

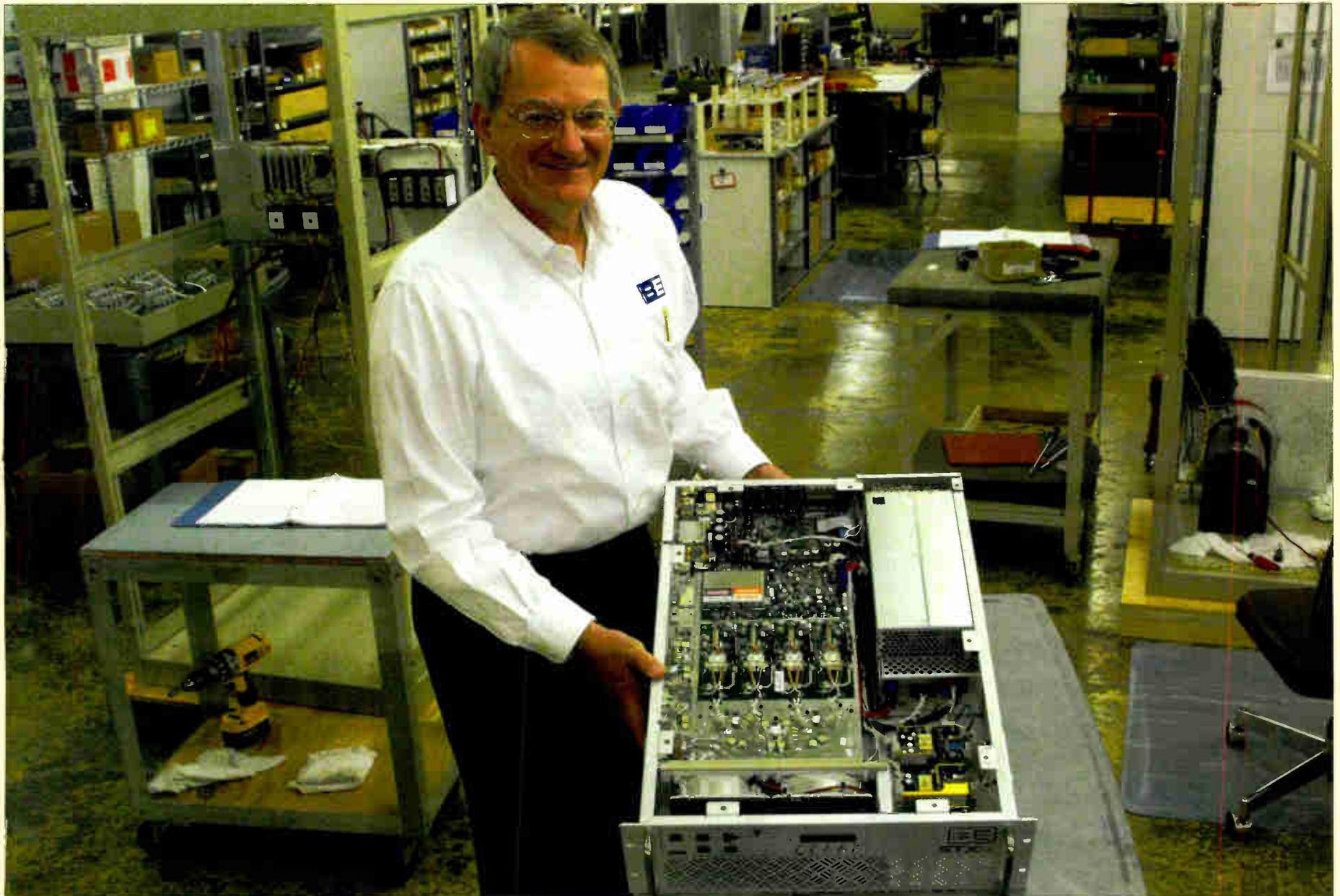
# Radio Guide

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Digital Issues Now On-Line

May-June 2009 – Vol. 17, No. 3

## BE's New STX LP – Transmitter on a Board



### Inside Radio Guide

This issue on-line at: [www.radio-guide.com](http://www.radio-guide.com)

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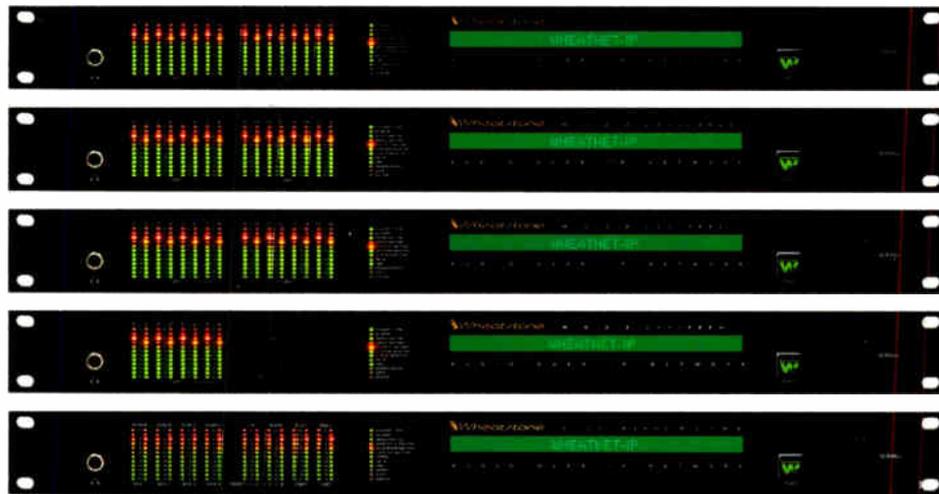
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## AUDIO-OVER-IP ROUTING SOME TECHNICAL STUFF.

### WHEATSTONE and WheatNet®-IP

WheatNet-IP is the new name for Wheatstone's Audio-over-IP networking, routing and mixing system. First introduced at NAB 2008, it now accounts for the vast majority of networking systems that Wheatstone quotes and installs.

First, a quick overview, and then why WheatNet-IP has been so successful, not only in converting Wheatstone's loyal clients to AoIP, but also in convincing clients of the superiority of Wheatstone's technology over other choices.

### WheatNet-IP BLADES

We call our I/O and mixing hardware and software "BLADEs"... way beyond the cutting edge, they're sharp and to the point (and yes, pun intended). Each BLADE is designed for a specific function—we don't cram unrelated tasks into one box making a central point of failure; we all know about 'putting all your eggs in one basket.'

#### BLADEs

are access points in and out of the network. They interface seamlessly with Wheatstone's Evolution Series Console Control Surfaces, the Glass E Virtual Console Control Surface, most of the popular automation systems, and streaming audio.

Three BLADEs are line level I/O interfaces, one all analog, one all digital and one half of each. Our newest BLADE provides mic level inputs. A fifth hardware BLADE mixes the audio for a Wheatstone console control surface. Each of the BLADEs and each Wheatstone console control surface connects to the network with a single CAT5E/6 cable.

BLADEs are loaded with lots more sharp features: Each includes two 8x2 virtual utility mixers that can be used for a wide range of applications, a front panel headphone jack with source select and level control to monitor any system source, SNMP messaging for alerts and silence detection on each output that can trigger alarms or make a routing change.

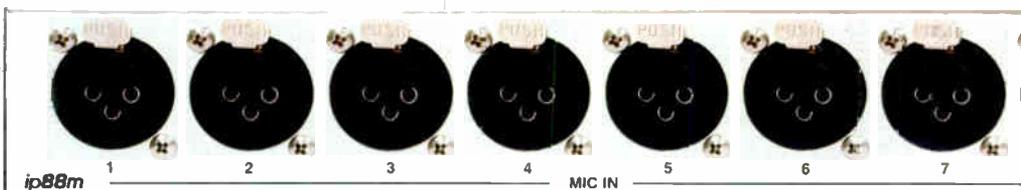
There's also WheatNet-PC, a software BLADE that you install on automation system computers, news workstations or even the PD and GM's desk computers—to control, play and record audio on and off the network. It eliminates the expensive sound card, and replaces tons of audio and control wiring with a single CAT5E/6 cable.

### EASE OF INSTALLATION

The relatively small channel count of each I/O BLADE allows you to conveniently locate it close to your equipment. In TCC/Master Control there's no need for a back wall full of punch blocks, a BLADE (or occasionally two) in each rack keeps audio and control wiring entirely within the rack, allowing for a fast and clean build-out. In the studio usually just one line-level BLADE is required; they're silent so you can locate them with live mics.

### FAST AND SIMPLE SETUP

Wheatstone's goal was a system that's extraordinarily easy to implement without the need for super-complicated network engineering, and where you don't need to be concerned about setting priorities to assure that those signals that are most critical are available.



WheatNet IP setup is easy, intuitive, and takes only a few minutes until you're on the air. The front panel setup wizard in each BLADE gets you up and running in moments. Extensive front panel metering and status indicators provide quick confirmation that all is well. WheatNet-IP's web interface and WheatNet-IP Navigator software let you further customize your system, locally or remotely, with input and output names, logic associations, routing and much more.

### RELIABILITY

Audio everywhere all the time, and keeping you on the air, were foremost in the design of WheatNet-IP.

Wheatstone chose Gigabit Ethernet (10GBASE T) because 100BASE-T just can't simultaneously handle the large number of audio channels prevalent today in large broadcast plants without the very real risk of audio not being available when you need it. Gigabit protocol means all audio everywhere with extremely low latency.

WheatNet-IP is completely self-contained—no PC is required to perform any of the system functions, including routing, mixing, salvos, and logic control. The PC is needed only for configuration changes.

Each BLADE carries a complete map of the entire connected network in its onboard CPU flash RAM. Talk about redundancy: a system with 36 BLADEs has 35 backups! Need to replace a BLADE? Assign its ID number and connect it to the network—it will query the other connected BLADEs and import all the necessary configuration settings!

### BLADES

**ip88m ANALOG MIC I/O BLADE:** 8 fully balanced reference-grade mic preamps with phantom power, 3 analog outputs, 12 universal logic (GPIO) ports programmable as inputs or outputs, routable throughout the system.

**LINE LEVEL I/O BLADEs:** 16 input channels, 16 output channels (switchable 8 stereo, 16 mono, or any combination), and 12 universal logic (GPIO) ports.

**ip88a ANALOG I/O BLADE:** 16 analog in/out.

**ip88d AES DIGITAL I/O BLADE:** 8 AES (16 channels) in/out.

**ip88ad ANALOG & DIGITAL I/O BLADE:** 8 analog in/out, 4 AES (8 channels) in/out.

**ip88e WheatNet-IP MIX ENGINE BLADE:** Handles all of the mixes from Wheatstone Evolution Series Console Control Surfaces and the Wheatstone Glass-E Virtual Console Control Surface, distributing the four stereo PGM, four stereo AUX SEND, per-channel MIX-MINUS, monitor outputs and other bus signals to the network. Once on the network, they are available as sources and outputs anywhere. This creates an extremely flexible system, where program outputs from one surface can be a source on any other surface; for example a news mixer's program bus as a source on the air studio surface. While the ip88e doesn't house audio I/O, it does include 12 universal logic (GPIO) ports.

**WheatNet-PC BLADE:** Installs on Windows PCs to replace the sound card; interfaces eight stereo audio signals in/out, plus automation control data (start strip, etc.)

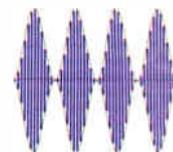
# Radio Guide

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by Barry Mishkind – Editor



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## Radio Guide

Volume 17 – Issue 3

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Since 2002, when Ray asked me to become the Editor of *Radio Guide*, the last seven years have been quite an exciting and interesting time. Right from the start, I got to remake the Radio Shopper into the kind of magazine for engineers that I wanted to read – hoping you would feel the same way.

Being flashy was not the goal. We don't waste space tooting our own horn, printing fluff, self-promotional material or our own pictures. We avoid articles ghost-written by PR agencies. We want every column inch to count. Simply stated, our goal is to provide radio engineers the information needed to help them do their jobs.

From your feedback, I take satisfaction in knowing that working engineers view the *content* of this magazine as unsurpassed. We haven't even needed a sales department to hard sell against other publications – basically we've been sold out virtually for every issue.

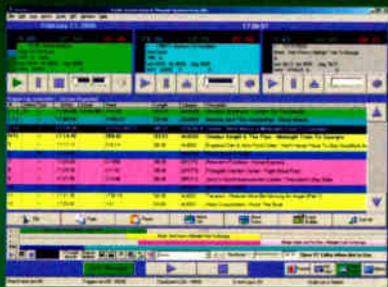
Putting our money where our mouth was then led to our AM Transmission Seminars. Alan Alsobrook and Phil Alexander put together a great program to help engineers do their job better.

We decided at the outset to do it right, not as a web-video run as a profit center for the magazine or some organization just to make money, but as a live hands-on event at modest cost in a classroom setting. Those who have attended generally agreed the program exceeds any similar educational opportunity.

Now, another step. Effective with this issue of *Radio Guide*, I am exchanging hats somewhat. Over the next few months I will be focused on developing some content that I hope you will find very useful in your work. As they say: stay tuned!

– Barry M.

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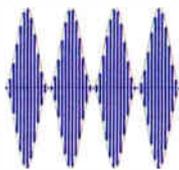


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World Radio History



# A Look at the New BE STX LP Transmitter

by Dee McVicker

They say that necessity is the mother of invention. It is hard to think of another time in radio history when an affordable, flexible low power FM transmitter like Broadcast Electronics' (BE) new STX LP has been so necessary.

## MANY FEATURES, MODEST PRICE

Introduced in January of this year, the STX LP is the first low power FM transmitter scalable from 1 kW to 5 kW with a starting price below \$7,000. Standard features include scalable architecture, redundant backup controller, IP connectivity and an internal exciter—all of which are add-ons to other low-power transmitters.

Easily half the price of most other transmitters in its power category, the STX LP effectively removes a major cost barrier for broadcasters wanting to move forward with transmitter replacement, booster or HD Radio plans, short or long-term.

For example, broadcasters can purchase the STX LP 1 kW transmitter for backup now, and then add more PA modules later for a main signal upgrade or an HD Radio signal. Power upgrades are done in the field with no need to purchase yet another transmitter as power or frequency requirements change.

## THE STX STORY

BE put a great deal of thought into the design of its newest transmitter line. To find out more about the people, the technology and the company behind the STX LP, we sat down with BE's senior executive, Vice President of Sales Tim Bealor, and BE's newest member of its executive team, Vice President of Engineering Brian Lindemann. Both Tim and Brian are credited with the success of the STX LP, Tim from a market perspective and Brian as the lead on the design team.

**DM:** Tim, let us start with you. What was the main driver behind BE introducing a low power FM transmitter at this time?

**TB:** Given overall market conditions and where the bulk of the business opportunities are coming from in the near future, we believe that, worldwide, there is a lot more near term demand for this type of product than there is for higher power units. Also, none of the top-tier radio transmitter suppliers had ever attempted to design and produce a product anything like this. Anyone looking for a low power, low cost 1 kW FM transmitter automatically thinks that they have to look at someone other than BE. That is no longer the case.

**DM:** There are quite a few unique and timely features in this transmitter; the built-in exciter immediately comes to mind as well as the scalability. How did BE come up with the design criteria?

**TB:** Actually, we had been discussing a specific upcoming opportunity outside the U.S. and the needs of the broadcasters involved. We found that our existing product line did not meet all of those needs, and the price was going to be too high. The project was so large that it prompted us to rethink how we approached this specific initiative and also the low power market. We determined that it was time to rethink our whole approach.

## TRANSMITTER ON A BOARD

**DM:** From what we understand, the real genius of the STX LP design stems from a concept that has been described as "a transmitter on a board." Explain that.

**TB:** That's right. In order to make this product as cost effective as possible, we knew we needed to set aside all, or nearly all, of our preconceived notions about what a 1 kW FM transmitter should look like. When we did that, we discovered that the most cost effective way to execute the design was to put as many parts of the unit on as few boards as possible. Brian can go into more detail. He's been our behind-the-scenes engineer on this product since day-one.

**BL:** Thanks, Tim. What we did is essentially miniaturize the size of the RF electronics through innovations in our combining method and higher integration of the final stages. We were also able to significantly reduce the size of the exciter and controller. It's also important to know that the RF portion remains similar to our existing products, so we kept the "BE" in this transmitter.

**DM:** So, this transmitter is based on BE's C and S Series transmitters?

**BL:** Yes. The design team at BE has produced a legacy of reliable FM transmitters. The performance of the power amplifier portion of the C and S Series transmitters is unsurpassed in the market. The STX LP takes advantage of that robust design, and at the same time takes advantage of our newer combiner technology to reduce the size of the transmitter.

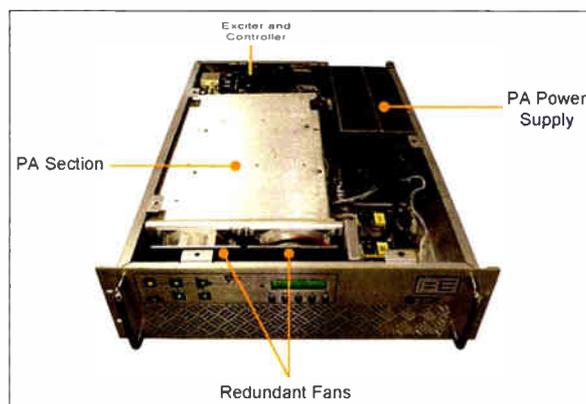
**DM:** Did any of BE's HD Radio product development also make it into the design of the STX LP?

**BL:** Absolutely. The knowledge we gained in designing our HD Radio products has played a large part in the development of the STX LP. For instance, we borrowed what we learned about HD Radio to optimize the STX LP power control loop to perform the right functions at the right times.

Some of the power control is performed within hardware in a tight feedback loop, while software performs an outer feedback control loop at a slower rate. This allows the STX LP to perform accurate power control for both FM generated by the internal exciter as well as FM or FM+HD from an external HD exciter.

**DM:** It is amazing that you were able to include all those features in such a small transmitter, and for under \$7,000.

**BL:** The main reason why is that we have tightly integrated the hardware and software design.

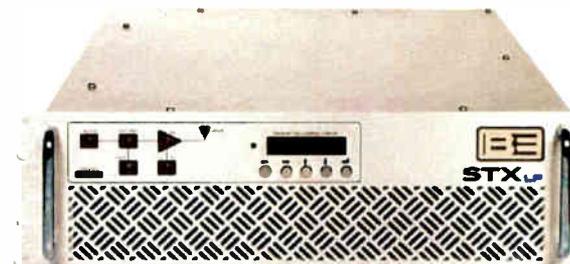


This allows excellent functionality – e.g. a direct-to-channel exciter – at a lower cost and size than possible with prior paradigms. Because of the reduction in cost in other places, we have been able to maintain excellent performance where it matters – for example, better than 55 dB

stereo separation. In some cases, we were able to actually increase functionality as a result.

**DM:** You were able to cut costs and increase functionality? Explain.

**BL:** An example of where we removed some cost is the STX LP front panel. It is fairly bare-bones. It has five push-buttons, a rudimentary 2-line LCD display and a handful of lighted indicators.



Simple and effective front panel design.

But that doesn't mean that it has bare-bones configuration and control capability. The design includes full discrete remote control via I/O on the back panel as well as built-in Web-based control. Via the Ethernet port, the user has access to a full-featured graphical user interface which is similar in look and feel to our top-of-the-line transmitters.

**DM:** I understand you have a background in satellite communications. How has your prior engineering experience contributed to the design of the STX LP?

**BL:** The vast majority of my career has been spent doing satellite communications, which has included systems design, and hardware and software implementations of telephony, Internet capabilities, RF control, and complex waveform generation. My background gives me a healthy respect for the interactions that occur between seemingly unrelated modules.

I think those experiences served us well when we got into the hardware/software co-design methods that were needed in order to encapsulate all those functions we've been talking about into a transmitter that is three rack units high and weighs less than 40 pounds.

**DM:** Thanks, Brian. Tim, can you give us some final thoughts on what the success of the STX LP says about BE transmitters and products moving forward?

**TB:** I think the STX LP is probably one of our more important milestones at BE – and we've had a lot of milestones, as you know. BE has been a partner to radio broadcasters for 50 years; we have a lifetime invested in designing and building quality transmitters. That's not going to change.

What I think this transmitter does change is the speed and agility to which we can respond to radio, whatever the market conditions. This transmitter pretty much broke the mold in its power class, and we couldn't have done all that without making some significant headway in product development and engineering design. We now have the building blocks for some very powerful products moving forward.

*Dee McVicker operates Grassroots Communications in Gilbert, Arizona, where she does articles and marketing for her clients, including BE. She can be reached at [deemcv@grassrootsco.com](mailto:deemcv@grassrootsco.com)*

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World Radio History

# FCC Focus

## A New Plan for Channels 5 and 6

From the Broadcast Maximization Committee

The FCC has a once in a lifetime opportunity to allocate valuable broadcast spectrum to respond to the enormous demand for new radio service.

### DTV MAY BENEFIT RADIO

TV Channels 5 and 6 (76-88 MHz) have become available due to the migration of nearly all TV stations away from the low VHF band as part of the DTV transition. In response to a request to allow this spectrum to be used for FM broadcasting, the FCC solicited comments in July 2008. The Broadcast Maximization Committee (BMC) was formed to develop a comprehensive plan for this spectrum and was the only party to offer such a plan which is detailed below.

The benefits to all segments of the radio industry are monumental. AM service can be rescued and modernized. The FM service will include more and improved space for LPFM stations. In addition, the NCE service can expand in response to the large demand for additional stations.

The FCC's most basic regulatory obligation is to allocate frequencies fairly, efficiently and equitably in response to the demand for its use. BMC has made a major contribution to this cause by demonstrating this broadcast spectrum could be utilized in a manner that truly maximize benefits to all sectors of the radio industry.

### THE PROPOSAL

The BMC's technical proposal consists of several aspects. First of all, it is a framework to develop a specific long-term plan to eliminate the sharing arrangement within the existing FM band between full service and low power

FM stations and the potential for interference affecting both services.

Secondly, the plan provides an allocation scheme to allow the migration of most if not all AM stations to FM, and allows these stations to operate digitally. Third, the plan creates numerous new digital quality noncommercial educational voices in local communities.

Options also exist to form national emergency or informational channels or other uses.

### A BETTER PATH TO DIGITAL

The newly created channels would be all-digital from the outset. By starting fresh with all-digital, the allocation efficiencies inherent in digital broadcasting are maximized.

Furthermore, it incentivizes consumers to buy new digital receivers so they can pick up the new channels. Since these new digital receivers would also decode the current HD FM stations, it serves the existing FM broadcasters as well.

### COMPATIBLE WITH DRM

Channel bandwidth is proposed at 100 kHz (instead of the analog FM bandwidth of 200 kHz). Currently, Digital Radio Mondiale is building a system called DRM+ which incorporates exactly the requirements necessary to operate within the parameters the BMC proposes. We also believe that iBiquity could modify their digital-only mode to operate in this fashion.

The new digital channels would be able to accommodate up to four LPFM's per authorized 100 kHz channel (so

encoder costs could be shared) and, of course, this would also allow up to three sub-channels for primary class stations to offer additional programming.

In our initial filing with the FCC, we proposed to equally divide up the TV 5-6 spectrum into 117 distinct 100 kHz channels. The eight channels immediately below the current NCE band (87.0 to 87.7 MHz) would be used for an expansion of the noncommercial educational service. The next 100 channels (below 87.0 MHz) are suggested for the AM migration. Eight channels would be created for a protected LPFM service.

BMC has conducted a feasibility study and allocation plan which proves that all existing AM stations could migrate (if they chose to do so) into this newly allotted radio spectrum while replicating their current 2 mV/m footprint. BMC further recommends a nationwide channel for use by NOAA and Homeland Security.

### WHAT ABOUT TV LICENSEES?

There is also the issue of the last few remaining TV Channel 5 and 6 full service and LPTV stations. BMC has suggested alternate channels.

Currently, the proposal advanced by BMC in MB Docket No. 07-294, et al., is under consideration at the FCC. The comment and reply comment periods closed in Oct, 2008. There is no time frame set for the FCC to act. It is expected that further proceedings and additional opportunities will be needed to explore details of the proposal in the future.

The priority for this proceeding will be set after a new Chairman is confirmed which is expected in the next couple of months.

*Additional information on The Broadcast Maximization Committee can be found on the committee's website, [www.broadmax.org](http://www.broadmax.org). Questions and/or comments can be directed to [info@broadmax.org](mailto:info@broadmax.org)*

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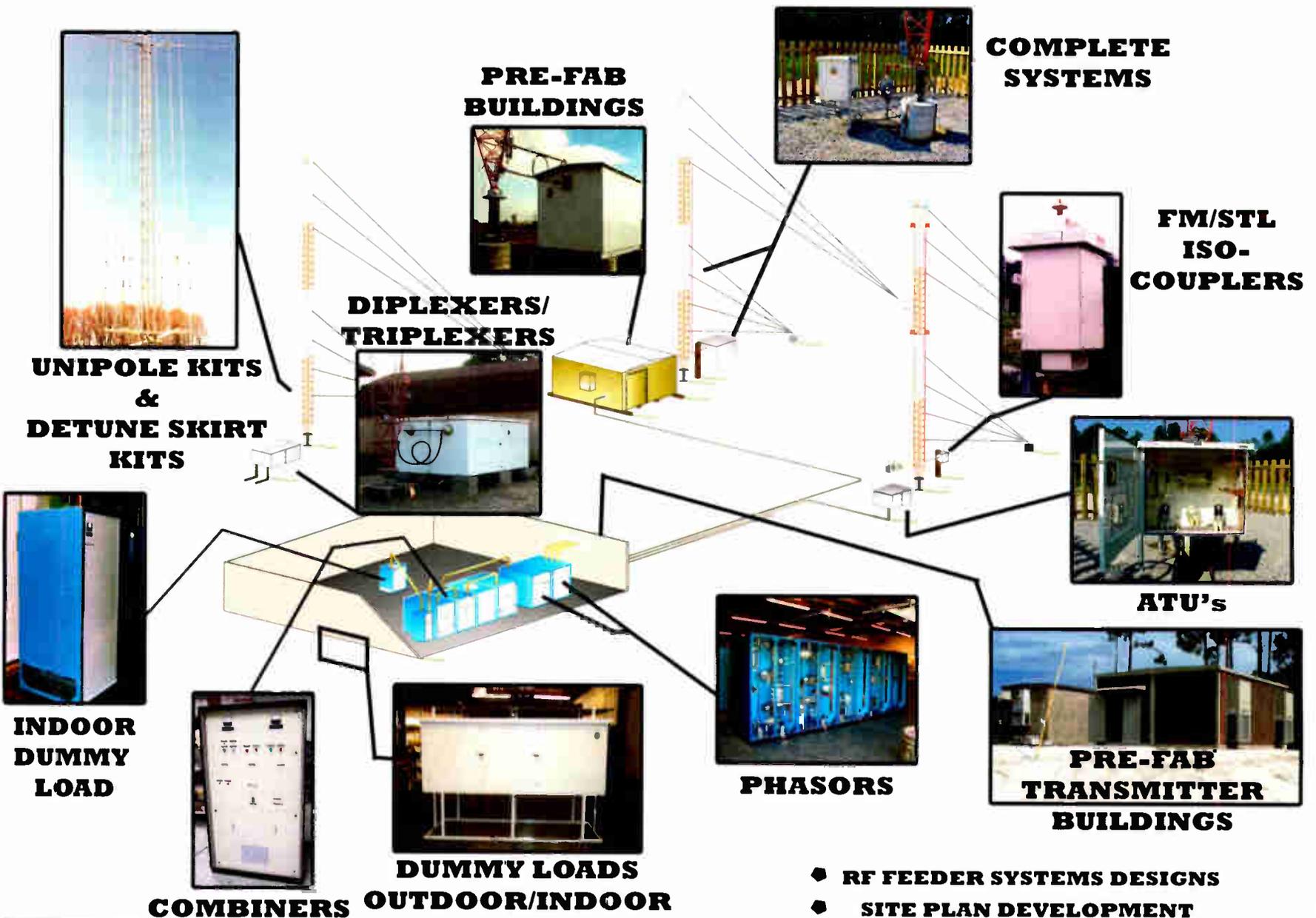
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# Operations Guide

## Keep Your Station and Staff Healthy

by Steve Fluker

*Although the recent H1N1 virus did not live up to the media hype of pandemic proportions, it is a good wakeup call for companies. At worst, it can prod efforts that will improve hygiene and staff health all the time. At best, it will help you be prepared should there be a real health emergency.*

In our industry we think about disasters and what we would do to get our radio stations back on the air, or keep the business running should we be faced with one. Typically we think of a disaster as being something that is destructive such as a fire, hurricane, earthquake, blizzard or ice storm, etc., but we really need to open our eyes to much more including a pandemic outbreak, such as the H1N1 flu outbreak.

If your disaster plans do not include this type of emergency, now would be the time to sit down and address it before you get caught off guard.

### WHY WORRY?

Why should we be so concerned? This does not seem too bad right now, or is it? Plus the virus seems to be on the mild side compared to other strains of flu so would this not just blow over? These are questions and comments that I have heard over and over.

Just take a quick look at the statistics. A week ago we were talking about a large number of cases and deaths in Mexico and how it also had then turned up in New York with about 40 cases. One week later, as of this writing (on May 7th), the number of cases nation-wide has climbed to 642 with two deaths spread across 41 states.

This was a new strain of the flu with unknowns. There were many more suspicious cases, prompting the CDC to issue warnings and advisories, heightening apprehension that it would become much more widespread. Although it now appears to be much less dangerous than some reports, there still is a lesson here.

### WAKE UP CALL

We chose to take those advisories seriously. The best scenario is that you prepare now, develop a plan, and later look back at the incident as a good drill and learning experience.

A pandemic outbreak is different from other types of emergencies that you may have included in your disaster recovery plans. For those living in areas of the country vulnerable to natural disasters such as earthquakes or hurricanes, you most likely have outlined which of your staff members will be stationed where and what their job descriptions will be.

In an outbreak such as the N1H1 flu, you have no idea who on your staff will be affected and either home sick or in the hospital. This makes predicting what will happen that much more difficult.

Planning must include thorough preparation to have substitute coverage of the jobs of key staff members from your general manager, to business office personnel, sales account managers, programming staff and DJ's, and yes, even the receptionist. Imagine walking up to the office and the front doors are closed and locked because the receptionist is out sick.

You may be able to survive and cover for a few people out sick, but what if that number climbed to 25% or even higher which is very possible in an all out pandemic period? With our current economic situation, our stations are already operating with fewer people and those still working are doing the job that multiple people were doing just a few years ago.

We also need to keep in mind that it is not just your office affected by a pandemic outbreak. Your clients will most likely be short staffed as will your vendors for office supplies, food deliveries, and other services we normally take for granted like HVAC, generator servicing, and fuel deliveries.

### WHAT SHOULD YOU DO NOW?

Here at my office we already had a business continuity plan in place, which includes a section for a pandemic outbreak. When something like this is lurking, we start with a team of four people, called our "Initial Contact" group which I am a part of. We met and looked over our full plan to decide if more needed to be done. The decision was yes.

From here we develop a plan and take it to our next group, called the "Crisis Management Team." This team consists of a group of managers representing every department in the building. For now the team is simply getting familiar with all of the stages of the plan so that we do not have any surprises in the future. Our plan follows along with the alert levels issued by the CDC.

Each stage has a set of action items for us to take. We have studied each of these items up to the current phase alert set by the CDC, and even beyond, and made decisions as to which action items we needed to implement. Those items include:

### GENERAL STAFF INFORMATION AND HYGIENE:

- Monitor the CDC website frequently for updates on the spread of the flu. Note how many cases are affecting our area. One week ago it was zero. Now there are five confirmed – including one at a local theme park – and now it appears we will have one confirmed in the Metro Orlando area.

- Also keep up to date with bulletins from the CDC, SOS, WHO, and OSAC – State Department for any key information.

- Download helpful tips and articles from the CDC and other various websites, as well as items that have been sent to us from our corporate office and pass these on to our staff. These typically include general health tips on how to stay healthy and lower your risk of contracting the disease.

- Inform our staff of a corporate hotline number available to them where they can get a recorded message update on emergency plans such as office closures, alternate meeting places or phone numbers to call, etc. This number also allows them to check in and let us know they are OK and accounted for.



- We are encouraging our staff to stay home if they feel flu like symptoms, and to see their doctor immediately. Early detection can help minimize the severity of the disease.

- We have put alcohol-based wipes near our entrance doors and other common areas, and are cleaning the door handles frequently

- We have put hand sanitizers throughout the building in common areas and encouraging our staff to clean their hands with it. This does not replace normal hand washing with soap and warm water though, which we also encourage. Some feel as though the hand sanitizers are not effective on the virus, but we figure that keeping clean is important and why not take all preventative measures we can.

### PROACTIVE STEPS:

- First we have reviewed our emergency plan to be sure all of the information is current and up to date. We are also making sure everyone on our Crisis Management Team has updated their individual books too. The information includes:

- o Names and phone numbers of everyone on the Crisis Management Team.

- o Full staff phone and address list.

- o Names and phone numbers of all key vendors and advertisers that we use which includes the telephone company, power and water company, cable and Internet services, tower crews, generator fuel providers, office supply stores, plumbing, etc.

- o Key numbers at our corporate office.

- o Outlines and flow charts for various forms of disaster, including pandemic procedures. These flow charts give information and guidelines as to what to do for each disaster, who to call, what to look for and appropriate steps to take. It helps keep us organized and calm during a disaster.

- Next we are taking an inventory of our office supplies and stocking up on items like paper, toner, pens, paper, etc. Yes, we need to be mindful of our economic situation, however the items we are ordering would have been ordered over the next few months, so we are just stocking up early. In a full scale pandemic, many of the suppliers may be short staffed and not able to provide the necessary supplies.

- We are checking the capacity of our office VPN. If the situation worsens, we may find a lot of people wanting to work from their homes either with the flu, or to avoid exposure to it. This may increase traffic on our VPN beyond anything we have ever tested before. We may need to set up a schedule and regulate the access to the VPN - set up a time-share as it were.

- We are also making changes to our telephone system set up. Unlike many companies, when you call our main number during business hours, a live person answers the phone. We have identified everyone who has experience working at our front desk to try to maintain that level of personal service that we are proud of, but at the same time, we are making sure our system is programmed for an auto-attendant mode should we find ourselves short of staff.

### READY

Each of our departments already has a plan in place to put in action. Should the situation continue to get worse our Crisis Management Team would continue to meet and determine what further steps to take. Should the CDC elevate the pandemic alert level again, Future steps may include:

- Restricting travel by staff members to avoid airplanes and other modes of public transportation.

- Consider suspending meetings in conference rooms to limit face to face exposure.

- Consider further supply stockpiles including water, food for those working, and fuel.

- Consider the option of more people working from their homes.

- Restrict or manage deliveries to the office.

By taking early precautions and knowing your options you will have a much better chance of getting through the H1N1 flu outbreak.

*Steve Fluker is the Director of Engineering for Cox Radio, Orlando. His email is: Steve.Fluker@CoxRadio.com*

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# Site Guide

## Using the Proper Warning Signs

by Dave Maxson

“Lighten up, David, it’s just a sign!” I get looks that seem to say this when I talk about RF safety signs.



Hard to tell if it is people or the sign that is in more danger.

After all, many people feel a safety sign is no different than a bumper sticker or a post-it on your cubicle wall. But it is not; it is very different. As an employer and a producer of RF energy, your company has an obligation to provide for worker and public safety in a structured manner.

### KNOWING THE DANGERS

RF exposure fits in the Occupational Safety and Health Administration (OSHA)’s workplace hazard rubric just like any other risk. There is an expectation that a company will have a program to manage these hazards. There should be a written company policy; workers should be trained; and information should be presented in a uniform way.

The American National Standards Institute (ANSI) has a standard for hazard communication via signs. This provides a structured approach to signing a facility that is uniform across industries and hazards.

When you see an ANSI-compliant “Danger” sign, it should mean the same thing whether the hazard is RF, electrical, chemical, mechanical, or whatever. In ANSI parlance, the Danger sign goes at the specific point where there is an *imminent risk of serious injury or death*.

At RFSigns.com, we take this to heart. Our Danger sign is for those points in an RF facility where you could be *killed* by contact with or approaching an energized surface. The most obvious location is at the base of a series-fed AM tower.

### THE ANSI SIGN

What makes an ANSI sign different from any old safety sign? There are several components: a **Signal Word**, a **Message Panel**, and a **Safety Symbol**.

**Signal Words** are placed in a corresponding color band across the top of the sign: Red = Danger, Orange = Warning, Yellow = Caution, Blue = Notice. There are some others.

The **Message Panel** has three pieces of information, where applicable: 1) the nature of the hazard (e.g. high levels of RF energy), 2) the consequence of the hazard (e.g. shock or burns) and 3) means to avoid injury (e.g. stay away, shut off power).

The **Safety Symbol** is any standard symbol used to illustrate a hazard. We tend to deal with two: RF energy, which we tend to associate with thermal exposure; and electrocution, which we associate with contact current, shocks or burns.

### LAYERED ENVELOPES

I have created a concept I call *Maxson’s Envelope Method*. If you think of your facility as containing layers of spaces progressing from the most hazardous (the innermost envelope) to the least (outermost envelope) you can determine how to sign it.

AM towers make good examples. A person can become the path to ground for very nasty amounts of energy at the base of an AM tower.

If there is a risk of electrocution at the base, mark it with Danger. The same applies for points of contact in the tuning unit or doghouse – exposed feed lines, tuning units and RF relays can be dangerous in ANSI terms. They all should have Danger signs.

If the danger is a point within a marked off area, then a Warning sign should go on the envelope that surrounds that area.



ANSI says “Warning” indicates “a Danger is inside.” Rather than a risk of imminent serious injury or death (Danger), Warning simply indicates there is a risk of serious injury or death within the envelope. So post Warning signs on your AM tower fence and the outside of your ATU or doghouse if there is Danger inside.

### NON-LETHAL HAZARD AREAS

What about non-lethal hazards?

An FM or TV tower site may not present an immediate opportunity for serious or lethal injury. Or there may be locations at an AM site that are off limits to the public or workers, without risk of serious injury. Here, we would utilize the Caution sign.

ANSI says “Caution” is for risk of minor injury. But what constitutes such a risk?

The way I interpret it is that there is no official point at which you are “slightly” injured by RF. However there are the familiar regulatory thresholds that the government says you should not cross – general public/uncontrolled exposure limits and occupational/controlled exposure limits.

Do you get injured crossing into non-compliant RF exposure fields? Usually not. But since you have to keep the public away from certain power densities and you have to keep workers away from certain higher power densities, it makes sense that these boundaries be respected with Caution signs.

### PUBLIC SAFETY

So at an FM transmitter site, for example, there may be places from which the public should stay away. If so, mark the envelope (fence, door, etc.) with a public safety Caution sign.

If, inside that envelope, if there is an area that exceeds – or can exceed – occupational exposure limits, create an envelope for that area and mark it with an occupational Caution sign.



Since this is an occupational threshold for trained personnel, it does not have to be a “*positive envelope*” such as a locked fence, door, or cage. It can be a *passive envelope* that consists of a rope or floor markings, and the Caution sign.

In some cases, it may be sufficient to post a Notice sign, which is informational and is not announcing a specific hazardous location, say on the door of the shack.

If routine or emergency repairs at a transmitter site could produce a temporary hazardous condition, such as an open live cabinet being serviced, or exposed conductors, then it is wise to identify a positive envelope inside which general public cannot go without an escort, whether it be a transmitter room or the entire shack.

Mark such an envelope with a public Caution sign.

### ENHANCED SAFETY ZONES

Just to be sure, Caution, Warning or Danger areas that are temporary in nature still could be permanently marked and placed. For instance, even if your cabinet is interlocked, you might want to stick a Warning on the outside and a Danger on the inside in anticipation of a failed interlock or bleeder resistor, or of servicing conditions that expose normally secured spaces.

It generally makes sense to mark any tower for occupational exposure (Caution) at the climbing point, because the worker then is notified in advance that there are exposure issues to prepare for by consulting the site policy and/or site manager/attendant.

However, it can also be helpful on a busy tower to mark the points at which the Occupational envelope actually is located. This way, workers who may have specific systems with which they work on the tower will be informed of places where they should not go without exposure control.

### THE SIGN

What about the proper size for a warning sign? ANSI has specifications for the proper letter size. For example, a message with one-inch lettering is assumed to be visible at 300 inches (25 feet). The Signal Word must be two inches high to be officially visible at that distance.

Of course, this leads to the natural question of “how many signs do we need to install? Simplistically, each 50-foot length of fence ought to be satisfied with a single sign with the lettering sizes just mentioned. (In certain areas, it might be advisable to augment this with signs in another, locally prevalent language.) Nevertheless, it is always wise to consider local regulations to reduce the potential liability.

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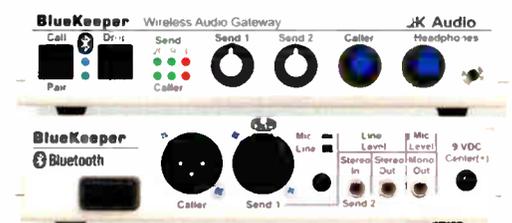


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# Troubleshooting Tech

## The Smell of Failure

by Dan Roach

One of the most powerful electronic troubleshooting tools is a mental catalog of remembered fragrances of damaged components. Who can forget the delicate aroma of a burnt carbon resistor, the pungent fragrance of an overheated inductor, or the telltale stench of a cooked selenium rectifier?

Successful troubleshooting can be a sensory experience as well as being a theoretical exercise. Burnt resistors often – but not always – have a certain look to them, and a burst electrolytic capacitor is a dead giveaway that there is trouble afoot. But the most valuable trick is to remember the ways that individual components fail. After all, there are patterns to how stuff breaks.

### FAMILIAR PATTERNS

First: the fuse. Most of us know transistors fuse faster than the fuses that are there to protect them. But fuses can get tired, too – particularly the slow-blow variety. Supposedly, metal fatigue in the expansion occurring during each power-on surge finally takes them out.

Thermal problems also can cause intermittent faults in power supply rectifier bridges, and they will sometimes cycle on and off every few seconds in a most entertaining fashion.

type will sometimes contain itself and just go short; the newer black plastic ones generally will spray flaming black rubbery goo all over the place until the transmitter overloads and gives up. These can present a real fire hazard. Both types can smell very bad when this happens.

Metal oxide varistors always fail by suddenly providing a dead short. Of course, they often explode when this happens, so you might end up with an open circuit and two leads where the varistor used to be. Bear in mind that either way, the “ex-varistor” is not providing protection to the circuit in question any more.

### PINHOLE SCOUTING

Hollow doorknob capacitors will heat up inside until the solder connections to their terminals melt. The solid red doorknob kind will get tiny pinholes or carbon traces, sometimes internal, but almost always very hard to see. Typically these are very intermittent faults, too.

Mylar capacitors, or plate blockers, also are prone to tiny pinholes hidden under the plate bypass element. These can be almost invisible to the unaided eye. Still, if they were easy to see, there would not be a challenge!

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Anything at high voltage potential attracts dust particles, which eventually adhere, develop a path to ground, carbonize, and either provide a high voltage shorting path – or an explosion. This natural law is partially counteracted by the tendency of all physical connections to busily expand and contract as power is cycled, trying to work themselves loose. However, they usually will get hot and burn before they open up completely.

Electrolytic capacitors are always either trying to leak or to dry out. If they dry out, they will intermittently go open. If they leak, Murphy's Law states “corrosive electrolyte will drip onto and destroy the traces on any printed circuit board in the vicinity.” Even if that does not happen, PCB material left to its own devices (!) will gradually blacken, carbonize and start conducting under the influence of heat from nearby power resistors.

### YES, RESISTORS CHANGE VALUE

The heat generated by power carbon composition resistors actually causes the carbon particles inside the resistor to regranulate over the years, causing the resistance to drop. Of course, in most circuits this means the resistor will pass more current, causing more heat, more regranulation, etc., etc.

After this they usually present a very high and unstable resistance, and often will fall apart if touched. Look for a telltale discoloration. But often there is no visible clue this is occurring, and you will have to measure the resistor to be sure it is “cooked.”

Over time, mica capacitors (the cylindrical kind with metal flanges), develop an increasing internal series resistance, often varying with ambient temperature. The resistive component begins heating up – until the inevitable fire. The old white ceramic

### MORE PATTERNS

Oil-filled capacitors generally leak, or short out and explode with a tremendous noise! Tantalum capacitors prefer to go out with a dead short. Disc ceramics go “leaky,” developing a varying shunt resistance, or they will just absorb water vapor and start drifting in value.

Old selenium rectifiers also go “leaky,” but when this happens they produce a stench that makes skunks stare in disbelief. You will know exactly where to look as soon as you enter the transmitter building.

Heat and ozone can break down high-voltage wire, eventually causing carbonizing, typically near one end or the other. However, the carbon traces can travel several inches back from the end. Neoprene rubber insulation also rots from heat and ozone, and flakes off, exposing the (usually blackened) copper underneath.

### IF YOU SEE A PHONE BOOK...

An old trick of high-power plate supply inductors is to maintain their inductance, but short a point in the windings to the case. You can sometimes solve this by slipping last year's telephone book under the unit, insulating the whole works from ground. If the transformer does short out some windings, the smell of cooking shellac will tell you where to look.

Outside, ceramic tower guy line insulators (“eggs”) will develop carbon traces, then start arcing over, creating RF interference. The fiberglass rod type will break down in the sun, absorb water, and arc until they are fully carbonized. Then they explode.

Finally, old circuit breakers – like old engineers – just get “tired” and start tripping over themselves for no good reason! – *Radio Guide* –

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# Safety Guide

## Good Habits Promote Safety

by Dave Dunsmmor

Radio engineers often find themselves working in places and at times that are – at best – inconvenient. (If the station is off the air, you can add in “pressure packed” as well.) Nevertheless, at no time should your personal safety be sacrificed.

Whenever the topic of safety issues is raised, I immediately recall to mind the old line: “Keep one hand in your pocket when finger-poking around.” And that is a very good place to start. It has saved me a trip to the hospital (or worse) at least once.

### AVOIDING DANGER

Of course, keeping your hand in your pocket is only good insurance up to the voltage it takes to punch through one’s shoe soles (or jeans if kneeling on the concrete floor), which usually is not as much as you might think. Personally, I will not poke around bare-handed in anything that has more than about 25 volts in it while energized (40 volts is the point at which a Fluke DVM shows “HV” and I like to stay under that).

The one exception I will admit to is when I am doing IPA cathode current balancing or tuning and loading for lowest reflected power in the Continental 816 transmitter. Then one must put one’s hand inside the center cabinet with the 10 kV power supply filter capacitor on the floor. However, I always make very sure that I am balanced on both feet first.

And, yes, I also have learned the hard way to remove jewelry! This was a requirement when I was in the Air Force, but I did get lax once while changing the spark plugs in an old Pinto wagon. During the process, I got my wedding ring between the wrench and the positive battery



It was 23 years ago, but the memory is still fresh!

post. After the major spark light show (and some yelping sound effects) the ring now had a couple of notches, and I had a circular blister on my finger.

The blister lasted about a month before it went away, but 23 years later I still have the ring (and my lovely lady), and it still has two little notches in it (the ring, not my wife!). I have never forgotten to remove my ring and watch since.

### A SAFER WAY

I want to emphasize here that there is a better way, one where you do not have to worry about insulation and electrocution issues: *Power down. Connect the test equipment. Stand back. Power up.* Then you can safely watch the meter or oscilloscope, and as a side benefit you now have both hands free so you can be recording data, symptoms noticed, sounds, smells, etc. The point is: never connect a piece of test equipment to live circuits in a transmitter.

Even in lower voltage circuits taking care about where and how you touch and test is important. True, doing things this way can slow troubleshooting down a bit. But you will never kill yourself by doing things this way.

You may have been told that test gear probes and wire are usually insulated to 5,000 volts. But remember: that is usually. You do not want to bet your life on this one. A friend

nearly died as a result of the electrical shock he received when checking an energized capacitor at a voltage of about 2,000 volts. The probe insulation failing was not the main problem, but more likely there was a buildup of surface contaminants that allowed enough leakage to nearly stop his heart. He was burned, and spent some time in the hospital.

I suspect that leakage is not the only way to suffer an electrical shock. It also seems to me that even if someone is very well insulated from ground while poking around, if they accidentally touch a high voltage source, they will stand a good chance of serious shock as a result of “body capacitance.”

In such a case, the inrush of electrons to equalize the charge differential between the source and the individual may indeed be fatal, or at least very painful. While I do not have any supporting data on this theory, it does seem like a good possibility, so again I say: *Power down. Connect the test equipment. Stand back. Power up.*

### UNEXPECTED DANGERS

Have you ever removed a high voltage capacitor after it has been in service for many years? Perhaps you placed a jumper across the terminals, put it in the back of the truck, and hauled it off to the shop. I did this one time many years ago, and after a couple of weeks removed the jumper, leaving the old capacitor just sitting in the corner of the shop.

Some weeks later I thought again about this dusty old capacitor and went to investigate exactly what had caused it to perform poorly (we had had a noticeable hum on the signal). I was very close to connecting the capacitor checker to the terminals when I recalled a story told me by a previous employer.

He had been a Navy SONAR technician, and one day he mentioned to me that the capacitors would pick up a charge from the air. Of course, I knew better than that, but I also knew he stated facts as he saw them. So I shorted the capacitor’s terminals again “just in case” with a screwdriver. A large “SNAP!” resulted which removed part of the screwdriver’s tip.

I was quite surprised, but very thankful that I had checked first. It was some years later that I learned the reason for the capacitors gathering a charge “from the air.” It is known as dielectric absorption, and in short it is the tendency of a capacitor to regain a charge on its plates after removal of the supply voltage and a short across the terminals is removed.

This happens because the charge in the capacitor is stored in the dielectric material itself – not in the plates as it would at first seem. The dielectric is not a perfect insulator, so it will tend to absorb some of the charge, and release it slowly due to the high internal resistance of the dielectric material, eventually building up a substantial charge value. The better the quality and condition the capacitor, the less this occurs.

All of this probably is not an entirely accurate explanation from a chemist’s point of view, but the thing to remember here is: *short the capacitor and leave it shorted.* Otherwise, it will bite!

### SAFETY IN OTHER AREAS

Safety issues often include the actions of others as well as what you are doing. For example, there are reasons you

leave the tower climbing to the professionals. After all, they are the ones with the proper climbing equipment, training and insurance. Have you ever watched them at work to see what is involved and how they conduct themselves? You should. It is instructive – and you might avoid a major problem.

To illustrate: as I watched a crew work one night, a kid threw a bag full of bulbs over his shoulder, and headed up into the dark. I asked the foreman about the lack of climbing gear (harness, belts, anything), and he agreed that he probably should require them. That was the last time that particular crew climbed for this company.

That may have been the way it was done in the good ol’ days (A newspaper article relating the construction of a 1,500 foot tower in Oklahoma in the 1950s had the foreman boasting that his climbers did not even have helmets, much less harnesses.), but not today.

Today, it is essential to realize the potential liabilities. I suspect that if a fall had occurred, our company would have been in court defending themselves even though they were not directly involved in the tower relamping activity.

It is to your advantage to insist any tower company provides you with references and proof of insurance before you allow them to approach your station. Of course, this can be a double-edged sword if you are working for a company that does not appreciate proper engineering. Sometimes the riggers will turn down your work!

### KEEP A CLEAN HOUSE

Clear access to the work area is essential. I was called in one time to repair a transmitter that had burned up the phenolic insulator that held the modulator tubes. It had become coated with dust, and the high voltage had arced enough times to cause a carbon path, which then continued drawing current and eventually caught fire. The phenolic insulating plate then completely failed, and the tubes fell into the cavity below and the station went off the air.

Upon arrival, it was virtually impossible to get to the circuit breaker panel due to all the junk stored there by the station. I should have required it all be removed before I started, but in the spirit of “I can do this quickly,” I let it pass. Although there were no emergencies this time, requiring a fast trip to the breaker panel, it came close to that.

I replaced the phenolic with some 1/2” plexiglas, replaced the tubes and restarted the transmitter. It immediately came on the air, but began shooting sparks out the top vent above the RF tube. Fortunately, I was able to shut the transmitter down from the front. Yet, it is easy to imagine what could have happened. The point of this story is choose your clients carefully – require them to do things *your* way when it comes to basic safety related issues.

This can be a rewarding business, but often it can be frantic. Never rush yourself. Take the time to think about what you are about to do and how you are going to do it. I have managed to live for all these years by s-l-o-w-l-y learning and applying this idea. It will pay. There is no emergency worth risking your health or your life. – Radio Guide –



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# Practical Engineering

## Planning Ahead

### Keeping Mice Out – Keeping the Station On

by Dave Dunsmoor

*There are many engineers out there on their own – perhaps as an owner/operator, or even someone new to the trade. Dave Dunsmoor shares some tips based on his personal experiences to help those without all the resources of the big shops. They are all meant to promote practical, but safe engineering. Get those jobs done, but get home safely!*

While summer is starting to turn to fall, generally the weather is still nice. The mice are playing in the fields, but soon are likely to get ready to find a place to live for the winter. Other critters will soon be doing the same. The practical engineer will plan now to keep them out of transmitter buildings, storage sheds, ATU doghouses, and even our houses and garages.

Of course, a building out in the middle of nowhere with old wooden doors and tall grass all around is just inviting mice. And mice must be among the worst nuisances with which a transmitter engineer must deal. They get into *everything*, they stop at (almost) nothing, they make a mess, they smell very bad, they eat wires, they are disease ridden. All in all, they are bad – bad for us, bad for equipment.

Therefore it follows that buildings and grounds that are not mice-friendly will have fewer problems with the little buggers.

#### REMOVING THE WELCOME SIGN

What then is “not mice-friendly?” First of all, they do not like wide-open spaces; they prefer tall grass, short grass, stacked up junk next to buildings, and so on. They certainly do not like to cross 20 feet of open gravel covered ground to get to a building. They do not like to gnaw around a good quality steel door and steel siding to get inside. (They also do not like trying to gnaw through steel wool, or steel hardware cloth.)



Almost like having a sign saying “No Mice Wanted!”

It might seem like an unnecessary expense up front, but the explanation you present to management should be along the lines of increased equipment longevity, outage prevention, lower repair costs, and far lower exposure of disease to the engineering staff, etc. All these points should be immediately recognizable to any good General Manager as positives for the station’s business.

By the way, if good building construction helps to keep the smaller critters out, good, well-maintained fences will help to keep the cattle out. Do not forget to ensure the “bigger critters” are contained. Otherwise, they might make it easier for the smaller ones to gain access.

Finally, if you already have some “unwanted residents” at the transmitter building, you may wish to employ the tactic described by Gary Peterson in the August 2003 issue of *Radio Guide*. A proper application of moth balls will go a long way to serving an “eviction notice” to the critters.

#### A CAREFUL APPROACH TO TOWER REPAIRS

Whenever you are dealing with tower repairs, there is more than just the danger of the stick coming down, and even when you plan for some problems, others can easily “pop up” and give you a nasty surprise if you are not careful.



#### Well Maintained Fences Keep the Livestock Out

Several years ago I ran into a situation where the tower base was gradually tilting and, despite repeated warnings, the owner was not ready to drop the tower and install a new one. Neither could I get any tower crew interested in trying to re-align it. It was either “drop it,” or “forget it, we’re not interested.”

The concrete tower base (sitting in about 3-4 feet of water, year round) was listing at about a ten degree angle; the tower itself was bent from vertical (at about the 60’ point) over to match the base at the ground. The base insulator looked like it was about to slip out of its socket; the feed point had pulled tight and was pulling out of the doghouse. Getting into the doghouse to take antenna current readings required hip wadders. It was a mess.

The owner eventually found a couple of old steel workers who said they could brace it up and make it good as new. I wanted no part of this pulling-the-base-back business, and told the owner so.

#### ANTICIPATING PROBLEMS

However, in case things went terribly wrong while the steel workers were pulling with their cables and winches, or if the tower just dropped during the afternoon news, I persuaded the owner to install a power pole and went to work stringing up a dipole. This was a daytime one kilowatt station, so feeding this “hammered together” antenna seemed a feasible plan.



Dave Dunsmoor is shown rigging the dipole antenna.

We used some heavy wire and a center insulator, and strung it up on the pole with the help of the utility company’s cherry picker. Then we went to work to match it up to the transmitter. As I recall, this took most of the afternoon and well into the evening.

I set the power to about 200-300 watts and ran it into a 160 meter amateur antenna tuner, and then to the dipole. After cutting and tying the ends, checking the VSWR, then cutting

some more and checking some more, little by little we got the dipole fairly well matched. To check, we drove down the road about 20 to 30 miles and found the signal was acceptable, so now it was time to let the guys work on the tower.

#### NO HURRY, JUST GET MOVING!

As we finished up, the summer thunderstorms were coming up from the southwest. At first they were still quite distant – the sky was darkening and only a little lightning poked out beneath the clouds on the horizon, so we felt there was no reason to worry. We just had to get the cable troughs covered up, tie the RG-8 carefully into place, hook the old coax back into the transmitter, and get the transmitter properly loaded and tuned. It seemed like a piece of cake.



#### An emergency antenna right on site.

Snap! “What was that?” Snap!! (again) I opened the cable trough cover and the RG-8 coax is snapping a good spark to ground every time lightning hits in the distance. As the storm drew closer, I started pulling the new coax out, rolled it up outside and grounded it.

The coax was just about all tied to the ground rod outside the building when the guy who was working with me said, “it’s time to go now!” Lightning had struck again in the (much closer now) distance, and this time sparks jumped the guy wire insulators on the tower behind us as well as creating a large spark between the coax and ground rod on which I was working.

I have seen this particular phenomenon several times over the years, but usually during a dry wind (a snow or dust storm). The sparks that jump from the coax to ground usually are fairly low energy. But this time it was a substantial spark, and I suspect it could have done some severe damage to either me or my assistant. I (re)learned that an antenna does indeed carry energy both directions.

The moral: Remember to plan your work carefully; you will not do anyone any good if you are in the hospital (or the morgue). After all is said and done, it is just radio.

#### IT DOES NOT TAKE LONG

A final story will illustrate why you should plan *before* you start a job, and how quickly things can go wrong. Most engineers rarely will be directly involved in the joining of metals by the application of heat and filler material (welding/brazing type repairs or fabrication), but it is an occasional task I have seen accomplished in the back room of a well-equipped transmitter shop. Personally, I happen to like working with metal.

I was welding a small item held firmly in place by the metal bench vise. The shop was large enough and well lit, but had plenty of stuff to fill it up. The trouble was, I had not paid much attention to an object lying on the floor near the vise.

As I was nearing completion of the job, I heard a muffled “pop.” I stopped and looked around but, seeing nothing out of place, went back to my task. Shortly, there was a louder “POP,” and my hands, arms and the exposed parts of my face and neck began to burn slightly.

The object on the floor was a battery under charge, and the generated hydrogen gas ignited briefly, spewing battery acid all over the place. Fortunately, I was wearing goggles and that protected my eyes, but it could have been much worse.

So I repeat: think about what you are about to do, and how you are going to do it. Be safe, not sorry. – *Radio Guide* –

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SINCE 1963

# RF Guide

## FM on 87.75 MHz - Is It Legal?

by Burt Weiner

In the last few years a new type of FM Pirate has emerged. Many stations licensed as (Class B) Low Power TV's have morphed into faux FM broadcast stations. Even more recently some "Legal Analysts" have suggested that these stations seem to be working within the FCC's Rules. I suggest that these "Legal Analysts," and even the FCC themselves spend some time reading those Rules. While there are unintended loopholes in the Rules that are being conveniently used to allow this to continue, there are portions of the Rules and Regulations that are clearly being violated.

The frequency of 87.75 MHz is allocated for the Aural Carrier of channel 6 Television, which I must interpret to mean that a signal on 87.75 MHz (offsets included) is licensed as the aural channel of a TV station and therefore must follow the TV Rules, which for aural modulation includes Class A and LPTV stations.

There has been convenient confusion leading to the belief that the aural TV signal may modulate up to 75 kHz deviation. This is partially correct but clearly not with respect to the audio that falls in the range of 50 - 15000 Hz, the main channel by very clear FCC definition. This confusion arises because there is a misinterpretation of the Broadcast Television Sound (BTS) Rules.

The BTS Rules divide up the maximum allotted 73 kHz deviation in the following manner with number 1 being the big one:

1. The Main Channel Signal, the material within 50-15,000 Hz, may not deviate the TV aural carrier by more than +/-25 kHz under any circumstances. (Main channel deviation in excess of +/- 25 kHz is not compatible with any standard NTSC television receiver made on this planet.)

2. The 15.734 kHz Stereo Pilot injection may not deviate the TV aural carrier by more than 5 kHz.

3. The DBX encoded AM DSSC "Stereo Channel" signal, the equivalent to FM's L-R channel, injection may not deviate the TV aural carrier more than +/- 50 kHz.

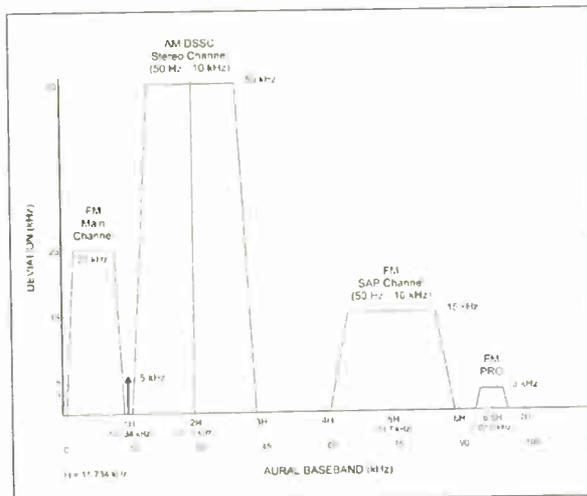
**NOTE:** The L+R and L-R channels teeter-totter and are not both fully present at the same time and as a result their deviation allotments trade off.

4. The FM Secondary Audio Program (SAP) channel injection may not deviate the TV aural carrier by more than 15 kHz.

5. The FM Pro Channel injection may not deviate the aural carrier by more than 3 kHz.

Under maximum stereo conditions these add up to a maximum of 73 kHz deviation of the aural sound carrier. These allocations may not be divided differently and except for the L-R channel as noted above, trading one allotted amount of deviation for another is not permitted. While the Rules allow for other stereo systems to be used, the Main Channel deviation limit of +/- 25 kHz must still be adhered to regardless of the system used. It is also interesting to note that there are no television receivers manufactured that decode the stereo system used by FM broadcast.

The Aural Baseband allocation of signals for BTS Television is shown in the chart below.



The aural signal requirements can be found in §73.682 and §73.681 of the FCC Rules and Regulations, which also hold true for Class A and LPTV stations in order to be compatible with existing analog NTSC television receivers.

### PART 73 - RADIO BROADCAST SERVICES - Table of Contents

Subpart E - Television Broadcast Stations  
Sec. 73.682 TV transmission standards.  
(7) Multiplex subcarrier or stereophonic aural transmission systems must be capable

of producing and must not exceed <plus-minus> 25 kHz main channel deviation of the aural carrier.

Note the term, "Main Channel" and then go to definitions:

Subpart E - Television Broadcast Stations  
Sec. 73.681 Definitions.

Main channel. The band of frequencies from 50 to 15,000 Hertz which frequency modulate the main aural carrier.

The television aural baseband signal is allocated differently than FM broadcast's baseband is allocated. For FM Broadcast the maximum deviation is +/- 75 kHz with slight allowances for SCA injection. The pilot, and any other subcarriers are subtracted from the maximum allowable +/- 75 kHz deviation. In television, the subcarrier/s injection is added to the Main Channel's maximum allowable +/- 25 kHz deviation. So, when the TV aural Main Channel audio modulates to +/- 75 kHz, then this becomes 300 percent of the allowed modulation.

From my home in Glendale, California I can see a Channel 6 TV station that is deviating +/- 83 kHz with main channel audio, has a 19 kHz pilot, no L-R information and no SCA's. That calculates out to about 332 percent main channel modulation. They promote themselves on the air and with bumper stickers as 87.7 FM. I have personally measured another Southern California channel 6 LPTV clearly promoting itself as a FM Station complete with bumper stickers and modulating their aural carrier 702 percent with main channel audio and has no visual carrier.

One last point: a standard television receiver cannot reproduce an aural only signal. If a "TV Station" does not transmit a visual carrier the audio is not recoverable on any standard television set manufactured in this country over the last 50+ years. Intercarrier NTSC television receivers require the visual carrier to provide the 4.5 MHz difference from the aural carrier in order to produce the necessary 4.5 MHz I.F. signal within the TV set for the sound system to work. This is the same way a traditional super-heterodyne receiver requires a local oscillator to produce the I.F. signal. So, no visual carrier, no TV sound! A television station that has an aural carrier but no visual carrier cannot possibly be considered a television station and is nothing more than a pirate.

Now, if only the FCC would read their own Rules and Regulations and regulate based on the word as well as the intent of those Rules.

Burt Weiner is a longtime engineer in Los Angeles, CA. His email is [biwa@att.net](mailto:biwa@att.net)

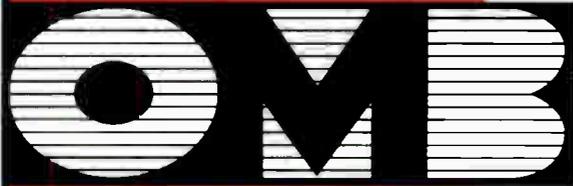
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## Managing Station-Owned Computers

by Chris Tarr

We live in a mobile society. In fact, radio has always prided itself in its mobility, from "News Cruisers" to play-by-play, radio has always been out and about in the community.

Meanwhile, from notepads and pencils, to recordings, to Marti's, and now notebook computers, the devices we use have become more advanced and expensive. Notebooks now are common at station remotes, especially in conjunction with wireless Internet connections.

As the use of notebooks increases, the importance of protecting and managing these devices becomes critical. They are by nature small and portable – they make easy targets for thieves inside and outside the building, and can also be subject to quite a bit of abuse.

### HANDING THEM OUT

It is not unusual for a radio station to issue notebook computers to many different staffers these days.

The most important item when dealing with these computers is to have a detailed and easily accessed policy on the use of company-owned computers, as well as clear expectations on their use and handling.

For example, if I issue a company notebook, I make it very clear that it is to be used for business purposes only. And just like a company-owned desktop, the company retains the right to take it and inspect it at any time. There is no expectation of privacy at all with those computers.

Additionally, if they bring the computer home (which I allow) they must bring it back with them when they are at work. The computer is to remain in their care and custody at all times. If the computer gets lost, they are responsible for purchasing a replacement.

### KEEPING THINGS SECURE

Another important aspect is data security. You need to remember that the minute that computer leaves the building, you lose control over the contents.

Since company-owned notebooks can generally access our networks and can contain proprietary information, I require at the very least a login password for the operating system, and in some cases a boot password, which is a password that it needed for the computer to boot up.

You can also add "lo-jack" type software that can help you track down a stolen computer by checking in every so often with a central server. Information is then passed to the police to help with the investigation. A caution: savvy thieves now are aware of this type of software, and will often replace the hard-drive before they turn the computer on thus making this method ineffective.

If you have very sensitive data, you will want to look into encrypting the data on the hard drive. There are several ways to do this, but it is beyond the scope of this article.

### POOL COMPUTERS

What about "common" computers, like ones used at remotes? With these computers, the concern is not about data, it is about the physical computer.

Again, I recommend a "checkout" system where the person taking the computer is responsible for its security and use. That will go a long way in preventing problems.

In most cases a simple notebook computer lock will be sufficient. These are much like bicycle locks in that you wind the chain around a fixed object and slip the lock into the computer. Almost all current model notebooks have a slot for this type of lock.

### KEEPING THE SOFTWARE "CLEAN"

I often find that these "common" computers take a lot of abuse and the operating system gets easily corrupted.

I use a program like Norton Ghost to make a baseline image of these machines after I set them up the first time. That way when they come back to me with problems, I can just simply re-image the hard drive and it is ready to go. It is quite a timesaver!

### HAVE A POLICY

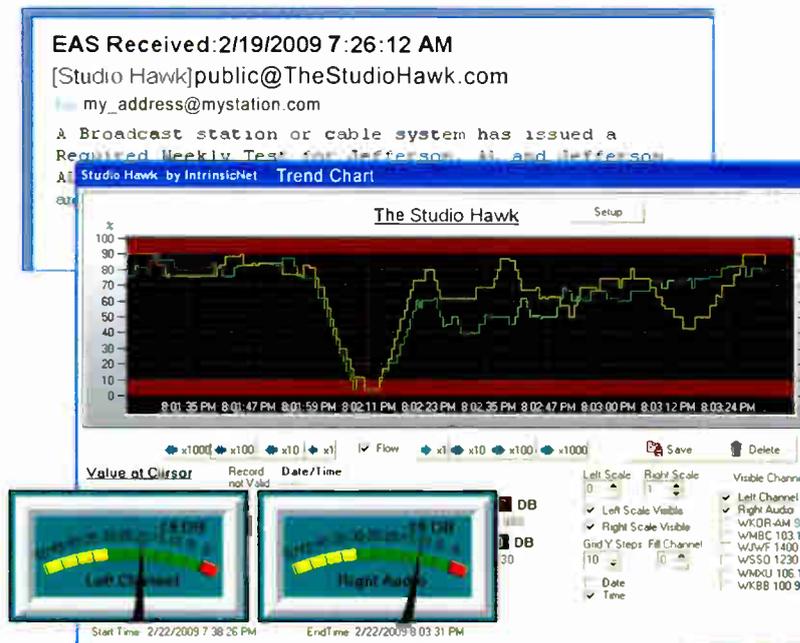
There are many other tricks that you can use in the care and handling of these computers.

I have found that 99% of potential problems can be prevented by simply having a thorough and complete policy regarding the use of notebook computers – and by making sure that the users of those computers completely understand and accept that policy.

If you emphasize the importance of what is contained in that policy, chances are users will see the importance as well.

Chris "Doc" Tarr, CBRE, CBNT, is the Director of Engineering for Entercom in Milwaukee and Madison, WI. You can contact Chris at [ctarr@entercom.com](mailto:ctarr@entercom.com)

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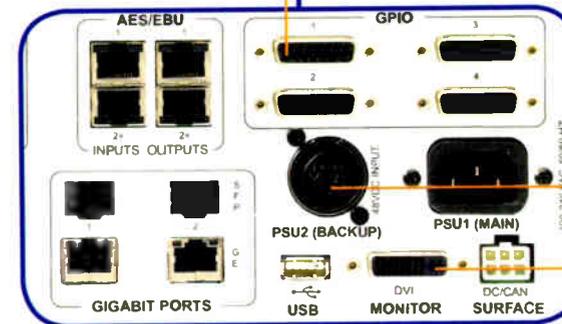
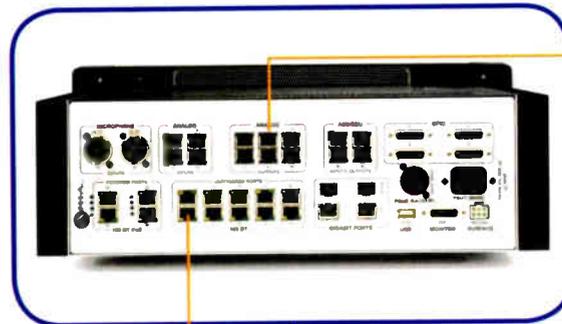
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**Fan free** • PowerStation is **silent and fanless**. Because studios today are already full of PCs, laptops and playout servers clicking, whirring and generating heat — who needs more of that? Not only is there no in-studio noise with PowerStation, those **big extruded heat sinks** are just plain cool. No pun intended (or maybe it was. We're like that, you know).

**Built like a tank** • Remember when consoles were built to last? We do. At Axia, we're all about the long haul. **There are no compromises**: PowerStation uses only best-of-the-best components. Like studio grade Mic preamps and A/D converters. A rigid, steel-framed, EM tight chassis that shrugs off RF like Walter Payton brushing off tackles. An industrial CPU designed for high reliability in harsh environments. Beefy extruded heat sinks. Big, brawny handles to make rack-mounting easy. (And it looks cool, too.)

### Redundant power redundancy

The power supply is the heart of any broadcast equipment, right? That's why PowerStation is **hardened against failure** with a **super-duty power supply** that sports enough amps to power an arc welder. And for those of you who like to wear a belt *and* suspenders, there's even a connection for **redundant auxiliary backup power** — with automatic switchover, naturally — that kicks in if it's ever needed.

### Screen play

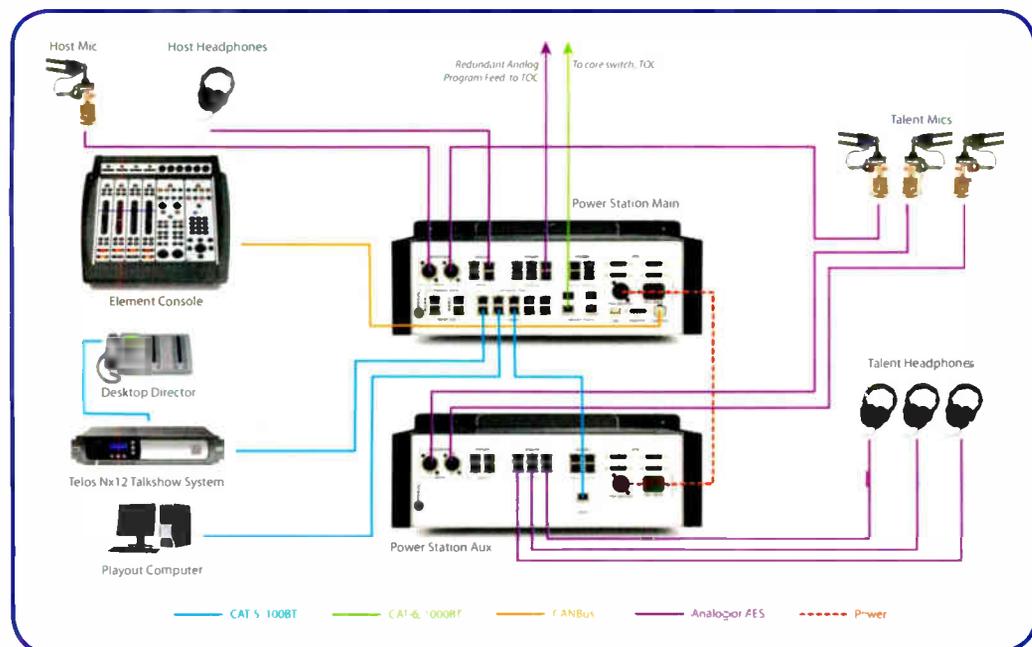
Yep, that's a DVI connector. **Your favorite monitor** — standard or widescreen — plugs in to present the console operator with Axia's "so easy an overnight jock could do it" **info-center display**. Meters, timers, fader assignments, mix-minus settings and more, all on-screen, on-demand.



**Element 2.0** ■ With more than 1,000 consoles already on the air, Element is a huge hit. And now, thanks to suggestions from our clients, it's better than ever. Element 2.0 has cool features like Omnia™ **headphone processing** presets to give talent that "air sound", **super-accurate metering** with both peak and average displays, **one-touch phone recording** with automatic split-channel feed, **automatic mix-minus** for every fader, an eight-channel **Virtual Mixer** that lets you combine multiple audio streams and control them with a single fader, and metallic bronze or silver module overlays. And we haven't even begun to tell you about Element's **Show Profiles** that instantly recall talent's favorite settings, its **built-in fella controls**, fully-integrated **talkback/IFB** and **Mic processing** by Omnia. And durable? Element is nearly indestructible, ready to take whatever pounding ham-fisted jocks dish out and keep going. You want examples? Element's **avionics-grade switches** are rated for more than two million operations. What look like ordinary rotary controls are, in reality, **bullet-proof optical encoders** — no wipers to wear out or get noisy. The silky-smooth **conductive-plastic faders** actuate from the side, not the top, so dirt and grunge stay out. The **high-impact Lexan** module overlays have their color and printing applied on the back, where it **can't wear or chip off**. The frame is made from **thick aluminum extrusions** that are stronger than truck-stop coffee. To find out even more about Element, visit [AxiaAudio.com/Element/](http://AxiaAudio.com/Element/). Grab some coffee and prep for a good, long read — remember, our marketers get paid by the word.

**Come together, right now** ■ Now that you know what you can do with PowerStation, let's build a studio. The diagram below shows how a typical Talk.Studio might look. Mics and headphone feeds plug into the built-in Mic inputs and Analog outputs... you play out PC, using the **Axia IP-Audio Driver** for Windows®, connects to a built-in Ethernet port... and so does the Telos Nx12 Talkshow System (which sends 12 lines of caller audio, mix-minus and take/drop/next commands over **one skinny CAT-5 cable**). Send a **backup audio feed** to your TOC for extra peace of mind. And after all that, there's still plenty of I/O left to plug in the turntables for the Saturday night Oldies show.

**The standalone network** ■ You want your console to be more than just reliable — you want it **built like a battleship**. You want the absolute peace of mind that comes from knowing your gear will **never let you down**. And if you take one studio down for maintenance, you want the rest to be completely unaffected. So we designed PowerStation to be the world's **first networked broadcast console that doesn't need a network**. It's completely self-contained: sure, it plays nice with others, but unplug its network cable and it keeps right on truckin'. Build just one studio, or a dozen, at any pace you choose — your PowerStation network is ready to expand when you are.



[AxiaAudio.com](http://AxiaAudio.com)

# Maintenance Guide

## Plan to Be Safe

by Barry Mishkind

Several years ago, one of the Big Three car manufacturers came up with the slogan: "Safety is Job One." This simple, yet profound, statement somehow seems to be ignored so often during times of stress or when things get busy. However, the implications are very serious, and deserve due consideration.

You probably can name many dangerous occupations: construction workers and laborers often get hurt on the job, chemical workers (including beauty salon operators) have respiratory or skin problems, meat cutters and alligator handlers seem to lose a lot of little appendages, and the list goes on. In broadcasting, we immediately think of the dangers faced by tower climbers. And then there are safety issues concerning engineers in general.

### VOLTS AND DEADBOLTS

While final amplifier voltages on solid-state transmitters are significantly lower than tube models, current is still high – enough that manufacturers continue to add "Danger!" stickers to the transmitters. Add to that the potential personal security concerns of exiting a transmitter room door at 2:00 a.m., and you have some real workplace issues that deserve proper consideration. If you are a manager, the word "liability" should be flashing in your head right now.

Perhaps one of the most troublesome issues arising out of consolidation is the increased workload placed upon engineers. While some companies and markets are exceptions, in some places broadcast engineers now are a vanishing breed. Yet, at the same time, a fair number of managers – most of them never having been to a transmitter site – have a highly

inaccurate view of what an engineer is and what he does. They consider an engineer merely an expense – an expense to be reduced or avoided whenever possible.

Without dwelling upon the number of light bulbs changed, toilets fixed, lawns mowed, or home stereos repaired, in this discussion we will concentrate on the safety and personal security aspects of an engineer's activities. (OK, one short diversion: How many GMs does it take to change a light bulb? None, that is what they keep engineers around for! If that is the attitude in your facility, please raise your hand now.) To be fair, we also need to ask: Have these GMs ever been educated as to what their technical department is all about?

### DON'T TOUCH THAT!

Many places around a transmission facility can be dangerous – from the transmitter itself to the tower environment. And additional hazards lurk at the studio as well. One of the reasons OSHA mandates "lockout tags" on breakers and disconnect boxes is how easy it is for someone to happen upon an open box, without knowing someone is working in a room far away. A quick flick of a switch, and someone could get zapped.



Sample Lockout Tag

True, it is not uncommon for an engineer to be alone at the transmitter site, so it might seem as though a lockout tag would not be of much use there. On the other hand, it is easy to get busy and become so engrossed in the task at hand that you forget whether the breaker is on or off. And when alone it can be especially dangerous, because it only takes a tiny memory slip and one could literally turn to toast.

Here is another potentially lethal situation, combining two errors: A disk jockey suddenly notices the transmitter is off the air, and pushes the remote control "on" button. Meanwhile, the engineer is working inside the transmitter, having forgotten to disengage the remote control. It does not even sound funny, does it?

### INITIAL SURVEY

Whenever an engineer arrives on site for work, whether at a transmitter site or a studio, it is essential he survey the situation and be very aware of which circuits and equipment are energized. Also the condition of the site itself deserves attention, because in addition to technical problems, there are hazards from a variety of two, four, and multiple-legged creatures. So include those concerns, too.

Why not start at the entrance? What do you see? Is the gate in good repair, as well as the fence? While the engineer may be in a hurry to solve an off-air situation, a broken gate or cut in the fence can alert him to intruders who may well have had a hand in causing the problem. A great many stations *do not* take the time to secure the service disconnect boxes outside the building. More than one station has gone "silent" because a local kid played "let's pull the handle."

While you are checking outside, include the towers and bases, as well as the buildings. In most cases, graffiti is not a good sign – for several reasons. It indicates there were unwanted visitors; and if not cleaned up it will attract more defacing. You might have to repaint two or three times, but once the local kids figure the building is not abandoned (they never see you, right?), they will usually move elsewhere. (Continued on Page 28)

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# Maintenance Guide

Continued From Page 26

## Plan to Be Safe

Locks, chains, gate hinges. And as you approach the main door, see if there are indications of crowbar application. This could be an early warning sign of impending invasion, and merit installing a more secure entryway.

### INSIDE

Inside the building, the first thing that comes to mind is the condition of the entryway. Is there sufficient light and a walkway clear and free of clutter that could cause tripping and injury? A quick check of the surroundings should verify that no intruders have been inside the building.

Getting down to the issue at hand, whether your visit is for routine maintenance or an emergency visit to get the system back up, the key word is caution. With caution you will avoid many potential causes of injury. Even if you plan to work with the power off, disable the remote control – an unexpected “command” can come when you least expect it.

Clearly the best protocol is to have two persons on site at all times. In some markets, the union contracts forbid an engineer to work alone on high voltage. And some companies make this their policy as well. A second person can be instrumental in saving a life in case of accident, whether by performing CPR, calling 911, or simply being ready to kill the power switch. A second person also can be “in charge” of remembering if the tower is hot or not, and determining “go” and “no-go” for climbers.

Whether or not your chore is routine maintenance, it is important to know *exactly* which disconnect feeds which equipment. Mark or label each box clearly. And, unless you are testing the transmitter's operation, turn it *off* before opening the transmitter.

However, this does *not* eliminate all danger. Inside your transmitter are all manner of large capacitors. They can hold enormous charges. And sometimes the interlocks do not work properly; they may be broken, defeated, or lead to an “open” drain resistor. Worse, you might just find a disconnect switch was mis-labeled or broken. (John Stortz' tech tip of mounting neon bulbs across power leads is a good way to have visual confirmation of power status. A bulb could be mounted on the disconnect, and one *in* the transmitter. See page 34.)

All of this leads us to grounding sticks, and the many lives they have saved. In short, *always use the grounding stick!* Engineers who have had a screwdriver or wrench turn into in an ad hoc grounding stick will tell you how impressive the “flash” can be! Those of you who observed and noted the safe practice shown on the cover of this issue may now take a gold star out of petty cash. That is right. Keep one hand *in a pocket*.

It might seem awkward or inconvenient, but until you have ensured all power sources are discharged, having a hand in a pocket will prevent many an inadvertent “circuit” from being formed through your body. Once everything is discharged, then you can use both hands. But, be sure you have carefully made the way safe.

The safe use of various tools and chemicals are definite topics for another article. The same applies to the necessary maintenance on air condition systems, generators, etc., that are found at many sites. Meanwhile, we will assume your maintenance visit is successful.

### SAFE PRACTICES CONTINUE

Even after you have serviced the transmitter (or other gear), there are some important things to do before getting back in the car and heading home.

First and foremost is to document what you did. Maintenance logs are no longer required as in years past. However, the same issue applies as with studio logs: If you have an issue during an inspection, well kept logs will demonstrate that you

do not typically run without regard to your licensed values. It will also provide a paper trail for replaced parts, and what parts of your transmission system need the most work.

Restoring power disconnects and remote control to their proper operating positions should be done by now, and as you prepare to leave, ensure the air conditioning/heating and lights are set for “unattended mode.” As you secure the building, take care of your personal security. Again, two people on site are much better than one, in case some two legged animals are waiting for you to exit into the dark.

Better yet, have a camera set up to show you what is outside, before you exit. Even if your gate is closed, the “smell of activity” attracts some less than savory sorts. Management that does not acknowledge the need for sufficient plans to insure the safety of the individual is asking for a major liability lawsuit.

As you drive away, you might use your cell phone to call the studio or remote control and ensure it is working normally. Some stations even “remote” the light over the door for positive indication things are working (and it sure keeps you from having to get out of the car in the dark!).

### SITE SAFETY CHECKLIST

1. Site appearance: Are the fences and buildings all secure, with no indication of vandalism?
2. Building integrity: Are the doors secure, properly lit inside (and outside after dark), and walkways clear?
3. Disable the remote control system.
4. Disconnect the power to any equipment you plan to service. Use lockout tags “to be sure.”
5. Use the grounding stick!
6. Keep a hand in a pocket until you are sure gear is completely safe.
7. Handle tools and chemicals safely.
8. Note down all relevant details of your work in the maintenance log.
9. Make sure power and remote control are restored to “normal” operation.
10. Check on any untoward activity outside.
11. Lock up carefully.

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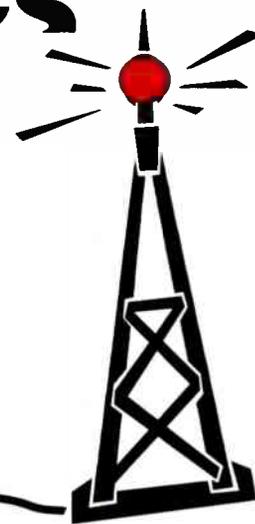
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# Transmitter Guide

## High Voltage is Not Your Friend

by Dave Dunsmoor

When working with equipment utilizing high voltage, it is a given that we stay clear of energized elements. But what constitutes "high" voltage? And how faraway is safe? How can we determine both what is safe for us and safe for our equipment?

Forty volts seems to be the threshold that activates the "HV" annunciator on many DVMS today. I never used to consider this seemingly low voltage to be a problem. However, manufacturers (or their attorneys) presumably have done the research indicating anything over 40 V is potentially hazardous.

Current is the dependent variable here; its value is the result of the applied voltage and skin resistance. Very low currents – way less than 1/10 of an Ampere – can bring severe pain, loss of breathing and/or muscular control, and even heart fibrillation. As little as 50 mA can be fatal. This is why the "One Hand in the Pocket" Rule is a good one – it has saved me at least once.

Since I personally prefer to avoid such empirical research into the subject, I will use 40 V as the point where I do not poke about with my bare hands.

Now that I have defined 40 V as "high voltage," just how do we go about safely troubleshooting equipment that generally has far more potential in it than this? After all, it seems like many feel it is just "common knowledge" that you have to do some "fingerpoken" to get the job done.

### KNOW THE CIRCUIT

Probing equipment with a voltmeter can usually be done safely if you are very careful to keep in mind where your hands

are and where the energized parts are located. This rule works well until you get distracted, or are tired – situations that can easily occur during a callout to make repairs.

Older audio boards, new audio boards' power supplies, older transmitters, newer transmitters, receivers, and computers all have high enough voltages in them to be truly hazardous. If you treat them all with the required care and respect you will reap the benefits of (1) keeping your life and good health, (2) keeping your repair time to a minimum, by not having to run out for more repair parts or test equipment, and (3) keeping your self respect and professional status with your clients intact.

Few things will make you seem to be the dull-witted, nerdy stereotypical engineer quicker than a "snap!, flash!, and a puff of smoke." Someone will always notice the event.

### DANGER COMES QUICKLY

Consider this: the override of your nervous system when you contact a high voltage source is instantaneous. You have no control over the muscles involved. Just like the FM capture effect, the strongest signal prevails. Your fist will clench, your arm will jerk, chest muscles contract, and your heart may stop.

Even if you do not receive a severe enough shock to do permanent damage, you may suffer substantial cuts as a result of this involuntary reaction. Worse, while your hand is busy impaling itself onto some hardware, that open wound now provides an even better electrical path, and the damage could become even more life threatening. This is an immediate effect – you simply cannot pull your hand out before the electricity has done its work.

I have managed to arrive at the ripe old age of 53 relatively unhurt, partially by luck in my earlier years and mostly by being careful in the later years. Troubleshooting or adjusting transmitters often requires the determination of high voltage levels and comparing these values to either published specifications, or to theoretical or logical values. The only safe way to do this is to power the equipment down, carefully connect your test equipment, then power everything back up and interpret the metering indications.

Truthfully, I (almost) always do this for anything over 24 volts. And I when I say power down, I mean for you to give it time to discharge completely. Use the shorting stick – after all, it is there to protect you.

### TAKE YOUR TIME

Sure, I have poked around in live service panels checking for an open fuse, as I am sure all of you have. I just no longer think it is worth the time saved. First, it is just too easy to contact live parts, and secondly, the test leads and probes can fail to provide the insulation protection as designed. You do not need any information so immediately as to chance being hurt or killed while doing your work.

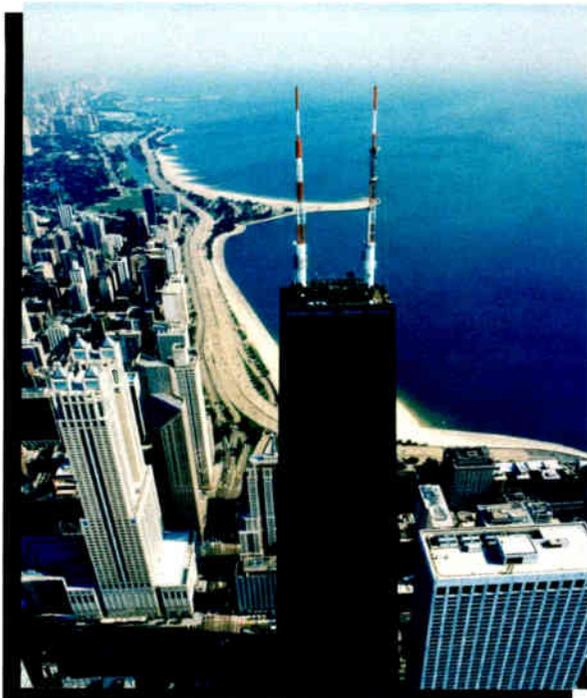
I was nearly knocked off the chair at the bench some years ago by "only" 500 volts in a two-way radio. I felt it clear into my chest even though I did have one hand in my pocket.

Mentally reviewing the event later on, I guessed that the shock I received was similar to the charging of a capacitor – me being one plate, the carpeted floor the insulator and the concrete being the other plate. I do not know for certain what the actual dynamics are. But it was intense, and I do not ever want to experience that again.

An acquaintance of mine was troubleshooting a 2 kV power supply problem some years ago by probing it "hot" with a voltmeter. He was nearly killed, and suffered some severe burns across his chest. Possibly the probes were dirty, cracked, or maybe his hand slipped. No matter, if he had powered down,

(Continued on Page 32)

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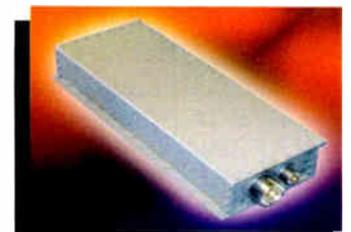
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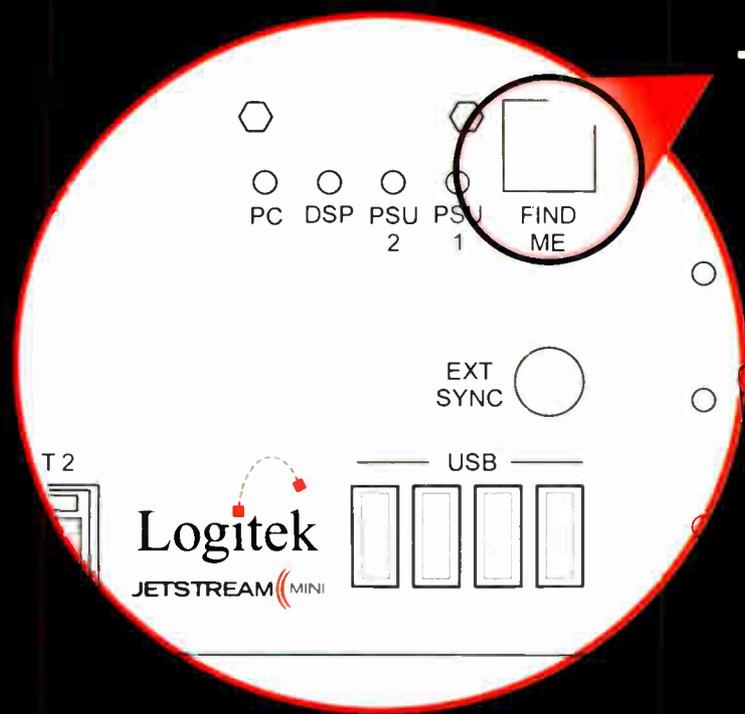


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# Transmitter

## Guide – Continued from Page 30 –

### High Voltage is Not Your Friend

connected the meter, then powered up when he was outside of the equipment, he would have not have spent time in the ER and ICU.

True, 2 kV does not seem like much when compared to the 10 kV or more usually associated with FM transmitters, but it is a dangerous and potentially lethal voltage. I will submit to you that contact with the 5-10 kV B+ inside tube transmitters will likely kill you before you even hit the floor.

#### KEEPING THE EQUIPMENT SAFE

Earlier, I mentioned "safe for the equipment." This refers to how you dress your test leads outside the cabinet before you power it back up. I usually bypass interlocks with their built-in mechanical override, then continue. However, if the door or access point you have open does not want to stay open, please be sure to block it open.

Although a set of test leads may fit under the door without being completely pinched off, they can still arc through – or worse, be cut by the door's edge. Then you have at least one more problem to solve before you get back to troubleshooting. And the evidence of you having been there is left forever.

Next, consider test equipment placement. Just because your meter has a plastic or rubber case is no guarantee it will not flash over when you do re-apply the power. Whether it is sitting on the chassis or on the concrete, relying on the case to provide sufficient insulation can be risky.

Insulating matting (or electrical switchboard matting) is cheap enough, and available from many suppliers. It is sold in

various lengths and thicknesses, and rated from 20 to 50 kV, with suggested working voltages from 3.5 kV up to 17 kV.

Check your favorite parts and equipment supplier, and if they do not carry it, there is always the Internet. I did a Google search and found several. For the extra \$100 or so, I think this is good protection for you and your test equipment. It is also more comfortable than walking or kneeling on concrete.

#### PROBLEMS FROM LOOSE CONNECTIONS

Another aspect of working with electrical equipment is the open or loose neutral. This most commonly is exhibited by either dimmed or overly bright building lighting. What happens is this: the neutral connection from the utility power transformer becomes loose, which in turn causes the 240 VAC to the building to lose its center tap neutral reference.

The phase-to-phase voltage still reads 240, but measuring from the breakers to the panel neutral will show anything from very low to very high. I have had voltages from 65 to 185 volts at the 120-volt connection. The equipment on the low leg will run poorly or not at all, on the high leg will probably run OK (for a while) but its power supply will be over-stressed and will probably fail early. A third problem associated with this is the offending connection will run hot, and could even start a fire.

This applies to all connections from the utility power to the last bullet in your FM antenna, or the connector to your AM tower. If it is not tight, it is taking power from its intended purpose and generating heat instead. It is a good idea to go through your entire plant annually and check and retighten as necessary all connections, not just the high current/high voltage ones.

A new method to check connections is the non-contact, Infrared (IR) thermometers that are generally available for under \$100 (Another Franklin well spent!). They make quick checks easy to do, but I still like doing an occasional physical "back off and re-tighten" as connectors not drawing much current will not heat up much, and thus will not show up on the IR thermometer.

#### RF VOLTAGE

The last item I want to discuss is an issue for many who maintain transmitter sites, and that is the RF voltages on the AM towers, on the output connectors of the transmitter, or the exposed portions of the ATU components. There is a real problem of RF burns.

I have had RF burns at power levels as low as five watts. So how much worse will 5,000 watts feel? Lots. As I said: I was more lucky than smart in my earlier years.

Five kilowatts into 79 ohms results in about 680 V RMS at the feedpoint – and with full modulation, it rises to over twice that (if you are running your processing hard). RF voltages will be even higher in the ATU, as the impedances are greater at some points in the tuned circuits.

Contact with exposed parts burns – and it burns deep. Quite often RF burns take a long time to heal as it seems like the wound goes clear to the bone, and heals from the outside in.

My "Elmer" once showed me "the wooden pencil drawing an arc from the tower trick," warning me: "Dave, don't ever do this!" Understanding the physics, I will not do that. Yet, some years later I started pulling the metering panel off an ATU while the tower was hot.

The metering cable was about a quarter-wavelength long back to the transmitter building. After the last panel screw was removed, what do you suppose I had in my hand? Yes, a very expensive, very RF hot meter panel. I must have gotten a half dozen good RF burns before I got it put back into place.

#### TAKE IT SLOW AND EASY

The lesson is clear: think about what you are going to do and how you are going to go about it. Take your time. Thinking a problem through and developing a careful course of action will likely lead you more quickly to an answer – and may also keep you alive. – *Radio Guide* –

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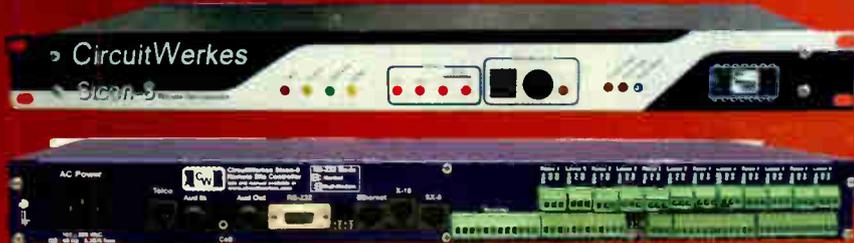


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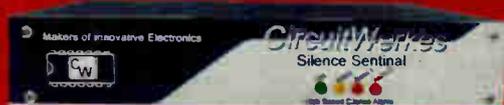
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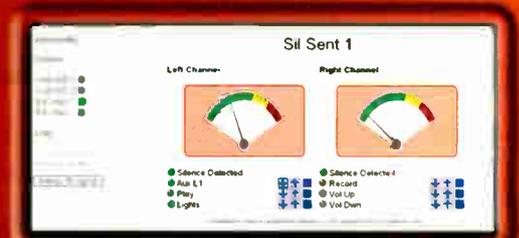
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# Tech Tips

by John Stortz

## Home Made Tools Save Time ... Save Life

Here is an easily homemade tool that falls in the "Why didn't I think of that years ago?" category.

### INSPECTION PROBLEM

When doing a tower lighting inspection, how can an engineer know if the photocell will work properly without waiting around until dusk or dawn? Here is my solution to the problem: a tool made from one of those 18 or 48 ounce oatmeal (or similar style) round boxes and attached to an appropriate length of 1/2 or 3/4 inch PVC pipe.

All it takes to mount the box to the PVC handle is a bungee cord or some duct tape. By using a dry oatmeal cardboard box, rather than one of metal, the project results in a lightweight and easy to use tool. Painting the box flat black on the inside helps absorb light.



The PVC provides a handle long enough for the engineer to place the can safely over the photocell without needing a ladder. Covering the photocell simulates dusk and the tower lights should switch to the night mode within about a minute. Remove the tester and the tower lights should return to day mode. What about those horizontal sensors on the side of tower or building? The use of the bungee cord makes it easy to adapt the tool to whatever angle makes it easiest to cover the photocell.



### MODE AND SAFETY CHECKING

And while checking those tower lights, take a moment to be very sure they *all* turn off when removing the tool. This is especially important on taller towers. We recently had several sidelights burn out because lightning had caused one of the solid-state relays to lock "on." The small 110-watt lights were simply not bright enough to be noticed from the ground in the daytime, so the lamps just burned day and night, until they failed. Eventually, I realized this would be another good application for one of those cheap neon indicator lamps.



I first discovered those little neon indicator lamps while still fairly new to broadcast engineering. I used to short out everything with the shorting stick – not only the HV capacitors, inductors & transformers, but also the incoming power terminals. One time, I had forgotten to turn the 150 Amp main breaker off before shorting the incoming power. The resulting sparks, smoke and sound nearly scared me out of my socks and shoes! That event got me wondering what might help prevent another pyrotechnic display, yet provide good safety.

These lamps use about 1/4 watt and will last for years. Any normally closed cabinet with power controlled only by an external circuit breaker or fuse would be a good candidate for an internal neon light. The purpose of the light is just an extra warning to whoever opens the cabinet, reminding them the power is still on. The best place to put them is somewhere near the line inputs. It becomes a nice safety warning when you open the transmitter if you forget to turn the power off.

When purchasing neon lamps, the 240 volt version will last longer – buy extras. I prefer indicators which can slip into a panel hole, have an internal resistor and insulated wire leads; these can be picked up for \$3 to \$5 each. Another good place to hang one of these neon indicator lights is across the main power feed(s) of any equipment or the output of any breaker where danger could be present.



### ALWAYS USE CAUTION!

I still short out the incoming power feed, as well as the other stuff, before sticking my hand into a transmitter. While neon indicator lamps have a predicted life of at least 100,000 hours, a power surge might have shortened that life to zero. I would much rather have another sparks and sound event with a shorting stick, than having that energy passing thru part of me. Remember: The life you save might be your own! – Radio Guide –

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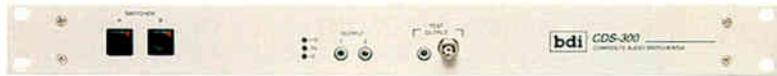
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## The AES-302 Digital Audio Switcher/DA/D-to-A Converter



The *AES-302* switches between two AES3 sources automatically upon loss of feed. Features include a four-output AES3 DA and balanced stereo analog output. The unit triggers on silence, loss of clock or other user determined digital error flags. The *AES-302* is remote control compatible with position status.

## The CDS-300 Composite Audio Switcher/DA



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

## The CDS-302 Automatic Composite Audio Switcher/DA



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

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## The CMP-300 Composite Audio Mixer/DA



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

## The CTD-300 Composite to AES Converter



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

## The ACS-300 Six Channel Audio Control System

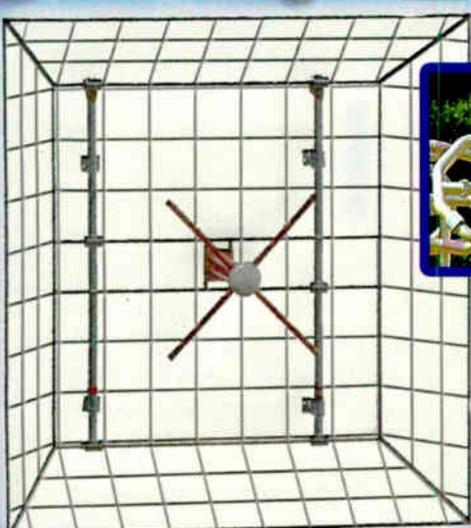


Originally designed for the rigors of six channel television sound, the *ACS-300 Audio Control System* provides six channels of balanced I/O where each channel or groups of channels can be remotely turned on, off or dimmed by a pre determined level. Uses include monitor muting for consoles that lack this feature or for paging applications where audio dimming or muting is required. Of course, the *ACS-300* is well suited to six channel audio surround applications too. Each input is differentially balanced and can provide up to 14 dB of gain. All outputs are differentially balanced 600 ohm impedance. Use any time audio needs to be turned on or off and line amplification is desired.

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# Full Duplex

by George Nicholas

## Identifying Important Things

"I've got so much work, I don't know where to begin," Murph the Engineer moaned to his manager. "I know what needs to be done, but I can't seem to engage today."

Mark, the GM, replied, "One of the reasons I hired you, Murph, is your ability to juggle three or four high priority projects successfully. That's what makes you a better Engineer." Murph looked a little dazed at first, then realized Mark was probably right. "You may be on to something. I seem to have a lot of work, yet my calendar seems pretty empty." Mark gave the obligatory wink and "finger shooter" gesture and strolled down the hall.

### PRIORITY PARALYSIS

Clearly, Murph suffers from a disease I like to call "Priority Paralysis," that defeated feeling one gets when faced with a desk full of papers, a person standing in the office and the phone ringing simultaneously with the pager! The good news is: there is a cure. However, it may take time, and it will take change.

Murph sat at his desk and started a list of every thing he needed to do. After reviewing his list, it became clear there were a lot of tasks that really were not important, or less important than others. For example, he was two weeks behind on reviewing the logs, yet "sweep out the doghouse" was one of the first things on the list.

Murph's priorities were contaminated with *minutiae*, the fine points of everything unimportant. This is not to say details are not important; it is how they affect the process that matters. Many times priorities are not black and white, but

various tones of gray. Hint: Setting the first priority is always the most difficult, so do not start there. Start lower, and work your way up.

Meanwhile, never be too quick to blame yourself! Some problems in priority ranking may be the result of your organization. John Maxwell, in "Leadership 101," suggests three common problems in most organizations:

- **Abuse:** Too few employees are doing too much.
- **Disuse:** Too many employees are doing too little.
- **Misuse:** Too many employees are doing the wrong things.

Sound familiar? While you may not be able to change your organization single-handedly, you can recognize these problems and make adjustments.

### QUALITATIVE ANALYSIS

What is *really* important, and what is not? Answering that question requires perspective. Perspective requires experience; and experience allows judgment. Here is a way to get to the heart of the issue: What if you had only one day left to do your job?

That sounds dramatic, but it is an excellent thought-starter. Suppose you are leaving for vacation in a week (which some studies suggest is your most productive week of the year), or you may be leaving for another position and want the engineering department to be in good shape for your successor. Or, worse, it may be your last day of good health.

For example, Craig Hospital in Colorado specializes in spinal cord injuries. A spinal cord injury is about as serious an injury as one can sustain and remain alive. They have done research on the effect of spinal cord injuries and how it relates to quality of life decisions of their patients.

Based on a British study that spanned several years, 195 men with back injuries were asked to consider 15 categories that contribute to quality of life, including health and personal safety; material comforts; relationships with family; relationship with spouse; raising children; having close friends; helping others; work; learning; understanding oneself; ex-

pressing oneself; socializing with others; entertainment, such as reading or listening to music; participating in active recreation, and participating in local government.

### WHAT IS IMPORTANT

Interestingly, both injured and non-injured men ranked health and personal safety first. But from that point on, the results were much different. The injured men cited relationships with family and spouse as second and third, followed by understanding yourself, followed by learning.

The non-injured men listed relationship with spouse as second, followed by work and material comforts; having and raising children was fifth. This correlates with experiences I have seen in others; usually a life or career threatening issue makes someone re-evaluate what really is important.

You might be asking yourself, "That's all fine and good; how does it affect me?" The point is that when determining what is truly important, you must look beyond the immediate tasks and try to imagine the "big picture," even taking yourself out of the picture.

To apply the principle, let us start with a list of categories (in no particular order) for you to consider, followed by a suggestion as to importance.

- FCC Compliance – Important.
- Being on the air – Important.
- Modulating at 100% – Not as important.
- Being competitively loud – Important.
- Being loudest in the market – Not as important.
- Helping the boss fix his/her computer at home – Important.
- Going to the bar with "the gang" after work – Not as important.

You get the picture. The importance of any matter is relative to the other issues at hand.

Finally, when prioritizing, make sure you include some "PTO" (personal time off) to relax – even briefly – between projects. No matter what anybody may tell you, taking time off to recharge your batteries is important! –Radio Guide–

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# Tech Tips

by Gary Peterson

## Keeping Stuff Out of Your Transmitters

I hate cleaning transmitters. There are so many other things I can do with time otherwise spent removing dust and critters from the transmitter cabinets. So, you can understand that I am always on the lookout for tricks to keep stuff out of the transmitters in the first place.

If you dislike spending your maintenance time cleaning dirt and dead bugs out of transmitters, the following tips may help make your life more pleasurable.

### HELPING THE FILTERS FILTER

Your first line of defense should always be properly sealing the doors and other openings in the transmitter building. (Although most transmitters have some sort of air filtering, there is no law that says you cannot do as much as possible to trap dust and dirt before they reach the transmitter.)

Of course, the more stuff that your air filters catch, the less you will have to deal with inside the transmitter cabinet. I use disposable fiberglass filters and change them frequently. It is possible to greatly increase the efficiency of your air filters. The trick is to use a good filter spray.

For several years, we have been using RP brand "Filter Coat." It comes in two forms. One is an oily liquid in a plastic spray bottle. After experimentation, we find that we prefer the oily material in the aerosol spray can.

The Filter Coat is available at some hardware stores, and heating/ventilating and air conditioning shops may carry it. I

would suggest you avoid the kind that smells like wintergreen. While it will make your transmitter shack smell like Life Savers, I have found that it does not catch dirt very well.

Application is easy: take the new air filter outside and lean it up against the perimeter fence. Shake the can well and apply a light coat to both sides of the filter before installing. You will be amazed at how quickly the filter gets dirty. When I began doing this, I tried spraying the filter on only one of the two transmitters at our site. Within a few weeks the difference was obvious.

The filter on the left is shown after three weeks in typical dry, dusty "Plains" service. It is compared with a new filter.

You will have to change filters more often. But as you can see from the picture, that dirt does not end up inside the unit, where it adheres to all manner of irregular surfaces and, therefore, is much more difficult to remove. If you try a filter spray, the next time you open up the equipment for maintenance, you will notice the difference.

### INSECT BARRIER

Of course, use of a good insecticide around the walls and openings will go a long way to reducing the number of critters in the building. I also like to use naphthalene mothballs to discourage both little and some not so little "tenants" from taking up residence.



For whatever reason, certain years and/or seasons seem to result in huge infestations of various insect species. In a bad year up here in South Dakota, "miller" moths can quickly clog a transmitter air filter. They even seem to be able to easily get into what is, for all practical purposes, a tight building.

### A FLYING CRITTER TRAP

When the millers get real bad, I leave a pan of water on the floor with a bit of liquid dishwashing detergent added. (Most soapy materials should work.) The only other thing needed is a trouble lamp to clamp to the pan.

Later on, when the transmitter room is dark, the moths will be attracted to and circle the light attached to the pan. Eventually each of the critters will hit the water and the detergent will wet their wings.

On my next trip, all I have to do is dump the water-detergent mix, with all the drowned moths, and refill it with

a fresh mixture. None of those critters made it to clog the air filter on the transmitter. Just make sure that you use enough mixture to last until your next visit.

These are a couple of easily implemented ideas. Perhaps you have some other tricks that have worked at your site. If so, please let us know. After all, a clean transmitter is a happy transmitter! - Radio Guide -



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	3.5 kW	1986 BE FM3.5A
	10 kW	2005 Harris Z16HD IBOC Solid State
	14+5 kW	2005 BE Fmi1405 Solid State
	20.0 kW	2005 BEFM20S Solid State
	20.0 kW	1983 Harris FM20K
	20.0 kW	1996 Harris HT20CD
	21.5 kW	1989 Continental 816R-2B
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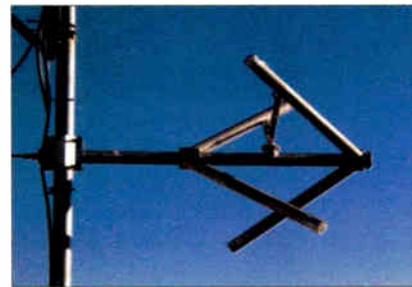
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# Field Guide

## The DME Audio Pod

by Burt Weiner and Craig Robbins

Craig and I provide remote services to many different stations and networks, with events ranging from tire stores to major sporting events.

We try to provide the talent with as many creature comforts as possible. It makes them happy, and happy talent is a good thing. They will often let us know when they appreciate the setup as well as the reliability of service we provide.

### ON THE ROAD

Providing such comforts to a varying range of talent and at the same time minimizing the amount of equipment we travel with requires some innovative yet straightforward equipment and setup practices.

One major concern is physical size. With air-travel security and luggage costs being what they are these days, the fewer cases and the lighter you can travel, the better.

One of the most appreciated and yet so basic of creature comforts is the ability for talent to control his or her microphones' on/off function and headset volume within comfortable reach. Until recently we had been using a passive box with a microphone on/off switch and a stereo headphone volume control. While this worked well, it lacked some of the features we would have like to have.

### AUDIO-POD

Dave Mandelbaum, the owner of DM Engineering, Craig Robbins and myself were brainstorming over our needs and desires. Dave went to work and designed his "Audio-Pod."

The Audi-Pod is a small box, about the same size as the simple boxes we had been using. Inside is a headphone amplifier, an optional microphone-to-line level amplifier and illuminated microphone on/cough and off push buttons, as well as a headphone volume control. With the microphone amplifier option, the Audio-Pod provides switchable phantom mic power. The inclusion of the microphone-to-line amplifier makes it possible to use a standard line-level mixer.

The headphone amplifier input can be driven from any low level output from our mixers by way of the Audio-Pod's rear terminal block connections or 1/8" mini-jack. The amplifier has selectable high or low output impedance and enough gain and output level to drive almost any impedance headphones with more than sufficient volume via the 1/4" or 1/8" front panel earphone jacks. This eliminated the need for a separate high-power headphone amplifier, freeing up valuable rack space or table clutter.



### SOLVING THE HEADPHONE ISSUE

One of the issues that had plagued us over the years was that of "bone conduction" and headphone polarity. What

happens is that talent will complain that everyone else is louder than they are when that is not really the case.

The real culprit is that bone conduction, the talent's voice being conducted through the bones in the head. You can prove this to yourself by poking your fingers in your ears and pushing the little flappy piece at the front of the ear in and sealing off outside sound. If you talk you will hear yourself quite well but not much else. This is the conduction of your own voice through your head. This same sound can arrive at the ear's sensor at a different phase or polarity than the audio coming out of the headphones causing partial cancellation of the talent's own voice.

Flipping the polarity on an individual pair of 3-wire stereo headphones, when you think about it, is not an easy task. Dave resolved this by adding a ganged polarity reversal pushbutton to each of the Audio-Pod's headphone amplifier sections. This gives us the capability to instantly correct the problem for each individual talent and their own personal headset. It is great to be able to simply push a recessed button on the Audio-Pod and have the talent exclaim, "That's much better!"

The Audio-Pod is available with either top or front mounted pushbuttons and if desired, can even be mounted into studio cabinetry using optional bezels for through-the-table mounting or a "tilting" table top mounting bracket for permanent mounting to the table surface. Up to four Audio-Pods can be operated simultaneously from the supplied power source and ten foot power cables are supplied with each unit.

The Bottom line: The Audio-Pod is a cost effective way to provide a lot of creature comfort and also reduces travel weight and space.

Learn more about the Audio-Pod at:  
<http://www.dengineering.com/pages/audio-pod.htm>

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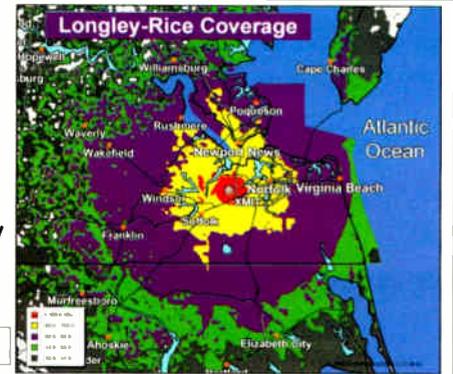
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Ecreso – JK Audio – Wheatstone

## JK Audio Innkeeper LTD Digital Hybrid

JK Audio introduces Innkeeper LTD, a desktop digital hybrid providing talk show quality phone connections. Their simplest digital hybrid yet, innkeeper LTD allows you to send line level signals into the phone line while maintaining excellent separation between your voice and the caller. The balanced XLR output jack contains only the caller's voice.



This digital hybrid connects audio signals to a standard analog telephone line without the transmit/receive crosstalk common to analog hybrids. Its Digital Signal Processor (DSP) continuously monitors both the phone line and audio signals to deliver excellent separation. This proprietary, dual-convergence echo canceller algorithm can achieve excellent separation, typically exceeding 50 dB, without any setup and without sending a noise burst down the line.

An auxiliary telephone is only required to place outgoing calls. The auxiliary telephone is disconnected when you press the "Call" button, and reconnected when you press the "Drop" button. The Remote jack allows connection to a JK Audio Guest Module, allowing remote control and dialing without an auxiliary telephone.

Innkeeper LTD features Auto-Answer/Auto Disconnect for use in IFB and monitoring applications. Other applications include: telephone interviews, talk shows, church PA interface, and conference room full duplex applications.

The RA2 Rackmount accessory holds two Innkeeper LTDs in a 1U rack space.

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## Wheatstone SIDEBOARD™ Console Control Surface

Sideboard is a space-efficient console control surface that integrates with the Wheatstone WheatNet-IP Audio-over-IP system, connecting to the WheatNet-IP network via CAT5 Ethernet.

It's designed for installations where a full-size console is not required: edit, voice tracking, and news announce booths, and production rooms where the bulk of the work is done on the digital audio workstation and the broadcast console is used for source routing and monitoring. Sideboard can also be used for a sidekick or second anchor position in the air studio, giving the talent control over their own mic, computer playback, and any other desired sources.



Sideboard's input panel has four full-function fader strips; a second four-bank panel can be added to create an 8-fader mixer surface. Each fader panel includes a source name display with a rotary encoder that can access any source in the entire WheatNet-IP system. On a fader-by-fader basis the sources displayed can be limited to only those that are required - what Wheatstone calls the "visibility list" - or even limited to just one source, typically the mic and other critical sources that are "locked down" to be always there.

Each channel strip includes a broadcast-grade fader, two output bus switches - PGM and AUX - that allow for simultaneous audio-to-air and cue/mix-minus, a channel ON/OFF switch, and a talkback button.

The monitor section of Sideboard provides pre-programmed and on-the-fly programming of eight sources, speaker and headphone level controls, and an LED VU meter.

Sideboard can be supplied in a desktop cabinet, or for mounting into your custom furniture.

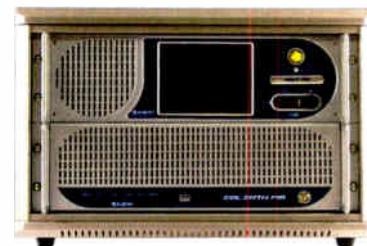
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In addition to a 1, 20 or 100 Watt FM exciter/transmitter, the Next FM also delivers all the core broadcast functions that one requires at the FM transmitter site. These include: powerful digital audio processing, stereo encoding, RDS encoding, audio back-up, I/O remote control and TCP/IP connectivity - all in a slimline 3U enclosure.



Ecreso's innovative approach of combining a high quality transmitter with this essential broadcast functionality delivers many savings to the broadcaster in terms of cost, real estate, time and energy. The Next FM occupies less space at the transmitter site, draws less power and is a highly competitive, cost-effective alternative to purchasing a range of separate devices. With a single, integrated user interface to control all functions, the Next FM also enables greater user efficiency. With the powerful Scripteasy V2 supplied as standard, broadcasters can control and monitor a wide range of external equipment and create automatic actions via an intuitive graphical interface.

Crucially, these savings do not come at the cost of quality. The Next FM transmitter offers the best FM S/N ratio of >80dB and an extremely low distortion level of <0.05%. The 20 or 100 Watt exciter can be used together with an external power amplifier to reach an output power of up to 3 kW. Similarly, the onboard audio processing uses the latest multi-band DSP technology and offers a versatility, consistency and audio quality to rival the leading industry brands. Dual Power supplies ensure a high level of redundancy.

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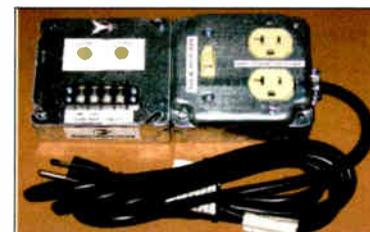
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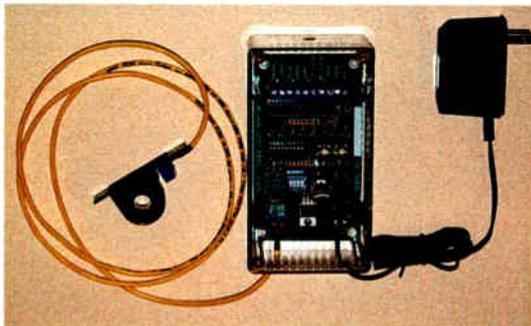


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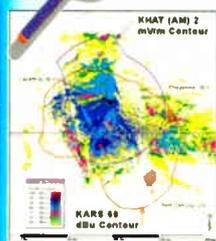
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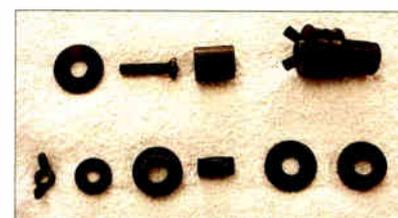
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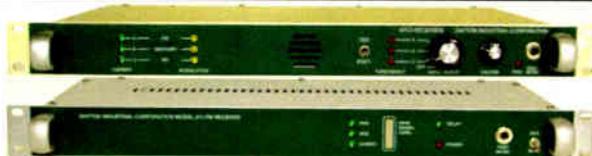
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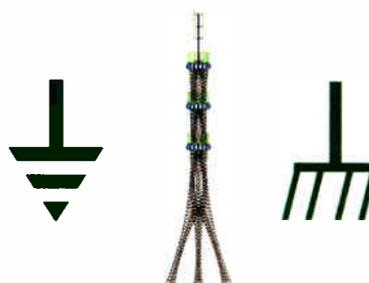
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Bext – Telos/Omnia – Wheatstone

## Wheatstone WheatNET-IP Audio Over IP Networking, Routing, Mixing

WheatNet-IP is the new name for Wheatstone's second-generation audio networking system, with updated features and capabilities. First introduced at last year's NAB, there are now hundreds of WheatNet-IP units in use, as stand-alone routing and distribution systems, and in multi-studio facilities with Wheatstone E-series console control surfaces.

WheatNet-IP access points are called "blades." Three 1RU hardware blades handle 16 channels of line-level audio I/O and logic I/O (GPIO). I/O blades are available all analog, all AES digital, or half of each. Audio presented to the network is available anywhere on the network, as a console source or routed to any output. Because WheatNet-IP uses Gigabit Ethernet, all sources are available everywhere on demand, without concern about setting priority of service.



New this year is the ip88e WheatNet-IP Mic Blade: 8 built-in mic preamps with phantom power, 8 analog output channels, and 12 universal logic (GPI) ports. Mic audio is available anywhere in the WheatNet-IP system. Analog outputs can access any system source, and are typically used for studio headphone and speaker feeds.

All blades run silent, no fans, so they can be installed in a studio with live mics.

WheatNet-IP is designed for ease of installation and operation; the built-in wizard quickly guides you through setup to be operational in minutes.

WheatNet-PC is software that is installed on automation and Internet computers, replacing the expensive sound card and all of its wiring. A simple NIC card connects the computer to the WheatNet-IP network, passing 8 stereo channels of audio in and out, plus full control. WheatNet-PC is certified by virtually all digital delivery and news editing manufacturers.

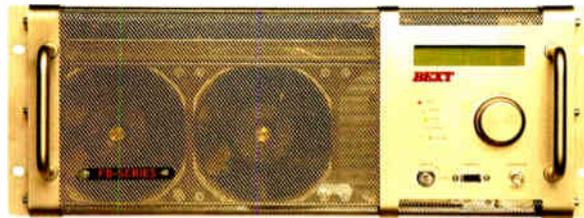
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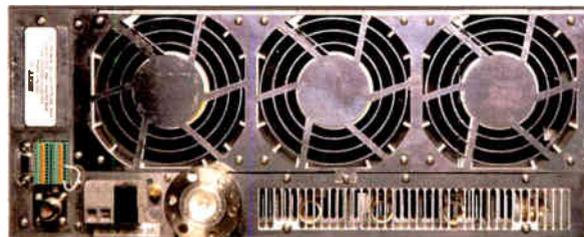
## Bext FB 5000 – 5,000 Watts of Power in a Revolutionary Package

The Bext FB Series, previously available in the 2 kW and 3.5 kW power levels, is now available also in the 5 kW version, still in the same extremely compact size.

In just 4 standard rack spaces, Bext provides broadcasters with a remarkably space efficient FM Transmitter solution: a 5 kW so small and lightweight you can carry it with you and install virtually anywhere. Highly energy efficient, the FB 5000 will also cut down on your utility bills.



Like all other FB Series FM Transmitters from Bext, the enclosure is a very rock solid stainless steel, and the unit offers unsurpassed flexibility, ease of operation and excellent local or remote control through user friendly menus, all backed up by the Bext reliability and customer service.



**Main Features:** Broadband; fast access to programmability, functions and all readings from front panel via user-friendly menu display; proportional auto-foldback of output power in the event of excessive VSWR; adjustable power output from zero to full power with soft-start; automatic power control maintaining the output at any pre-set level; includes low pass/harmonic filter; modular Architecture, internally hot pluggable; enclosure just four rack spaces tall; highly energy efficient, remote controllable by traditional analog contacts and PC connection via RS 232.

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## Telos and Omnia Join Axia in 24/7 Support

Broadcasting is a 24/7, 365-days-a-year business. And now, broadcasters with Telos and Omnia gear can join Axia clients and receive 24/7, 365-days-a-year support.

Since launching 24/7 Support one year ago, Axia clients have realized the enormous value this service adds. In fact, Michael "Catfish" Dosch, President of Axia Audio, is "Surprised to find that no other console companies have caught on to the amazing value provided by around-the-clock technical support."

Denny Sanders, Managing Director of Telos Systems comments: "Service and support are paramount to our organization. It was a natural to expand the Axia 24/7 support model to our Telos and Omnia brands as well."

"I was very pleased to hear about the inclusion of Telos and Omnia in the current Axia 24/7 support system. The immediate Axia response history has been most impressive, and to now have the same for Telos and Omnia is most gratifying," says Milford "Smitty" Smith, VP/Radio Engineering, Greater Media, Inc.

Clients of Telos, Omnia, and Axia can reach the 24-Hour Support Line at +1-216-622-0247

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# Tool Guide

## A Couple of Very Nice Radios from C. Crane

by Barry Mishkind

The C. Crane Company has a reputation for high quality radios. Two recent products, the CC Witness and the WiFi Internet Radio, continue that tradition.

### THE CC WITNESS

The CC Witness is a digital MP3 recorder/player that is especially attractive to broadcasters because it – unlike iPods – has a built-in AM/FM radio. It can be used for monitoring the station at remote broadcasts, for recording interviews of sponsors or listeners, for news gathering/interview needs, or for playback of previously recorded material.



With C. Crane's reputation for great radios, the tuners do not disappoint. The audio is crisp and clean. For FM, the earphones also serve as the antenna, although there is also a separate antenna so you can listen on the built-in speakers. The AM Radio is, of course, a bit more difficult. To help reduce interference from the LCD screen, an option turns it off during AM operation. A special low-noise AC adapter also helps.

### RECORD, PLAY, UPLOAD

Recording can be done at rates from 32 kbps to 256 kbps, separately settable for AM, FM, line in, and microphone. An optional stereo microphone is available. The difference is definitely audible at the low end, especially on AM stations. The trade-off? At 32 kbps you can get 140 hours of storage from the internal 2 GB of memory; that drops to 17.5 hours at 256 kbps. Of course, the unit accepts an external SD memory card up to 16 GB.

The twin speakers are small, however the audio is decent – more than good enough for monitoring a station on a remote, for example. However, using the provided earphones, the audio is very good. The CC Witness can be connected to your computer's USB port, to share files or for charging. A cradle is provided. Another neat feature is the timer, along with built-in calendar, to permit recordings to be set up ahead of time. There is room for 20 timer pre-sets.

Overall, I have enjoyed using the CC Witness and between time-shifting radio programs, recording conversations and interviews, and carrying some music with me, I find it is a very nice tool for radio folks.

### STREAMING AUDIO

OK, perhaps a radio that does not get AM or FM may not seem "right" to a broadcaster. However, the

reality is that there are many Internet streams out there – one of which might be your own. C. Crane has made a table radio that easily brings these resources to your home or office.

The CC WiFi Radio works off of either ethernet or 802.11b or g signal, so you can place it where you need it. The audio can come from the Internet streams or any computer on the LAN, after you set it up for sharing. While there is only one speaker in the unit, it does have stereo outputs to drive an external set of speakers.

This C. Crane unit gives you access to more than 16,000 Internet stations and audio feeds from around the world. Using the radio itself (with or without the remote control) or a web interface, you can browse the list of stations or search, select, and store your favorites for easier selection among the 99 possible pre-sets.

Here is an idea: if you have trouble getting enough RF signal at your studios or you want to send different feeds around the facility, you can easily set up several local streams to feed different CC WiFi Radios. And if you want to impress a client at a meeting, play their spots or your promotional material right from the LAN!

All in all, these are two more excellent products from C. Crane. (Additional info is available at [www.ccrane.com](http://www.ccrane.com))



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Pennsylvania Convention Center, Philadelphia  
[www.nabradioshow.com](http://www.nabradioshow.com)

# FINAL STAGE



## RADIO ROUNDUP

The Radio Guide Event Register

Email your dates and info to: [radio@rconnect.com](mailto:radio@rconnect.com)

**TAB Trade Show and SBE, 56th Annual Convention**  
August 19-20, 2009

Renaissance Austin hotel – Austin, Texas  
[www.tab.org/convention-and-trade-show](http://www.tab.org/convention-and-trade-show)

**NAB Radio Show 2009**

September 23-25, 2009  
Philadelphia, Pennsylvania  
[www.nabradioshow.com](http://www.nabradioshow.com)

**SBE 22 Broadcast and Technology Expo**

October 6-7, 2009  
Tuning Stone Resort and Casino – Verona, New York  
[www.sbe22expo.org](http://www.sbe22expo.org)

**127th AES Convention**

October 9-12, 2009  
Javits Center – New York  
[www.aes.org/events/127/](http://www.aes.org/events/127/)

**Wisconsin Broadcast Clinic**

October 13-15, 2009  
Madison, Wisconsin  
[www.wi-broadcasters.org](http://www.wi-broadcasters.org)

**Pittsburgh SBE Chapter 20, 2009 Equipment Expo**

October 19-20, 2009  
Pittsburgh Expomart – Monroeville, Pennsylvania  
[www.sbe20.org/expo.html](http://www.sbe20.org/expo.html)

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### Website

[www.altronic.com](http://www.altronic.com)  
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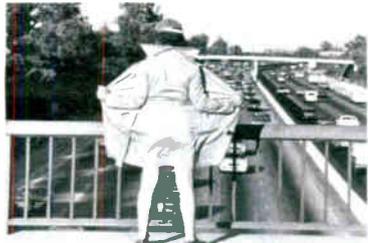
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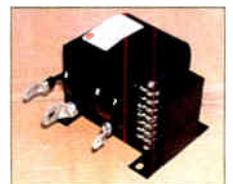
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