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March 2003
Volume 11 Issue 3

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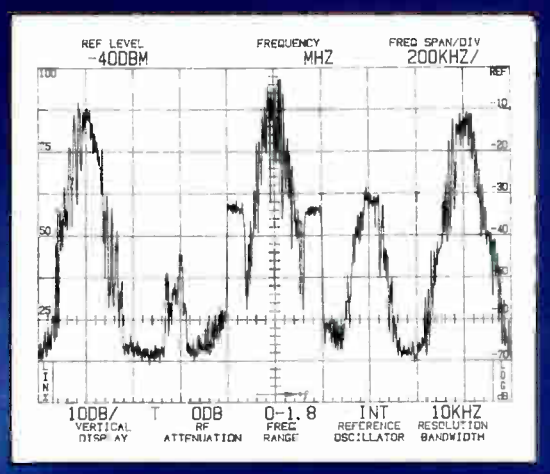
And This Year NAB Means IBOC



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Ray Topp *(Publisher)*
Email: radio@broadcast.net

Barry Mishkind *(Editor)*
Email: barry@broadcast.net

PO Box 20975, Sedona, AZ 86341
928-284-3700 Fax: 866-728-5764

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Columns & Articles

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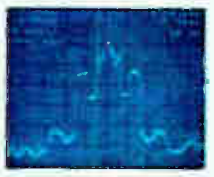

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Burt Weiner - IBOC spectrum scope shot.
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Getting Together – Moving Ahead

The annual **Spring NAB Convention** in Las Vegas is just around the corner. While there are continuing effects from industry consolidation, as well as the events of 9/11/01, the **NAB Spring Convention** is still the primary place manufacturers come to display their latest models, and engineers from all over gather to share knowledge.

If you can make it to Las Vegas, you'll definitely come away with a better understanding of the direction the industry is taking, especially regarding digital audio and transmission. Doubtless, IBOC will be spoken at many booths and sessions. And, with the economy as it is, there are very attractive airfares and hotel packages still available.

Of course, I'd like to invite you to my **11th Annual Lunch Gathering.** Originally an opportunity to meet the folks that communicate via computer, it has become an annual opportunity to greet old friends and meet some new ones. We will be at the Riviera Hotel Buffet Restaurant once again, at Noon on Tuesday. Some special surprises await, so please do come have lunch with us, and don't miss out. (The Riviera is just west of the LVCC, not too far to walk.)

At lunch, one of the topics we'd love to discuss with you is your opinion of the changes we're making in **Radio Guide**. The goal is to make this publication one you want to read each month, for information relevant to what you do each day. What would you like to see? How do you feel about the articles we're running? Please let us know.

In addition to the Lunch Gathering, Ray and I will be on the floor, and at **Booth N2355**. If you really can't make it, please write to us. Email can go to radioguide@earthlink.net. Regular mail is good too.

IBOC Heads for Prime Time

by Barry Mishkind

With reservations ... IBOC is moving ahead.

[Tucson, AZ - March 2003] Will 2003 be the year of the biggest change in broadcast transmission, since this whole "wireless" thing got started? There are a lot of companies and people with millions of dollars at stake, hoping that IBOC (In Band, On Channel) digital broadcasting will "take off" and be adopted by the industry.

One thing is certain: Opinions differ widely on IBOC – everything from cautious optimism to severe criticism. Audio purists like Robert Orban see the ability to transmit without nasty pre-emphasis curves which introduce artifacts and distortion. Manufacturers look forward to replacing antennas, transmitters, and processors with IBOC-ready units. iBiquity hopes for success and royalties from broadcasters and receiver manufacturers.

Small market owners worry about the expense of conversion to the proprietary hardware and software, wondering if this generation of equipment will be superceded in a few years. DXers (hobbyists who like to listen to stations from far away) fear the entire band will be destroyed by the "digital buzz."

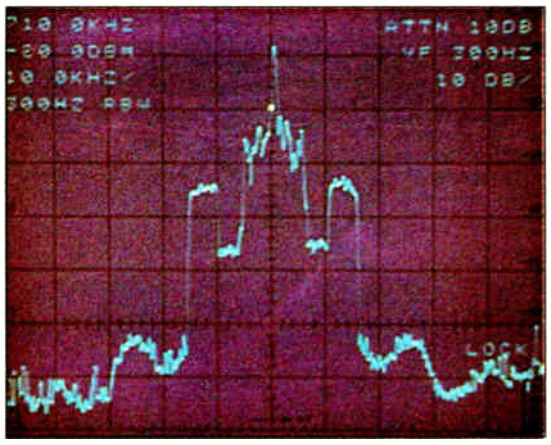
Regulatory aspects are still being resolved. The FCC recently made some changes, such as licensing digital STLs, as well as IBOC itself. Still, since one of the goals of IBOC is to bring some parity between AM and FM, that parity will be elusive until AM stations can use IBOC at night. Nevertheless, more than a few major radio corporations from around the country have embraced IBOC.

Over the past year, the technology is becoming more and more familiar to most engineers. While there may be some (or many) reservations about the system, the industry is gearing up to make the most of IBOC. True, there are financial incentives – some companies are investors in the technology, and others are seeking the royalty waivers offered by iBiquity for those who implement IBOC early.

Of course, lurking in the background is the inconvenient question: Is IBOC the best possible system that could be put into play in the US? Or, would the Eureka, now on the air in Europe and Canada, or the DRM (Digital Radio Mundial) system be better options?

IBOC Basics

The FCC decision to go with the IBOC system devised by iBiquity appears to follow the traditional US regulatory pattern of making broadcasts "backward compatible." The bandwidth specifications (and NRSC mask for AM) must be met.



AM IBOC spectrum display, within NRSC mask.

Unlike High Definition TV (HDTV) broadcasts, which require a new tuner, stations broadcasting IBOC can still be received on any radio, albeit without the improvements in audio quality promised by the digital technology. Indeed, for AM analog listeners, the band is even slightly more restricted than it has been, with the analog component of most IBOC transmissions limited to 5 kHz.

FM analog listeners should not notice any difference; some critics say the average listener will not hear an appreciable difference in IBOC on FM to drive receiver sales, yet, some tests indicate IBOC will overcome the severe multipathing that destroys coverage in many cities.

In addition to higher quality program audio, the IBOC system promises to allow additional data transmissions to handle everything from digital displays to additional program content to audio "On-Demand."

An interesting aspect of digital transmission is the need for a buffer to allow the decoder to operate properly. Depending upon the manufacturer you talk to, it is anywhere from 4.5 to 8 or 10 seconds. This means the analog audio must also be delayed, as the tuners are designed to "lock" on the analog audio and then "blend" into digital as soon as the decoder catches up. Immediately, it is apparent that new systems for monitoring the "off air" signal will be necessary, as well as procedures for "cueing" remotes and other programming.

How much will all this cost? iBiquity quotes an average of $75,000 to upgrade. Of course, that presupposes it is not necessary to buy a new transmitter, which can add significantly to the costs.

Getting Ready

For AM stations considering adding IBOC to their signal Tim Bealor, VP of RF Systems at Broadcast Electronics notes: "There are three or four big issues that need to be handled." Some are easy, some are more complex.

Bealor said, "The antenna system needs to be wide and flat. If it is OK for AM Stereo, it is probably fine, so long as the antenna is flat to about 10 kHz." Checking over your last base impedance measurement is a good idea. Directional systems need more analysis, as the entire bandwidth is important, not just the common point.

A consideration for stations not co-located with the transmitter, is how to get the digital audio from the studio to the transmitter. The traditional STLs will not be sufficient, and either need to be augmented or replaced. Regardless of the studio and transmitter locations, the digital audio will need a separate processor, running with less density than analog, and not using asymmetry. Likely, it won't be long before some "combo" units arrive on the market.

According to Bealor, the biggest variable may be the transmitter itself. "Since these systems are pretty complex, there is a lot that has to happen to make all this work. To prevent group delay problems the transmitter "needs to be linear." This usually means solid state transmitters with the latest designs are fully compatible, while some older units will work with modifications. Most transformer plate modulated transmitters will not pass IBOC.

Bealor says BE is supplying plug-in boards and modifications to convert most of their AM transmitters, and designing the next generator of transmitters so that the IBOC circuitry will be on one card. The main issue is the need for a wide, flat modulator – out to around 50 kHz, with low IPM (or IQM). Bealor advises "calling the manufacturer of your transmitter and finding out for sure what is necessary to run IBOC."

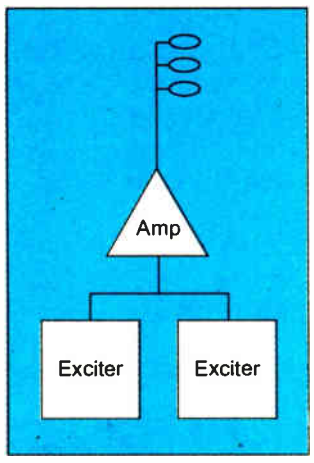
Recent Nautel and Harris transmitters are also either IBOC ready or convertible. Jeff Welton, Nautel Customer Service Manager says that "all current Nautel AM transmitters are ready for IBOC, and all older modules made since 1992 can be upgraded under our module exchange program." Since an IBOC exciter is essentially a computer, running special software, Welton says further upgrades should be just a matter of loading updated software.

FM Issues

Some of the issues for FM stations are similar – the need for a digital audio path, and separate processing. Issues relating to transmitter and antennas, however, can be more complex, due to the way the power is handled, as well as how it gets to the antenna.

There are three ways to achieve IBOC on FM: High Level Combining (also called Separate Amplification), Low Level Combining (Common Amplification), and Space Combining. Which choice works for a given station depends upon the power level of the station, as well as the antenna system in use, or available.

Common Amplification is the only method using one transmitter. However, since IBOC utilizes both phase and amplitude components, it must be linear; older, tube type transmitters need not apply. Bealor says the digital component needs very little power, as little as 1% of the analog TPO, making the TPO of the analog component the critical value. Current FM solid state technology is limited to about 20 kW.

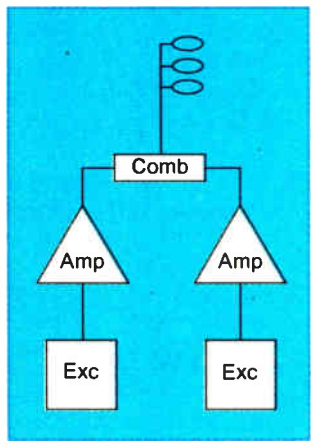


Low level Combining

Analog & digital exciters feed one power amplifier.

However, the peak power needed for low level combining means any analog TPO over about 14 kW is probably best handled with one of the other methods, requiring dual transmitters.

Above 14 kW TPO, current technology requires two transmitters. Either the transmitters need to be combined going to the antenna, or two antennas need to be employed. Engineers are hard at work in this area to achieve better solutions. Bob Surrette of Shively Labs noted, "things have changed more in the last six to seven months than in the last five years."



High Level Combining

Two transmitters are combined to feed one antenna.

Standard combiners, in use where multiple stations share a common antenna, can be backfed with the digital signal. The existing high power main transmitter can be used as is for the analog portion of the transmission, with a new transmitter installed for the digital part. The downside is that 10% of the main transmitter's power and 90% of the IBOC transmitter power are wasted into dummy loads.

The "middle" ground, so to speak, is two transmitters run into two antennas. This prevents any wasted power, but does require a special antenna. Last year, Shively Labs introduced an interleaved antenna. According to Surrette, it is the best current solution for many situations, including stations with limited tower space, or those wishing to avoid the operating costs of burning up the excess power. Eventually, there will be antennas with a built-in two-port hybrid – one for analog and one for IBOC signals.

Initial reports from the testing in cities with difficult terrain, like Seattle, show the promise of reduced multipathing to be achievable. Although receivers are, again, just hitting the streets, stations in such markets look forward to IBOC solving a lot of their problems in holding audiences through the day.

IBOC has made digital radio technically feasible. Engineers now have the ability to install and operate equipment capable of moving transmitted audio to a higher level. Of course, that leaves content as an issue, which is sort of difficult for engineers to deal with, as they don't have control there. "CD Quality" audio is not a great achievement these days, some having distortion levels so high programmers are complaining to the music companies.

On the other hand, an oft heard comment notes there is still no rush of people at the electronics stores, demanding IBOC radios. While the commitment of some car makers to include IBOC radios in their new models will no doubt cause many people to experience digital radio, it will be interesting to see if the demand grows with sufficient speed to avoid an AM Stereo type of failure. After all, manufacturers will not want to build slow selling units. Perhaps to make IBOC really take off, it will be necessary to have the FCC mandate all new receivers operate in digital mode and/or force analog transmission to end, as with television.

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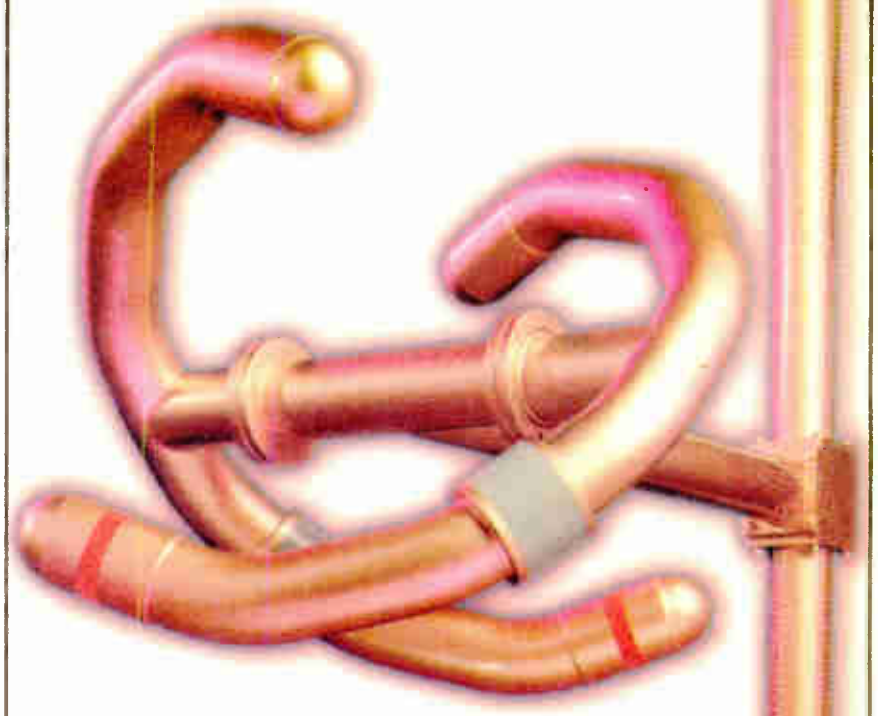

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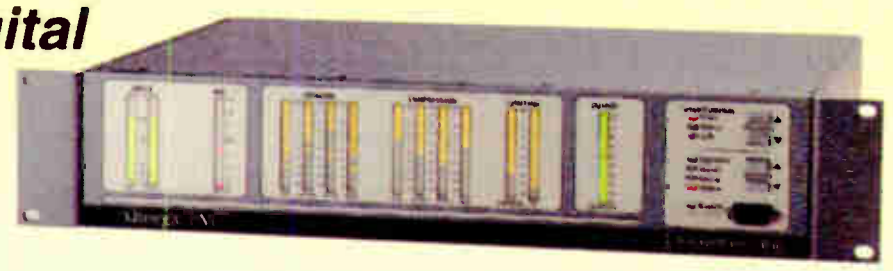

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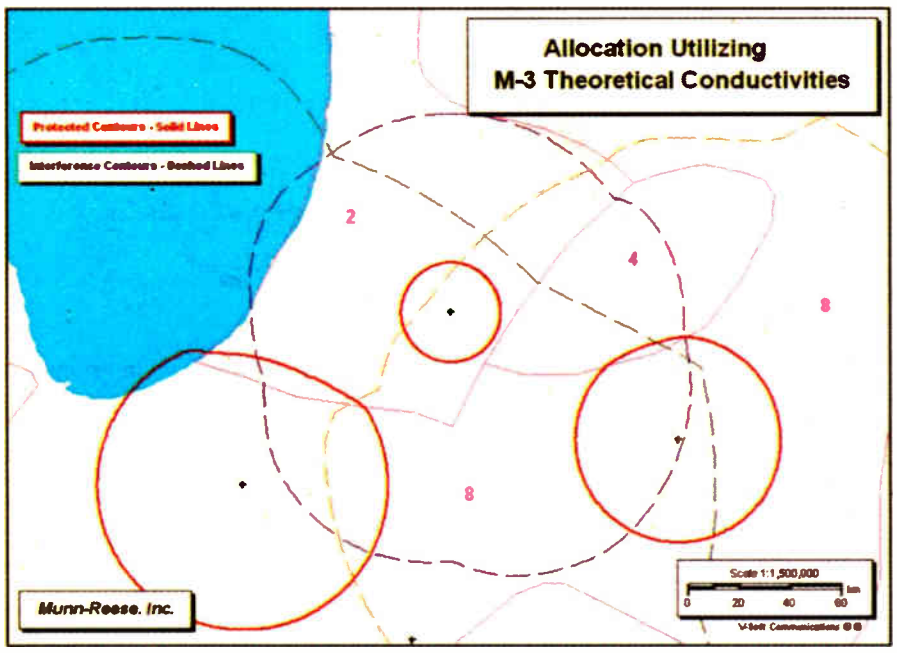
DA Low-Down

by Wayne Reese – Coldwater, Michigan

The importance of DA systems, and securing allocations.

As a part of our series on Antennas, Radio Guide presents DA Low-Down, a consultant's eye-view of conceiving, planning and implementing a Directional Antenna. Wayne Reese, from Munn-Reese, is our guide as he shows us DAs are not to be feared ... when you know what you are doing. [Ed.]



[Coldwater, MI - March 2003] "AM Directional." This phrase strikes fear in the hearts of existing and potential broadcasters. However, an AM directional antenna system (DA) can be worth the hassle! It can provide major power increases and supply additional nighttime services. Moreover, a DA may be the key to starting up a new station. There are several components to understanding directional antenna systems. In this article we will look at the importance of DA's and what is involved in securing allocations.

Why a DA?

AM directional arrays have become a virtual necessity. Originally, AM stations operated on a fulltime basis. When the demand for stations grew, the FCC opened allotments for daytime-only stations. At this time, Class A (formerly Class I-A or "clear channels") stations could not be duplicated on their channels at night. Then the FCC allowed stations to file for nighttime operation on these clear channel frequencies, but with a maximum power of 1 kW.

In 1992, the FCC changed the rules to their present form. They outlawed new daytime-only stations and required full-time operation. Many existing daytime-only stations were issued "nighttime authorizations." This allowed them to continue using their daytime facilities at low power levels during nighttime hours.

Some of these authorizations were as low as 1 watt and, unlike fully licensed operations, they were not protected from other stations. But this taste of nighttime service only whetted the appetite of station licensees for more power.

Now, if broadcasters desire their frequencies to be fully protected from other stations, they must increase their power level to 250 watts (or a RMS of 141 mV/m). When this level is achieved, stations become "licensed nighttime operations." Unlike nighttime authorizations, stations that are licensed enjoy full protection from other nighttime operations. However, to get to that point, broadcasters almost always need DA systems.

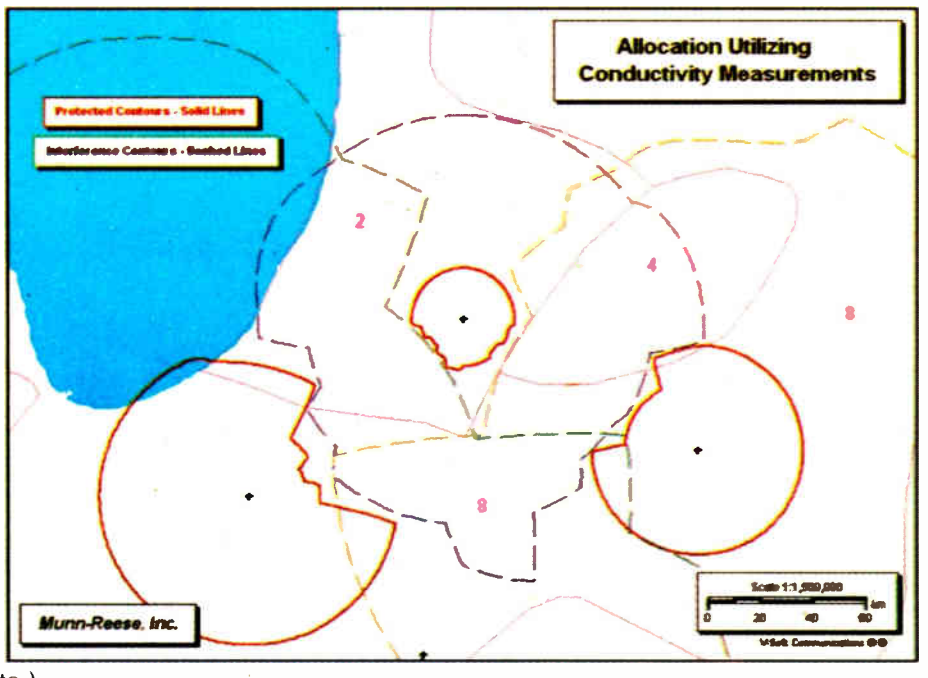
Allocations for new stations are presently limited to the portion of the band from 540 kHz to 1600 kHz. Since the original round of expanded band allocations (1610 kHz to 1700 kHz) the FCC has not opened allocation procedures for additional stations on these frequencies. A plethora of stations have been added to the AM band, which is creating obvious congestion. This has made creative engineering a must!

Finding a Place on The Dial

Generally, it is more difficult to find a frequency in the lower portion of the standard band. This is due to the extended propagation of the radio signal on these lower channels. Some stations on these lower frequencies will block allocation for new facilities for hundreds of miles around. But, even if a minimum power facility (250 watts) can be found on a low frequency, it can cover as much as a high power station, say 5 kW, on the upper end of the band.

AM stations are required to protect other co-channel stations (stations on the same frequency) as well as the upper and lower three adjacent channels (stations 10, 20 and 30 kHz above and below). Therefore, one station in a community will block seven channels from being used in that area. This explains why there are virtually no frequencies left in the large metropolitan areas.

Open channels are discovered through "frequency searches." Frequency searches normally start by examining the daytime allocation. The requirements for fulltime operation eliminate some channels immediately. Proposals for stations inside the nighttime interference-free coverage of a Class A station are prohibited. (For non-directional, fulltime 50 kW stations this carves out a radius of roughly 750 miles from their transmitter site.)



Daytime allocations are based on actual contour locations (whereas FM channel allocations are based on a chart of fixed distances). Ground conductivity plays an important part in contour calculation. The lower the conductivity, the shorter the contour extends. Conductivities vary widely in different parts of the country. Salt water has the highest conductivity. The next highest conductivities fall in the farmlands of the Midwest. The worst conductivities lie in areas that have rocky soils (like that of the Northeast and Mountain states) and those containing sandy soils (like soil found in some Great Lakes and Floridian terrain).

Delving Deeper into Technical Aspects

It is standard procedure to use theoretical soil conductivities specified from the FCC's Map M-3. This is a map developed many years ago by the FCC. It estimates the value of conductivities across the country.

In some areas it is accurate. But, in many areas the Map M-3 conductivities are significantly higher than actual measured conductivities. This results in theoretical contours extending farther than the actual measured contours would. When these conductivities produce prohibited contour overlaps, it becomes permissible to substitute actual measured conductivities.

Measured conductivities are obtained by operating a transmitting facility and making a series of field intensity measurements. These measurements are normally made along one or more selected bearings from the transmitter site.

In the "old days" this was done by drawing "radial" lines on paper maps – usually starting with topographic maps of 1:24,000 scale and then switching to larger scaled mapping such as 1:250,000 as the distance from the transmitter site increased.

As each point was measured, the location was marked on the paper maps. The distance from the transmitter site to each measurement point was then scaled on the maps.

Now, with the proliferation of low-cost, high-accuracy GPS receivers, this procedure is often modified to use the GPS readouts to determine the distance and confirm the bearing. After the measurements have been completed, the signal strength at each measurement point is plotted on log-log graph paper versus the distance to that point.

The curve created by these plots is then compared with "families" of ground wave patterns. The FCC rules contain "families" of ground wave curves. Each "family" is drawn for a specific, limited range of medium wave frequencies. Contained within each "family," are multiple ground wave curves for a series of discrete ground conductivities. The measured conductivities are determined graphically. Engineers decide which conductivities most closely track the measured data for the known radiation.

Although this system may seem quite archaic in this computer driven age, the results are surprisingly accurate and repeatable. When the ground

(Continued on page 8)

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DA Low-Down

Continued from page 6.

wave curves are superimposed on the measured data, the overall trend becomes quite clear. In addition, some of the anomalies caused by local re-radiating objects, such as water towers, power lines, etc. become obvious "bumps" in the data. The Commission allows this measured data to be submitted and substituted for the theoretical Map M-3 data. (Figure 3)

Getting More Bang for Your Buck

Since actual measured data may reveal lower conductivities, using them may expand the potential for daytime allocations. The lower conductivities can pull back contour locations, opening holes where stations can be developed. The length of the radial to be measured will vary based on the contour signal level one is trying to establish.

For first adjacent channels, finding the 0.5 mV/m or 0.25 mV/m may be required. But if the station in question is a co-channel, trying to locate the 0.025 mV/m contour might be desired. Interference from other stations often prohibits measuring down to this signal level. In that case, the measurements are made as far as reliable readings can be obtained. Some radials can extend out 100 to 200 mi.

Making these kinds of measurements may appear to be costly. However, if they succeed in pulling the contours back for enough, they may also simplify the design of the required DA. Thus, if one can reduce the number of towers in an array by even one, the measurements can quickly more than pay for themselves.

Another approach to enlarging an allocation's hole is to purchase a station and either move it

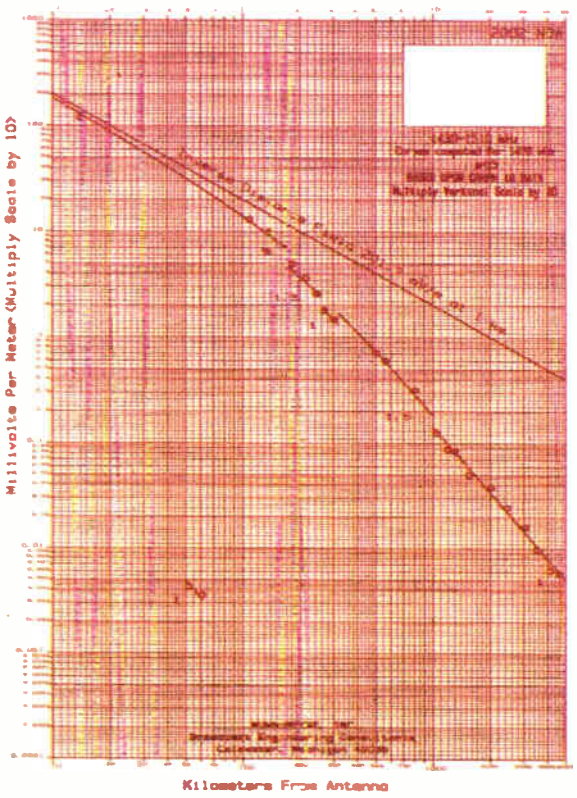

Figure 3: A plot of measured field strength showing the ground conductivity.

farther away from the proposed station or turn its license in and eliminate it. Both options are expensive, but they have been gaining in popularity. It can be cost effective if the proposal allows the upgrade or move-in of a station in a large market.

This has occurred in several markets that, even with all the associated costs, increased the value of the station five to ten times. Munn-Reese Inc. has aided some of its clients in accomplishing similar upgrades.

Will it Work for Me?

Good question! There are still places where daytime non-directional operation is possible. However, in other cases, the allocation rules will require the use of a directional antenna system. Established daytime, non-directional stations wanting power increases normally require directional patterns. This is due to the 1992 rule changes that modified the adjacent channel protections.

Older stations were allocated under previous rules where the first adjacent channel contour relationship was 0.5 mV/m to 0.5 mV/m. In 1992, this relationship changed to 0.5 mV/m to 0.25 mV/m. So, without doing anything, many stations automatically inherited prohibitive overlap with stations on their first adjacent channel.

Under the present rules, this overlap area created by the two contours cannot be increased. So, to increase power, the signal level in this overlap area must be held to the present value or be reduced. This can only be achieved by the use of a directional antenna.

To discover if a DA is necessary, or even possible, call a broadcast engineering consultant. Consultants specialize in finding available frequencies and maximizing present channel allocations.

Wayne S. Reese is President of Munn-Reese, Inc, a Broadcast Engineering Consultant firm in Coldwater, MI. You can contact him at wayne@munn-reese.com

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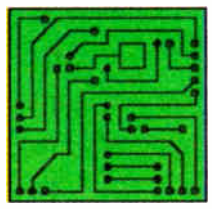

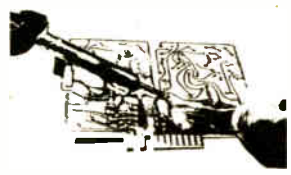

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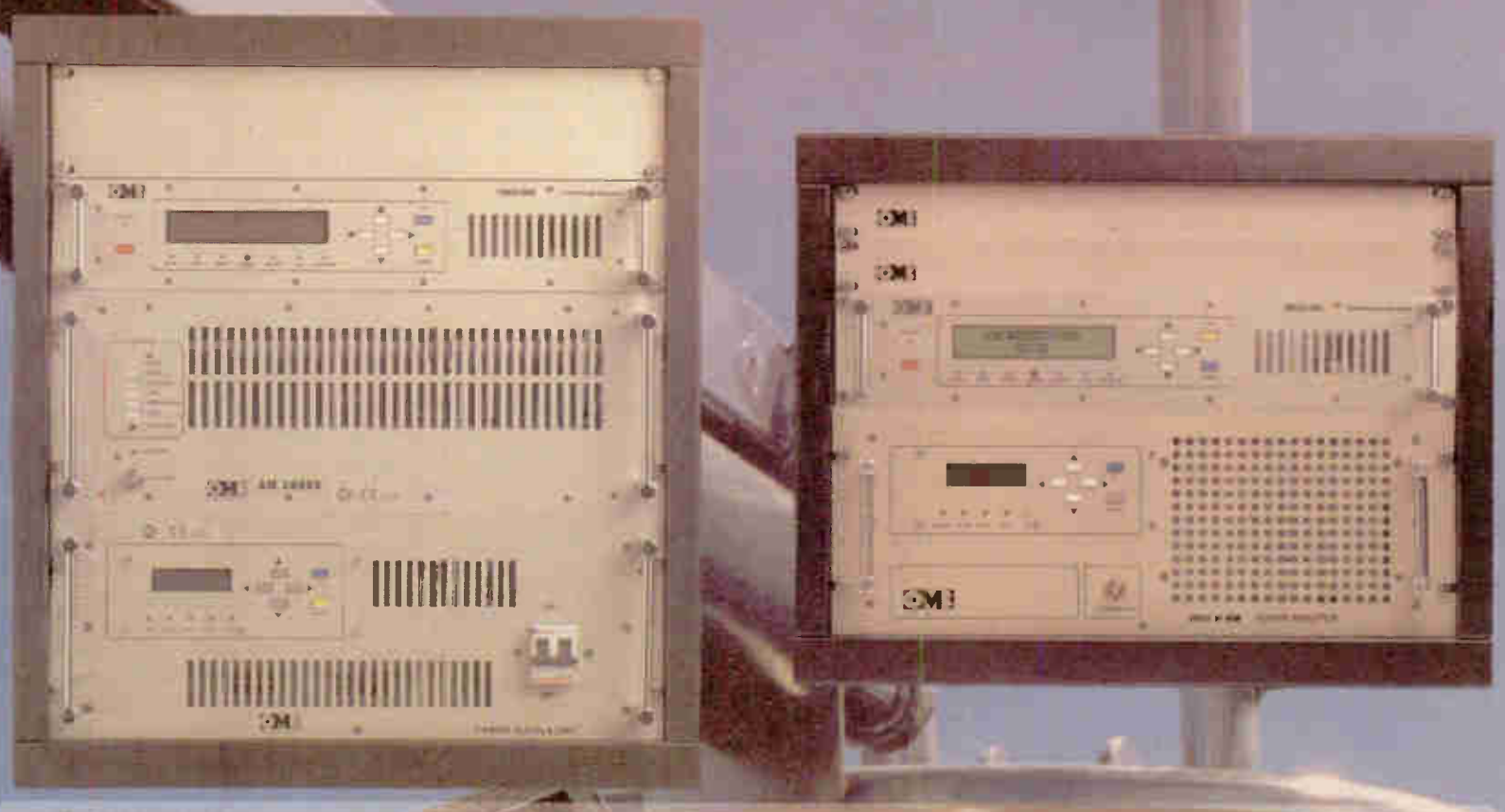

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Audio Processing From the Ground Up

by Cornelius Gould – *Cleveland, Ohio*

Part 3: Taming the Multiband Beast

Listening to the difference between "line" and "air" makes us highly aware of the value of the audio processor in the chain. What is inside turns out to be more than some filters and combining networks. In this installment, Cornelius explains what goes on inside an audio processor. [Ed.]

[Cleveland, OH - March 2003] Previously, we discussed how the push for 'more' led to the need for something better than the good 'ol wideband units, which were being pushed so hard that it was becoming difficult to curtail "listener fatigue." To overcome this problem, processor designers developed the concept of multiband processing.

Back in 1986, I was dealing with a similar situation with my AC-302 broadband compressor. As a result, I made the decision to go multiband with my audio processing designs. The first thing I needed to do was to come up with a crossover design. I did that in a few minutes, and bread boarded up two more of my AC-302 broadband compressors – fed the outputs of the crossovers into the 302's, and connected the three outputs to three line inputs of an old DJ mixer I had lying around, to see how this new experiment worked.

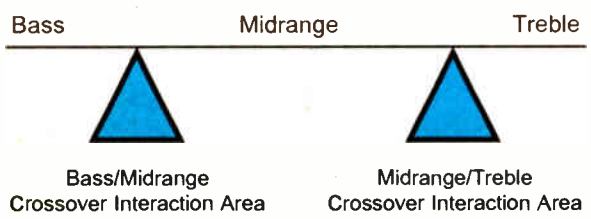
I was impressed for about 30 minutes. It was after that point I started noticing 'weird anomalies' in the audio. These anomalies reminded me of phase errors you get from tape head misalignment. It was time to dig into the mathematics and figure out what was going on. The problem was obviously due to the crossover design.

Multiband Basics

It all starts with the crossover.

The concept of a crossover is relatively simple. A crossover is a circuit that splits wideband audio into multiple frequency bands, or sections. What this does is to allow the treatment of each frequency band in an individual way to "enhance" the audio, or to boost the performance of devices such as speakers or compressors so they can work their best. The goal is to make a pleasing sonic presentation when the (conditioned) frequency bands are re-combined into one signal.

Ideal Crossover Response Across Frequencies



This method was applied to audio processing, when a better mousetrap was needed, to ease the amount of listener fatigue being experienced from wideband units being pushed too hard.

As with most innovations, the first multiband devices were not too terribly complex as far as crossovers went. However, the overall effect of more loudness, with a dramatic decrease in "pumping" and other artifacts, were enough to cause the world to go nuts over the results. Furthermore, the introduction of Multiband processing created another controversial aspect to broadcast audio processing – the automatic "re-equalization" of the program source.

With the power inherent in multiband processing, you can effectively force all audio to have the same spectral "signature." This led to radio programmers not only wanting to sound loud, but to sound "distinctive." All the music is converted to sound like "the radio station" regardless of what the producers did at recording studios.

Some find this "an absolute outrage, and a smack in the face to the producers that worked so hard to achieve a particular sound for the album." Others see it another way: "This is radio ... theatre of the mind. These tools are necessary to aid in the perception of the station's image."

One of the many interesting experiments done in the development of multiband processing was to play "what if" by moving the crossover points around, and see what effect they had on the overall sound.

At the same time, this is where one of the artistic aspects of multiband processing comes into play. In addition to the exact attack and release values of each of the multiband compressors, you can move the crossover points around to give deeper bass, more sparkle on the highs, or whatever effect you're after. The audio processor manufacturers typically make the decision of exact crossover frequencies, as they come up with designs that will address what they feel the needs currently are in the broadcasting community.

Some processors even allow you to move these crossover points around. This feature is something you would *definitely* expect to find in a DSP based audio processor; I am not aware of any analog processor capable of adjusting all of the parameters needed to keep the crossovers from causing the dreaded peaks and dips from happening while moving crossovers about. (More on this issue later.)

"If a Little is Good, a Lot is Better"

With most of the original problem of heavy bass "pumping" being solved through the use of multiband processing, the temptation to go into "overdrive" became almost irresistible. As we said before, faster time constants usually mean louder audio, but it also introduces bizarre byproducts of its own when you move past a certain point. The most familiar sound is the "plastered" audio effect where dynamic lively audio is transformed into one big uniform audio sound – both in level and frequency response.

Over time, this type of sound can be even more fatiguing to a radio listener than a little pumping. The best way I can describe this fatigue is that it is similar to listening to someone vacuum a room, or power drilling through something continuously. While you can sort of cope with it while it's going on, there's definitely an urge to say "thank heavens!" when the person finishes and shuts the noise off!

OK, let us dig deeper into the guts of multiband processing ...

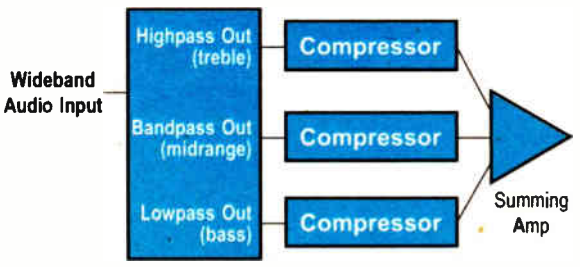
Crossover Design Issues

When rolling your own multiband audio processor, one of the most important aspects of multiband processor is the design of the crossover circuit

Crossovers are built around highpass filters and lowpass filters. A highpass filter attenuates lower frequencies, and allow higher frequencies to pass through. A lowpass filter does the opposite. Various combinations allow for the isolation of mid-range frequencies, for example.

Let's put this information together to form a theoretical three band audio processor. A three band audio processor would consist of a lowpass filter (for the bass frequencies) a highpass and lowpass combination for the midrange frequencies, and a highpass filter for the treble frequencies.

A Three Band Audio Compressor



Each of the three crossover outputs will then feed a stand-alone audio compressor. The output of the three audio compressors will then be summed into one signal again through a "summing amplifier."

As a lowpass or highpass filter goes about doing its filtering job, it causes "phase rotations" to happen as it starts to truncate (roll off) frequencies outside the frequency band(s) of interest. If it is a relatively "gentle" slope, say 3dB per octave, the phase errors are spread out in such a way that you can almost not worry about them. The trade off in using such a gentle rolloff is that you are unable to get enough "isolation" in any particular compression band to totally prevent some gain control interaction from "outside" frequencies.

Increasing the crossover slopes to something higher than 3 dB per octave will give you the necessary isolation, but it also causes these rotations to happen closer to the operating frequencies of interest. This is where it starts to get a little confusing, and is one area overlooked in so many audio processors out there.

While these phase rotations are of no issue in the world of, say, the mid-band compressor, it does become an issue for the low and high bands, as the "slopes" of the mid band crossover will overlap into the operating frequencies of the low and high bands.

To make matters a bit more complicated, the high and low bands will have slopes that cross into operating range of the mid band.

Now, while this isn't a problem for the bands themselves (the compressors aren't affected by the slopes of the neighboring compressor's crossover). It only becomes an issue when summing all the bands into one signal again. That is because frequencies in the crossover "slopes" which do not align properly in phase (and time) to the operating frequencies of neighboring bands will cause frequency response peaks and nulls to appear in the recombined broadband audio signal.

Unfortunately, these peaks and nulls do not always stay put. As the gain state of the bands change, the nature of the peaks and nulls will change. These peaks and nulls will "move about" the audio spectrum, depending on the exact gain state of the various operating bands.

Many companies will only measure the "static" performance of the crossover (i.e. each band is summed together at unity gain). This is fine, provided this is the normal operating state of the crossover design. However, multiband processing is constantly turning up and down the various bands. Not taking this into account, is where a lot of audio processors run into trouble!

Getting Control Over Time

To correct these issues, a complex design process is performed, and the crossovers then become quite complicated. Anyone who looks at the XT2 chassis crossover schematic, (or the ones used in the Gregg Labs processor) will see that first hand! You can see there is still "stuff" that goes on "after" the main crossovers. That "stuff" is also part of the time alignment network!

As you can imagine, the later generation of design engineers came up with various methods for "time and phase" aligning the crossovers to match up with each other. This greatly minimized the problem of "peaks and nulls." Furthermore, this allowed the use of much steeper crossover slopes, allowing the true power of multiband audio processing to be realized.

These newer crossovers take into account what happens, as the various compressors change the gain states of the crossover outputs, and ensures that at all times, the audio will sum together in a nice smooth response curve without the sharp peaks and nulls.

Armed with this knowledge, we can all look back to my first multiband project. As you remember, I was experiencing weird anomalies with the sound of the proof-of-concept version of my first multiband compressor.

The anomalies I was hearing turned out to be the peaks and nulls roaming around in the recombined audio output. The net effect was that of an "audio comb filter."

Now, it took me years to figure all this out, but that's the fun of rolling your own audio processor – you learn a lot!

(As a side note, I should point out that while I was writing this article, a big discussion broke out about crossovers on the Broadcast.net Tech forum, but from a completely different angle. The issues went much deeper than I can deal with here, but it is worth a look-see into the archives for February 2003. Look for the thread about HD Radio blend to analog discussion)

Cornelius Gould has had a life long interest in the insides of audio processors. He is the Senior Staff Engineer for Infinity Broadcasting in Cleveland, Ohio as well as Chief Engineer for WJCU 88.7 FM in Cleveland. You can reach him at: cg@radiocleveland.com

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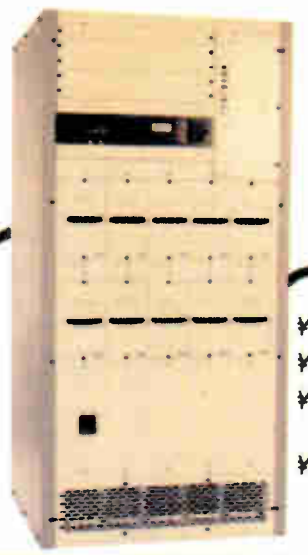

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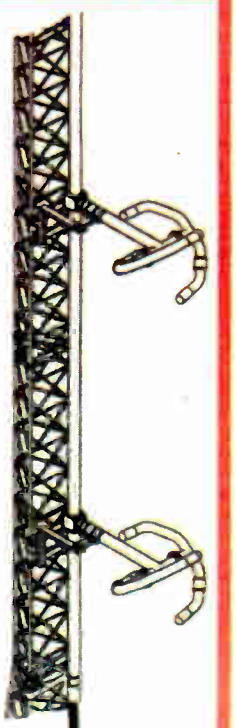

A Report on SBE Activities and Programs

SBE National News

Rules Change Sets New Standards for Frequency Coordination

by David Otey, CSTE

The Society of Broadcast Engineers is a professional organization now encompassing more than 5,000 members. Within the engineering community, the Society is probably best known for two of its ongoing programs: certification of broadcast engineers, and frequency coordination of the broadcast-auxiliary bands in markets throughout the country. In most markets, frequency coordination is usually a low-key, behind-the-scenes activity that goes unnoticed on a day-to-day basis-until something changes in a big way. Well, one of those big changes is upon us now, and it has got a lot of people wondering what is in store for them.

In November 2002, the FCC issued its long-awaited Report and Order in the rulemaking procedure known as ET Docket 01-75. The thrust of this rulemaking is to revise and update Part 74 to make the technical rules governing Broadcast Auxiliary Services (BAS) more consistent, both internally and across services. Most engineers familiar with this section of the rules would agree it needed updating (ever try licensing a digital STL?), but the sweeping scope of the R&O seems to have taken much of the community by surprise.

Changes in Coordination Procedures

One change in particular has generated a lot of questions. Once the new rules take effect, any new, fixed, and point-to-point links in most of the BAS bands from 944 MHz on up will require the coordination procedure already in use for Fixed Microwave Services as defined in Part 101 of the rules. (The exception will be the "2 GHz" band, 1990-2110 MHz [for now], in which local coordination will still suffice.) Note that this applies only to fixed links. Mobile operations at 2.5 GHz, 7 GHz, and 13 GHz will continue to be coordinated locally.

So what does "Part 101 coordination" mean to you, the engineer? Essentially, two things: one technical, the other procedural. On the technical side, a new fixed link will require an interference analysis that may be more quantitative than what you have done in the past. ("Hey, Bill, I'm turning this on now ... you let me know if you see/hear any problem at your end!") The specifics – which are spelled out in a TIA document known as TSB 10-F – are beyond the scope of this article; suffice it to say that power levels, antenna gain and discrimination, path geometry, and topography are all inputs that determine whether the required desired-to-undesired ratios are met.

On the procedural side, the new acronym to learn is "PCN," which stands for Prior Coordination Notification. Before submitting an application, but after completing the interference analysis, you must notify, in writing, all the "affected parties." That is, other licensees in that band within a certain radius of your proposed transmitter. And do not forget adjacent-channel licensees in the next band, if you are using an edge channel. Then you must attach to the application a list of the parties notified, along with a copy of the notification.

There is a lot more detail in the rules than what I have summarized here, including requirements for waiting 30 days for replies or using an expedited procedure, etc. Bottom line: It is a formal, defined process requiring specific documentation. It is no longer possible to coordinate a fixed path simply by making a phone call to your local SBE volunteer.

You may wonder just exactly who is going to do all this additional work. Certainly, there are for-profit firms out there who will be happy to do it for you – for a fee. Not every station engineer nor every volunteer Frequency Coordinator, for that matter, is going to have the time or other resources to commit to these additional steps. Contrary to popular belief, however, there is no requirement to pay a commercial frequency-coordination firm to do either your analysis or your PCN. A station may choose to do either, or both, using its own personnel and resources.

A Changing Regulatory Landscape

And where does the local SBE Frequency Coordinator fit into all this? As I see it, the most important elements of the job are unchanged: to be the central clearing point for BAS usage information in a given market, and to facilitate communication among local users as they strive to use their shared spectrum efficiently and equitably. As to the new fixed-link requirements, there are discussions taking place at the SBE Board level regarding such things as new software tools and other responses to the changing regulatory landscape. The jury is still out on the question of just how the Frequency Coordinator's job will change when the new rules have taken effect. Rest assured, however, that SBE is committed to its ongoing role in frequency coordination.

David Otey is the National Frequency Coordination Director for the SBE. He can be reached at dotey@sbe.org

by George Nicholas

Full Duplex

Broadcasters communicate. Or, do they? With on-air broadcasting being mostly a one-way affair, the same talents used on air actually can prevent station employees from understanding each other and their needs. George Nicholas uses his wealth of experience in broadcasting to communicate with us. [Ed.]

[Cedar Rapids, IA - March 2003] Welcome to the most important part of your job: communication.

Long ago, I came to the conclusion that this topic involves a most important, yet understated part of our jobs. We are in the communication business, yet we often do a lousy job of it among ourselves! That is not to say we are all doomed – there are many successful people in this business, and they credit the ability to communicate well as one of their secrets to winning.

My goal is to help spread the word.

So that we are clear, this article will not focus on technical things like zener diodes, which pin is really the "hot" pin in an A3F connector, or who has the loudest audio processor. Instead, we are going to focus on the non-technical part of our job and how to streamline our thoughts and actions in clear and concise terms.

We will discuss things like writing effective memos and e-mails, time management ideas from industry experts, tips for getting along better with managers and co-workers, and some proven management techniques to help you win. Even if you are not a manager, you will benefit by being able to recognize what your manager needs, sooner. We will also highlight some great books on communication and teamwork that are "easy-reads," since we are all too busy.

One such book is John C. Maxwell's *The 21 Indispensable Qualities of a Leader*, (Thomas Nelson Publishers). I have to admit up front, I am a huge John C. Maxwell fan. "Educators take something simple and make it complicated. Communicators take something complicated and make it simple." As Engineers, we can appreciate that. After all, when we read a schematic, we take a complicated circuit or formula and break it down to its simplest form to solve it. Effective communication is no different.

There are four basic truths to being an effective communicator.

1. ***Simplify your Message.*** Communication is not just what you say, but how you say it. The key is to keep it simple.

2. ***See the Person.*** When communicating with an individual or group, try to envision them, and anticipate what questions they might have.

3. ***Show the Truth.*** Credibility precedes great communication. Believe in what you say, and follow those beliefs with action.

4. ***Seek a Response.*** After all, what good is communication when we cannot receive feedback. "What do you think?" is a good trigger.

Contrasting Memos

Here are a couple of examples of what we are talking about. This is a memo from Murph, the Engineer, to Tracy, the General Manager. This is after several hours of being off the air, due to a serious transmitter problem:

Memo #1 – 2:45 a.m.

Tracy -

After 4 hours and 53 minutes of troubleshooting, I found a screen to grid short on the underside of the final tube socket. This caused the bias rectifier stack to blow and several transistors cascaded as well. You know what they say about those 2N3141's ! There was also a lot of mouse do-do in the bottom of the transmitter. I hope I don't get infected. I'll be in sometime after lunch.

-Murph

In the above example, good ol' Murph is making Tracy wonder why she hired him. When we quickly break it down, Tracy does not care how many minutes and seconds it took to fix the problem. She has no idea what a screen or grid is, a rectifier or 2N3141, and does not want to know. The mouse do-do confirms you are not doing enough maintenance and we have a mouse problem; Murph's attempt at humor falls short. Assuming Tracy even read this far, she probably assumes you are already sick! And, "sometime after lunch" narrows it down to "just" five hours or so.

So, in summary, assuming Tracy has no engineering background, the communication Murph thought he was sending was received as an entirely different message. The only thing Murph did correctly was to keep it short.

Now, here is an example of different memo, which hopefully conveys the message:

Memo #2 – 2:45 a.m.

Tracy -

Just a short note to let you know we made it back on the air around 2:00 a.m. There were several issues with the FM transmitter and final tube, which were difficult to find. Fortunately, we had all of the spare parts on hand. I also noted evidence of mice in the transmitter building! Let me know when you have a minute to discuss the situation – I have an idea that might work. I'll be in the office around 1:30 p.m.

-Murph

In the second memo, all of the four truths listed above were followed. Murph kept it simple and short, and wrote with Tracy in mind. He shows action and solicits response. "That's why I hired Murph," she says after reading the memo. "He takes good care of me."

Is it also interesting to note, the first memo above could have been submitted by the world's best transmitter Engineer, and the second by his apprentice assistant, yet the second has more credibility in communication.

Since we're near the end of our first article, I encourage you to make it "full-duplex." Write me, in care of Radio Guide at the address below.

George Nicholas has been in the broadcasting business since 1975, most recently as a Regional Engineering Manager with Capstar/AM-FM/Clear Channel, and now operates George Nicholas Communications, specializing in technical and communication consulting throughout the US. You can contact him via radioguide@earthlink.net

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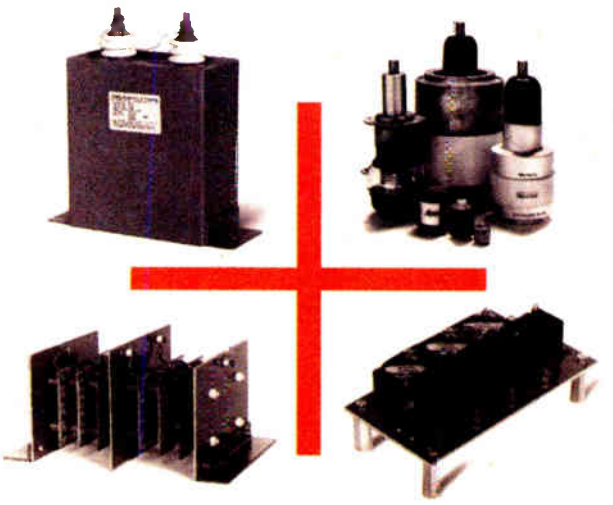

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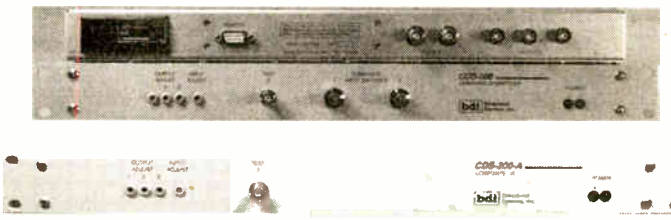

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What is This Thing Called Broadcasting?

Radio History

Part 12: The AMRAD Station - A POWERful first in Massachusetts

by Barry Mishkind

[TUCSON, Arizona, March 2003] As the First World War drew to a conclusion in 1918, it was time for broadcasting to "reboot." During the war years, the government had shut down all but a few stations doing tests for the military. As the early stations came back on the air, they were few and far between. The challenge was not just a matter of turning the dial on your radio to find a station playing your favorite music. The challenge was finding any station at all.

Those first stations were operated by enthusiastic, zealous young people. Some were scientists, some were amateurs, but all were seeking to develop the new wireless technology. What they lacked in funds, they more than made up for by way of dedication, ingenuity and versatility. Commercial exploitation followed slowly, since very few could imagine how to make a profit from broadcasting. Among the first, receiver manufacturers like Westinghouse and their retailers put stations up to demonstrate their receivers. However, there were not enough listeners to interest most other businesses.

While receiver sales were indeed increased by the broadcasts, more was required to sustain a successful radio station. Operators soon discovered they needed more than a product to sustain broadcasting. There was a need for financing, and a solid plan for production and sales. Clearly it was a "mine field" for anyone who was not a good businessman. And thereupon hangs a tale ...

A Power-ful Idea

As a young man, Harold Power discovered Marconi's experiments in radio and, intrigued, set out to build his own wireless. He was ten years of age 1903 when he built his own receiver, and managed to construct his own amateur transmitter only two years later. By the time he enrolled at Tufts College in Massachusetts he had built several more sets. An indication of his dedication to the technology: Power was able to support himself while at college by teaching wireless to high school students.

Harold Power

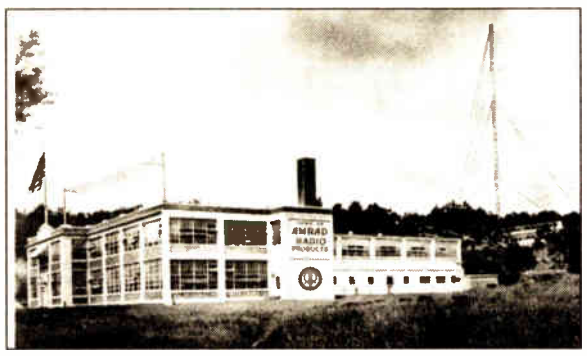
Power graduated in 1914 with an engineering degree from Tufts. Wanting to put his education to work, he and several other Tufts' graduates formed the American Radio and Research Corporation (AMRAD). Their plan was to utilize the knowledge they had learned at Tufts, and build an improved receiver. Initial support came quickly.

Power and associates went to work in a building provided by a couple of Tufts' professors. Coming into contact with the noted millionaire banker J.P. Morgan, Power was apparently able to impress him with his early receiver models and his personality. Morgan agreed to bankroll AMRAD. Things started to accelerate.

Applying to the Department of Commerce (DOC) for an Experimental License, Power was granted the call letters 1XE and soon began tests. Eventually he constructed a 306 foot tower on the site; quite a feat in those days. Transmissions began coming from the AMRAD plant; irregularly at first, then on a weekly schedule.

By 1917, "The AMRAD Station" had begun broadcasting pretty much on a daily basis until it had to shut down for the duration of the war. (The government banned all broadcasts once the US entered World War I.) Sometimes the station transmitted talk or music, sometimes just code transmission. Either way, the 100 watt transmitter was the only "local" station in the Boston area and boomed into local receivers.

Shortly after World War I ended, Power and his company sought to put 1XE back into operation as soon as permitted by the government. Actually, up to this point the fledgling company was faring reasonably well, having picked up both a backer and a contract to build receivers for the Navy. Additionally, many Tufts students, sensing the opportunity to be on the cutting edge of a new medium, volunteered their efforts both in the lab and on the air. Even some professors helped out by lecturing over the air.



The AMRAD factory and station at Tufts' College - 1921.

Quite a few Boston broadcasters got their start at the AMRAD station. One of the more popular announcers, "Big Brother" Bob Emery, went on to become a Boston mainstay for over four and a half decades.

All the various talents of the volunteers were put to use, whether they were good readers, singers, or musicians. Another of Power's key employees was very unusual for the time: a woman, Eunice Randall. Like Power, Randall had an early interest in radio, building her own amateur station (W1CDP and ER). She was a draftsman, engineer, and even served as an announcer for 1XE. Since it for most early broadcasters the job might change from day to day, Randall would do whatever was required: sing when a guest artist failed to show or read bedtime stories to children (The Story Lady!) - whatever it took.

Unfortunately, despite all this "energy," certain financial realities began to come to bear at AMRAD.

Problems at AMRAD

While WWI proved to be an opportunity for Power to sell his receivers to the military, when the war came to its end troubling problems started to surface. Specifically, there was a lot of unsold inventory. Turning to the general public, Power belatedly started advertising AMRAD receivers in magazines such as QST, and opened a sales office in New York.

There was no question that AMRAD receivers were indeed of high quality, but getting them built and shipped out seems to have become difficult for the company to accomplish. In today's terminology, it appears that many of AMRAD's designs were no more than "vaporware." Accomplished engineers kept designing, but the various layers of managers could not quite get an economically viable production schedule set up.

Meanwhile, on the air, 1XE was enjoying continued popularity as Boston's only local station. In early 1922, the station changed to the "regular" call letters WGI. Everyone who was anyone in the arts, politics and education was heard on The AMRAD Station at some point. Unfortunately, this did not generate any income for the station. In fact, when Power was finally able to acquire a couple of advertisers early in 1922, DOC head Herbert Hoover directed that WGI "cease and desist" from such activity. Power appealed, but finally complied.

With this scenario, predictably, money began to become a problem. Neither the station nor the manufacturing was providing any real revenue. Although J.P. Morgan was more of a businessman than Power, he was said to have dropped as much as $800,000 into the company. Ultimately, he was rapidly losing interest due to the lack of any return, and withdrew his support.

Over the next few years, WGI radio devolved into a complete economic basket case. True, WGI offered college courses by radio, lectures by famous people, opera singers, daily newscasts, speeches by local politicians, even a morning show (unusual in those days when most broadcasting was done in the evening). But the financial damage was done. AMRAD's reputation had become one of missed opportunities are failed shipments, financial disaster. The result was an inability to repair the transmitter when it failed, and the programming became somewhat sporadic.

By late 1923, the station experienced more and more equipment problems which took it off the air just as other stations were coming on - some with a lot more power than WGI's 100 watts - to compete for the audience. A number of the original air staff started leaving for these other stations, including "Big Brother" Bob Emery, the best known and most popular announcer on the station. And then ... things just got worse.

Bob Emery at WGI in 1924

The End

Perhaps it was an attempt to avoid confusion with WGY Schenectady, or maybe it was an effort in preparation to sell a station which did not carry the WGI "reputation." In any event, WGI changed its call letters to WARC in early 1925. But it was too late. Power simply had run out of time. He lost his headquarters when Tufts College asked him to vacate its building; and then there were all those creditors demanding their money. The station even lost its full-time status and had to share time with a religious station.

Finally, Power had no choice but to try to sell the station. Yet, even though merchant John Shepard was actively seeking to buy another station, neither he nor anyone else wanted any part of AMRAD's reputation nor its founder, Power. This was virtually the final blow; the station was now totally out of funds, and just disappeared from the airwaves, going dark in April 1925.

Late in 1925, Powel Crosley acquired AMRAD's manufacturing equipment. The radio station equipment was finally sold to the Boston Evening Transcript's WBET. However, as if a curse had settled on the transmitter, WBET had little more success with it than Power, and eventually even had to publish a front page apology for their poor transmissions.

Thus we come to what seems on the surface to be the sad end of AMRAD: the staff was gone. The factory was gone. The dream was gone. But in a time when the broadcast industry was struggling to become something, Power and his associates had accomplished a lot in those few short years of effort. They had shown they could develop better receivers, produce a wide variety of programming, and bring radio to the point of acceptance by the community. Power was a true Pioneer Broadcaster.

I'd like to share the credit for this look at The AMRAD Station with Donna Halper, a radio consultant and broadcast historian at Emerson College in Boston. 1XE and pioneer women broadcasters like Eunice Randall are among her favorite topics.

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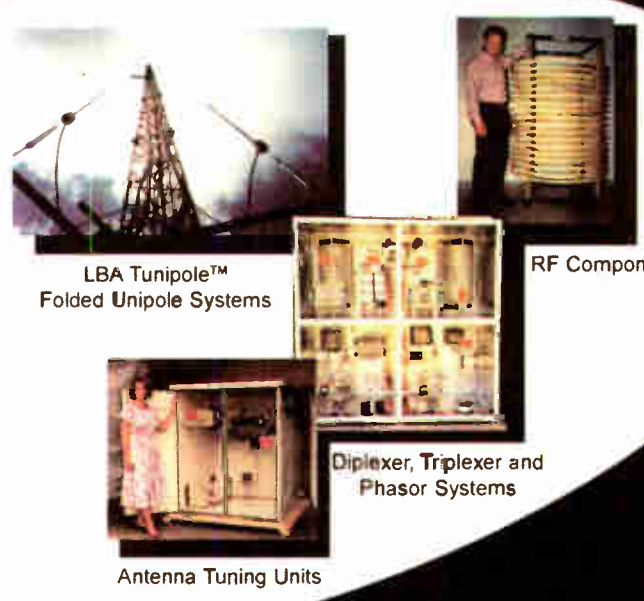

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Answers to the EAS *by Clay Freinwald with Barry Mishkind*

EAS Q&A

EAS Q&A is an informal conversation between Clay and Barry, designed to highlight issues of concern to those tasked with overseeing EAS operations at stations. Your questions are welcomed, either by letter to the address on page 3, or at the email address below. [Ed.]

[March 2003] The January discussion detailing the areas an FCC inspector looks at when inspecting EAS operations brought forth some additional questions, especially relating to the EAS logs and how they are kept.

Barry - Let's start with the output of the printer on the EAS unit. Do we have to save these things?

Clay - My quick answer is yes, you should save them as an additional means of clearly demonstrating to the FCC that you are striving for compliance (as opposed to just doing enough to get by).

Barry - Would you please review the elements of EAS operations you recommend be logged?

Clay - I have worked with a couple of systems. In the event a station keeps an Operating Log sheet for each day of operation, I like to have a section specifically dedicated to logging of EAS activity.

There should be spaces for logging:

1. The receipt of EAS tests indicating who the message was received from, the nature of the event, the time etc. – essentially the information on the tape.

2. The transmission of tests (RWT's and RMT's).

3. A segment for logging actual use of EAS, whether received or sent.

4. A space for remarks to detail other related activity. For example: taking the unit out of service.

I would recommend that the printer output be attached (stapled) to the day's log.

Barry - Can a station put an entire week on one log?

Clay - Certainly. One of my stations used a log form for 7 days of operation. The same items should be logged.

Barry - Suppose a station doesn't have a special EAS log and just keeps all the printouts in an envelope. Has there been any problems involving stations that just keep the printer output?

Clay - Yes, there have been those who argue the thermal printer paper used in some EAS equipment will fade after a while, rendering the message unreadable. I have not seen this myself. However, although keeping the records out of the sun might be a solution – again, keeping a paper log is always the best idea.

Barry - Must the tapes (EAS decoder printer output) be saved after the Chief Operator has inspected the logs?

Clay - I recommend stations keep these tapes just as they do their Operating Log. Just because the log was inspected does not mean the stations records can be discarded.

Barry - What if one of the tapes turns up missing?

Clay - This is all the more reason for having an established procedure to ensure all EAS activations are logged. Of course, if your station is automated during these periods, that is another matter.

Barry - It is clear you are recommending that the cautious approach is best. But how can that same cautious approach deal with the situation where you are putting new paper in the EAS box at the same time a message comes in? Has Murphy won?

Clay - No, not necessarily. However the operator with no paper output to rely on has to listen carefully to the message to get all the details. This is another good reason to have a "display sign."

Barry - Are you talking about one of those LED signs that flash messages?

Clay - You are correct. What the sign does is display the information contained in the Header Codes of the EAS Message. It depends on how you set them up, but my practice was to have it display the time and date. Then, upon receipt of an EAS message it changed color and began scrolling the EAS message. (However, you still must listen to the audio portion of the EAS message to get the fine points and details.) The good news is that the signs are relatively inexpensive.

Barry - That sounds very cool! You'd think every station would have one.

Clay - Yes, indeed. But, I can't believe the number of EAS decoder installations I've seen that do not have a display sign. These stations simply have denied themselves the opportunity to transform EAS into something station operators can really relate to. I will tell you this: In stations where these signs have been installed, the air staff is usually transformed into a group of EAS believers, and they thank the engineer.

Barry - I have to agree with you; those signs are a whole lot better than strobe lights. Getting back to multiple receptions, let's say you are monitoring an LP-1 and an LP-2, and they both transmit their RWT at the same time, what happens?

Clay - Remember, the EAS decoder functions much like a 'bucket brigade' ... with *one* bucket. What I am saying is the unit will store one message, and if no other message is received prior to you instructing the unit to 'dump' its contents, all is well. However, if your unit has a message in cue and another one comes in, the first one will be 'dumped' and you will receive the second. In the case you mention, you would likely receive only one in the 'horse race.'

Barry - You are saying then, there is some risk of losing messages if you delay taking them from the decoder?

Clay - If the station is un-attended, and your system is telling the EAS Decoder to 'hold-off' until a programming break, there is a very real chance during this period that a new message will come in and the first one will be lost. For this reason it's wise to keep the delay down to a minimum. If the station is 'live' you obviously don't have this problem, as you have the printer outputs providing some of the information about the two events, but you will have lost the voice portion of the earlier message.

Barry - How important is it that the voice message portion of an EAS event be heard or saved?

Clay - Often this is where specific information is contained about an event. Let's take as an example a CEM. This is a Civil Emergency Message. The source could be the local Law Enforcement agency or perhaps the Emergency Management Office. Let's say the issue has something to do with "Home Land Security."

The header codes would simply state "Civil Authorities have issued an emergency message." The voice portion of the message is where the details are spelled out, usually giving specific location information as well as instructions as to what the public should do as a result.

Barry - Recently there has been a lot of discussion about upgrading EAS equipment for the new event codes. What should a station do if they find they have a decoder that cannot be upgraded in time to be compatible with their state and/or local EAS system?

Clay - I really feel for stations in this situation, as the alternatives are not pretty. It is like older computers that will not run a new software package. In the case of software, the writers know the new program might not run on your old trusty 486, and they bank on the notion that those who buy their product will upgrade an older machine if they want to run it. This happens time and again. But with EAS units, this is new territory.

Unfortunately when a great many of these EAS boxes were purchased, the ease of upgrading them was not considered as important. After all, we were used to EBS Boxes, and those never needed to be upgraded. Nevertheless, some now are faced with these issues and some hard decisions must be made.

If we understand the FCC has changed part 11 once already, with changes impacting this hardware, and consider they might do it again, we may want to look down the road and ask the hard question: "Is it time to purchase a different EAS unit – one better able to deal with these changes?"

Barry - It does seem education is needed in a lot of areas. The other day on a network TV morning show, the person kept referring to the Emergency Broadcast System. Don't these folks understand that EBS is long gone?

Clay - Apparently not. I recall a piece on a network magazine show, right after announcement of the now famous 'color-coded' threat levels, where the 'talking head' really got EAS, EBS and Alert levels all messed up. In these instances it is unfortunate that perhaps millions of people are receiving erroneous and misleading information. This all just underscores the need to all do our part to educate 'everyone' as to what EAS is and how it operates – something I feel the Federal Government has done a very poor job with.

Barry - With NAB just around the corner, what events connected with EAS will be on this year's agenda?

Clay - Again this year I will be conducting a 2-hour EAS session. This year it will be on Monday afternoon in the LVCC, so as to avoid conflict with your ever popular Lunch Gathering at the Riviera. I am still putting together the agenda for this meeting. A portion of it will be devoted to dealing with EAS questions and issues presented by the attendees.

Barry - Who is invited to attend this meeting?

Clay - Anyone involved with EAS, at any level, is welcome; the meeting is open to all.

Barry - Will there be any government officials there?

Clay - In years past we have had a number of representatives from various government agencies. Last year, for example, there were representatives from FEMA and the NWS. I expect this year to be the same

Barry - One more thing: Last year's meeting was "broadcast" on the internet for those who could not attend. Will that be the case this year?

Clay - I have been informed that this meeting indeed will be broadcast, and information will be made available as to how to find the broadcast. The value of this program is shown by noting there are still folks accessing the audio file from last year's meeting.

Clay Freinwald, Senior Facilities Engineer for Entercom in Seattle, is Chairman of the SBE's EAS Committee as well as chair of the Washington State SECC. Please feel free to address your questions about EAS to Clay at k7cr@wolfenet.com

Technical Support Forum

by Paul Black – *Pleasant Hill, Calif.*

Part 1: How to Get the Best Service from the Manufacturer

Investigating, evaluating, budgeting, purchasing, installing and using equipment, are all important steps in making operational improvements at any facility. But, what do you do when trouble happens? How do you get the help you need, when you need it? The ***Technical Support Forum*** *is designed to provide tips and tricks of getting the best possible tech support. This month, Paul Black helps us get connected. [Ed.]*

[Pleasant Hill, CA - March 2003] I happened to notice a cartoon, in a magazine lying around our house the other day, that probably expresses what a lot of people think about technical support in general. It showed a young woman sitting at a computer with a telephone headset on. I don't remember the exact caption, but it was something like: "If you'll wait just a moment I'll try to find a Technical Support representative to abuse you."

I suspect we have all had trouble with technical support reps from time to time. Either we can not hear them clearly, they do not seem to care, the tone of voice they have chosen is, shall we say, less than complementary, or something else about their "assistance" doesn't sit well with us. Usually, we are not in the best mood to begin with.

Normally, you only need to call for help when something is wrong. The bank balance was not correct, or the book club got the billing wrong, or some similar mistake took place. Facing five minutes on hold while they get around to you is no one's idea of a good time, either.

Of course, the problems broadcast engineers face are usually a little more serious than a billing error. Calling a manufacturer for technical support normally is done only when you have a critical failure on your hands. The rig has blown its primary breakers and will not come back, the computer is frozen and the jocks are playing CDs out of the production room – or something similar is keeping the station from working right. You are in trouble, and you need fast, competent, professional help! And you need it *NOW!*

Help is Available

That is exactly what the TS (Technical Support) person is there for. But how you go about accessing, and using that help can make the difference between getting out of trouble quickly or making the situation worse.

I have a long history as a working engineer in radio and television. I have been out there on the "firing line" when a blowup happened and it was up to me to restore things. I also have spent many years working for different manufacturers, as an "Applications Engineer" (that is, telephone troubleshooter) and as a "Technical Support Engineer" (also telephone troubleshooter). Having ridden on both ends of the seesaw, I have come to know clearly what each side is up against when the nasty stuff hits the fan.

So, if you are out there in front of that fan, and getting peppered by the unpleasant waste, what are the best things you can do to make it easier? Here are four points to keep in mind.

1. Stay Calm.

As silly as this looks at first glance, it is the best advice there is. I quote Botterell's Law, after Art Botterell, an old friend and disaster recovery professional: "Stress creates stupidity." Nothing was ever more true.

Remember the old Navy saying? "When in danger, when in doubt, run in circles, scream and shout." That is what we *all* tend to do, even if we are not aware of it.

You have to make a conscious decision to keep your wits about you when things blow up. There are a number of obvious reasons for this, but here's the best reason: A calm person is a better observer and reporter. If you call tech support for emergency, or even post-emergency help, the calmer you are, the faster the tech support person will help you get to the bottom of the problem.

A tech support person is depending on your eyes and ears to observe the data necessary to solve the problem. While it is very likely that they have seen or heard of your problem before, or a problem just like it, *you* are the one that controls the information they get, by means of your description of what the sick widget is doing (or not doing).

Do not interpret the support person's attempt to sound calm as being an attitude of "I don't care." Some customers think "It's not *their* station, and *they* don't have a GM breathing down their necks to get things running again."

That is not why that voice on the phone is staying calm. The support person sees trouble all day long. They have learned to stay focused on the problem and ignore the side effects, like yelling co-workers. They also know that if they can keep *you* focused, it will take less time and effort to get the problem under control.

If stress creates stupidity, calm fosters control. Help out the support person ... *stay calm.*

2. Have a Clear, Complete Report Ready

The more complete you can be in reporting trouble symptoms, the better the support person can help you. There is nothing wrong with grabbing the nearest piece of paper and making a few quick notes to read to the tech support person. Having your "ducks in a row" on paper will help a lot.

Of course, to really help, writing out the symptoms needs to be an exercise in accuracy. I once received an e-mail from a customer that said (and I quote): "Our XXX suddenly failed last night. It just quit working. Please e-mail us *the cause of the failure* as soon as possible." (The italics are mine.) I kid you not; this was the actual request.

Well, if I had that kind of "second sight," I could put all those psychics you see on the late-night infomercials out of business. Unfortunately, that is not a talent most technical support people have.

Today even the simplest and least complex piece of equipment will likely have multiple causes for the same failure. The above-referenced XXX was a complicated digital audio unit. Such a "sudden failure" could have a dozen or so causes. Only by playing detective can the actual cause be found. And to play detective on the phone, you need clues – lots of them.

Some tech support people use the "question" method to get data. The validity of this is that by asking you things in a particular order, they can build in their mind a picture of what is going on. Be willing to answer questions about the problem, even if you have already stated what is going on in your own words.

Another helpful tip: Have your test equipment close-at-hand when you call. The TS person may be able to tell you exactly where the problem is, and how to fix it, if you can just take one quick measurement with your VOM or DMM. If your meter is out in the car in the toolbox, or at some other remote location-like your garage at home, then it might take a little longer to fix your problem. Fire up the scope, the DMM, the trouble light, and whatever else you think might be handy. It could pay off, big time.

3. Leave Useful Messages

I have received messages from customers asking me to call "Joe" at "Monsterdopoly Broadcasting in Bigtown" and, upon calling back, have been informed they have four people in Engineering named Joe, plus two salesmen and a traffic coordinator. Which one do I want, they ask? A very good question.

Always leave a last name. It does not matter if you are the only Joe or Tom or Rich or Vladimir working there. Leave a full name. It always makes it easier to get back to you.

As to products, you would be surprised how much it helps to leave a model number, type number, etc. If the TS person knows what item you're dealing with, they can "shift gears" in their head and bring up all the memory stuff they know about that particular item – and also get their computerized help system pointed in the right direction. (Most TS people use a computer database when dealing with problems; information on both customers and equipment systems are usually kept in such a database.)

They can also get a manual for that product out and in front of them, if necessary. This will allow them to get you the answer you need more quickly.

Never leave a phone number where you can't be reached for the next two hours or so. If you carry a cell (and how many radio and TV engineers do not have pcs/cell phones today?), and are going to be on the move, leave *that* number. You need not worry it will "get out" to someone it should not. Technical support people are typically extremely respectful of their customer's rights and privacy.

If you are a contractor, it is especially important that you leave a number where you can be reached. I've found that many station employees do not know the name of the contract engineer and are of little help when the technical support person calls back and asks for the station's engineer. Don't expect the technical support person to have to chase you down.

Remember, too, having the TS person leave a voice mail for you can not solve most technical support problems. The TS person will probably have to talk to you to get you out of trouble.

One last tip: if you do leave your callback number on a voice-mail, leave it s-l-o-w-l-y. To "parrot" out a name or number can make it really tough to understand. It does not hurt to say it twice, by the way, especially if you are on a pcs/cell phone. There are such things as dropouts, even in the digital world.

In Part II, we will offer some further points to help you have the best possible experience you can with the Technical Support people you contact.

Paul Black is a long time broadcast engineer and technical support person. He operates Media Technical Consulting in Pleasant Hill, CA, and can be contacted at paul@mediatechcon.com

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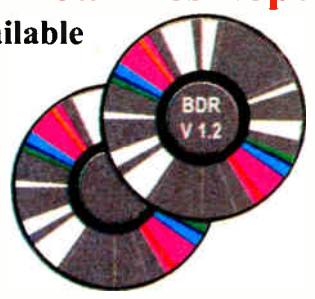

At last year's NAB, Version 1.0 of the Oldradio.com CD was released. **Broadcaster's Desktop Reference** (BDR) is now is available to everyone. A work in progress – it seems something new is added almost every month.

Among the resources already available, you'll find: Barry's Radio Utilities-2002, The Continental Electronics E-Slide, RF Specialties Toolkit, Tom Osenkowsky's Toolkit, Bob Carpenter's AM and FM/TV database viewer, Top Ten Lists, EAS paper sources, some project schematics, and some nice historical files.

To make the CD even more valuable, when you are at the transmitter site, we have added the FCC and EAS checklists, and some equipment manuals. And this is not the end ... more is planned.

You will find most of the CD contents are listed at: www.oldradio.com/latest.htm

The proceeds from this CD are going to be put into improving the next edition of the CD, and supporting Oldradio.com and its efforts to document and display the history of our industry.

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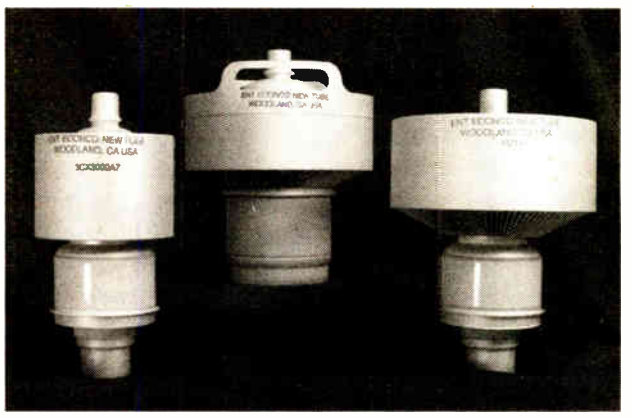

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Networking 101

by Tren P. Barnett – *Tucson, Arizona*

Part 2: Setting Up a Windows Network Server

[Tucson, AZ, March 2003] Last month, we decided to build a network for a reasonably sized radio station, using a Windows 2000 server, with Windows XP Pro workstations. We discussed some of the benefits accruing from these choices, and offered a brief overview of how security could be implemented. But as you well know, long before we can take advantage of our chosen network, we must set it up. So, how do we start?

These days, floppy drives are out and zip drives never really made the scene because long before they became popular their capacity was already too small. It would take an eternity of loading floppies to install Windows 2000 server or Window XP Pro. Fortunately, we can boot off of CD's and install either operating system. It is possible to create boot floppies if you don't have a bootable CD-ROM drive, but installation requires a CD-ROM drive.

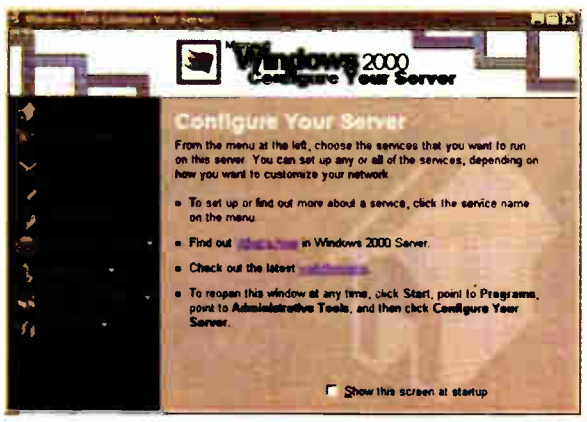
Since it is possible to do everything we need to do to our server after we have completed a basic Windows 2000 server installation, we will not focus on the installation process. However, there are two things in the installation that you will want to consider. How large of a partition does Windows 2000 server need, and what files system should you use?

My personal preference is NTFS for the file system, and at least 10 GB for the server partition, especially if you are going to add any other server services such as Exchange Server, SQL Server, or ISA Server. Some may argue that there are benefits to using FAT32 over NTFS. Since this is going to be a domain controller, and will require at least one partition to be NTFS, we will use NTFS.

During the setup process, you are going to be asked for an Administrator's password. This is possibly one of your most important choices – pick something memorable – you will need it to accomplish the rest of the initial setup of the server. (A lost password can result in having to reload everything from scratch.) Hint: do not put this information on a piece of paper taped to your monitor!

Configuring the Server

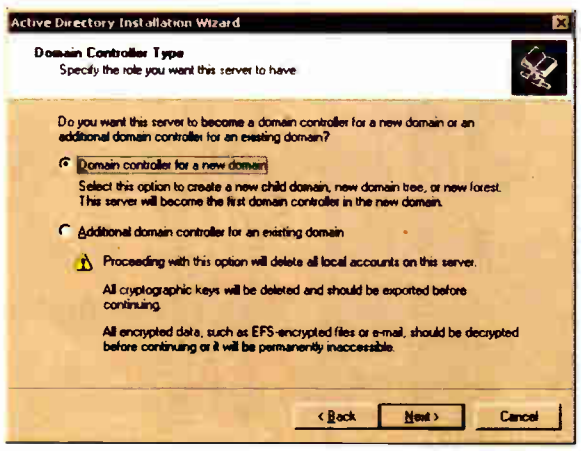
Now, with our server starting up for the first time, we will see the "Configure Your Server" window pop up after we successfully log on. If you like "Wizards" (Microsoft's way of assisting you to complete a task) you will be in heaven. However if you do not ... well ... never mind, it won't be heaven anyway.



Upon initially logging into the server, we are faced with many choices; so many, it can seem overwhelming with everything the Wizard wants to know from us, or maybe the word Wizard itself is annoying. However, the goal is to build our primary domain server. In order to be successful in doing so, we need to understand that, unlike the world of Windows NT, Windows 2000 server is very reliant on DNS.

Therefore, instead of letting the Wizards ask us several questions, lets take the needed steps ourselves, one at a time, so that we understand what is happening. Let's close this window for now. We can always get back to it. It is listed in the Administration options as "Configure Your Server."

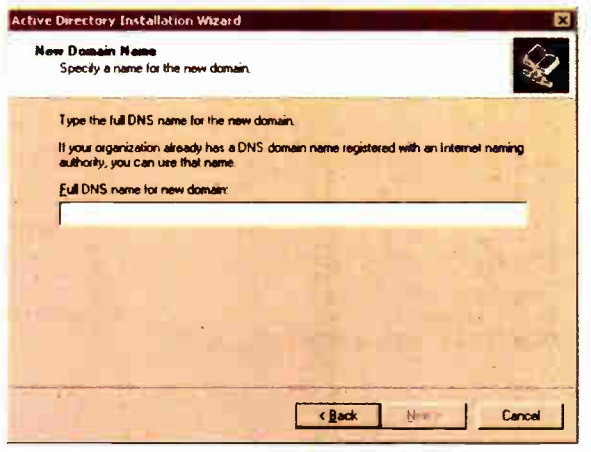
Windows NT 4 required you specify, during the installation process, if your server is to be a PDC (Primary Domain Controller) BDC (Backup Domain Controller) or just a server. Fortunately, we can promote and demote our domain controlling status all day long with Windows 2000 server. Let's go to the "Start" button, and choose "Run." On the command line we will type "DCPROMO." A screen will pop up that says "Welcome to the Active Directory Installation Wizard." Click next. You will arrive at the next screen entitled "Domain Controller Type." This is where we get the option to create a PDC or BDC. We want a "Domain Controller for a new domain" or what NT 4 knew as a PDC.



The nice warning states: "Proceeding with this option will delete all local accounts on this server." As you may recall from our last article, workstations as well as servers can have local computer accounts. This is not so with a domain controller. Our workstations are going to receive their security clearance from the domain server. Once a computer workstation becomes part of the domain, the domain controller dictates its security settings. When a server becomes a domain controller, it's security can only come from itself; a local machine account would be a conflict to security.

The "Administrator" account that we set up when we installed Windows 2000 server, is a local account. It will be deleted. We will be prompted for another password; it can be the same password. Upon selecting "Next," we are going to choose to "create a new domain tree." Select "Next" again, and we will "create a new forest of domain trees." Select "Next" one more time.

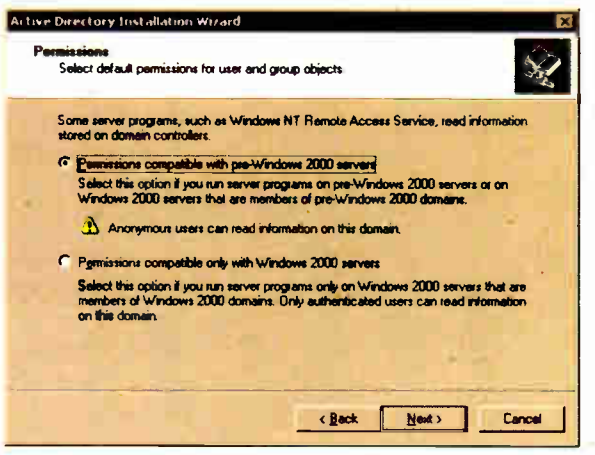
Now we need to enter the new domain name. Some things to consider: If we are going to have an Internet presence, and we have already registered a domain name, we can use it here. On the other hand, there are definite benefits to using a different domain name than our Internet registered domain. With DNS, we can create any domain we want, and still have our Internet presence work correctly.



For our settings, we will use the domain name of corp.radioguide.com. At first glance, it may appear that we have created a sub-domain of radioguide.com. We have not, though. The domain radioguide.com will be our Internet presence and will have no control or authority over our domain. Select "Next" and you will find that we have a backward compatible NetBIOS name of Corp.

Select "Next" again, and now we can choose where we will keep our Active Directory database information and our log. For best performance and recoverability, we should store these items on a different hard drive. If you don't do that, you will still operate fine. Selecting "Next" again prompts us for a Sysvol folder location. The default location is fine.

Now, selecting next gets us a window for Permissions. We can now select the option for setting up security settings compatible with an existing NT 4 or older domain. We do not need to worry about this, since we do not have any older domains we are tying in. But we will leave it anyway, just in case you do have. We can change this setting later. Selecting "Next" prompts us for our Domain Admin password for the Administrator account. Finally, we are prompted with a list of our settings upon clicking "Next" one more time.



We now must wait as the server installs Active Directory settings for our new domain controller. As mentioned at the outset of the article, DNS plays a very important role in Windows 2000 server domains. In our next article we will cover the needed DNS settings to work correctly, and cover how to set up DHCP.

Tren Barnett is a System Administrator and Programmer in Tucson, Arizona. He welcomes your questions on solving network problems in your facility. Contact Tren at tpb@aires.org

Equipment Reports From the Field

User Reports

Tieline Makes a Connection

by Mike Ereickson – *New York*

[New York, NY - March 2003] At WFAN, we are always out looking for new codecs to make our lives easier. As is common in broadcasting, remotes can creep up with little or no notice, depending on how the local teams are doing. Sometimes, there is not enough time to order ISDN, but the quality of past POTS codecs is not exactly something you want to hang your hat on for a five-hour show.

I was really interested in the Tieline i-Mix when WFAN Chief Engineer Mark Olkowski and Engineering Supervisor Dick James showed me the brochure. They had arranged with Tieline for a live demo at an upcoming remote, where we knew ISDN was going to be impossible. The Tieline i-Mix was sent out to the remote site, while a Commander was set up as a receiver back at the shop.

The Tieline i-Mix

The i-Mix has a built in five-channel microphone mixer and a dedicated output to feed a PA. Each fader includes a volume control for the corresponding headphone output and a mix/balance control that allows you to adjust for more talent or more return in the headset. Each channel also has its own on/off switch just below the VCA pot that controls the overall level. VU metering is switchable between audio leaving and audio return, and is an actual LED VU meter, not just a clipping indicator. Other controls are available to tailor the unit to your needs. (Since this was a beta unit, some functions, such as being able to control the level of one Tieline from another, were not working on the unit just yet.)

The best feature of the i-Mix is the LCD status panel. The connection rate is given, and line quality is shown in percentage. It is a virtual look at how good (or bad) the phone line is. In the shop, the i-Mix connected with the Commander at 28.8 kbps. Line quality was better than 45% (Tieline says anything over 35% is acceptable. If it's lower than 35%, you should renegotiate the unit). We threw on a pair of Sennheiser headsets and took a listen. Voice was as good as ISDN. We renegotiated the unit to 21.6 kbps. Voice was still pretty close to ISDN. We did not hear that "POTS codec sound" we were used to, until we got the unit down to 14.4. Of course, although it looked good in the shop, how would it perform in the field?

The remote broadcast was at Gallagher's in Manhattan, for the Mike and the Mad Dog New York Mets Caravan. The Mets showcase all of their new talent and the old stars with lots of interviews and photo-ops. Mike and the Mad Dog runs locally from 1-6:30pm and phone lines in Manhattan can be touch and go on a weekday afternoon.

WFAN engineer Martin Travers and I headed to the remote with high hopes for the i-Mix. When we arrived, we connected with the studio end Tieline at 26.4 kpbs. Line quality was 65%. Our backup codec connected at 21.6 kpbs with the usual quality (high end loss with lots of digital artifacts). All of the microphones were hooked up, and we ran cable to the PA and got that going. All without a hitch! Jim Pierce and Walter Mason, my engineers on the studio end, could not believe the quality from a POTS codec!

The Tieline was on the air for the entire five-and-a-half hour remote without flaws. Mark Chernoff, WFAN's program director, was very happy with the quality of the audio and I was happy with the ease of set-up with the built in mixer. Since Mike and the Mad Dog is simulcast on the YES television network, technicians from YES were also looking at the new Tieline i-Mix with a great amount of interest.

As for our backup codec, it did not do as well. It renegotiated and hung up quite a few times (which is par for the course with that unit on Manhattan phone lines).

There are a few bugs they need to work out. The VCA pots seem to stagger level control (and it can be noticeable if you do not have a gentle touch on the knobs), and the headphone volume doesn't go to 11 (borrowing a line from "Spinal Tap").

If you're looking to simplify remotes, or get great quality and reliability anywhere out in the field, then I would strongly recommend checking out the Tieline i-Mix. The bottom line: It is simple enough for even non-techs to figure out and the quality is astonishing for POTS.

Mike Erickson is an engineer and Shop Steward at WFAN in New York City. He can be reached at wirelessmedia@simpsons.com

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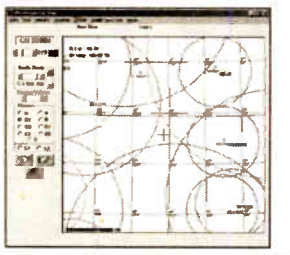

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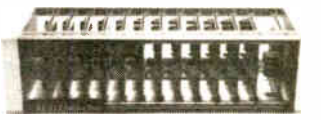

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Sunday, April 6, 2003
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You gotta network. You gotta learn. You gotta see. You gotta NAB.

Let's face it, time is money — now more than ever. For the most comprehensive electronic media industry experience available, you'd be wise to invest your time in an event with global returns.

NAB2003 is the only truly worldwide event for electronic media, offering professional networking opportunities with industry leaders from more than 137 different countries. The **Radio Management Conference** is guaranteed to leave you with the wisdom you need to succeed well into the future. And there's no bigger or more complete showcase of broadcast and multimedia products on the planet.

Make plans to attend **NAB2003**, The World's Largest Electronic Media Show and the Radio Opening Reception on Sunday, April 6. Because if you wanna know, You Gotta Go!

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