source for these are SBE and NAB website bookstores; both of them usually offer discounts to members.

MAGAZINES

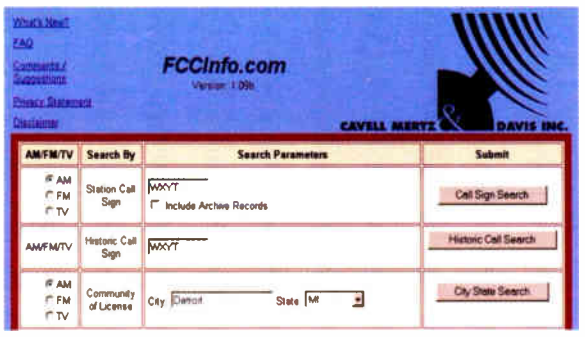
I subscribe to several magazines, if for no other reason than to keep them as reference material. *Nuts and Volts* is a great magazine at $25 a year if you are looking for a simple circuit while you are designing something from scratch.

Popular Communications deals a little with broadcasting, and mostly with the non-broadcast spectrum. But there are always one or two interesting articles on propagation and a great listing of ads for radio receivers, scanners, and peripherals for a subscription price of about $29 a year.

Of course there are monthly periodicals specifically for radio, including, of course, ***Radio Guide***. Editor Barry Mishkind also has a great site, www.oldradio.com. Besides radio history, may I suggest a shameless plug to purchase the BDR (Broadcaster's Desktop Reference) CD, with proceeds going to maintaining the site and future editions of the BDR. You can find information on the BDR website at: www.oldradio.com/bdr.htm

OTHER GREAT LINKS

One of my favorite links is www.fccinfo.com, offered as a service of Cavell, Mertz and Davis, consulting engineers in Manassas, VA. This site offers an incredible search engine and provides a plethora of information about a station, including AM pattern, RPU and STL licenses, licensee information, "if they don't have it, you don't need it!"



I also suggest www.dlr.com, the website of duTreil, Lundin and Rackley, consulting engineers in Sarasota, FL. Of particular interest in this site are the White Papers offered by the various engineers in the firm, including Ron Rackley. Covering many aspects of system design and operation, reviewing these papers is an education all by itself.

Another resource is the many Internet user groups and list-servers, including broadcast@radiolists.net, techassist@radiolist.net, and pubtech@lists.wduq.org. Fortunately these lists are moderated, which helps keep things on topic. Whether you want to network with other engineers, or get quick help in solving a problem, there are hundreds of engineers monitoring these lists and often ready with suggestions and tips based on their experiences.

You can subscribe free of charge to these and other lists by visiting their websites (www.radiolists.net or www.pubtech.org) and choosing between receiving regular emails or a consolidated digest version. While there are occasional rants about political and religious afflictions, typically there are one or two technical gems worth putting in your "saved" folder every day.

Please keep the dialog going. What other resources do you treasure? Drop me a note and let us all know!

George Nicholas specializes in technical and communications consulting throughout the US. If you have an experience to share, or an idea you would like to explore, email him at: georgenicholas@csi.com

Crash!

It's Not a Sound You Want to Hear at Your Transmitter Site.

Only BE delivers second generation HD Radio architecture, eliminating the need to have a PC at your transmitter site. How? The reference-design HD Radio signal encoder runs on a Linux computer installed at your transmitter site. The encoder could become a wildcard with a risk (at minimum) of taking a very long time to reboot. BE's second generation HD Radio architecture puts this computer in your studio, next to all the rest of the mission critical PCs that you have learned how to effectively coddle. While others promise this solution down the road only BE delivers today.

Total Radio

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Telephone: (217) 224-9600 • Fax: (217) 224-9607 • E-Mail: bdcast@bdcast.com

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Visit Nautel at NAB2005 Booth N2811

World Radio History

Products

Audio-Tx

STL-IP – Live Audio Over IP

www.stl-ip.com • Email: sales@stl-ip.com

AudioTX **STL-IP** is a 1U device designed for transmission grade audio over IP networks with a very low delay of only 5ms. It is suitable for studio to transmitter links, program distribution or sharing of any form of permanent or semi-permanent audio connectivity. It can send/receive linear (uncompressed) audio at up to 24 bit, 96 kHz sample rate, or can reduce the network bandwidth required using audio coding including ADPCM (between 128kbps and 384kbps), J.41 or professional grade MPEG Layer 2 coding.

It can be used within a building – over a standard LAN – or between buildings over your WAN. It can operate over Satellite, WiFi, private circuits like leased lines and T1/E1. It can even be used over high-speed internet connections.

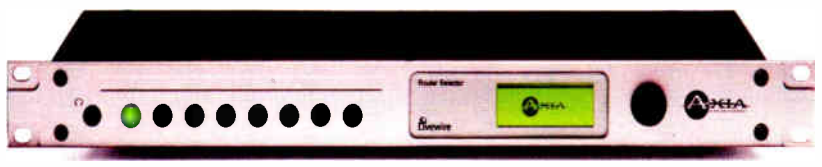
STL-IP can also send and receive ancillary data in sync with the audio (via an RS232 port) and has 4 logic level inputs and 4 outputs which are also carried end to end, in sync with the audio. It has balanced line level audio in/outputs on XLRs and AES/EBU digital audio in/out, again on XLRs. It offers a delay that is more than low enough for presenters to monitor in headphones.$2,800 per unit.

Axia

Router Selector Node

www.axiaaudio.com • 216-241-7225

The **Router Selector Node** resembles the X-Y controllers used with expensive cross-point audio switchers. The LCD screen lists available sources, which can be browsed and selected with the scroll wheel; eight "radio buttons" provide instant access for your frequently-used sources.



Unlike an X-Y controller, however, the Router Selector node has audio output direct to headphones, and analog and AES3 outputs. It even provides a convenient analog and AES3 input, making it ideal for production or news studios where operators typically both create and play audio streams.

Axia

Analog Line Node

www.axiaaudio.com • 216-241-7225

The **Analog Line Node** has eight balanced stereo inputs and eight balanced stereo outputs, presented on easy-to-install RJ-45connectors. The inputs are switchable to accommodate consumer level -10dBv or professional level +4dBu. The short-circuit protected outputs are capable of delivering up to +24 dBu before clipping.

Create an Ethernet audio snake with Axia Analog Audio Nodes at each end (or mix and match digital, microphone and analog line terminals), a single 100Base-T link can be used to send and receive 8 stereo audio channels, eliminating old-fashioned multi-pair cable. Studio-grade specs include 102dB of dynamic range, <0.005% THD, etc. Axia produces the very best quality A/D/A converters and low-noise components, so that each Analog node provides superior audio performance for high-end studio use.

Broadcast Electronics

FMi-201 – FM+HD Radio Transmitter

www.bdcast.com • 217-224-9600

The FMi-201 boasts the high performance common to all BE FM+HD Radio Transmitters. The FMi-201 sits in the middle of the FMi transmitter line, with a 2.1 kW FM + HD Radio or 875 W HD Radio only.

The DSP-based architecture of the incorporated FXi 250 Digital Exciter creates the only Direct-to-Channel exciter on the market. Based on BE's established FM-3C solid-state design, the FMi-201 has six plug-in power amplifiers and three power supplies, all fully redundant and accessible from the front. BE FM+HD Radio transmitters are unique in their ability to switch "on-the-fly" among FM-only, FM+HD Radio and HD Radio-only.

Advanced transmitter control and monitoring capabilities, as well as a super-low-noise cooling system to extend transistor life are among the other FMi-201 enhancements.

Broadcast Tools

tiny TOOLS VAD-2 – Auto-Dialer

www.broadcasttools.com • 360-854-9559

The tiny TOOLS **VAD-2** is a user-programmable, two-input multi-number voice/pager auto dialer with integrated stereo silence sensor, designed for dial out paging and/or voice message notification. The VAD-2 has two dry contact inputs and stereo silence sensor, which, when tripped, will sequentially dial a pager and/or up to four different phone numbers and play back a user recorded message corresponding to the tripped input. The VAD-2 is also equipped with two SPST one amp relays for the control of external equipment. The VAD-2 can store up to four 32 digit phone numbers and one 32 digit pager phone number which may be associated with any of the two inputs and/or stereo silence sensor.

The VAD-2 is capable of remote or local configuration and message recording with a total recording time of 16 seconds. The two SPST relays may be programmed for momentary, latching or tone duration operation.

Burk

Lynx 5 – Remote Control Software

www.burk.com • 800-255-8090

Burk Technology released **Lynx 5** as a major upgrade from previous versions of GSC3000 and VRC2500 transmitter remote control software. Lynx 5 provides a hands-on user interface for managing remote sites. Among other features, it offers customized data logging, automatic report-printing, on-screen history charting and drill-down alarm detail.

New in Lynx 5 is the real-time data update feature. Now Lynx receives status updates as they occur, without having to wait for periodic polling responses.

Lynx 5.1 makes its debut at NAB2005. With a new Virtual Channels feature, users create remote control channels derived from conditions on existing channels. Virtual channels provide a quick reference to verify conditions at multiple sites, or to check on critical processes that rely on several pieces of equipment working together. Software is included free with new VRC2500 systems, I/O units, or GSC/VRC Web Interfaces. Version 5.1 is a free upgrade from 5.0.

World Radio History

in Focus

Find the Latest Product Updates Here

CBT Systems

Dual Lens and Retro Style On-Air Lights

www.cbtsystems.tv • 858-536-2927

CBT Systems' retro style **Dual Lens On-Air Light** mounts on the wall or ceiling, and offers visibility from three different approach directions. The unit's Plexiglas windows, which are available in blue or red, can be illuminated by a single 120-volt bulb or two 12-volt bulbs. Standard legends include "On-Air" and "Recording." Custom lens colors, legends, color powder-coated finishes and a 220-volt option are also available. All units are UL approved.

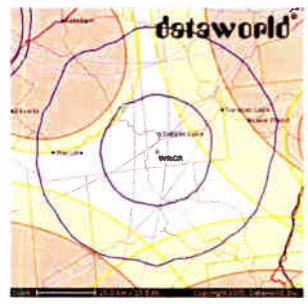
The **"Classic" ON-AIR Light** by CBT Systems brings the "Golden Age of Radio" into your broadcast studio. The aluminum housing is built using traditional sand casting methods and then buffed to a mirror-like finish. Available in either red or blue, the unit's Plexiglas window comes standard with ON-AIR or RECORDING legend. The whole unit can be easily installed on a standard 2 gang j-box and is UL approved. Custom lens colors, legends and an optional flasher module are available upon request.

Dataworld

FM Explorer – FM Allocation Program

www.dataworld.com • 800-368-5764

FM Explorer is a graphical allocation tool. It includes a multitude of features required for creative FM allocation work. It clearly shows fully-spaced areas in white, 73.215 permissible short-space areas in yellow, international conflicts in blue, and prohibited areas in red. It provides updated contours "on the fly" as you click on the map to move the transmitter.



For international and 73.215 short-spaced situations, FM Explorer draws protected and interfering contours in blue if there is no overlap. Overlapping contours are drawn in red.

FM Explorer allows you to play "what if" with transmitter location, channel, and class – not only for the study station, but for the conflicts, as well. Click on the call sign of the conflicting station to study and play "what if" with it. Then go back to the original station and the conflicting station stays modified as you left it. You may do this with multiple conflicts.

Map layers that can be turned on and off include: cities, county boundaries, highways, and locations of taller towers with estimated HAAT shown for each.

JK Audio

PBXport – Digital Hybrid

www.jkaudio.com • 815-786-2929

JK Audio introduces **PBXport**, the professional digital hybrid capable of providing talk show quality caller audio from your PBX phone system. PBXport allows you to send mic or line level signals into your PBX telephone system while maintaining excellent separation between your voice and the caller.

The balanced XLR output jack contains only the caller's voice, allowing full duplex voice conferencing through the existing PBX phone system without fear of echo and feedback.

PBXport provides connections for a microphone, headphones, mixer, telephone handset and your telephone set. Simply disconnect the handset coily cord from the base of your telephone, and connect this handset cord to the front or rear panel jacks on PBXport. Now connect the supplied cord from PBXport to your telephone base. The handset is disconnected when you press the "Online" button, and reconnected when you press the "Handset" button.

The digital hybrid sends your audio signal into the PBX telephone system through the telephone handset cord. The Digital Signal Processor (DSP) continuously monitors both transmit and receive audio signals to deliver excellent separation. This proprietary, dual-convergence echo canceller algorithm achieves excellent separation.

Sencore

DAG5161 – Digital Audio Generator

www.sencore.com • 800-736-2673

The Sencore **DAG5161** "SurroundPro" Digital Audio Generator is a handheld, multi-channel digital and analog audio generator. It provides stereo, Dolby 5.1 and DTS 6.1 surround, and PCM digital audio from industry standard AES/EBU and S/PDIF coaxial and Toslink outputs for testing professional and consumer audio systems and simplifying acoustic tests and calibrations.

The battery operated DAG5161 teams with the Sencore "SoundPro" Audio Analyzer for eight automated tests of A/V receiver and room acoustic calibration. The DAG allows installers to switch between speaker channels seamlessly to simplify calibration.

The DAG5161 provides all the test signals needed for audio testing and room acoustic analyzing such as variable frequency test tones, pink noise at various bandwidths, and impulse waves.

An audio technician using the DAG5161 will be able to run automated tests, capture the performance of the system, and make the necessary manual calibrations based on the test results.

Spacewise

ALLTALK and TALKRADIO – Studio Furniture

www.spacewise.com • 480-704-9385

Many of our customers buy these versatile **TALK Radio Systems** for all their studios, not just Talk Radio applications. The designing we offer is impressive, and makes any studio installation look big and impressive, especially when incorporating "creatively selected" hard pressure laminates.

The rounded bases and round arced tops with 1-1/2" 180 degree rounded bullnosing make them a showpiece that can be complemented as required with wire block backplanes, any number of racks and adjustable shelves and countertop equipment racks. Our ten years experience with standard quality materials allows us to provide studio systems that are durable and sturdy, that last and that are affordable. Of course SPACEWISE offers our "DESIGNED TO FIT" expertise with all our studio furniture systems.

V-Soft

Probe 3 – Propagation Prediction

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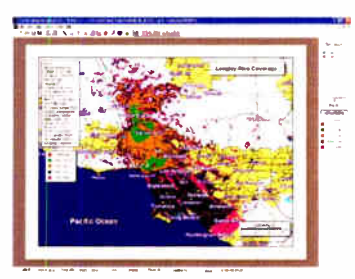


The program can be used to search for full service stations, translators and LPFM and uses high quality, atlas-like mapping. AM-Pro is a grouping of enormously powerful routines in one integrated program designed to calculate and map AM standard band broadcast coverage and perform allocation studies. The program uses M3 or R2 ground conductivity curves for daytime studies and the skywave formulas for nighttime analysis. V-Soft Communications provides many more innovative and reliable broadcast engineering software products.

World Radio History

Studio Guide

by Mark Shander

Microphone Talk: Part 1

[PHOENIX, Arizona] Acquiring new tools has always been a favorite subject for broadcast engineers and technicians.

For television folks, camera brands, camera types and camera specifications seem to dominate a lot of conversations. Production managers tend to lean one direction, frequently based on more subjective points, while engineers tend to lean another, based on economics, performance and long-term maintenance data and projections.

Radio studios and production facilities share the same story – everyone has a favorite microphone, preamp and processing solution, and everyone has at least a dozen justifications as to why they prefer a particular configuration for common environments.

FOCUS ON MICROPHONES

We intend to focus this discussion on microphones. We will do some testing of various microphone, even a few "shoot-outs" of similar models. But before we place microphones side-by-side and test them in real-world environments, we should review some of the more common places you find microphones in a radio broadcast facility, and why some types of microphones are generally preferred for particular placements.

If you would like to share comments about a particular microphone to which you are partial, please email us and let us know the manufacturer and model number. We can add it to our tests and see how your suggestions stack up against those of our other readers. Just email your recommendations and suggestions for testing to me at mark@shander.com

There are generally five places where you are most likely to find microphones in a radio facility (six if you count the miniature bronze Shure55 tie tacks FM DJ's are wearing lately. Talk about your trends!).

First, you will find them in the control room. You will also find them in talk studios, production studios, out in the field for use at remotes and newsgathering, and of course, you will find them in fine recording studios.

ONE FOR ALL?

Why not pick one microphone and standardize on it? After all, that way you can have a very consistent sound from one source to another, right? While on the surface it seems to make sense to buy the most expensive microphone you can afford and use it for everything – that will not work.

Imagine buying a Corvette and using it for everything from hauling furniture to taking the family out for an evening of fun. Sure, you can bring the family one at a time to the theatre, but in a van you could seat them all at once; it is more efficient.

It is the same thing with microphones. Microphones differ in their ability to provide the best quality sound under a variety of conditions. The goal is to purchase a microphone that captures your source material as realistically and efficiently as possible, given the physical environment and budget allowance as variables.

We should start with the "Master Control" environment.

WHAT IS NEEDED

Most master control rooms house a control console or switching system of some type. Unless your board operator or producer is expected to come up on air, quality is not as important as durability; the purpose of an MC microphone is usually cuing and talk-back – clean, clear and loud enough to get over talent IFB.

Hence, the microphone you might expect to see in that environment would be something like a dynamic utility microphone.

As we move toward a more controlled studio environment, the characteristics – not only of the microphone itself, but its performance under a variety of physical environments – become important.

One of the most controlled areas in which microphones are placed is in a talk studio. While you will have the occasional person shouting and ranting and raving into a microphone, for the most part sources are fairly controlled. There are differences, some subtle and some not, between how loud or how soft someone speaks, and like a good stage microphone, some of our old favorites are still the best available – they handle high SPL's (sound pressure levels) without "popping" or creating excessive sibilance.

At this point we do have to stop talking just about microphones for a moment, and consider the entire audio chain, through the processors and onto the air.

For each microphone in a talk studio, you can expect to connect an external microphone preamp (it may be part of a microphone processor). Microphone processors are cool! They are all about frequency response and dynamic range. A microphone processor will do leveling, that is help keep gain consistent even when your source might be soft-spoken or exceptionally loud. It makes it easier to tell a board operator where to pot a microphone fader up to, and is a must for a professional sound.

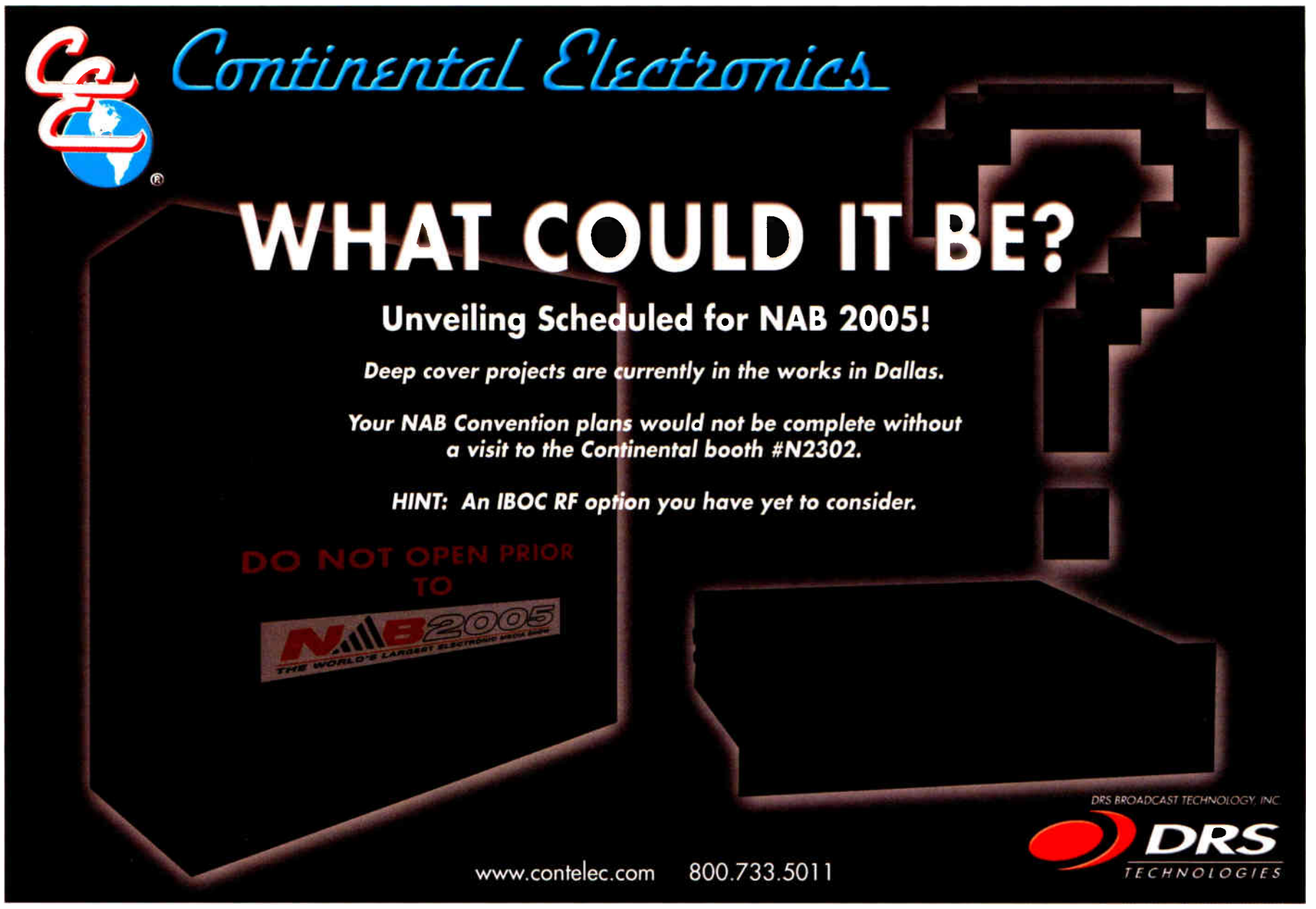
Microphone processing is usually a combination of compression, leveling and limiting, usually resulting in the sound perceived by the human ear to be louder. Compression reduces dynamic range, the difference between the softest sound possible and the loudest sound possible. For example, when micing the human voice, it is the difference between the softest whisper to the loudest scream.

As you add compression, you reduce gain and usually reduce high frequencies as well. That is why many microphone processors have EQ sections built in.

In our next issue we will talk more about which microphones are best suited for which environments, and why the best microphone for one station's studio application might not be the best microphone for another.

(Remember to send us a note about your favorite microphone models and tell us how you use them. In the end, we should be able to share to some fine suggestions and have a great "Microphone Shootout!")

Mark Shander has experience with using microphones in radio, TV and the Internet. He can be contacted at mark@shander.com

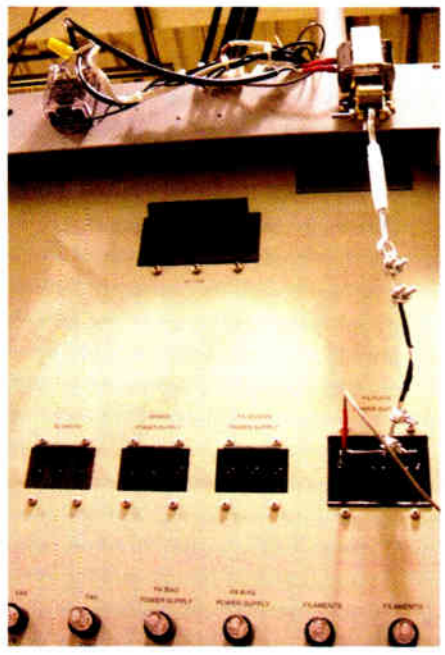


World Radio History

The Worst I've Ever Seen

A periodic display of curious solutions for technical problems.

It is a pain to have to drive out to the transmitter site, just to reset a breaker. What often makes it worse is when you sit there and watch carefully, after resetting the breakers, and everything works perfectly – with no indication that anything was wrong. Of course, you know what comes next: no sooner do you get back to the studio than the transmitter pops off again!



Remote "Manual" Breaker Reset

So, what can you do until a solution is found?

This picture shows a solution we have seen employed in a number of places. While perhaps not the prettiest sight, the solution gets the job done.

As with all these pictures, our purpose is not to embarrass anyone. After all, solving problems and keeping the transmitters on the air is one of the main reasons radio engineers are employed.

Indeed, we ought to share a chuckle of appreciation for the inventiveness of our fellow techies!

Do you have a picture demonstrating genius in engineering – or something that wouldn't quite measure up to the "Rube Goldberg" standards? Please – send it on to us, so we can share the good, and the not so good! Email to Editor@radio-guide.com

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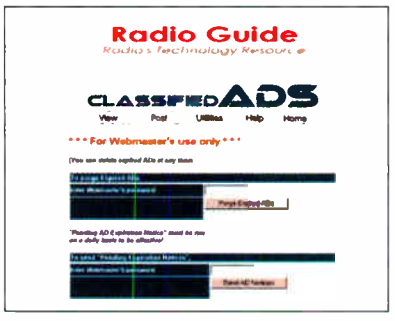

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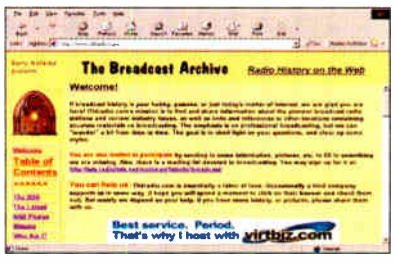

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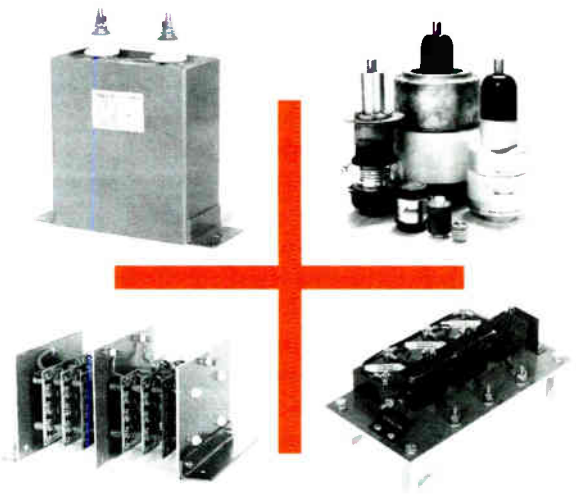

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World Radio History

Tips From The Field

by Clay Freinwald, CPBE

Modified Intake Air Filtering for Continental/Collins FM Transmitters

[SEATTLE, Washington] Back in the 1970's some engineers at Collins started with a clean sheet of paper and created what was, at the time, a very different design for an FM transmitter. In the process they used such innovative things as SCR power controls, grounded screen tetrode and a positive pressure cabinet.

Little did they know at the time that this basic transmitter design would continue to be produced some 30 years later.

A DIFFERENT APPROACH

The Collins decision was to use a fan to draw air in the top of the box, away from the dirt on the floor, and pressurize the cabinet so that the only air getting inside went through the fan and air filter. This was – and still is – a radical departure from the others, who to this day approach this issue in a hap-hazard manner.

The result of this was that owners of Collins and Continental rigs did far less transmitter cleaning.

A DUSTY PROBLEM

Over the years, under the Continental name, the product has been continually improved. However one area, unfortunately, was never improved and that was the matter of the method of filtering the air entering the unit.

Back in the middle 1980's I looked at, and discarded the foam air filter (after our trusty 831G2 ingested one) in favor of a couple of 2-inch pleated filters (Farr 30-30's) housed in what has been called "Clay's Tee-Pee."

The rationale behind this was two fold: 1) Use better air filters that will filter smaller particles, and 2) slow the air flow down through the filers. This worked quite well, and I was quite surprised to see this modification in a Continental publication, and eventually see a number of these around the country.

KEEPING THE CRUD OUT

While dealing with a problem involving a Nautel AM located next to a freeway – where the transmitter was ingesting carbons from vehicle exhausts – I was forced to do some additional research into better filtration.

In this process, I selected the Farr Riga-Flo – 90% filter. This critter is 20 x 20 x 12 inches in a big metal box. I installed a number of these in our pre-filter area and the carbon problem was eliminated. Wow! My mind then turned to the possible use of these on the Collins and Continental FM rigs.

My first installation was simple. I purchased a standard 20 x 20 filter frame, applied it to the top of the FM Rig with some adhesive and dropped in the filter on top of a freshly cleaned and tubed transmitter.

The first big test came when it was time to change the PA tube – about 2 years later. To my great pleasure, the inside of the transmitter was immaculate. I was impressed. This brought up another problem. How in the world would I know when to change the air filter?

WATCHING THE FLOW

At the AM plant, I had used a manometer to measure the pressure drop across the filter wall, so I installed one on the FM rigs to see just how long one of these "big-boys" would last. Surprise number two: these filters were lasting *years*! The secret to the filter is its 39 square feet of media area. Suddenly I could easily justify spending the comparatively hefty price for the filters on more than just having a clean transmitter.

I quickly learned that there is no way to determine when to change the filter without the manometer. Looking into the filter, after a couple years of operation, it will appear to be full of bugs, dirt and other stuff that would make you think it is time to toss it.

By this time you are probably wondering if this is some kind of April fool joke. Nope, it is for real. For the first time you will find that your transmitter cleaning will be reduced to wiping down a couple of HV insulators – and that is it.

A couple of years ago we had some engineers from another manufacturer in the building. They were explaining to me their frustration over failures caused by dirty transmitters. I was pleased to show them how to modify their transmitter, changing their transmitters' air-flow to the "Collins method" and adding a Rig-Flo filter.

Now then, if you have not made this modification to your Collins or Continental, and gotten the benefits, here is how you do it:

PARTS REQUIRED

1) Filter Frame, 20 x 20 Inches
FARR Model 079473-002
You do not need fasteners to hold the filter in the frame.

1) Air Filter, 20 x 20 x 12 Inches
FARR Model Riga-Flo, P-Series 200, 90-95% Efficiency Part # 122556034
FARR can be contacted at 1-800-432-7726

1) Manometer – Dwyer Model 25

INSTALLATION INSTRUCTIONS

1. Prepare the Filter Frame by attaching a piece of aluminum, centered, on one side of the frame to which you will mount the manometer. This need only be larger than the Manometer (Use pop rivets so as to not intrude on the inside of the frame thereby preventing insertion of the filter)

2. Mount the Manometer on the aluminum, using 6-32 hardware. (Make sure your mounting screws are level as it is important that the device be level; also make sure the screws are just long enough to mount the manometer and not interfere with the installation of the filter.)

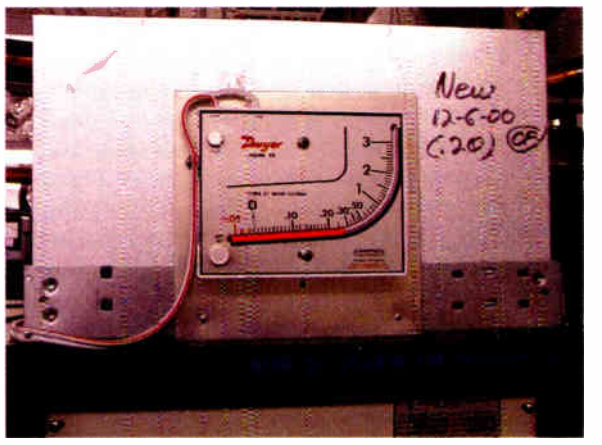
Warning: Do not add the gauge fluid at this point!

3. Remove the old air filter from the transmitter and discard. If your transmitter has a fan guard (made of expanded mesh), discard this as well, as it will add about 0.1 inch of static pressure (SP).

4. Attach the Filter Frame to the top of the transmitter with RTV or other suitable adhesive/sealant. There is no need to use fasteners, however you want to make sure the frame is air tight to the transmitter top.

5. Make sure that Manometer is level: adjust as required.

6. Now that the Frame and Manometer are attached to the transmitter, you may now add the Red Gauge Oil. Start by adjusting the calibrate knob (on the lower left) to the middle of its range. Then *carefully* pour the oil into the device (Warning: Do this *slowly*, as it is easy to add too much.) When you have reached the point where the oil is just visible on the scale – STOP! Adjust the device for a Zero Reading.



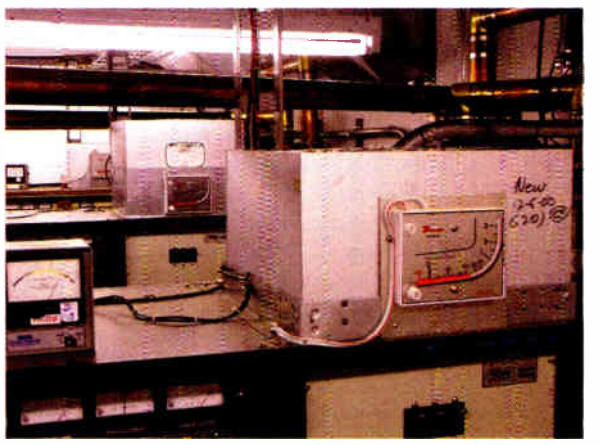
7. Discard all but 3 feet of the supplied Manometer hose.

8. Separate the two hoses so that you have one long piece (about 3 feet) and one short (about 1 foot)

9. Connect the hoses to the top of the Manometer with the long hose on the Manometer *input* and the short one to the other connection.

NOTE – THE TRANSMITTER MUST BE OFF TO PERFORM THIS PORTION

10. The long hose must penetrate the top of the transmitter and then enter the space below the filter. (The goal is to sample the pressure drop across the air filter; you do not want to sample pressure under the fan, but rather *over* it.) The end of the hose must be secured and should be dressed in such a manner that it is parallel to one of the side of the transmitter fan housing to avoid picking up the turbulence of the fan.



11. Carefully locate a place to drill through the top of the transmitter cabinet close to the edge of the filter frame. Check under the location you wish to place the hole to make sure that there are no major metal parts or components. I suggest you have someone hold a damp rag under the area of the hole to catch any stray filings.

(Continued on Page 30)

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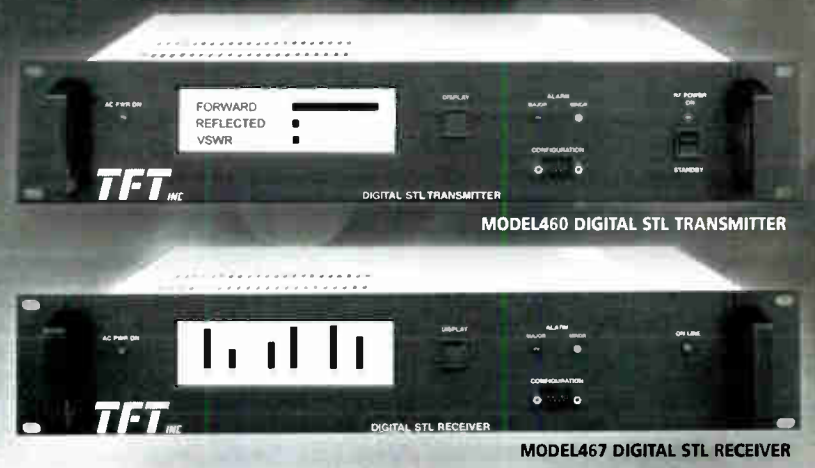

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World Radio History

Tips From The Field

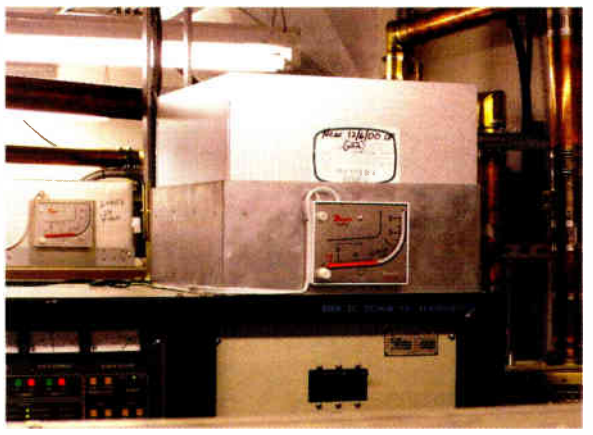
by Clay Freinwald

Continued From Page 28

I usually penetrate the transmitter top midway down the side of the filter frame on the left side, facing the transmitter.

12. Drill your hole just larger than the size of the Manometer hose

13. Next drill a hole in the *side* of the fan housing, above the fan, near the point where you have drilled the transmitter top. Drill down from the top.



14. Seal both of these holes, around the hose, using RTV etc.

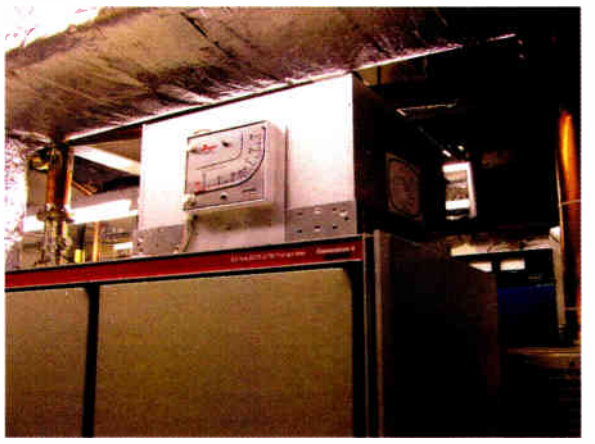
15. Dress the hose from the point that attaches to the Manometer down along the side of the device and then to the point where you have entered the fan housing. Remember not to cut the foot long portion of the house (to goal is to have it sample the air pressure within the room and be out of the way of the actual Filter Intake turbulence). You may secure this with small clamps or a dab of RTV.

16. Set the air filter in the frame. You will not require any fasteners as the filters weight will keep it in place.

17. Using a felt tip type marker, mark the date of your installation on the filter. This will, over time, clearly demonstrate how long these critters last. Remember – the *only* way to tell when the filter needs changing is by measuring the pressure drop on the manometer.

18. Turn on transmitter filaments and note initial pressure drop across the filter. Depending on the dynamics of your location, fan type, speed, elevation etc. this reading will vary. In Seattle, these usually start about 0.25 inches of SP. The Manometer should come with an adhesive marker to place on the scale of the Manometer to mark the starting point.

19. Enjoy your clean transmitter!

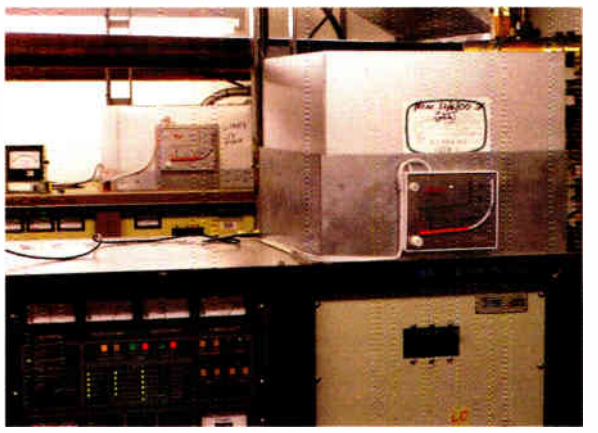


WATCHING IT WORK

The Manometer will tell you when its time to change the filter. The factory recommends that you change the filter at 1.5 inches of SP. I have found that the pressure drop on a new filter will be about 0.3 inches; I have been changing the filters at 0.5 inches.

If you *really* want to have a clean plant, consider the installation of a blower system that creates a positive pressure within your transmitter building and pre-filter the air using the same filters.

If you started out with a nice clean transmitter, you will, in short order, notice the dramatic improvement: most transmitter cleaning will become a thing of the past, with the exception of wiping down some HV insulators. Pollen, exhaust, carbons, dust etc., all will remain on the outside.



If you have a transmitter made by another manufacturer and are forced to clean the rig periodically, seriously consider following Collins lead of many years ago. You will quickly be thankful when you can reflect on those nights you used to spend cleaning the transmitter.

Clay Freinwald maintains a whole raft of very clean Collins and Continental transmitters for Entercom in Seattle. He is always happy to share his experience and answer questions. You can email him at cfreinwald@entercom.com

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World Radio History

Tech Tips

by Ken Benner, NCE

Some More Nems-Clarke Tips

In the October 2004 ***Radio Guide*** *Ken Benner shared some tricks to get more life out of the venerable Nems-Clarke 120-E Field Intensity Meters (also sold as the RCA WX2D). This month, he returns to share some more goodies.*

[TUCSON, Arizona] I was pleased to receive a number of e-mails in response to my recent article on the old Nems-Clarke Field Intensity Meters. Apparently, a lot of them are still in use!

You know these Nems-Clarke 120-E (or RCA WX2D) FIMs are rapidly approaching their weight in gold as the price of the newer field meters continue to escalate out of orbit. To quote my mentor, the late Consulting Engineer, W. D'Orr Cozzins from Salt Lake City, "Take good, loving care of your test equipment and it will take good care of you financially."

TIPS FOR REPAIR

One email offered a suggestion that involved using a simple screen-door spring cut to the proper tension to replace a defective original spring-loaded side-mounted cover tensioner to assure proper pressure for the antenna contacts. That will keep your unit running for quite a while.

Another good suggestion to keep an older unit in the field was to make a replacement for the carrying handle by using 15-20 strands of 1/16 inch nylon clothesline, covered with a good quality vinyl adhesive tape and sealed at each end with nylon wire-ties.

LISTEN TO A GREAT IDEA

Here is an easy to implement tip that may become one of your favorites: Bill Barry suggested a readily available battery operated audio-amp (Radio Shack #277-1008) and a 6ft patch cord with proper 1/4" and 1/8" male plugs (Radio Shack #42-2433) to monitor the audio when taking field measurements.

I really like this one. Indeed, on more than one occasion I have found myself in the embarrassing position of having measured the wrong carrier because I was in the field without the means to hear the audio.

In fact, Bill even made up nice little carrying case for the amplifier and wires, using a 5.5 x 3 x 2 inch camera case.

Finally, my friend Dave Smith (307-367-2182), who is now servicing these units, reports he is frequently able to bring these FIMs into (or very close to) calibration with simply a careful alignment procedure. If you would like some advice on how to maintain your meter, feel free to give Dave a call.

A simple monitor to use with the FIM.

5.5 x 3 x 2 Camera Case

Ken Benner is a veteran of many hours of field intensity measurements. He still loves his Nems-Clarke 120-E, and will not sell it to you. However, he would love to talk about it with you. His email is bennerassociates@aol.com

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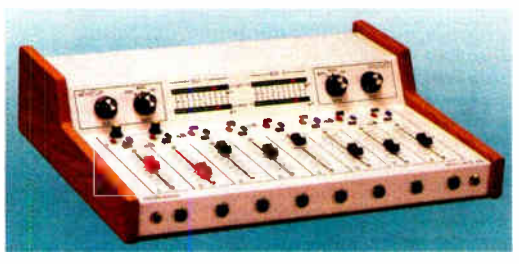

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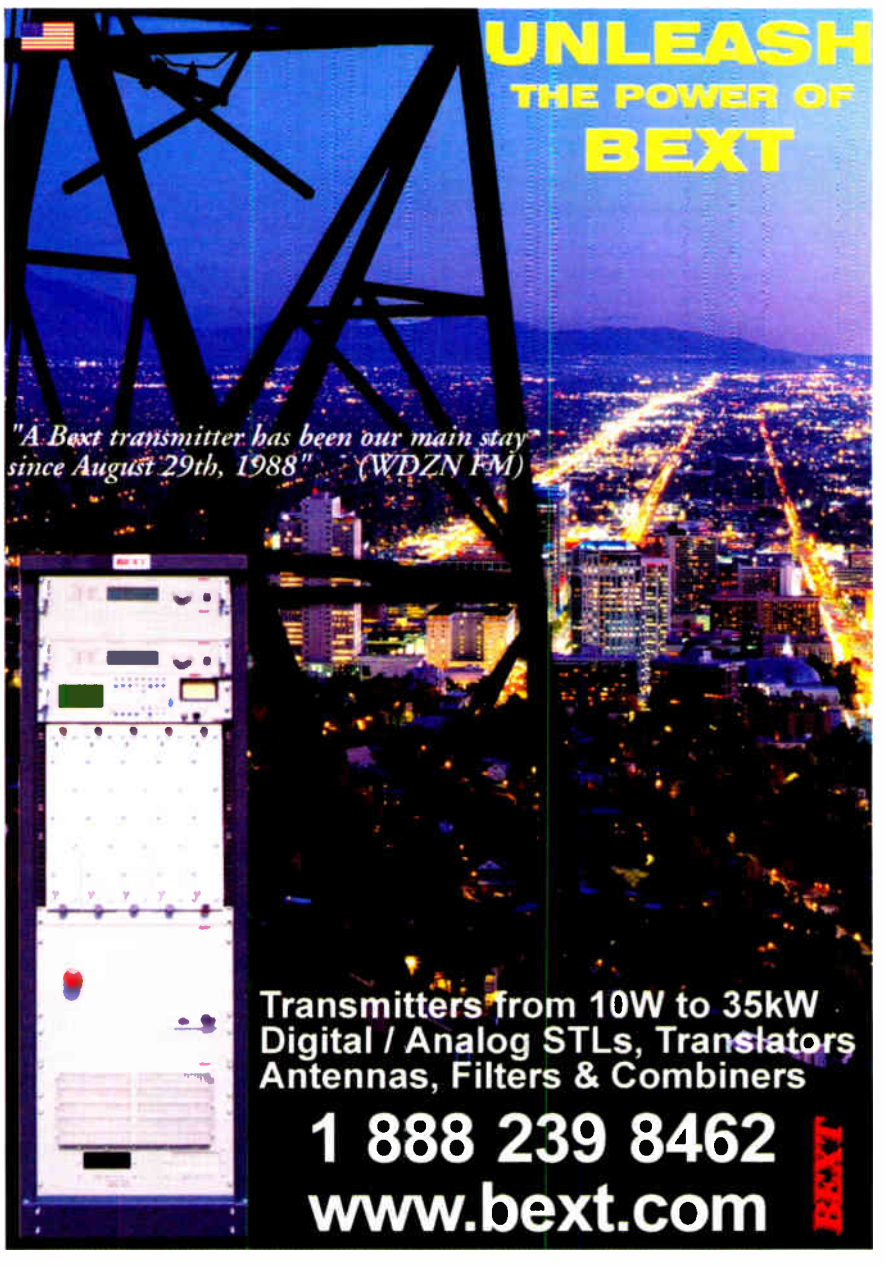

World Radio History

Radio.edu

A Non-Comm View

by John Devecka

Computers in the Station

Part 1: Plain Vanilla Computers

[BALTIMORE, Maryland] Selecting and installing computers in a radio facility is a strange dance of balancing the needed horsepower – including operating systems and networks – to get the job done with the need to protect the system from a myriad of hassles, both internal and external.

Sometimes problems arise in dealing with the Information Technology (IT) folks, who often know a lot about computers, but are clueless about a radio station's operation. In an educational institution it might be those students who know everything possible about computers (or think they do). And sometimes the foe is a product from a certain large software company.

Of course, one of the bigger hassles occurs when the already overloaded engineer suddenly has a large project dropped on him – installing the various computers and connections to get a facility up and running. To make it more interesting, there is usually a short timeline attached.

If you are tasked with setting up computers in your radio station, here are some basic plans and suggestions that have been helpful in a lot of stations that do not have full time computer staff on their rosters.

BENEFITS

This thing we call a computer is supposed to: (1) remove all paper from our offices, (2) exceed all possible human productivity, (3) work 24/7/365 without fail, (4) do whatever we want. Nevertheless, it is we inferior humans that are expected to set up the computers; the result can be, shall we say, interesting.

Assuming you have come to grips with the idea that computers can be a big help in the station, but need almost as much babysitting as my 2-year-old, we can begin looking at some of the things you can do to make your life easier.

Step one (as I have said before): make friends in the IT department. Do not let them look on you as a loner cowboy trying to work outside the system. Get them to understand you need a mix of "vanilla" computers for office tasks and specialized machines for special radio tasks. Involved IT people can be a *big* help when things go wrong.

WHERE TO PUT THEM

There are several areas in the radio station that can use a computer. Automation systems can provide an easy way to cover those embarrassing moments when a student "forgets" they had a show to do, or you have a holiday break and no one is around to be live.

Production systems can avoid razorblade injuries and ease the creation of new sound beds, IDs or even complete shows. Word Processing and Page Layout programs can allow for the easy communication of your staff with the school, community and suppliers (record labels, materials, gear, etc).

Web Development software will allow you to create and maintain your own web presence. Contact Management software can keep you up to speed on many aspects of the station's operations. Yes, most of these are obvious, but they all help develop real autonomy for the station and increase your "branding" control. And, being computers, they will break.

WHY CULTIVATE IT

The good news is that most of your station operations do not require a Cray supercomputer. Instead, a basic computer from your local retail center will probably be just fine. However, you will probably find the IT folks can get slightly better ones – that they will service – for about the same price.

Getting to know your IT folks means you will be able to better understand the way computer hardware is purchased for campus. You will probably find "vanilla" (generic) machines the IT department might buy for a computer lab or a professor's desk are available to you, often at a low cost.

You might even discover they have a budget, unrelated to your own, specifically for these machines. Another nice thing about your IT department is they probably have a life-cycle plan in place to replace/upgrade machines on a regular schedule (likely 3-5 years).

Obviously, a current model is the first choice, and it does not need huge amounts of RAM or hard drive space if it is just running office functions. This does not mean you cannot buy the latest "screamer" offered, but if money is tight, it is OK to back off a bit.

FEATURE CHECK LIST

Some features you will want to have, for ease of functions in the station, would be things like USB2.0 (PC) or Firewire (Mac) connectivity; CD burner; Ethernet and/or Modem cards; and I would suggest flat display monitors for space conservation. Virtually all of these machines will come with on-board video and sound support. If you plan to do any voice-tracking or production on these machines, consider a decent quality add on sound card such as the MIA from Echo, which I use.

These basic machines will likely need to connect to the Internet, right? OK, let me tell you something I have learned about students: they may be well versed in *having* computers, but they are not very good at *protecting* them. If your students have Internet access, you will have virus and spyware problems within hours of their first connection – if they can check their email on the machines, maybe even faster.

Let me save you some of the days of headache I went through and direct you to www.merijn.org. Download or follow links to get: Spybot Search & Destroy, Spyware Blaster, Bug Off, Hijack This!, and CWS Shredder software. Also go to www.lavasoft.com and get Ad-Aware SE. Immediately after installing them, make sure your run their update functions.

If these are new machines with your IT department's installations and blessings, they will probably already have an anti-virus program installed (hopefully with auto-updates enabled). If not, you should be immediately buying Norton or MacAfee's anti-virus software and installing it. If these machines came pre-loaded with software, you may want to remove and/or disable a lot of it.

ENSURE PROTECTION IS IN PLACE

Step one, however, for any new machine in your station is to load all the above anti-spyware, anti-hijacker and anti-virus programs. Many of them (Ad-Aware, Spybot, Norton, MacAfee) are active scanning programs that keep an eye on everyone trying to come into your house (kind of like having a bodyguard frisking everyone at the front door).

Others, like Spyware Blaster and Bug Off are extra locks and bolts on the doors. Hijack This! and CWS Shredder are programs for finding and/or fixing machines that already have an intruder present.

A brief note on the security software above – it is all *free*. But, it is all written and maintained by people that need to eat, have massive bandwith use and other issues to deal with, so they ask you to donate something if you use their software.

No, it is not mandatory, and you can probably sleep at night without paying, but *please* do support these folks. Once they have saved your system, you will understand why it is so amazing that they do not force you to pay up front. Read the CWS Chronicles on the merijn site to understand how much work has gone into this security effort.

PRODUCTIVITY APPLICATIONS

Once you have all these systems in place, you can begin adding operational software to make life better at the station, like Office or other programs. These are probably already in use all over your campus and available through your IT folks under educational pricing.

Basic machines should be set up with common software sets for office functions. I would suggest Microsoft's Office suite for Windows victims and Claris Works for Mac users. In both cases this will provide your office staff with simple word processing and communications options and allow them to create and trade templates for press releases, letterhead, faxing and other functions, keeping your image consistent.

These packages can be supplemented with something nice like Adobe's Create Suite set which includes all of the visual design software you could ever use. It will allow you to do web development, graphics, photo editing, page layouts and more.

SAVE MONEY

The nicest thing about all of the above items? *Educational Pricing!* While Creative Suite lists for about $1,200, the educational package price is $200! Let me repeat that: Retail $1,200, Educational $200. Again, making friends with your IT folks will make it easier to get into the educational purchasing process.

The Music Director, Business Manager and others will all thank you if you run a contact management program like ACT! on at least one machine. It will allow them to not only database all their contacts, but create templates, communication records, email and document attachments, etc. ACT! is a fairly inexpensive way to keep all that information available for these important positions and keep everyone current on communications. Oh, and make darn sure you back up that database!

These programs have many custom options; if you are not comfortable with "tweaking" your system, just let them auto install. However, *do not* set any of these programs (including the operating system) to auto install updates. With the exception of anti-virus and anti-spyware programs, you should review any update before it installs, and be certain it will not cause new problems in your system.

Get in the habit of setting aside one day a week as "computer day" and making sure you check all the security programs for updates and run full system scans. These take time and can prevent use of the machines while running, so plan them accordingly. Run your operating systems update check, and download critical patches, but check in with the IT folks before downloading any major upgrades (like SP2) to verify that all is well.

OUTPUT TOO

Another wise choice is an integrated scanner/printer/copier. Ours is in constant use producing DJ flyers, scanning pictures and printing everything else. A cheap inkjet printer in a common area of the station is used for general things, which often means student papers. A networked printer is ideal, but can be expensive. See if there is network printing available through your IT pals – you may find a way to do that with an existing machine on campus.

In part two, we will get into some of the more specialized items you need to consider for specific operations like Automation, Production, etc. Here are the key points you should remember from this column: Always install and update security software; support shareware; make friends in IT; and get a nap.

John Devecka built WLOY (with assistance) from the ground up, and is happy to share the tricks and traps he has learned in the process. Email John at wloy@loyola.edu

World Radio History

How to outwit, out-maneuver and out-perform your competition.

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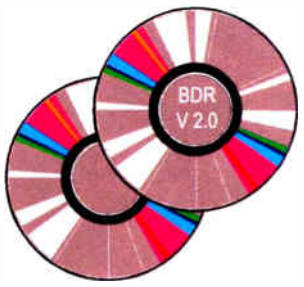
Missing Your Radio Guide? Get Them All on the BDR

Version 2.0 of the Broadcaster's Desktop Reference now includes every issue of Radio Guide since January 2003 to the present. Plus, there is an index for the PDFs, for easier location of older articles.

The BDR (Broadcaster's Desktop Reference) is an ongoing effort to provide useful tools, information, and history of interest to broadcasters.



The CD includes several sets of Radio Utilities, an AM and FM/TV database viewer (including DA patterns), as well as EAS printer paper sources, project schematics, historical data and pictures – even some humorous Top Ten lists.

Recent additions include updated FCC and EAS checklists, and some equipment manuals. Having this out at the transmitter site can save you lots of time and effort.

A Table of Contents for the BDR can be found at: www.oldradio.com/bdr.htm

The proceeds from this CD fund both future improvements of the BDR as well as helping the efforts of oldradio.com to document the industry's history.

There is no set price for the BDR. Many find $15-$20 appropriate to cover the costs of materials and shipping, plus a little extra for funding the improvements. If you pay more, it will be put to good use.

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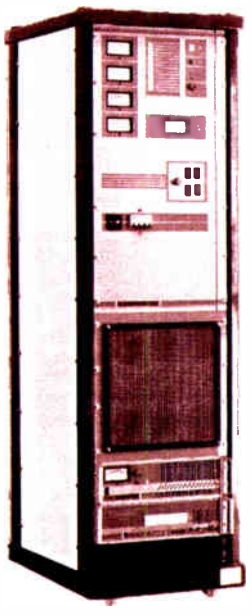

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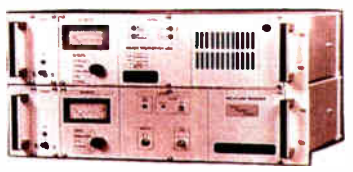

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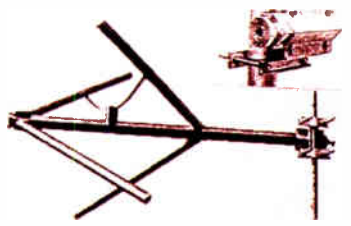

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World Radio History

Field Guide

by Mark Spalding

Saga Communications Selects BE FM 25T for Install

[DANVILLE, Illinois] When Saga Communications purchased WXTT(FM), Danville, IL, last August we knew we had a lot of engineering work ahead of us, and not much time in which to do it.

We had less than six weeks to overhaul the transmitter building and to totally re-gear the RF chain, including dismantling a neglected 20 kW transmitter and replacing it with a Broadcast Electronics FM 25T single-tube transmitter.

DOWN TO THE WALLS

The building itself is of block construction, but it had gaping holes in the walls, leaving transmission gear exposed to the outside elements. Box fans substituted for air conditioning and the electrical throughout was a mess.

We rented a portable building and wired up an auxiliary transmitter while we patched up all the holes in the building and reinforced the roof to protect against ice. We tore out all the electrical and ran new service in from the utility pole to bring the building up to code. We were able to leave the antennas up as they were, but we had our tower crew, Rhodes Tower Service, re-mount the coaxial lines with the proper mounting hardware, do a plumb and tension, and give the tower a "good going over."

With such a tight deadline, project crews had to be carefully timed, so that as the electricians were finishing up, the HVAC guys were coming in to do their part. At times, we had crews working around each other in order to squeeze as much out of daylight as possible.

AN EXPERIENCED TEAM

Fortunately, we have had some experience at fast turnaround projects like this, given that Saga Communications has grown to 77 AM and FM stations through similar acquisitions. We have assembled an excellent engineering team that can be counted on to get the work done, and an important part of that team is Broadcast Electronics.

BE worked with us every step of the way to ensure the transmitter was delivered on time, down to the hour. When we placed the order, we knew we would need the transmitter in three weeks. Just like clockwork, as soon as our electrical and HVAC crews finished and we were ready for the transmitter, within 30 minutes the truck was pulling up to unload the FM 25T and FX 50 exciter.

I was not let down after delivery, either. I was fairly confident BE technicians would have checked over the transmitter thoroughly before shipping it. Sure enough, it was ready to go out of the box. After putting in the required hardline and completing the AC wiring, we fired up the FM 25T. The transmitter was running at full power in no time – with no drifting, or any of the headaches typical of a new transmitter install. The output power was solid and steady.

DESIGNED FOR STABILITY

Overall, I like the straightforward design of the transmitter. BE T series transmitters are well-known for their folded half-wave cavity design, no plate blocking capacitors to malfunction and no sliding contacts to deal with. This adds to the stability of the transmitter, and my peace of mind knowing that this transmitter is going to sustain the usual run of power surges typical of our operating environments.

This is the first FM 25T I have installed, but I have worked in other Saga markets where a BE FM T series transmitter already existed. We have found success with these high-powered, single-tube transmitters in the Midwest because they have proven to be more forgiving of lightning hits and brownouts than solid-state transmitters. The tubes seem to handle extremes better.

There were other practical reasons why we chose this transmitter. We need to keep close monitor of our transmitter at all times, especially with the Illinois weather patterns and the transmitter site being in a remote location. The FM 25T transmitter has a standard remote control interface that is easy to understand. The first time I wired it to our Burk ARC-16 remote control, it worked perfectly – all the transmitter telemetry voltages matched up perfectly within the ranges of the Burk unit.

EASY MAINTENANCE

I also liked the way the FM 25T offered easy access to all major components. Power supplies and amplifiers were within easy reach and there was plenty of room inside the cavity so I did not have to stand on my head trying to get to a component!

Even after a few months on the air, the transmitter is still chugging along at WXTT, unaffected for the most part by the regular Illinois lightning storms and power glitches. This is good, because I am now getting ready to start work on another new Saga project, and we plan to install an FM 25T there as well.

Mark Spalding is Saga Communications' Chief Engineer for Danville/Champaign, IL. He can be reached at mark@illiniradio.com

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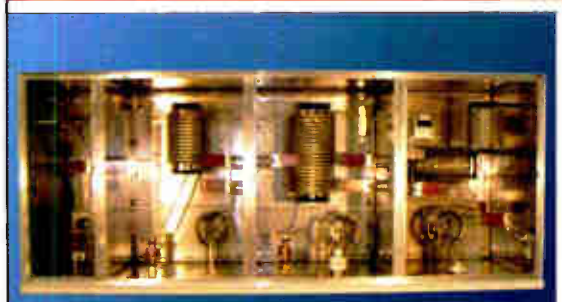

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World Radio History

User Guide

by Jay White

I Got an XM for Xmas

[PALM SPRINGS, California] When I received an XM SkyFi 2 for Christmas I thought it would be the opportune time to put this new technology to the test and see what it is all about.

Although I had experienced both XM and Sirius in rental cars previously, it was for a rather short amount of time. The following are my experiences and opinions of satellite radio technology, programming and potential impact on our industry.

INSTALLATION

I received two packages. The first contained the XM SkyFi 2, which is the receiver-transmitter section of the unit. The second was the auto installation kit, which includes a cradle for the SkyFi 2, a power adapter to plug into the cigarette lighter socket, a magnetic mount antenna and a cassette adapter to retrieve audio from the SkyFi 2 and play it over the cassette deck.

Once I got the packs open (it only took twenty minutes of wrestling with the packaging and a pair of round-point scissors), I read the installation and operation manuals. Since I speak English I read that section.

The manual claims the best audio quality is achieved by using the cassette adapter, however since my car radio does not have a cassette player, I used the built-in wireless FM modulator. (Actually, since the last thing I wanted to see is a bunch of wires hanging out all over the place, I would not have used the cassette adapter even if I had one.)

The modulator transmits through the XM receive antenna to the car's FM antenna and is frequency agile on both the lower and upper ends of the FM band. I set the frequency of my unit right on top of a competitor. It was easily programmable from the SkyFi 2 front panel. The instructions say to change the modulator frequency from town to town when interference occurs. Interference?

My son is an install manager at a local auto sound shop and helped me with the installation. The cradle includes a cigarette adapter and takes the 12 VDC down to 6 VDC to operate the SkyFi 2. Since I wanted to hide the wires, we devised a way to pull power from the radio and hid the DC-DC converter inside the dash. He cleaned an area on the roof of the car and snapped the magnetic antenna into place.

The coax was routed along the weather stripping, down the "A" pillar and into the cavity of the dash. We coiled up the excess and exposed just enough of the coax end to plug into the cradle. The Roady 2 snaps into the cradle, but care must be taken when removing it since the mount for the cradle is nothing more than foam tape.

ACTIVATION FUN

Activation was a slightly more painful experience. I did it on Christmas Day. I attempted to create a screenname and password. After filling in the fields and clicking submit, the screen froze. I waited, and waited, and waited.

I am a patient person; I had a 1,200-baud modem once. When I determined I had waited long enough I clicked on the "stop" button and then "back" only to get the "This Page is not Available" screen. Great. Back to the home page, create login, type in the screen name, password – and wait again.

Apparently the first one worked because I got a message that told me someone else already had the screen name I wanted. So I went to the login screen, entered my data, and then got a message that my screen name and password did not match.

I tried again, asking to have the password e-mailed to me. Nothing. So, I tried again with another password, all the while waiting for pages to come up at a *very* slow speed. In the end, I finally was about to create a new screen name and password and get to the next page. I registered, paid for my first month, printed the confirmation and then – finally – out to the car!

This process took about an hour and some lost some hair, plus $9.99 for the privilege.

AUDIO QUALITY AND PROGRAMMING

Before XM is activated, you only get Channel 1. Channel 1 has numerous promos for what is on XM, and instructions on how to activate. You get channel 1 no matter what – as long as you pull the car out of the garage first. Channel 1 sounded like a misaligned cassette.

The activation took about ten minutes to download into the SkyFi 2. I began to scan the channels – 40's: nope; 50's: nope; 60's: I hit the select button and heard a song I had never heard before. 70's: again, something unfamiliar. I have been in radio 23 years in almost every format and had not heard the songs they were playing.

I continued to scan; Country, Jazz, E!, ESPN, VH1, CNN, XM Comedy – I got to hear my first satellite radio delivered "F-Bomb" – cool. I noticed the audio quality seems to be better on some channels than others.

I also noticed that if the program audio is considerably dense the audio quality gets worse. I am guessing it is because there is more data to compress. The best description of the audio at times is "a poorly aligned cassette" since the high end is neither present nor clean. I have not called tech support, but I am sure they would tell me that using the FM modulator will not deliver the best quality and I should use the cassette adapter.

The talk channels are heavily data compressed, some music channels are better. The audio level can vary greatly from channel to channel, and the Hispanic stations seem to be louder than everything else – just like real radio! The SkyFi 2 allows you to set the audio level of the modulator to match the level of the FM stations on the dial; I am still looking for the quality adjustment.

The levels on some channels from cut to cut are inconsistent. I would not expect to have heavily processed audio on the channels, but decent consistency from cut to cut would be useful. In listening to the comedy channels, if you turn up the receiver to hear the comic, you can be blown out of the car when he screams like a girl.

SPECTRUM AND SIGNAL PROBLEMS

My son mentioned that when he installs the units with the modulator hard wired into the antenna line of the radio, the radio is desensitized when the modulator is on, resulting in poor reception on the regular FM channels. I had my own experience with this in a rental car equipped with Sirius.

When I hit the seek button, the only thing the radio would lock onto was the Sirius modulated frequency when the unit was on. When the modulator was off, the FM radio functioned normally. I wonder how many regular users of radio think to turn off the satellite modulator, or just continue to listen to satellite because they cannot get conventional FM. It is something that should be of great concern to the radio industry. My wireless system is clean, but one of my competitors seems to be missing.

When I pulled up to a local mall the other day, the XM went silent; the antenna's line-of-sight was blocked by the building. My regular radio worked just fine.

I have been frustrated at the bank drive thru with no reception. I recall going through a tunnel in that same Sirius-equipped rental car – the radio worked just fine because the digital buffering held up, but there was four seconds of silence after I left the tunnel; *that* was cool.

COOL FEATURES

- When you listen to a talk show, the phone number is on the display.
- You can record up to 30 minutes of programming.
- Title and Artist display.
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DUD FEATURES

- The display can be tough to read on bright days.
- Changing the channel is cumbersome.
- Audio Quality.

COMMENTARY

The radio industry will soon lose an icon – Howard Stern – to Satellite Radio. Will Stern's departure affect radio listeners? Certainly, it will affect his audience. Fans of Howard Stern, Opie and Anthony, MLB, etc, will have to subscribe to XM or Sirius for the specific purpose of hearing their favorite programming. But they will continue to use conventional radio the way they always have.

They still need to know which local roads are closed, what the weather will be, and where they can pick up their free t-shirt. Who are they going to listen to when there is an emergency? Does Satellite radio even have a plan to protect the public from harm in the case of an emergency or a disaster?

My greatest concern from this new technology is further fragmentation of an audience already splintered between media, including TV, cable, internet, radio, CD walkman, iPod, and the onslaught of other mediums in use today.

Radio has a specific purpose and satisfies a need. Technology like HD will not save radio, it will only change it. At last count, over 4 million people who have subscribed to satellite radio obviously do not care about better quality technology, they want content. Compelling, entertaining programming, and timely information will save radio. Heck, you can get your favorite music anywhere these days. Great radio programming can be harder to come by.

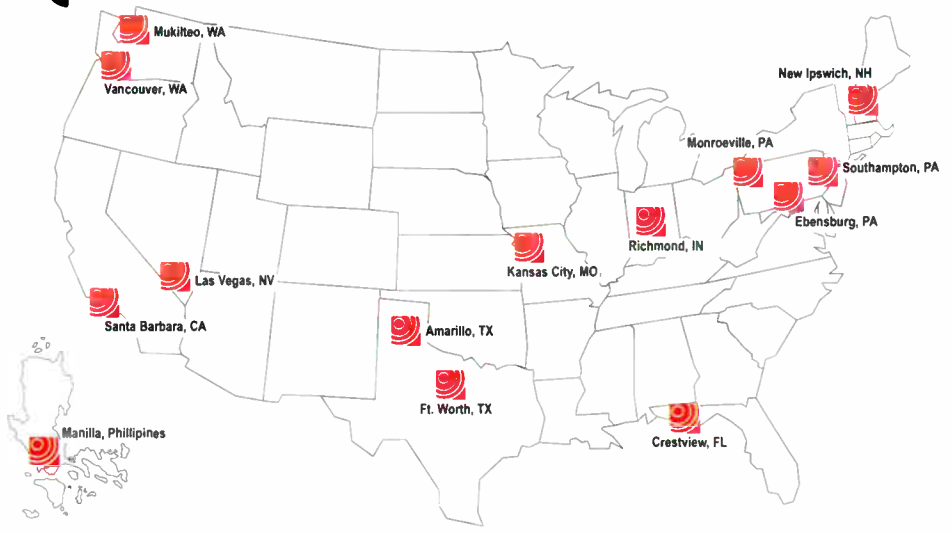
I have been amused by the XM programming, and have heard some songs I have not heard in a while. I have only had the unit for a couple months, and have heard plenty of content including comedy, international music, jazz, news, sports, but I will be darned if I can get the local weather on the thing.

One thing is for sure, in my opinion: without the localism, it is not radio. We need to remember what makes us different. In the not too distant future, you will be able to hear thousands of Internet radio stations in your car over WiFi. You think satellite radio is competition? We had better be on our game.

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

World Radio History

RF Specialties® Group



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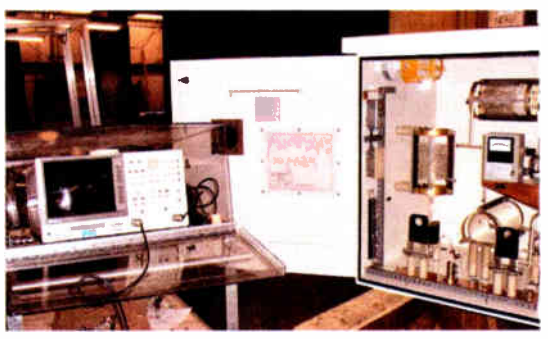

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World Radio History

Tool Guide

From the Radio Guide Tool Box

SLM-100 SPL Meter

Audio Technologies Model SLM-100 Sound Pressure Level Meter

[SEDONA, Arizona] ATI's new SLM-100 Sound Pressure Level (SPL) meter is an extremely versatile device for measuring sound intensity in just about any acoustic environment – loud or soft; high-pitched, low-pitched, or broadband; intermittent or continuous. The SLM-100 features a large, easy-to-read analog meter for taking quick measurements anywhere. A 9-volt battery supplies power, so the meter is completely portable.

Sound level meters are used in many types of sound and noise analysis including audiometer analysis and calibration; community noise assessment; engineering control studies; environmental impact studies; environmental noise measurement and compliance; frequency analysis and calibration; industrial safety; machine performance analysis; maintenance inspections and troubleshooting; noise ordinance enforcement; occupational noise measurement and compliance; product testing; traffic; scientific noise measurement, and transportation noise quantity. You can use it to measure noise levels in factories, schools, offices, and airports; or to check acoustics of studios, auditoriums, and home theater installations. This hand-held and battery-powered device measures real-time sound and can have functions such as noise dose measurement, signal analysis, and different time and frequency weighting.

The Range selector of the SLM-100 lets you select one of seven sound level ranges, each spanning 16 dB. The needle indicator shows the actual sound level as a displacement from the center point. The RCA output jack lets you connect the meter to recording or other measurement equipment. The response selector has two settings: fast and slow. In the fast position, the meter reacts quickly to changes in the sound level, showing you the peak sound levels present in the environment.

Frequency range and sound level range are two critical specifications for sound level meters. Frequency Range is the range of frequencies for which the meter maintains a constant sensitivity within defined boundaries. The SLM-100 measures Sound Pressure Level (SPL) and different weightings such as A-weighted SPL, C-weighted SPL, Sound Exposure Level, and so on.

The SLM-100 has both A-weighted and C-weighted responses. A-weighting is a frequency domain that filters out low frequency sounds based on human hearing response to simulate the human ear. C-weighting filters more low frequency sound than A-weighting for a closer consistency of acoustic energy.

ATI's SPL meter has an accuracy of ±2 dB @ 114 dB; a standard 0 dB = 0.0002 µbar; signal output of 1.0 volt (peak) minimum into open circuit with full-scale meter deflection at 1kHz; load impedance 10 kohm minimum, condenser omni-directional microphone, size (HWD) of 6-1/4 x 2-7/16 x 1-3/4 inches (160x62x44mm); weight of 6.6oz (about 185 grams). The SLM-100 is compliant with safety regulations and is CB approved.

The SLM-100 is a precise, versatile instrument, with its seven SPL ranges, A and C weightings, slow and fast response, built-in battery indicator, RCA connector output, and threaded inserts-making it perfect for your next set-up. ATI's SLM-100 SPL meter retails for $69.95.

The SLM-100 SPL Meter

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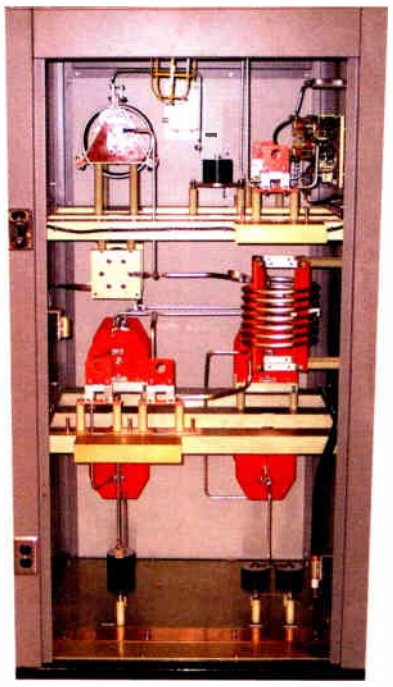

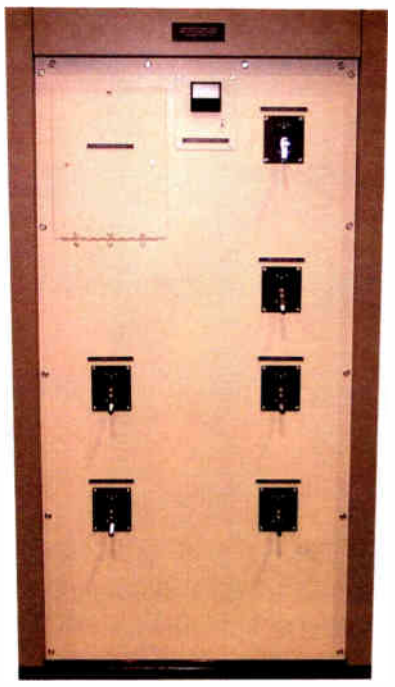

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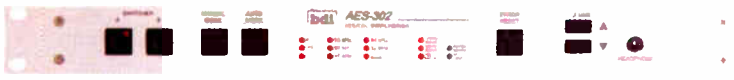

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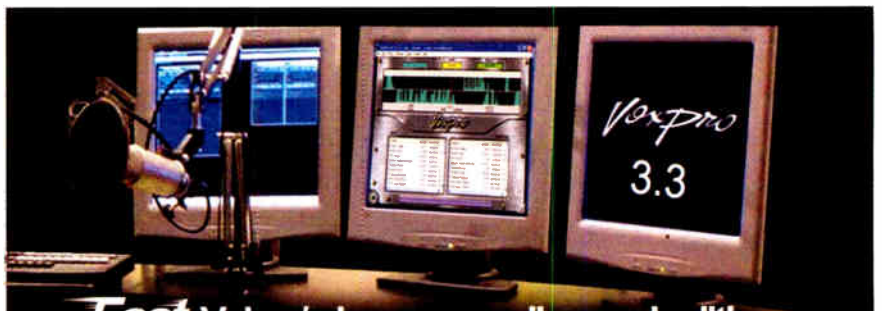

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VoxPro PC is available at most broadcast distributors. For more infomation go to www.audionlabs.com or call us at: 206 842 5202 x204

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World Radio History

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Billy Swan: "I Can Help" Billboard #1 hit in both Country and Pop 1976. Toured with Kris Kristoffersen. Produced Tony Joe White's first two albums, one of which included the hit "Polk Salad Annie." Musical director for the movie about Jerry Lee Lewis "Great Balls of Fire" starring Dennis Quaid and Wynona Rider. Inducted into the Rockabilly Hall of Fame.

Augie Meyers: Original member of "The Sir Douglas Quintet." "She's About A Mover" voted best Texas song of all time by Texas Monthly magazine. His biggest hits included "Hey Baby Que Paso" and "Guacamole" with the Texas Tornados whose four main artists consisted of Freddy Fender, Flaco Jiminez, Doug Sahm, and Augie Meyers. Recorded recently with Bob Dylan, John Hammon, and Tom Petty.

Charlie Rich, Jr.: Received 1999 NARAS Newcomer of the Year Award in Memphis, Tennessee. Recorded with Smokey Robinson, Freddy Fender, Charlie Rich, Dan Fogelberg, and The Texas Tornados.

Recently collaborated with Randy Meisner of the Eagles, Billy Swan, and Jimmy Griffin of Bread to create the supergroup "Black Tie." Then went on to record "Meisner, Swan, & Rich" in 2000. Currently recording new album on Music Row in Nashville.

Radio Guide Tech Initiative

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

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

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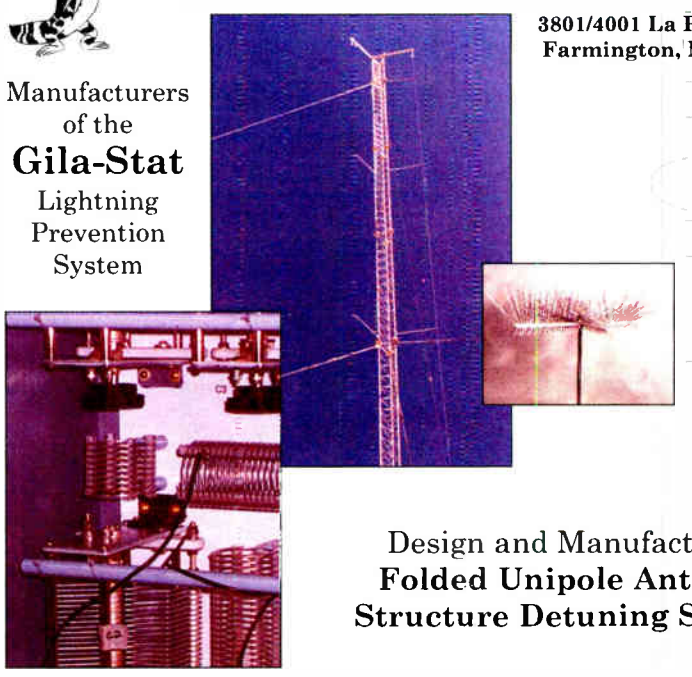

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World Radio History

Gear Guide: — Consoles and Mixers —

AEQ

The **AEQ BC 2000 D** Digital Console allows personalized configurations and multiple functions such as mixing, intercom, multiplexer, router integrated on a common hardware. Its control surface flexible design features motorized faders with position memory, allowing up to 9 different channels per fader with instant access. It provides flexible inputs and outputs allocated to faders, suitable for analog and digital environments for a single studio or multi-studio setting.

The enhanced interconnectivity between engines is accomplished through MADI multi-channels links. It offers additional control and monitoring through dedicated panels and GPI/GPO ports. Robustness and reliability of the system is accomplished by redundancy mechanisms in all critical elements or processes.

AEQ
Phone: 866-817-9745
Website: www.aeqbroadcast.com

Alesis

The Alesis **MultiMix FX Series** is a new line of compact mixers featuring low noise analog electronics and 100 great-sounding 28-bit digital effects. Four configurations include 6, 8, and 12 channels, as well as 12 channels with digital S/PDIF out. All models feature ¼" TRS balanced inputs, RCA connections, XLR mic inputs with high gain, low noise mic preamps, switchable phantom power and high-pass filters, and 3-band EQ on every channel.

MultiMix FX mixers are the most compact, affordable, high-quality mixers with built-in 28-bit digital effects and choice of configurations. MultiMix FX mixers are perfect for musicians and engineers needing a portable, flexible mixer with digital effects for sound reinforcement, rehearsals, studio recording, submixing, field recording, and digital audio/video computer workstation mixing.

Alesis
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Arrakis

The **12000 Series** Broadcast console brings new levels of features and performance to the mid-priced console market. Powerful, yet easy to use, the 12000 fully supports a Master Control room and two Studios with monitor feeds, muting, and talkback. Complete mic channel On/Off/Tally/Cough/ Talkback logic supports talk studios and announce booths. The modular mainframe simplifies installation & service.

Hot pluggable modules, VCAs and DC On/Off switches improve reliability while heavy aluminum panels, polycarbonate module overlays, and solid oak trim provides a durable, attractive appearance for many years. With mainframes for 8, 18, and 28 input modules, the 12000 is perfect for any size radio market or studio application.

Arrakis Systems
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Website: www.arrakis-systems.com

Audio Technologies

The **NANOAMP** Stereo Input and Output Mixers by ATI are the perfect choice for any location. These mixers are compact, convenient and rugged with low cost mixers and utility amplifiers featuring professional XLR type connectors; high performance; low noise circuitry and UL and CE approved remote power modules. Use them free standing, stack them, or rack them.

The ATI models consist of: three-channel mono mixers such as MX100, MX101, and MX100C; three-channel stereo mixers such as MX200 and MXS100; the four-channel stereo XPS100 Input Expander and the two-channel stereo XPS200 Input Expander. All mixers feature VCA master gain, headphone controls, and require 24VDC power. Replaceable and rechargeable battery packs, and DC converters for belt packs are available.

Audio Technologies Inc. (ATI)
Phone: 800-922-8001
Website: www.atiaudio.com

Autogram

The **Mini-Mix 8 and 12** Consoles are fully-functioned professional Broadcast Audio Consoles. Space and cost saving measures have yielded a small package along with attractive price for today's Broadcast Studios.

The Pacemaker "Classic" consoles are available in 6, 8, 10-pot configurations. All connections are made using miniature screw-type for easy installation. Mix-Minus is assignable on front panel. Four independent microphone preamps w/ balanced inputs and outputs may be patched to any channel. The Pacemaker 11k uses a bi-module concept – front panel module and a card module that plugs into the mother board. Up to 15 modules (PM 218) and 25 modules (PM 228) are available for customer's option. The Autoclock features Time, Count-Up, and Temperature and is available in console-mount or stand-alone desk cabinet.

Autogram Corp.
Phone: 972-424-8585
Website: www.autogramcorp.com

Broadcast Tools

The tiny TOOLS **SUM-4** provides four stereo line level high Z mixing inputs, which accepts balanced or unbalanced stereo sources; stereo and monaural balanced low Z outputs; individual front panel level controls; stereo mixing/link port for input expansion and removable screw terminal connectors.

The SUM-4 is powered by a surge protected internal bi-polar 15vdc power supply affording superior headroom and high definition audio. The SUM-4 may be set on a desktop, mounted on a wall or up to four units mounted on the RA-1, Rack-Able mounting shelf.

Broadcast Tools
Phone: 360-854-9559
Website: www.broadcasttools.com

Harris

Harris PR&E, presents **RMXdigital**, the latest generation of our Vistamax network enabled, high-performance radio broadcast consoles. RMXdigital is a new, cost effective, compact design built upon the philosophy and value of its big brother, the legendary BMXdigital: high reliability, extensive features, excellent performance, operational flexibility, ease of use, and robust construction.

While the RMXdigital is an excellent choice for stand alone console applications, the built in Vistamax audio/logic router, allows one to take advantage of networked power on one's own time frame. The Vistamax network shares audio resources across one's facility, without the need for time consuming, and costly, wiring. One gets flexible operation, while at the same time enjoying a quick, simple and cost effective installation.

Harris Broadcast
Phone: 513-459-3400
Website: www.broadcast.harris.com

Henry

Henry Engineering's **StudioDrive** is a compact audio mixer that makes any PC into a complete "studio-in-a-box." StudioDrive is ideal for live broadcasting, radio automation, and PC-based editing and production tasks. It can be mounted in the drive bay of a PC, or desk mounted as a stand-alone unit.

StudioDrive has inputs for 1 mic and 4 stereo line-level sources, plus a built-in telephone coupler (to record from a POTS line) and a mix-minus output. The comprehensive monitoring facilities include automatic mic-on muting, an Air Monitor input, and Headphones jack.

The unit interfaces with the "line-in" and "line-out" ports of any sound card, to create an integrated studio with the mixing, monitoring, headphone, and control facilities of a professional broadcast console.

Henry Engineering
Phone: 626-355-3656
Website: www.henryeng.com

Klotz

Klotz Digital has introduced the new cost-effective **AEON Digital Audio Console** which comes together with an integrated state of the art router.

AEON is based on the company's ultra slim console modules (1 inch thick) allowing flexibility in console layouts and studio set up. AEON is available with 8, 12 and 16-fader control surfaces with professional features like 100mm faders, alphanumeric displays with 16 characters in two lines per channel, large ON/OFF buttons, CUE/PFL, programmable TalkBack functions, freely assignable routing and function key and status indication LEDs for the most important parameters and functions.

The "AEON Setup Tool" software is included and enables users to set the configuration of the system exactly according to one's personal requirements.

Klotz Digital
Phone: 678-966-9900
Website: www.klotzdigital.com

World Radio History

Gear Guide: — Consoles and Mixers —

Logitek

Logitek Electronic Systems has announced the introduction of its **Mosaic Series** of digital consoles. Mosaic consoles use a series of drop-in modules that permit users to purchase console configurations that exactly meet their needs. As with other Logitek digital consoles, Mosaic consoles are router-based, acting as control surfaces for the Logitek Audio Engine.

The Mosaic line was designed based on extensive customer input. Each module has been developed for maximum flexibility, placing the most commonly requested functions at the user's fingertips.

Features include: multiple frame sizes, ranging from 4 to 24 faders; multiple full color LCD screens – at least one screen on each module, giving users meters, clocks, timers, delay information, text from the Audio Engine, downloaded bitmaps, etc.

Logitek Electronic Sytems
Phone: 800-231-5870
Website: www.logitekaudio.com

LPB

LPB Communications manufactures the **MX Series** of On Air Audio Consoles. Sizes range from 4-18 channels in frame sizes of 12, 24 and 36 inches.

The MX Console utilizes VCA's for audio level control which eliminates routing of audio throughout the console. This feature greatly improves the resistance to RF interference.

All versions have two stereo inputs per channel and four separate output busses (two stereo-two mono) as well as a Cue buss. Constructed of plated steel and covered with reverse screened Lexan, the MX is built for years of 24/7 operation.

LPB Communications Inc.
Phone: 856-365-8585
Website: www.lpbinc.com

Mackie

Mackie's new **Onyx™ Series** of small-format analog mixers incorporate the latest advances in hallmark Mackie technologies like extremely low-noise microphone preamps, tremendous durability, plenty of direct instrument inputs, and combines them into a modern footprint that includes a FireWire option for integration into any computer-based system.

The entire Onyx family derives its name from Mackie's new Onyx mic preamp, the next generation in low-noise microphone preamp circuitry. They also feature an all-new EQ circuit, and an appealing new industrial design and layout that are representative of higher-priced "boutique" gear.

Three mixers make up the Onyx line: The Onyx 1220, 12-channel mixer; the Onyx 1620, 16-channel mixer; and the Onyx 1640 16-channel mixer.

Mackie Designs
Phone: 800-258-6883
Website: www.mackie.com

Radio Systems

Continuing to enhance the tradition of the very popular **Millennium Broadcast Boards**, Radio Systems will begin shipping a *fully digital* version in the first half of 2005.

Major features of the "**Millennium-D**" include: AES-EBU or analog on every input, full analog and digital outputs – with 10 fully programmable mix-outputs, serial interface and a PC GUI for every input function.

One truly unique aspect to this console is that it continues Radio Systems' commitment to allowing customers to upgrade their existing analog Millennium and RS-series consoles. Any of the existing 4000+ console owners can simply change out the audio input and output motherboards in the field (or have the factory perform the upgrade) and enjoy all the benefits of the new digital circuitry for a fraction of the cost of a new console.

Radio Systems
Phone: 856-467-8000
Website: www.radiosystems.com

SAS

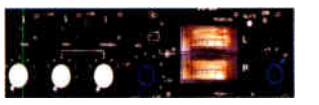
The SAS Connected Digital Network and **Rubicon™ Radio Broadcast Console Control Surface** continue to evolve. New features include (1) Onboard microphone and effects processing; (2) Optional LCD display for metering, clock, timer, and more; and (3) Built-in Intercom and Talkback that integrate seamlessly with SAS' well-established intercom. ANI-750 Audio Network Interface for the 32KD Digital Audio Router/Mixer provides static and dynamic sharing of up to 750 channels by linking multiple 32KD frames via fiber.

The RIOLink now can operate stand-alone as a 32x32 mixer/router or with the SAS 32KD. For the smaller market station or less demanding studio, SAS introduces the Rubicon SL. Like its bigger brother, the "SL" offers complete integration with the SAS 32KD and the SAS Connected Digital Network, as well as stand-alone operation with the new upgraded RIOLink Mixer/Router.

Sierra Automated Systems (SAS)
Phone: 818-840-6749
Website: www.sasaudio.com

Shure

The **FP33** is a 3-input, 2 output, portable stereo mixer specifically designed for remote audio recording, electronic field production, electronic news gathering, and location film production.



FP33 features include: high-quality, sealed input potentiometers; dynamic range of over 100dB; 48V phantom, 12V phantom power, and 12V T (A-B) power; LED indicators of input levels, output peaks, limiter action, and low battery. There are pop-up pan pots and a link switch to couple inputs 2 & 3 into a stereo pair; mix bus to connect an additional FP33 or FP32A; comprehensive headphone monitoring control including headphone MS stereo matrix; internal DIP switches for over 4,000 customized setups. The FP33 has an exceptionally low self-noise and a wide dynamic range that are perfect for use with DAT and other digital recording media.

Shure Inc.
Phone: 847-866-2200
Website: www.shure.com

Tascam

The **DM-3200** is an all-new 48-channel professional digital console from TASCAM, boasting an impressive list of specs competitive with consoles twice its price. Based on the DM-24 in operational ease-of-use, the DM-3200 adds more busses, more effects, more auxes, USB connectivity and many other new features.

Its user interface includes 16 rotary encoders with LED indicators to display mixer settings at a glance. Up to 6.1 surround panning is available, and the optional IF-SM/DM Surround Monitoring interface card adds multichannel monitor and downmix capabilities. When you add the IF-FW/DM 24-channel FireWire interface card, the DM-3200 becomes the most powerful all-in-one computer interface, control surface and mixing console available anywhere, making it ideal for professional recording, and installation applications.

Tascam
Phone: 323-727-4717
Website: www.tascam.com

Telos Systems

The **SmartSurface Studio Control Surface** works smoothly with the Axia audio routing system to access and mix any audio source in your studio facility. There is excellent support for phones and codecs – with auto-assigned mix-minus on each channel, unique easy talkback for remote talent cueing, one-button off-air phone record mode, and optional integrated Telco line switching. You can save unique profiles for each user, allowing different preferences, layouts and defaults for a variety of shows and talent. The unit includes digital EQ and many other advanced features.

The Broadcast Control Surface is designed to work with Telos Studio Mix Engine (2001-00139), and allows sharing of audio resources across multiple studios. Sixteen faders, two program buses, GPIO interface for logic control of sources.

Telos Systems
Phone: 216-241-7225
Website: www.telos-systems.com

Wheatstone

Wheatstone will add the **Generation Six** to the Generation family of router-based control surfaces. The Gen 6 embodies the feature set of the series' larger surfaces into a compact footprint, which provides seamless integration with the Bridge Digital Audio Router. Integration with the Wheatstone Bridge allows system-wide access to a station's on-air and off-air audio resources via interlinked CAT-5 or fiber optic cable.

In addition to standard features such as Ethernet protocol, VDIP configuration, X-Y controllers and 8 character controller displays, the Gen 6 offers an expanded number of AUX sends and increased preset options to boost save-recall capability.

Wheatstone
Phone: 252-638-7000
Website: www.wheatstone.com

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Service Guide: Radio Equipment Products and Services

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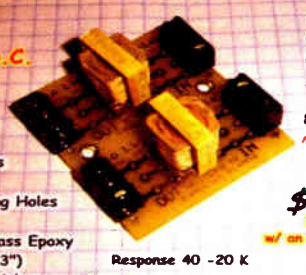

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Radio Guide Calendar

Email your information to: radio@broadcast.net

Oklahoma Assoc. of Broadcasters & SBE-56
April 1-2 – Tulsa, OK – www.www.oabok,org

SBE Certification Exam
April 19 – Las Vegas

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

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

Northern New England Broadcasters & SBE-110
June 23 – Manchester, NH – bteffner@wcax.com

Texas Assoc. of Broadcasters (TAB)
Aug 3-5 – Austin, TX – www.tab.org

Nebraska Broadcasters Assoc. & SBE-74
August 10-12 – Lincoln, NE – www.ne-ba.org

SBE Certification Exam
Aug 12-22 – Local Chapters – Jun 10 App Deadline

IBC2005 Conference
September 8-12 – Amsterdam – www.ibc.org

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

SBE Chapter 22
September 28 – Verona, NY – www.www.sbe22.org

Pittsburg Chapter 20 Regional SBE
Early Oct. – Pittsburgh – www.broadcast.net/~sbe20

Madison Broadcasters Clinic
Oct 11-13 – Madison, WI – www.wi-broadcasters.org

Boscon, Boston & SBE 11
Oct 25-26 – Marlborough, MA – www.bos-con.org

Arizona Broadcasters & SBE 9
Mid October – Phoenix, AZ – www.sbe9.org

SBE National and 2nd Annual Engineering Expo
Oct 10-20 – Grapvine, TX – sandytex@swbell.net

SBE Chapter 16 Regional Convention
October – Seattle – www.broadcast.net/~sbe16

SBE Certification Exam
Nov 11-21 – Local Chapters – Sep 23 App Deadline

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Saturday, April 16 – 3:00 PM to 5:00 PM
Room N116, LVCC
www.bdcast.com/nab/2005/HD_Radio_Seminar.html

Nautel Users Group (NUG)
Sunday, April 17th – 9:00 AM to 1:30 PM
Riviera Hotel
Info at: http://www.nautel.com/nabpr/

Orban All-Star Band
Tuesday, April 19th – 6:00 PM to 9:00 PM
Las Vegas Hilton

NAB Ham Radio Reception
Wednesday, April 20 – 6:00 PM to 8:00 PM
Las Vegas Hilton Convention Center

SBE Oriented Activities

Ennes Workshop
Building the Next Generation Master Control
Saturday, April 16 – 9:00 AM to 5:30 PM
Room N110, LVCC

SBE EAS Meeting
Monday, April 18 – 2:00 PM to 4:00 PM
Room N236, LVCC

SBE Certification Exams
Tuesday, April 19 – 9:00 AM to 12:00 PM
Grand/Royal Salon, Las Vegas Hilton

SBE Membership Meeting
Tuesday, April 19 – 5:00 PM to 6:30 PM
Room N109/110, LVCC

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President
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Look Before You Leap – The Dollars and Sense of Transitioning to HD

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David Krall
President/CEO
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Taking It to the Streets – Mobile Devices Add Drama to Sports & Reality Programming

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Mark Cuban
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