

Radio Guide

Radio Technology for Engineers and Managers

August 2007

A Preview of the Ultimate Audio Processor



Inside Radio Guide

Processing
Guide
Page 4

We have enjoyed Jim Somich's discussion about how modern audio processing has brought broadcasting from a lonely man in Master Control trying to anticipate changes in audio levels to microprocessor-based digital processors that can not only "learn" but by using delay lines can "rewrite history," applying correction no human could ever accomplish.

In this, his final installment, Jim brings his knowledge, experience, and humor to bear as he speculates on what innovations in audio processing will come in the future, and offers his suggestions on what hardware and feature sets will be built into the Ultimate Audio Processor.

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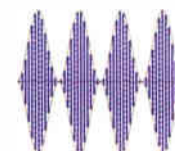
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The ForBan-1 Processor

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Perhaps no other person at the station – sometimes including the General Manager – is so intimately involved in so many aspects of the operation of a broadcast facility than the engineer.

Those long joke lists aside, an engineer's area of concern is large. It encompasses much more than just the studio and transmitter, including the entire physical plant(s), real estate, zoning, governmental relations, and more. In fact, as staff turns over, the engineer and the bookkeeper often are the only people left in the building with any "institutional memory."

As such, the engineer is the "first line of defense" in protecting a station's license and ensuring compliance with the FCC Rules and Regs, as well as local authorities. The engineer must be aware of the various applications and construction permits or Rulemakings in process that could affect his facility – and be up-to-date on them.

To help, check out Ted Schober's article on Page 14, regarding the NPRM related to the PSRA/PSSA Rules. This especially applies if your station is a Class B or D station with little or no power in winter drive times.

Of course, the engineer and GM need to have mutual respect and communicate closely for such information to have full benefit. Bob Burnham's article on Page 34 gives pointers on building a good relationship with the General Manager. Dave Dunsmoor's article on Page 12 focuses on the right way to leave a job.

Sometimes the experiences of others can help solve a difficult problem. If you need to get rid of unwanted RF, Mike Langner's experience with ferrites on Page 16 could provide you a solution.

There is so much to learn in so many areas. May we suggest putting the Fall NAB Convention and the *Radio Guide* Transmission Seminar (Page 2) on your calendar? You and your station will benefit greatly. – Radio Guide –

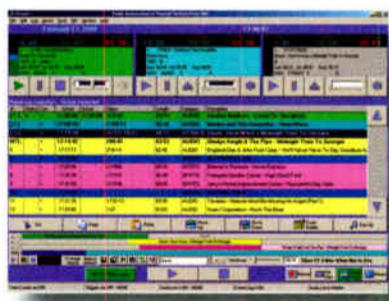
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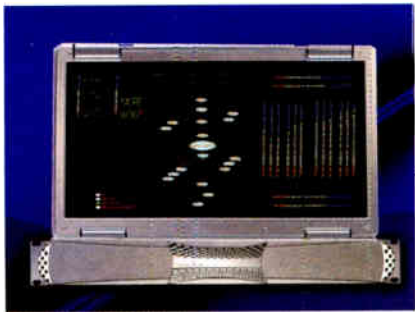
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Processing Guide

by Jim Somich

Processing: Yesterday, Today, and Tomorrow Part 7: The Ultimate Audio Processor?

We have enjoyed Jim Somich's discussion about how modern audio processing has brought broadcasting from a lonely man in Master Control trying to anticipate changes in audio levels to microprocessor-based digital processors that can not only "learn" but by using delay lines can "rewrite history," applying correction no human could ever accomplish.

In this, his final installment, Jim brings his knowledge, experience, and humor to bear as he speculates on what innovations in audio processing will come in the future, and offers his suggestions on what hardware and feature sets will be built into the Ultimate Audio Processor.

We have come a long way in broadcast audio – and this series (!) – from the manual gain-riding of the 1920s and 1930s, to the multi-band processing of the 1970s, to the modern processors, housing enough microprocessors to make a computer jealous.

But we are not done. The major processor manufacturers – and the lesser known ones as well – are busy working on new approaches, algorithms, and designs. No longer are we limited to a half dozen knobs on a rack-mounted processor, but computer GUIs (Graphical User Interfaces) provide access to a wide range of adjustable parameters.

Last time, we tried looking ahead five or ten years – quite a challenge at a time when the industry is undergoing great changes, not to mention the advances in technology that are driving electronics in general. How much further dare I go?

If you are ready, sit back and speculate just a little bit with me. I promise: it will be fun!

THE FUTURE REVEALED?

The crystal ball is getting darker and cloudy as we try to see ahead two decades. A lot can happen in twenty years and it is highly likely that we will not even recognize the technical end of the broadcast business by then. Nevertheless, things that were just "gimmicks" in the science fiction movies seem to migrate into reality.

For example, *Star Trek* style computers that operate from voice commands or touch pads are starting to become possible (have you touched an Apple iPhone yet?). Are "self-repairing" transmitters far behind?

Indeed, if you believe Moore's Law can be sustained twenty years into the future, why would we not expect computers to be – if not "self-aware" – at the least, programmed to react and adjust to a number of possible inputs and appropriate responses that are more than several magnitudes higher than today? All we have to do is avoid playing Global Thermonuclear Warfare.

MOORE'S LAW

Moore's Law is the empirical observation made in 1965 that the number of transistors on an integrated circuit for minimum component cost doubles every 24 months. It is attributed to George E. Moore, a co-founder of Intel.

DSP AS THE DRIVER

While there is no logical reason why the most advanced processing *must* be based on Digital Signal Processing (DSP), DSP may just prove to be simpler and more cost effective than elaborate analog designs, especially as the cost of processing horsepower plummets.

It is quite possible that the DSP processor of the future will become more of a faceless engine with no inherent philosophy or strategy. In other words, the strategy will be in the software: the box becomes a commodity.

Quick! Who manufactured the motherboard in your desktop computer? You probably do not know and really do not care. But would you want to be forced to buy all of your software only from Mr. Softie? In many ways, that is where DSP processing is today.

We are already seeing the leading edge of super-power processing at bargain basement prices. This downward price spiral will continue into the future and the result will be digital processors that make today's finest audio processing boxes look like Soap Box Derby racers performing against supercharged Porsche Turbo Carreras!

PEERING AHEAD

We will now climb way out on a limb. We start by taking everything we have learned for the past 90 years – from the peak limiter days through today's "sonic signature" boxes.

Now, let us allow our imaginations to run wild. With just a bit of fortunate guessing, perhaps the picture in the crystal is becoming a bit clearer as we peer ahead to 2022.

Of course, all broadcasting will be digital in 2022, using the Magna-Coreg-iBiquity System, widely adopted in 2010 after the original iBiquity failed to capture the imagination of listeners nationwide. M-C-I addressed and solved most of the negatives of the original HD Radio system – but that, dear reader, is something I will leave for you to learn in the due course of time (I just might be off by a few years!).

By that time, the definition of broadcasting will have been expanded to include terrestrial, satellite, mobile Internet streaming, and the national Wi-Fi network. Listeners in 2022 will barely remember analog broadcasting – if at all. Bob Orban and Frank Foti will be in well-deserved retirement and their heirs and successors will have formed a new company called "ForBan Broadcast."

Can you stand the suspense?

TOMORROW'S DREAM PROCESSOR

Fade in on the January 2022 digital copy of *Radio Guide* and we find the cover story: *The ForBan-1 – The Processor of the Future*. In the article, Cory Gould, the design team leader, describes how they managed to reach new heights of audio manipulation: "Once we managed to stop the Global Thermonuclear War function, it was easy," Gould reports. "We just told it to make the audio sound like 'Wow!' – and it did it instantly."

In the article, we find a set of specifications for the #1 broadcast audio processor in the year 2022:

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- Infinitely variable selective noise reduction.

- Instantly reprogrammable on the run; automatically reconfigurable in real-time.
- Self-diagnosis via artificial intelligence. Instant performance evaluation of any function on the run.
- 7.1 surround sound processing w/automatic encoding of 2.0 and 5.1 sources to 7.1.
- External memory ports accommodate 2x20-terabyte thumb drives.
- Space for two optional (but now obsolete) 3/4-inch 1-terabyte mini hard drives.
- Over two thousand 3rd-Party plug-ins available.
- Manufacturer's Support: Instant replacement for the life of the processor. There are no serviceable parts inside.
- List Price: Less than \$1,000 (in 2000 dollars)!

As you can imagine this audio processor will be able to feature performance that is infinitely variable from absolute consistency to pure sonic signature (from purity to distortion).

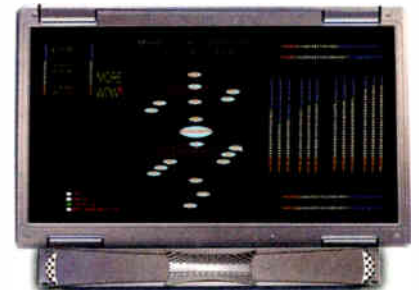
UNLIMITED SET OF OPTIONS

You may have fixed your eyes on the issue of plug-ins. Since the ForBan-1 will run on an Open Source Operating System w/3rd party accommodation, with an instant bootup via internal nRam, and feature Super-Ethernet Wi-Fi connectability completely IP Addressable for Internet 4.0, it will handle those two thousand 3rd-Party plug-ins by a quick, easy upload to the copious internal memory. (Moore's Law!)

The Program Director in 2022 will have available dynamics processing, fully adjustable reverberation, aural excitation, tube emulation, room/hall simulation, and station emulation. Yes! Over 1,000 vintage processors can be incorporated into 1,000 virtual airchains duplicating the sound of *every classic station in history!*

Well, maybe I am getting carried away a bit – the exclamation points are starting to stack up! (Oops, there is another one.) But maybe not. You decide. Perhaps you can see the ads now:

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 accommodation • External memory ports accommodate 2x20-terabyte
 thumb drives • Single-chip design using the new World-Semiconductor
 Mega-DSP chip • Over 2,000 3rd Party plug-ins available and easily uploaded
 to internal memory • 7.1 surround sound processing w/automatic encoding of
 2.0 and 5.1 sources to 7.1 • Dynamics processing, reverb, station emulation,
 tube emulation, aural excitation and room/hall simulation

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Engineers may or may not be pleased. With no serviceable parts inside, digital audio handling preventing any overmodulation, and the manufacturer offering instant replacement for the life of the processor, the engineering department will not have to do more than install the box.

It will be a far cry from the Langevin ProGar, that is for sure. One thing is for certain, the future will be an exciting place and the possibilities boggle the mind and stimulate the imagination.

(Continued on Page 6)



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*Keith DeGreen says:
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Processing

Guide

by Jim Somich

Continued from Page 4

THE "UNPROCESSOR"

What form will broadcast audio processing take when your one-year-old child is graduating from college? Maybe an "unprocessor" will, at the same time, be the most and the least processing possible. Here is a quick look.

Remember Moore's Law? Processing power doubles every 24 months for the same price. If you were of legal age when personal computers first made the scene, I do not have to dwell on the efficacy of Moore's Law. Its implications are fantastic!

Remember transistors? How many transistors are on a current, state of the art microprocessor? Would you believe 42 million transistors with the capability of executing 1.7 billion instructions a second? But wait, it gets better. "Intel Announces Tiniest Transistor Yet." (*The Oregonian*, 12/11/00). The end result, the semiconductor giant said, will be a thumbnail-size computer chip with 400 million transistors operating at speeds up to 10 Gigahertz. (hypertextbook.com/facts/2001/SerafinaShishkova.shtml)

In 20 years, processing power will have increased by a factor of over 1,000 while the price will be held constant - our un-processor could well be a chip that costs the equivalent of fifty cents in 2007 dollars! With that much horsepower, almost anything is possible. So here is the best part: our "unprocessor" does not reside at the station, it is built into the receiver!

YOUR GRANDCHILD'S BROADCAST PROCESSOR

I call my Ultimate Processor "The Unprocessor" because that is what it is - sort of. No, I am not going to tell

you, after all this processor-speak, that the ultimate processing is no processing. That just is not true!

There are those who do want a sound that is as close as possible to the original recording, be it CD, vinyl, or thumb drive. Others would find this sound to be flat and lifeless. We probably all hear things a little differently.

The Ultimate Processor will put processing totally in the hands of the end user. After all is said and done, in the end, processing is a matter of taste and need. You may prefer your heavy metal rock "balls to the wall" with almost zero dynamic range and distortion up the wazoo. I may be into Judas Priest as much as you, but prefer just a little "breathing room."

THE ULTIMATE PROCESSOR: LET THE LISTENER DECIDE!

Imagine having enormous processing power at your command. Digital Magic at your fingertips. You choose the sound you want, depending on need or your mood or whim. As processing power becomes more economical (Moore's Law) the ultimate personal processor becomes feasible and practical.

Even modestly priced receivers could include a "single chip solution" to personalized processing. But what about those people who "can't be bothered" with tinkering, the ones who just want to enjoy the music?

That is the beauty of the Unprocessor. The Unprocessor also resides in the air chain just like today's magic box. Set it up to your requirements: "signature sound" or purity, or anything in-between. And have every advanced function we have just discussed at your beck and call.

Want a "wall of sound?" Just punch up the 1988 Z-100 preset. Want to recall the WLS sound of the 50s? It, too, is just a preset away. But there is more. With this much processing power, you could generate a metadata stream that would contain all the information necessary to "undo" anything The Unprocessor could do to its input.

Now, imagine the listener with this enormous processing power built into his listening device, be it a radio, mp-3 player or whatever new gadget will be shown at the next

CES. Now you have the ultimate choice: the processing selected for you by the program provider or undo it all and apply a preset of your own. Everyone gets the same programming, but everyone also listens to it tailored to their own taste and listening conditions.

A FACT, NOT FICTION

Sound far-fetched? Not with the economical processing power that is inevitable. The Unprocessor could be a "single chip solution" that would add negligible cost to a listening device.

Wow! Maybe the Unprocessor is not so much science fiction as science fact yet to come. One thing for sure, the only constant is change, and I do not see progress slowing. Thirty years? Forty years? I think virtually anything is possible! (Those exclamation points are stacking up again, but all this is not so unthinkable.)

And so ends our journey through almost a hundred years of broadcast processing history. The engineers of yesterday did not have a clue as to what processing has become in the 21st Century, and the same will be said about today's young techs in a decade or three.

It is all very exciting is it not? May I leave you with my sincere wish: for you to have the best sounding and the loudest station in your market.

The author would like to thank Barry Mishkind, Corny Gould, Frank Foti, and Bob Orban for their invaluable assistance in the writing of this series.

Before his untimely death in February, Jim Somich's career included positions as Chief Engineer in several major markets (including NY and LA), Director of Engineering for a group owner, and as the designer of a number of products, including the FlexiMod FM Processor.



Radio Guide 2007 AM Transmission Seminar

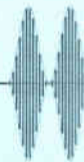
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More Studio Microphone Choices

Choosing a microphone is not a casual task. While there are some great microphones out there, not all are properly suited for all applications. George Zahn continues to share some of the choices he has found that work – along with the exhortation that picking the right model takes time and effort.

Whenever we discuss microphones, it is inevitable that the “Big Two,” namely ElectroVoice and Shure, are featured prominently. They are used in many stations, the world over, “by default.”

There is nothing at all wrong with that. These companies have built fantastic reputations on consistent quality and dependable and durable products. But, are your current microphones the right microphones for the sound you want?

BUILDING A “SOUND”

Whether you have an RCA 44 classic ribbon, old favorites such as a Shure SM7B, an EV RE27, a 635A, or even a Radio Shack “High Ball” microphone (as some smaller stations do), it comes down to your “sound,” and how much you value the timbre of your announcers.

Just stop and think about it for a moment. If you run a music format, your music decisions are often heavily influenced by the CD-buying or music-downloading community, or by the songs being promoted by the recording companies. Also, your clients often shape the tone and content of their spots.

What control does that leave you? Your overall “sound” – the glue in between all those other elements over which you have minimal control. Your production pieces and, most importantly, your announcer quality constitute the most controllable portion of your on-air product.

You can hire the best people, prep and coach announcers to follow your format, but if they are on a terrible quality microphone, the station will sound inferior. You do not need the highest priced microphone, but you do want a microphone that gives you the “sound” you want.

A STRANGE WAY TO CHOSE

Engineer Jay Crawford has worked on just about every level of radio broadcasting from large conglomerate radio entities to small radio stations, in both public and commercial radio. His feedback helps explain how many stations have chosen microphones over the years.

Crawford notes, “Especially in smaller markets, stations would buy what was recommended by other people they trust, or some stations would scout out what other stations were using.”

That is why we continue to urge managers, engineers, and program directors to listen closely to their studio microphones, as well as trying out some of the alternatives, to see what best “fits” their “sound.” In addition to the popular selections from ElectroVoice and Shure we have discussed in previous issues, there are some very attractive alternatives on the market.

Of course, these articles are not to promote any one company over the other, but to challenge you to gauge if your current microphone sound is what you really want.

GETTING “HAMMERED” BY A 635

Crawford relates how one of the great news microphones became the unlikely studio choice at a station where he worked: “One station had an ElectroVoice 635A as its air studio microphone because the owner of the station asked his staff to see what competitors were using.

“The main place they could scope out the competition was in the field, where the news reporters were, and since the news departments were using 635’s, that’s what the manager figured was the best microphone. They used that 635A as the air microphone (complete with all the extra studio noise picked up by its omnidirectional pickup pattern) into the 1990’s.”



The 635A – the noted “hammer” microphone – was known for its durability, not necessarily for its audio reproduction performance.

That same small station owner also could not understand why a talent he had hired from another station in the market just did not sound the way he did on the old station. Not having a technical background, he could not really articulate the difference, but he knew his “sound” was not right. He learned the hard way that microphones are not all the same. The EV 635A. Durable? Yes! A highly used and in-demand “on-air” microphone? Not so much.

JUST WHAT THE MD ORDERED

In the sitcom *M*A*S*H*, it was the doctors who showed the greatest humanity and cooperation, even across bitter and violent enemy lines. In radio, it is often the “family” of engineers who help solve problems that management of two different stations might not ever discuss.

Crawford inquired and discovered that at the old station the talent in question used Sennheiser MD 421 microphones. He was able to borrow one to replace the 635A and, *Presto-Chango*, the talent instantly sounded better! Within a few days, the station had equipped its studios with upgraded microphones designed for studio use, not field recording.

I had to ask Jay Crawford if buying those new microphones created a problem for the manager. “Not at all,” stated Crawford, “I could have spent \$5,000 on processing gear to give him the sound he wanted out of that misused 635, or he could buy a \$250 (1990’s price) Sennheiser microphone and get the same improvement!”

THE BIG TWO HAVE COMPANY

I use this story to introduce one of the numerous alternatives to “The Big Two.” While the choice of any microphone is highly subjective, Sennheiser microphones are used in some broadcast studios, and many who use them swear by them.

Sennheiser, based out of Germany but with U.S. headquarters in Connecticut, is a smaller company than the Big Two. It recently added the Neumann line of microphones under its umbrella, building an attractive catalogue of microphones.

Among the most prevalent microphones from the Sennheiser line is the popular MD 421, which is a pretty durable dynamic microphone with a 5-position bass roll-off switch – careful, the deepest roll-off would make James Earl Jones sound like a eunuch. A quick scan of retail prices on the Internet as of this writing shows a retail of about \$350.

MORE CHOICES

There is a super-cardioid cousin for tighter pickup situations, the MD 441, available for about \$650, which includes the same bass roll-off option, and a brilliance boost control to brighten the high frequency output of the microphone.



The Sennheiser MD 421 and MD 441

And for those stations in larger markets looking to add a small voiceover studio, Sennheiser touts its MKH 416 as a favorite of voiceover and cartoon producers in major markets, giving a discrete, round sound. It lists for about \$1,400 and features a hyper-cardioid pattern in an “interference tube” design that offers an excellent signal to noise ratio.

(Continued on Page 10)

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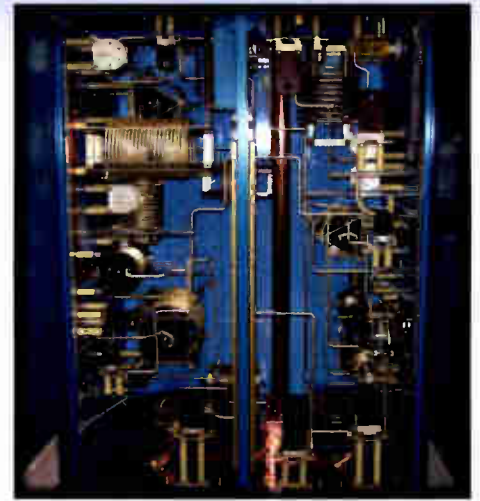


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More Studio Microphone Choices

On the Neumann front, you will find condenser microphones. Many offer large diaphragms and some have switchable pickup patterns. Among some broadcast favorites are the BCM Series, including the BCM-705 (about \$700 if you shop around), which have an unusually warm sound, and the U-87 (approximately \$3,000 retail), one of their premium condenser microphones you will likely see on many music studio videos.

GETTING THE RIGHT MODEL

On selecting microphones carefully, Ben Escobedo, Associate Product Manager for Sennheiser USA, says, "It's hard to pick a bad microphone, but it's always possible to pick the wrong microphone for an application."

Crawford concurs, "Early in my career at an FM station, they used all ElectroVoice RE16's because one of the jocks there was in a rock band and that was their favorite vocal microphone. When the manager needed a recommendation for all of his studio microphones, he ended up ordering RE16's which sounded good for some applications, but not for all. The microphone is still one of the most critical decisions managers will make, and the more they know, the better their choice."

On the big diaphragm sound that we often desire from the big diaphragm microphones, Escobedo points out that it is a largely American phenomenon, "the bassy, warm, big tone is something that we shoot for in the United States, but when we get orders from London, for example, the desired sound is more tinny, more thin."

Regardless of the sound you are seeking, Escobedo reiterates a tip we have mentioned here before: "When possible, try it before you buy it." He urges stations to develop relationships with retailers and sales reps, which makes it easier to get "loaner" microphones for the station to try out. This helps weed out microphones that do not fit your "sound" or brand.

GETTING READY FOR HD

Will the microphones we buy today be obsolete because of HD Radio? "Not likely," says Escobedo, "the frequency response of most professional microphones today has a bandwidth beyond the range needed by FM or HD Radio."

As more stations are gearing up with digital consoles and digital broadcast chains, the Neumann digital microphones are very intriguing as the "Microphones of Tomorrow" (with all due respect to NASCAR). From the company that lays claim to the first condenser microphones, the first switchable pattern characteristics, and 48V phantom power, they have introduced what they call Solution-D.

According to Escobedo, "the digital microphones each have their own Analog-to-Digital converters optimized for the capsule built-in, and they conform to the new AES 42 standard for digital microphone-console interface." An interface is also available to provide an AES/EBU output. Popular sampling rates are supported according to Neumann literature.

SOFTWARE DRIVEN MICROPHONES

The two microphones in this Solution-D family are the large diaphragm D-01 and the smaller diaphragm KM-184D with interchangeable passive capsules for omni, cardioid, and hypercardioid patterns. Escobedo says that the Solution-D microphones will offer remote switching of pickup patterns and other performance settings from a separate control point. The control software will run on a Mac or a PC.

As for the "Microphone of Tomorrow," Crawford says we may already be there, be it old school analog (he likes the MD 421 as a versatile choice for many applications) or new digital models. "There's no universally great microphone. If we could get a Neumann sound with the durability and size of a 635, that would be great!"

It all comes back to the proper application, and going for a consistent sound. We may not yet have the perfect microphone of tomorrow, but the trip to finding it will be a fascinating one.

FEEDBACK CAN BE GOOD

In coming issues, we plan to talk about the comeback of the ribbon microphone for broadcasters and look into digital editing software. We welcome your "feedback." If you have a microphone question or comment about a favorite microphone we have not covered, please let us know. Also, tell us which digital editing software you prefer.

George Zahn is the Station Director at WMKV-FM in Cincinnati, OH. E-mail him at gzahn@lifesphere.org

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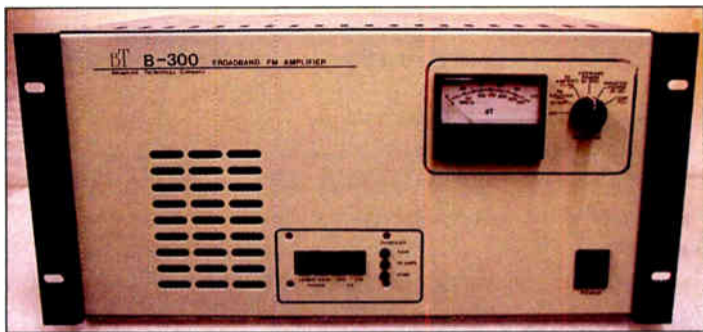
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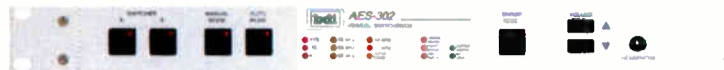
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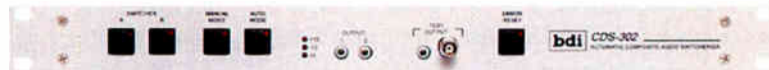
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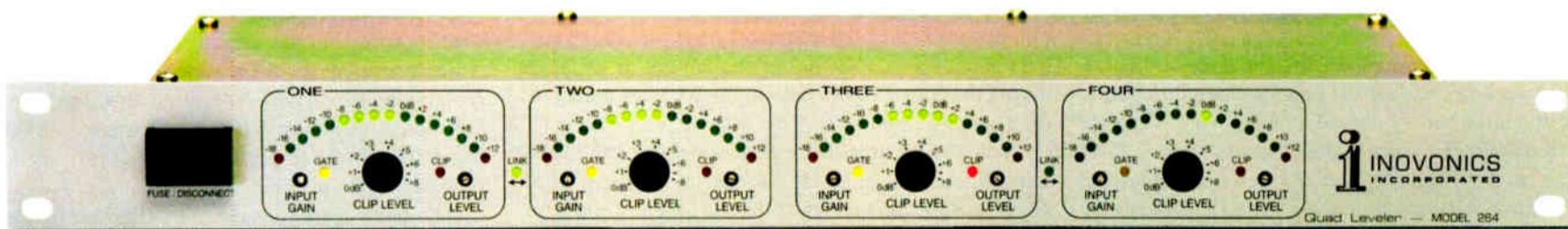
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Training a Replacement

There are many reasons for leaving a job: a better offer somewhere else, getting out from a bad situation, or retirement. The end result is that, of course, someone else will be sitting in "your" chair. Dave Dunsmoor suggests that it is wise to prepare well for the changeover.

How do you go about training your replacement(s) – and what do you teach them? What do you not tell them?

NOT IF, BUT WHEN

The old adage says anyone will be missed for about as long as it takes a bucket of water to fill the void when you pull your hand out. In other words, everyone is replaceable.

It does not matter how valuable you are, how much you know, how much you do, or how much of the station's essential data you keep "in your head" (instead of in the books). To repeat: *everyone* is replaceable. The real questions are: how smoothly will your replacement be able to pick up where you left off? Do you care? Does it matter?

In many ways, of course, the answer may depend upon the terms of your departure. If you are ready to "burn bridges," go ahead and just leave, with everything still in your head.

However, if you are on an upward progression career path, carefully training a replacement – maybe even finding one – accomplishes more than just doing a favor for the old employer in making a decent, smooth transition in the operation of the engineering department. It also gives your new supervisor a positive impression about you, showing him you will not leave them in a bind when it is time for you to move up again. This can have an immediate positive effect on your salary. (Now we are getting somewhere!)

SIZING UP POTENTIAL REPLACEMENTS

What you teach a replacement depends on what they already know, as well as how much time you have before it is time to turn in your keys.

Does the person have a fairly decent grasp of all things electronic/mechanical or merely basic conceptual knowledge? Even someone with a good background of "book smarts" can be terribly inept in actually putting all that theory to use, or they may just appear to be completely lost. Understanding them well might change what is actually needed to be taught.

One time, while training a new guy, I instructed him to troubleshoot a medium-sized UPS. He came back a few minutes later and announced that he had found the problem: "the battery is dead." *Grrrrrr*, I thought to myself: "I know the battery is dead, that's why it doesn't produce an output."

But instead of jumping on him about the obvious, I asked if he had checked the battery charging circuit. "Yes, and if the battery is dead, it will not try to charge the battery" was his more in-depth second answer. OK, now I saw that I did not have to teach him electronic theory so much as communication skills. I had asked one question, and he had provided me with one answer to the one question. Nothing more, nothing less.

I learned something that day.

MAKING IT ALL CLEAR

Since you are likely to run into any of a wide variety of skill levels in the people who have been selected to do

your job, to get the most value out of your time spent teaching them what is necessary in order to be able to take over when you do leave you might want to prepare some months (years) prior to the event. What I am talking about here is documentation.

I do not mean that you need to have a formal library of binders on every subject (although that would be great). However, something more substantial than a desk full of post-it notes is necessary. If you are adept at generating documents on the PC, this can be as simple as doing all your note-keeping or logs in Windows Notepad or Wordpad. A handwritten notebook also will suffice – if it is legible.

START AT THE CORE

Where do you start? Perhaps by looking around the engineering equipment room. If you were going to give an in-depth tour to a visitor (perhaps one of your peers), could you answer questions regarding the specifics of the operation of each rack, of each piece of equipment in each rack, of the interconnects between the racks and how they fit into the overall operation of the plant?

If you were going to do this over the phone – from a hospital room for example – could you describe exactly which pair of wires carries the RS485 data to the EAS box from the remote control unit? You could find it if you were there, but could an engineer from across town find it also? Could he find – or even read – your notes? Which IP is associated with which router, server, etc. Where does TelCo enter the building, what circuits go where?

Here is an idea: do the overall big picture first. A "oneline" drawing is useful here. A oneline drawing resembles a block diagram and lays out which equipment is in place, and where it fits in the overall scheme of things. One line connects the blocks together to form a quick visual of how everything is laid out.

Once this is done, then you can add the details. Racks, equipments, connections, pins, cable numbers and so on. This is where you will want to add notes (and drawings if necessary) about specific variances in wiring, setup, and so on. This is the kind of thing that will be invaluable to a new engineer as he goes about the job of keeping things running smoothly after you are long gone. By the way, "new" does not just mean newbie, a veteran engineer replacement will appreciate not having to "hand-over-hand" the wiring closet during troubleshooting.

HOW, WHERE, WHO?

Have you made an inventory of your spares? Where do you typically get replacement parts; which companies do you have accounts with; what are their phone numbers; who are your contacts? Anything and everything that has to do with the completion of your job during the course of the year ought to be in a notebook (or a series of them).

You should also make maps of the roads to the transmitters, STL hops, etc. Do you have a spare set of keys – and are they labeled? What are the entry codes for the security alarms and the various pieces of gear? It will not help someone else get back on the air if the audio processor is "locked" and the password is not available.

Know who to call in an emergency – the Police or Sheriff's number (besides 911) should be available, as well as fire/rescue numbers. (A side note, this should be a reminder to have the Public Safety folks out to

show them the facilities, what is inside, and who to contact if they get a call about the site?) They like to know what issues they are likely to encounter when called, for example when dealing with high voltage or especially if you ever need to call them to get an injured worker off a tower.

Similarly, document the key data with all your computers. True, almost everyone can reload Windows these days (it seems to be common occurrence), but where are the audio/video/chipset drivers, what are the configurations? Where are the applications, the passwords, the licenses, and so on?

BENEFIT NOW

Yes, I know – you have only so much time. However, if you start with one item, one small project, and do another every day or so, it will get done.

By the way, consider this: you are not just doing this for the new guy, but for yourself as well. The faster you can lay your hands on vital information in an emergency, the sooner you are back on-line, the sooner you are back on the air, the more valuable you are to your current employer, and the more professional you are.

And then, when the new guy shows up, you can easily, quickly, and with great comfort show him where everything is, and where to find the needed information.

TIPS, TRICKS, TRAPS

After you have gone over all of the general stuff, and where to find the needed information, a good next step would be to delve into some of the more subtle aspects of your installation. This area is potentially the most troublesome, but perhaps the most overlooked.

There are so many things that can go wrong in the middle of the night (or in the middle of drive time) that you cannot cover all possibilities. But do keep a log of some of the more repetitive, or urgent ones. The log will be helpful to you as you tracking down problems – and to the guy who follows in your stead.

Perhaps there are some quirks in tuning the transmitters, the ATU, some seasonal variances that you adjust for, some difficult neighbors to deal with, some planned improvements that have not happened quite yet, some wiring practice errors or intermittent equipment problems you have not had time to solve. Having these documented will save time for whoever has to deal with such issues.

WHO'S WHO

Another list might consist of the local engineers (or even folks not in the business) who are knowledgeable and willing to help in an emergency or for a special project. During a three-station move several years ago, one of the local "electronics guys" was quite willing and able to do some of the time consuming, tedious work while I and the other engineers were doing the "engineering." It was very helpful and very much appreciated – especially when on a short timeline.

These are the things you will want to pass on. What you want to keep to yourself are the office politics, the rumors, the things that can be hurtful. Do not be afraid to mention some things that will make life easier (office manager is a stickler about bringing in receipts), but if she likes to drink too much after hours, best to keep that to yourself. It is not job related. And it can boomerang.

A friend was on a job interview, and the HR department approved his application and soon passed him on to the department head. The supervisor spent about five minutes describing the job requirements. Then the conversation moved over to how bad it was to work there, how tough it was to get parts, and so on. My friend thanked him for his time – and left, never to return.

The point here is: make your engineering department easy for someone else to walk into cold and it will make it much easier for you to walk into every day.

Dave Dunsmoor is a contract engineer in the Minot, ND area, as well as a Navigation/Communications (NAVCOM) Technician for the FAA. Contact him at mrfixit@min.midco.net



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by Ted Schober

PSRA/PSSA Rulemaking

Just before Daylight Savings Time was implemented at its earlier time this spring, the FCC released a set of new power levels for Daytimers using Pre-Sunrise and Post-Sunset Authority. The numbers were so far from what stations were used to having that the ensuing protest caused the FCC to restart the process.

Daytime stations already have a hard time in the winter months. Their Broadcast Day is often highly shortened in both drive times, reducing both income and service to the local community. Ted Schober has been working on this issue and has petitioned the FCC to amend the Rules in a way that provides a better deal for all AM stations. A Rulemaking which should be of interest to many stations is now under way.

The FCC has issued RM-11384 to my petition to revise the Pre-SunRise and Post-SunSet Authorization Rules for AM stations.

The petition seeks relief for AM stations of all classes to operate with the maximum power that will not cause interference during the essential winter "drive time" hours, in the morning when people need information on travel and schools to start their workdays and in the afternoon for after-work travel.

A REALISTIC VIEW OF INTERFERENCE

The petition proposes that stations may maintain their present PSRA and PSSA operations but, if no interference is caused to any other stations, to potentially operate with much higher power during the transition hours.

Everyone knows that skywave signals do not just suddenly reach out the great distances that they do in the middle of the night. This petition looks at the actual levels of reflected signals and seeks to optimize the use of the available spectrum. The main points of the petition are:

- PSRA and PSSA power levels need not be limited to 500 Watts if no interference would be caused.

- Secondary (skywave) service areas of Class A stations expand and contract from east to west with the transit of the sun. There is no need to protect a service area that either does not exist yet on the western edge of the area or has ceased to exist because the sun is rising on the eastern edge of the area.

- Stations should be able to use their day, night, auxiliary, or one tower of the array – whatever works best for PSRA and PSSA.

- Class B and D stations should be able to operate with any power, up to the maximum of day or night station power during PSRA and PSSA so long as no interference is caused.

MAKE YOUR VOICE HEARD

All station owners who have stations with anemic night signals should com-

ment on this petition, as it could significantly increase their coverage during the critical hours when folks are getting out to work and coming home. Engineers who understand the issues can help their owners to recognize and properly respond to them.

Making a comment on this Rulemaking is easy:

1. Read over the petition posted at <http://amband.org/files/RM-11384.pdf>

2. Using the Proceeding number RM-11384, go to the FCC's Electronic Comment Filing System and make your thoughts known. Simply enter RM-11384 in the Proceeding box, then fill out your name, affiliation, address, etc.

You can either type in your comments directly, or you can upload an MS Word, Wordperfect, or Adobe PDF file that has been prepared off-line. Comments to the FCC are due by August 20th. And, no, you do not have to be an owner to file a comment and make your opinion heard.

If you think that this petition would benefit your station(s), is not too complicated, and protects the night coverage of other stations adequately, then you should make your thoughts known.

Ted Schober, PE, is the principal of Radiotechniques, a engineering consulting firm based in Haddon Heights, NJ, that handles all phases of AM and FM needs from applications to construction. Contact Ted at ted@radiotechniques.com

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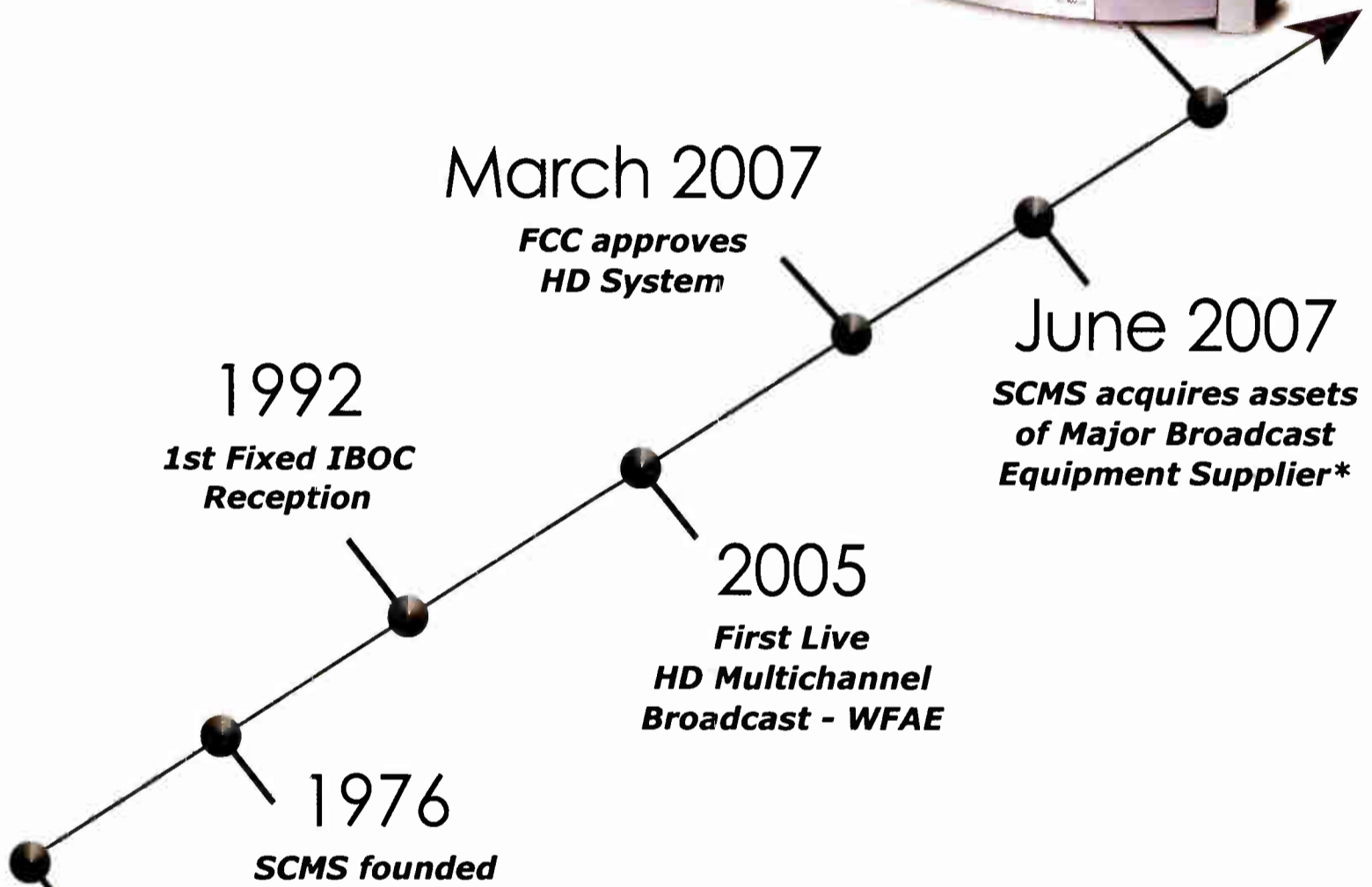


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Putting Ferrites to Use

Following Ron Nott's excellent article on ferrites in last month's *Radio Guide*, a few "real world" experiences seem in order. In this article, I will present the successful use of ferrites to:

- Bring a 3-tower AM Directional Antenna back into tolerance,
- Build a broadband, scalable Antenna Tuning Unit for an Amateur Radio vertical radiator that will work well for the AM broadcast band, particularly for AM HD radio with its requirement for wide bandwidth,
- Filter AM broadcast interference out of telephones and answering machines at homes near the AM transmitter site, and
- Silence a neighbor's set of powered computer speakers that had been playing a local radio station 24 hours a day, 7 days a week.

At the end of this article you will find contact information for several companies that provide ferrite experimenter kits and information on how to best use both ferrite and powdered iron toroids, cup cores, bars, coil slugs, and beads.

THE CASE OF THE WAYWARD DA

Years ago our company purchased a 1 kW day, .5 kW night, three-tower DA AM station on 1050 kHz. Prior to the purchase, I accompanied the seller on a "due diligence" tour of the facility. All monitor points were well within tolerance, as were all the on-site parameters. We shook hands and agreed to close the deal as soon as FCC approval for the transfer was received.

A few days after closing the deal, I remeasured all the monitor points and on-site parameters. The on-site parameters were fine, but *three of the five monitor points were out of FCC tolerance*. In addition, one of the monitor points in a deep null showed significant reradiation from somewhere. But where? And why now?

I contacted the prior owner, who is very technically knowledgeable. He had personally built the station from the ground up. He was at a complete loss. Neither he nor I could see any new construction in the area. We looked for new power line poles, new cell towers, new steel buildings, new buried gas lines, even new metal fences. We found nothing. And yet, all the on-site parameters were still perfectly normal.

FINDING THE PROBLEM

After a number of days spent "tweaking" the phasor, I still was unable to bring the array into compliance. Our company was contemplating relicensing the array when I tried one last idea.

I focused on a 450 MHz Yagi antenna that I had removed from the roof of the building. It was not connected to anything, so clearly it was not needed. But it must have been needed at some time, or it would not have been there.

A quick call to the prior owner determined that for years he had used a 450 MHz P-channel transmitter to send remote meter readings back to his studio. When he sold the station to us, he removed the old P-channel transmitter, ordered a POTS telephone line, and provided a dial-up remote control for us to use. Until then, there had never been telephone service to the transmitter building.

With that information, I followed the new overhead telephone line from the transmitter building for several blocks to a green pedestal Telco box. The lead coming down the pole adjacent to the Telco box was hotter than

a firecracker with RF – the vertical telephone cable run was our mystery parasitic radiator.

FERRITES TAME THE DA

What to do now? Trespassing on utility lines is a very bad idea, so I needed a non-invasive way to eliminate the parasitic radiator. Luckily, our transmitter telephone line was the only working pair in the pedestal. Temporarily disconnecting the download would not affect anyone's telephone service except our own.

Hoping for the best, I carefully removed the telephone cable connection so that I could slip about 80 ferrite toroids (ferrite beads) over the phone cable's vertical run down the pole. Additional ferrites were put along the cable entry to the transmitter site. They worked instantly as an RF choke. The directional antenna immediately slid into compliance – score a big one for ferrites!

For the more legally conservative, ferrite cores (beads) are available in halves. Ferrite manufacturers call them "split-beads."



Ferrites block the RF on the line.



Split-bead ferrites can be applied where breaking a connection is not possible.

With a pot of contact cement to glue the halves together, then I proceeded to place thirty or so split-bead toroid cores around every overhead conductor that entered the transmitter building, immediately detuning any overhead wire that might contribute any directional antenna instability at all.

Figuring surely there were other parasitic radiators involved, even if only at a low level, I soon further stabilized the directional antenna by placing a number of these "split beads" around every utility pole ground wire and guy wire near the antenna array.

Other than some small black donut-like rings in a foam waterproof cover around some cables, there was no indication I had even been near the utilities' facilities.

This gave me a completely stable, rock-solid directional antenna with no need for tweaking the phasor. There was no invasion of any utility company's physical plant equipment or wiring, and no cutting any cables!

LINE MATCHING WITH FERRITES

Since the beginning of LF and MF transmission, L and T networks have been used to match antenna towers to

transmission lines. Typically, in AM broadcast stations, we match antenna towers to our transmission lines with Antenna Tuning Units (ATUs), usually containing conventional tuned "T" networks.

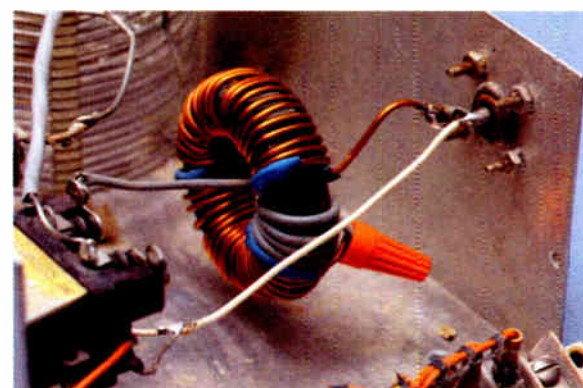
The complexity of the ATU and the number of components in it will vary with the nature – particularly the length – of the antenna tower. A typical series-fed vertical AM antenna tower's ATU will contain two coils and one or two capacitors to provide resonance at the ATU input (cancelling the antenna's reactance) and to transform the antenna tower's radiation resistance at the ATU input to the standard coaxial cable value of 50 Ohms.

Today, using a ferrite transformer or ferrite autoformer can provide the "R" transformation part of the antenna matching network without introducing any significant reactance, a decided advantage when the wide-band requirements of AM HD radio are addressed.

FERRITES IN THE ATU

Years ago I built a conventional 1/8 wave, 80 meter series-fed vertical amateur radio antenna. It needed an ATU to take care of two concerns. The ATU was needed to cancel out the antenna's reactance (providing resonance at the input of the ATU) and to provide a 50 Ohm load for the coaxial transmission line at the input of the ATU. It was in every way a miniature AM broadcast vertical antenna and ATU installation.

By employing a ferrite toroid as a transformer to match the very low antenna radiation resistance of approximately 12.5 Ohms up to the coaxial transmission line's 50 ohms, I then needed only one simple coil, a series inductor (loading coil) with four relay-switched taps to cancel out the antenna's reactance (resonating it) across the entire 80 meter band.



This ferrite toroid wired as an autoformer matched a 12.5 Ohm antenna to standard 50 Ohm coaxial cable.

This task was accomplished with fewer parts, lower loss, and a much physically smaller ATU than conventional construction would have provided. Cheaper, too. And, the best part was that it worked perfectly.

SCALING UP TO BROADCAST

The little ATU is fully scalable up to reasonable AM broadcast band power levels and fully usable on AM broadcast frequencies as long as the user is careful to choose the right ferrite core material and employ a ferrite core of sufficient size to handle the typical AM broadcast station's higher power and lower frequency. The required core size increases (a) as the frequency goes down or (b) as the power level goes up.

If you put too much power through a ferrite, you will invariably encounter core saturation. Excessive power dissipation can literally blow a ferrite core apart.

(Continued on Page 18)

WORLD LEADER IN TALKSHOW SYSTEMS

ONE-X-SIX



The perfect multi-line talkshow system for use with up to six phone lines.



TWOx12

Make fast-paced production and high quality conferencing a snap with this 12 line on-air phone system.

SERIES 2101

The world's only talkshow system especially designed to meet the challenges of integrating large connected broadcast plants.



Introducing Nx12!

Our most flexible standalone talkshow system...ever. This self-contained 12 line system includes 4 hybrids and is offered with Livewire Audio-over-IP and either analog or AES inputs/outputs. Call for availability.



CONTROL AS YOU LIKE IT

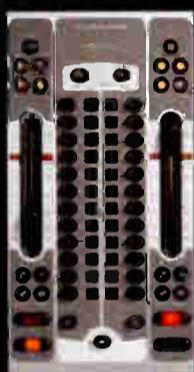
DESKTOP DIRECTOR

Sophisticated, yet easy-to-use, control stations that make fast-paced production a snap.



CONSOLE DIRECTOR

Console + turret mounted accessory controllers put control right at the talent's fingertips. Axia Element users get even tighter integration.



CALL CONTROLLER

Simplified and cost effective option for call screening and on-air control.



ASSISTANT PRODUCER

This talkshow management system completes your Telos multi-line talkshow system with easy-to-use client/server call screener software that provides vital real-time link between producers and talent.

Telos

AUDIO | NETWORKS

www.Telos-Systems.com

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World Radio History

Putting Ferrites to Use

Nevertheless, a core not quite hot enough to blow itself apart will present changed magnetic/electrical characteristics that are usually not desired.

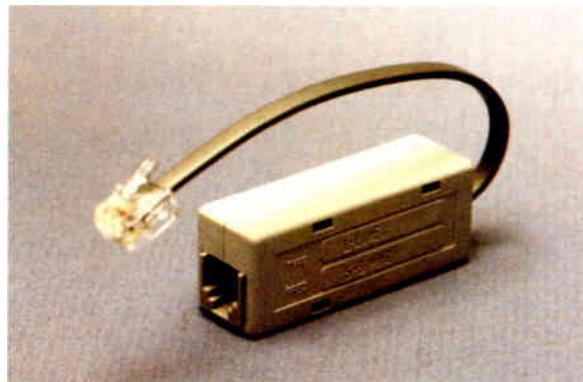
In fact, core saturation will very quickly create RF harmonics and signal intermodulation, which in an antenna ATU or output stage of a transmitter will likely result in a "pink ticket" from the FCC.

RFI ON NEIGHBORHOOD TELEPHONES

When I became the Chief Engineer of Citadel Broadcasting's Albuquerque market stations, I inherited a problem that I should have seen coming: KKOB(AM)'s 50 kW into a half-wave antenna makes a remarkably strong "near field," and residential development had begun encroaching into the former farmland around the tower location.

At first I would average a call or two each month from residents living near the transmitter, complaining about hearing KKOB(AM) in their telephones. As the years went by, the number of complaints each month kept increasing. It seems today's all-plastic transistor- and IC telephones have virtually no RF bypassing so, as residents "upgraded" their telephones, more and more cases of interference came to light.

Before ferrite DSL/ADSL toroidal RF filters were widely available, I used K-COM RF-1 filters optimized for .5 to 3.0 MHz with great success. These filters come in little plastic enclosures with modular plug-and-socket, so it is not necessary to cut into the resident's telephone wiring (more information at: www.k-comfilters.com).



The K-Com RF-1 is designed to remove AM RF from consumer telephone lines.

Seeking to be a good neighbor, Citadel purchased dozens and dozens of ferrite toroidal telephone line RF filters, which I mailed to complaining neighbors.

For more complicated cases of telephone RFI K-COM makes ferrite toroidal filters that plug into the curly cord between the telephone base and its handset. When the filter must be mounted inside the telephone or will be used with audio equipment, K-COM offers "caseless" extremely small ferrite toroidal filters with wire leads. Similar modular telephone ferrite RF filters are also available from a number of other vendors.

If the interference problem was a really difficult one, I personally installed the filters in the complainants' homes. Ninety percent of the time ferrite toroidal filters were a quick and inexpensive solution, completely eliminating the RF pickup. In a few cases, capacitor bypassing within the telephones' networks and at the answering machines' audio amplifiers was required.

Thanks to the arrival of high-speed Internet service on regular "last mile" telephone wires, inexpensive, widely available DSL/ADSL telephone line filters are now quite common and readily available. They work very well at filtering AM radio signals out of standard telephones.

REAL LIFE WITH THE NEIGHBORS

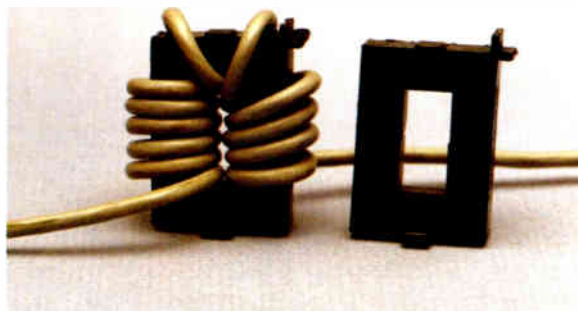
As luck would have it, I live within a mile of the NewsRadio 770 KKOB(AM) transmitter site. It was not planned that way, since my wife and I moved here in 1970, some 26 years before my association with KKOB(AM).

On the day after Christmas a couple of years ago, our next door neighbor called on the phone. She had gotten a new computer, monitor, keyboard, mouse, and amplified speakers as a Christmas gift from her husband. No matter what she did, KKOB(AM) came blaring out of her amplified speakers. She asked if I could fix the problem for her.

Once again, ferrites came to the rescue.

EVICTING KKOB FROM COMPUTER SPEAKERS

Unplugging her amplified speaker input stopped the interference, but, of course, also stopped the audio she wanted to hear. A quick trip to my "junkbox" produced a couple of Radio Shack two-part rectangular ferrite cores, about two inches across.



One or two cores like this can be used to eliminate RF from amplified speakers.

I wound eight turns of the audio input lead from her speaker amplifier onto a pair of the cores and presto, no more Rush Limbaugh! Radio Shack sells these rectangular "snap together," split ferrite-choke cores as their part number 273-104. Our neighbor thought I had performed magic. I was most relieved.

FERRITES IN COMMON PLACES

Ferrite makes up the little bars that constitute the built-in antennas in our AM radios. Ferrites also make great RF transformer and autoformer cores, coil slugs, cup cores, and chokes.

Look inside any modern transmitter and you will find ferrites by the dozens. Filter-tuned transmitter output stages would be pretty impractical without today's modern ferrites. Computer power supplies could not operate without them. And without ferrite beads on the connecting cables between computer keyboards, monitors, and many printer cables, today's computers would radiate enough RF that they would break every FCC Part 15 Rule in the book.

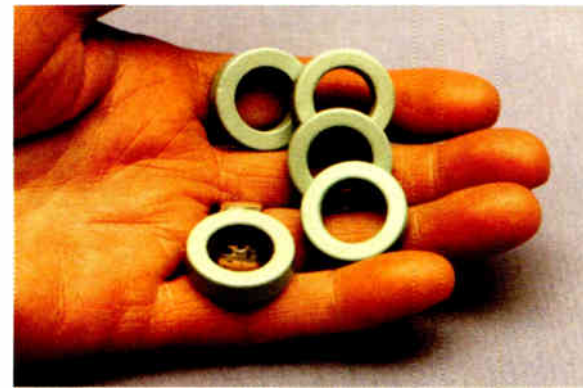
We broadcasters have used coils and capacitors to do our tuning, choking, and impedance transforming since the very beginning of radio. To this arsenal of RF problem solvers, we now add ferrite and ferrite's close relative, powdered-iron.

USE THE RIGHT MATERIAL

Please note that there are important differences between ferrite cores and powdered iron cores for RF use, and even greater differences when we examine the

characteristics of metal cores in low frequency (power) use. When coated in protective plastic and formed into toroids, all three look just the same, but inside they are quite different.

Ferrite cores and powdered iron cores have similar, but at the same time remarkably different characteristics. Yes, they are branches of the same tree, but they are absolutely *not* completely interchangeable.



Consult manufacturer's data when ordering ferrites to get the most appropriate ferrite core material.

Many formulations of ferrite and powdered iron cores are available, all with different best uses. A little reading on the subject will provide a clear picture of the individual benefits of the different core materials.

INFORMATION RESOURCES

Here are some sources for information on ferrite frequency range, power handling capability, applications, product availability, pricing, and the limitations of practical ferrite and powdered iron cores.

www.amidoncorp.com will lead to a wealth of information about ferrites of all descriptions. Follow the many available links, especially the Amidon Associates link on the left hand side of the page, for application notes, pricing, ferrite component kits for RF projects, and much more.

www.fair-rite.com provides technical notes, selection and application application, and provides evaluation kits of different kinds of ferrite and powdered iron cores, toroids and related products. The site is designed primarily for manufacturers' use but small end-user quantities can be purchased from their distributors. Contact information for many of their distributors is provided.

www.qrpkits.com is Doug Hendricks' home page. He provides a number of Amateur Radio low-power projects in kit form and offers a ferrite toroid experimenter's kit with 25 each of the most common low power or receiver toroid cores for \$30.

www.bytemark.com/products/kit_tor1.htm offers a half-dozen or so ferrite toroidal RF application and experimenter kits as well.

Finally, here is my #1 personal recommendation for reading on ferrites:

Ferromagnetic Core Design & Application Handbook by M. F. "Doug" DeMaw. The venerable original version of this book is out of print, but often found at www.amazon.com, www.alibris.com, and similar Internet book sale sites. A newer printing is readily available as part number 3506 directly from www.mfjenterprises.com.

A quick-read Internet site with a good PDF on RF ferrite in broadband transformers for amplifiers is at www.oselectronics.com/downloads/BroadbandTransformers.pdf

Mike Langner, CPBE, recently retired from the position of Albuquerque Market Chief Engineer for Citadel Broadcasting Corp. Mike is a lifelong Amateur Radio operator (K5MGR) who credits Ham Radio with launching his very rewarding 40+ year long broadcasting career. Mike can be reached via email at mlangner@swcp.com

Radio Guide on CD

The Broadcaster's Desktop Reference
Now Includes PDF Archives of Radio Guide
www.radio-guide.com/products.html

You're looking at a complete audio-over-IP routing system.

(Just add Cisco.)

Administer this • The beauty of the Web is that you can get information anywhere. Same thing with Axia — you can set up and **administer an entire building full of Axia equipment** — audio nodes, consoles, virtual routers, whatever — from your own comfy office chair. All you need is a standard Web browser (PC or Mac, we like 'em both). Put an Internet gateway in your Axia network and you can even tweak stuff remotely from home, or anywhere there's a Net connection. Hey, isn't it time for a Mochichino?

It's not rude to point

• Little kids tell mommy what they want by pointing — a pretty intuitive way of doing things. PathfinderPC software gives talent the same convenience. You can **build custom "button panels"** to execute complex operations with just one click. You can map these panels



to controller modules on Element consoles, or to turret-mounted controls, place mini-applications on studio computer screens, even run them on touchscreen monitors.

Jammin' on the mic

• Radio studios and microphones go together like Homer Simpson and donuts. Unfortunately, so do preamps, mic compressors, EQ boxes, de-essers — let's face it, most studios house more flying saucers than Area 51. Axia helps clean up the clutter by including mic preamps with our Microphone Nodes; not bargain-basement units either, but **studio grade preamps** with headroom enough to handle Chaka Kahn, Phantom power, too. And if you choose to use Axia Element consoles in your studios, you'll find world-class mic processing built right in: vocal dynamics (compression and de-essing) from the audio processing gurus at Omnia, plus three-band parametric EQ with SmartQ, available on every mic input. Rap on, Grandmaster.

Push to play

• Axia Router Selector Nodes are **really advanced selector and monitor panels** that you can put anywhere you need access to audio streams. Like newsrooms, dubbing stations, or even the station's TOC, so you can monitor any of the thousands of audio streams on your network at a moment's notice. The LCD screen scrolls through a list of available streams; the eight Fast Access keys let you store and recall the streams you use most. There's even an input, for convenient connection of an analog or AES device. Sweet.

Automation station

• Wouldn't it be cool to have a **self-monitoring air chain with silence-sense** that can fix problems, then e-mail a status report? To be able to switch your program feed from Studio A to Studio B with one button? Or build custom switching apps and scheduled scene changes based on Bookan logic and scheduling events? PathfinderPC software does all these things and more. But unlike HAL 9000, it doesn't talk back to you.

Nothin' but Net

• Did you know you can plug a PC directly into an IP Audio network to exchange audio? Can't do that with a mainframe router. Well, you *could* add more input cards to the mainframe, buy high-end audio cards and run more wiring, but with Axia, you just install the **IP Audio Driver** on any Windows PC to send and receive pure digital audio right through the PC's Ethernet port — no sound card required or additional router inputs needed. The single-stream version is great for audio workstations, the multi-stream version lets you send and record **16 stereo channels simultaneously** — perfect for digital automation systems.

Very logical, Captain

• Routing logic with audio used to be as hard as performing the Vulcan Mind Meld. But Axia makes it simple, converting machine logic to data and pairing it with audio streams. So **logic follows audio throughout the facility** on Axia's switched Ethernet backbone. Eight assignable GPI/GPO logic ports, each with five opto-isolated inputs/outputs, are built into every Element power supply, so you can control on-air lights, monitor mutes, CD players, DAT decks, profanity delays, etc. Got more than eight audio devices? Add a GPIO node like this one wherever you've got gear.

AES yes

• You like your audio to stay digital as much as possible, right? We get that; our AES/EBU Audio Nodes let you plug AES3 sources right into the network. Studio-grade sample-rate converters are inside; anything from **32 kHz to 96 kHz** will work. Oh, and there are 8 AES ins + 8 AES outs in each node. Digital distribution amp, anyone?

Brains in the box

• The typical radio jock cares for studio equipment about the same as a five-year-old cares for a puppy: haphazardly, if at all. That's why we took the **CPU out of our Element modular console** and put it in here, with the power supply and GPIO ports.

That means a greatly reduced chance of being taken off the air by a Coke spilled into the bread. Because we know that you have better things to do on a Sunday night than trying to de-lumidify circuit boards with a hair dryer.

Put that in your pipe

• How many discrete wires can a CAT-6 cable replace? Well, a T-3 data link has 44.7 Mbps of throughput. But Axia networks: Gigabit Ethernet links give 1000 Mbps of throughput between studios — more than 22 times the capacity of a T-3, enough for 250 stereo channels per link — the equivalent of a **500-pair bundle on one skinny piece of CAT-6**. Use media converters and optical fiber for even higher signal density. Think that might save a little coin in a multi-studio build-out?

Level headed

• These green, bouncing dots built into every Axia Audio Node are confidence meters. One glance and you know whether an audio source is really active — or just playing possum.

Heavyweight champion

This Axia StudioEngine works with our Element Modular Consoles (the fastest growing console brand in the world, by the way) to direct multiple simultaneous inputs and outputs, mix audio, apply EQ, process voice dynamics, and generate multiple mix minuses and monitor feeds on the fly. To make sure it delivers the reliability and ultra-low latency broadcast audio demands, we powered the StudioEngine with a fast, robust version of Linux — so fast that **total input to output latency is just a few hundred microseconds**. How can one little box do so much? There's a blazingly fast Intel processor inside, with enough CPU muscle to lift a small building. Strong *and* fast. Ali would approve.

You got to have friends

• Delivery system providers like ENCO, Prophet, BSI, BE, iMediaTouch, DAVID Systems, and more, all have products that **work directly** with Axia networks. So do hardware makers like AudioScience, International Datacasting, 25 Seven, Telos, and Omnia. Check out the whole list at AxiaAudio.com/partners.

Quick Connect • Axia I/O is presented on RJ-45 and adheres to the StudioHub standard. A couple of clicks and you're done.



AxiaAudio.com

The CDS32 from Pristine Systems

Operating and maintaining a market-leading cluster requires hard work and dedication among all departments. There are new challenges every day. Having tools you can rely on to handle day-to-day operations is essential.

Inner City Broadcasting's, Jackson, Mississippi stations are a diverse group. One is live full time. Another is jock intensive and live for half the day. Two are automated music-on-hard-drive. Two are primarily satellite automated, with one of them producing two daily call-in talk shows.

MULTIFACETED DELIVERY

We chose Pristine Systems' CDS32 (Content Delivery System) digital audio delivery and automation system. Through efficient yet comprehensive workflow, CDS32 helps to better interconnect our various departments and, most importantly, their listeners. Not only does the system broadcast "pristine" quality audio, it also delivers song titles, artist names, photos, sponsor logos, etc. to a station's website in real time.

Pristine's CDS32 allows stations to reach out to listeners in a variety of new ways. With CDS32 we can go live anytime with the press of a single button. Special situations, routine remote broadcasts and various weekly programs are easily accommodated. That was not the situation with many systems we considered, some costing several times more.

Most new cars include radio receivers with RBDS. Accordingly our stations take advantage of this technology as well. CDS32 feeds our RBDS encoders a steady stream of song titles and artist names through the data channels of our STL systems.

We have the ability to selectively pass or block any or all advertiser titles during the playback of spots. Some stations are using this feature as an additional revenue stream. CDS32 also makes it easy to implement RBDS flags, such as the TA flag used to tune all radios to your station for traffic announcements.

EASY SYSTEM INTEGRATION

Inner City's traffic department uses DeltaFlex software from Wicks Broadcast and our programming department uses Selector from RCS for music scheduling. All of the computers are on a common LAN network. Accordingly the stations use no floppy discs or paper logs.

CDS32 reads and merges the logs generated by each program. Once a quick scan is performed to be certain all spots on the log are available, the operators may make log changes in real time if necessary. Our General Manager and Operations Manager are very pleased as this has led to fewer mistakes on the air resulting in far fewer missed spots and lost revenue.

There are comprehensive Audit Log reports, which can be viewed in a variety of formats, showing what has been played, what has not, and lists any errors that have occurred. The Traffic and Programming systems reconcile these logs to insure the correct items have played.

OPERATOR FRIENDLY

CDS32 is designed to look familiar and logical to operators. The system is very intuitive and has a quick learning curve. Required training is minimal, and our jocks were up and running almost immediately with very few complications.

Practically every useful feature available on systems costing three times as much is built in. CDS32 presents them to the operator in an easy to use, logical manner. Absent are multiple levels of menus and screens to drill down through just to make a simple change.



A Pristine CDS32 screen.

Our traffic and sales departments really like the Audio Browser. This allows them to listen to any file on the system from their desktop PC. Copy can be checked and spots previewed without the need to go to the Control Room. The Traffic Department folks can also directly change or extend the run dates of a spot without leaving their desks.

BROAD AUDIO VERSATILITY

The CDS32 plays virtually all commercially available types of music libraries and audio files: uncompressed "wav," MPEG Layer II & III, Dolby AC2, ADPCM, and many other formats are supported. A "Normalize" function is built right into the recorder that allows our jocks to instantly make any recording the correct level.

Pristine also includes a CD Ripper program (CDTrax) to speed up music ingestion. It has saved us countless man-hours.

As CDS32 supports the industry recognized "Cart Chunk" standard, audio file and metadata exchange with other systems is easily accomplished. MP3 metadata importation is also supported through the ID3 tag standards. Many MP3 files we receive contain ID3 tags, so the title, artist and other data are automatically imported.

Although our stations do not currently produce any podcasts, it is reassuring to know that CDS32 can create XML items for use with the station website. Listeners can subscribe using iTunes or similar clients and automatically download new episodes as they are made available.

FLEXIBLE VOICE TRACKING

The Pristine Vtrax voice tracker allows our announcers to actually see the music log on screen. Voice tracks may be recorded "dry" or in-context so the announcer gets the feel of actually being on the air when he can hear what will play in real time. As a result, the voice tracks sound less canned and virtually live.

A helpful flexibility is that voice tracks do not have to be recorded on the workstation that will be playing them. They may be recorded from any CDS32 workstation on the LAN. This feature frees up rooms for other work and makes studio scheduling less of a problem, as we often have more than one jock simultaneously cutting voice tracks for the same station.

HOTKEYS SPEED ACCESS

Another standard feature of CDS32 that our stations use to great advantage is HotKeys. Each jock has available for immediate use his or her own customized group of up to 48 Hot Key buttons with frequently used beds, drops, sound effects, and such. Clicking one of the buttons immediately plays what is loaded into it.

HotKeys even has its own pot on the console so mixing is easy. Operation is totally separate from everything else on the system. In fact, it is so separate that you can, as we did, add an external USB HotBox so the HotKeys window can be minimized and the function can be run entirely from the button box.



The Pristine USB HotBox.

The HotBox also has several other quick access buttons that are very clever. The Recorder, Searcher, File Utilities, and HotKeys have their own buttons. The Instant Record feature is very handy. With the tap of just a couple of buttons the unit automatically assigns a filename and begins recording.

There are also six other user definable buttons that may be individually configured for general purpose In/Out, such as machine start, switcher control, serial commands or DOS commands that run other programs or processes.

ACCOMMODATING SPECIAL NEEDS

Our talk station, WJNT, is somewhat demanding with programming from 11 different networks, as well as producing two daily call-in shows (the HotKeys are essential here). However, CDS32 is up to the task, as it manages the 48 available contact closure inputs and multiple Broadcast Tools switchers.

Many WJNT programs are background recorded and time-shifted. CDS controls satellites and other ancillary equipment through automated serial commands. Church service broadcasts are automated through a switcher channel and a Marti unit; other remotes also can be automated through a Marti or phone couplers.

An additional feature of CDS32 that cannot be adequately praised is Smart Promo. CDS32 can look down a music log and automatically assemble very slick "Coming Up Next" style promos from pre-recorded voice tracks and your music library in real time. There is a demo at www.pristinesys.com/temp/promo.mp3

Furthermore, there is a built-in Time Announce function that we have yet to implement, and I understand from friends at several public radio stations that CDS32 interfaces nicely with the new store-and-forward satellite system PRSS Content Depot.

MAINTENANCE AND SUPPORT

To protect our valuable music and commercial libraries and reduce lost airtime, we acquired the RAID mirrored hard drive option. Everything gets backed up to a second hard drive that automatically takes over if the main one fails. This is cheap insurance against a potentially very expensive problem. It has already saved one of our stations many hours of grief.

On the few occasions we have needed it, tech support provided a quick response and seemed to be as serious as we were about solving the problem. Their friendly and knowledgeable, 24/7 emergency response team gives us true peace of mind.

Overall, I would have to say CDS32 has been a great choice for our stations. It has proven very stable, easy to use, and powerful enough to handle everything we have thrown at it.

Further information on the Pristine CDS32 can be found on their website: www.pristinesys.com

Roger Lamb is the Director of Information Technology for Inner City Broadcasting stations WJMI, WKXI AM-FM, WOAD AM-FM, and WJNT in Jackson, MS. Contact Roger at rlamb@wjmi.com

OMNIA-5EX HD+AM

LAUNCH YOUR HD AND UPGRADE YOUR AM SIMULTANEOUSLY



There's a reason why more of the world's powerhouse AM radio stations have turned to Omnia processing...It just sounds better! Additionally, Omnia continues to lead the industry with constant innovation. We pioneered the first non-aliasing digital clipper. (Some still feel it's the only one!) We introduced combo processing for HD-AM broadcast – dedicated processing for conventional AM, as well as a separate processor for HD Radio.

Omnia.5EX HD+AM has a powerful toolbox. 5-Band limiting for conventional analog transmission, along with a powerful oversampled, distortion-controlled, non-aliasing clipper that delivers loud, clean, and competitive audio. Output filtering that is suited for NRSC, ITU, or HD Radio requirements.

Processing for HD Radio/DRM is smooth and clean, thanks to a precision look-ahead limiter that reduces unwanted intermodulation distortion (IMD). This enables one box to generate two incredible sounding signals.

And for convenience, Omnia.5EXi HD+AM offers built-in Diversity Delay, which reduces redundancy, and points of failure in your transmitter plant. (BTW: It was our idea to put the Diversity Delay in the audio processor.)

Analog or digital, it doesn't matter. With Omnia.5EX, your signal will be remarkably clean and clear, with punch and presence that makes AM radio come alive!

INNOVATIVE OMNIA ENGINEERING: WHERE AM AND HD COME ALIVE!



OmniaAudio.com

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BSI's Simian System Reliable, Flexible, Consistent

Building a true "walk-away" automation system for programming used to require enormous piles of gear. Today's computer-based systems shrink the size, but can they provide the reliability needed? Longtime broadcast professional Ron Crider has seen broadcast studios change dramatically over the years, especially in terms of the automation systems used by stations. Here he compares automation – then and now.

Picture this: twelve five-foot high racks filled from top to bottom with twelve Ampex 440 reel-to-reel tape machines for music, two Scully 14-inch reel-to-reel tape machines (for time announcements), two Sonomag carousels (carts) for current music, and three more 440's for commercials. Oh, did I mention the boatload of stepper relays and multi-contact relays?

STATE-OF-THE-ART

You young guys and gals might not believe it, but that Schafer 800 system was state-of-the-art in 1969; it was "solid state" – so to speak – "no tubes." There were other automation products on the market at that time like IGM, Sonomag, and Gates (Harris), but Schafer was the real deal – the Rolls Royce of Broadcast Automation.

I should know, as I was one of the Schafer salesmen – later the Sales Manager – as well as one of the owners of 100.7 in Fort Lauderdale, FL, now Y-100. The automation system mentioned previously operated our FM station for several years, unattended, twelve hours a day plus weekends.

Schafer had a winning combination, Paul Schafer, one of the world's best broadcast equipment salesmen, and Jim Harford, a broadcaster and excellent automation engineer. Together they built and sold over a thousand of these very reliable, first class systems. They were sold to all the NBC FM stations, ABC, WQAM Miami, WRAL Raleigh, XTRA LA, KFOG San Francisco, WFOG Norfolk, VA, WBBM Chicago, and many others. Not all of them were as extensive as mentioned, but rarely was a system sold that had fewer than four racks.

Paul Schafer had the right idea for those early years: *reliability* was more important than flexibility. Therefore he incorporated all of those rugged Ampex reel-to-reel machines in his systems. As a result, stations stayed on the air.

PROGRAMMERS MOVE IN THE WRONG DIRECTION

However PDs wanted flexibility; they wanted *cartridges*. The broadcast cart was a great idea, but a really bad concept; think friction, friction – and *friction*. Attempts to reproduce spots easily brought about some really troublesome devices like the Gates ST-101 Spotter that used one 13-inch-wide tape that ran at 3-3/4 IPS, the Gates Cartritape, and RCA's RT7. Each was an engineer's nightmare.

Then came the Cadillacs of cart machines – Andy Rector's ITC and the IGM Instacart. Regardless of the manufacturer – including ITC – everyone was still working with what I considered a bad concept: the cart. It never got great, just a little better. All carts were an accident just waiting to happen – and it usually did at the most inopportune time.

Adding cart carousels, Gates 55s, and Harris Audiofiles to studio automation just increased the probability of mashing everything from carts to fingers.

Fortunately in the 90's the PC was born. The hard drive was starting to record audio files, and the broadcast industry took a quantum leap forward.

USER-FRIENDLY, PC BASED

Then came BSI. Could this really be true, a PC running a real Microsoft compliant, user-friendly broadcast automation system? Well, I bought WaveStation because I did not really believe it could do what the advertising said.

I was intrigued. If it could do half of what they were claiming, I wanted to know more. Wow! It really did work – and well.

Unfortunately Windows 95 & 98 were not quite ready for 100% reliability. Then came Windows 2000 and reliability started getting close to 100%; with the introduction of XP Pro we arrived at perfection.

WAVESTATION READY FOR PRIMETIME

It was not until Cumulus bought BSI that I actually starting using WaveStation in my own stations. When Cumulus signed on, so did I, figuring if Cumulus was going to use the software in their stations, it would have to be bulletproof.

I first put WaveStation at a few stations in Florida. All my Florida associates were really pleased.

In 2000 I created the Radio Colorado Network (RCN) and the Global American Broadcasting (GAB) satellite network with Dr. Gene Hood. In Colorado we operate five radio stations and three satellite networks with 16 Simian systems. As of today, the RCN and GAB facilities continue to pump out 24/7 programming exclusively on Simian.

RUNNING WELL WITH SIMIAN

The five RCN stations really put those Simians through their paces every hour. The format is a combination of live talk and satellite. All five systems use a Broadcast Tools ASC 8.2 Plus switcher to direct the various outputs to the STL.



A whopper of a BSI Simian installation!

The Broadcast Tools Switcher has two separate stereo outputs. Output # 1 is designated to go straight to the STL for its assigned station. Output # 2 is assigned to the recorders. Simian has the ability to redirect the automation output or any of seven other inputs to either of these outputs at any time by use of the Simian serial port and scheduler.

There are 16 trigger ports that are used for detecting satellite cues and remote cues to switch various events in the Simian operating program. RCN also uses the triggers to fire breaks from remote events through the Telos Export/XStream system, thereby giving the remote talent the ability to take breaks on the fly without relying on the studio board operator.

Simian's serial port is also feeding information to the Broadcast Tools 32/64 satellite controller each hour to change the satellite receiver settings to go to ABC News, WOR Network, as well as fifteen other satellite locations used throughout the broadcast week.

This switcher also has a programmable silent-sense monitor that is constantly checking the audio sources. Upon an absence of audio an alarm sounds. This information is then sent to Simian via the trigger port to log that event. Daily logs are generated through the Natural Log system and fed directly to the various station Simian systems over the LAN network.

SIMIAN HELPS GAB REACH OUT

The GAB satellite network also uses numerous Simian systems to generate its programming, both live and prerecorded. Here again, Broadcast Tools ASC 8.2 Plus switchers are used on each of the three networks. Simian is on the job directing the switchers to sort out the automation audio from live and other incoming sources.



The comprehensive BSI installation at GAB.

In this configuration I feed output # 1 of the switcher to an Aphex audio processor to smooth and control the audio level, then it is sent to the dedicated 56/64 kb Comrex encoder to be sent to ABC New York as well as to an ISDN Telos Zephyr to be used as emergency backup in the event the 56/64 line goes down.

At GAB the systems operate very much the same as at RCN, with the exception of a safety playback Simian. In this case an archived version of the current live program is always playing, so even in case of program loss on a live incoming ISDN line, all breaks stay in sync.

ROCK SOLID PERFORMANCE

Reliability, consistency, and quality control are the most important words used in a satellite network. Should a mistake or program anomaly take place, the event resounds throughout the entire network that could affect many hundreds of radio stations and millions of listeners.

Simian has been at the heart of both GAB and the RCN since 2000. Even after many hundreds of thousands of hours of combined operation, I cannot recall a time that Simian caused a problem in our operations.

Today is a new sunrise in the world of broadcasting. Who would have believed in 1969 that those twelve racks of equipment we were using could be replaced with less than one and a half racks of equipment that is at least one thousand times more powerful, capable of handling Internet radio, streaming, or whatever the future of broadcasting will bring.

A MULTITUDE OF PROGRAM STREAMS

In November 2006, on a trip to London, I got the idea to build an Internet and satellite production facility. On November 29, I activated the World Travel and Dining Channel (www.wtdradio.com). Then came Health Radio (www.healthradio.net), as well as the Home Improvement Broadcasting Network (www.hometalkusa.com). Our facility also originates public and private broadcasts for satellite distribution as well as Internet "webinars" and 24/7 Internet broadcasting.

Simian performs the same tasks as at the GAB network using all the triggers and making generous use of the serial port to control numerous devices, including a Broadcast Tools ASC 8.2 Plus Switcher, and a Broadcast Tools 32/64 satellite controller.

Here again the operative words are the same as at the GAB network "reliability, consistency, and quality control." BSI's Simian makes all those words come true for us. You can certainly spend more money, but you will not get a better product than Simian.

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Field Guide

by Scott F. Trask

RCS NexGen Digital Automation System

Finding an automation system that is reliable, feature rich – and one that on-air personalities will enjoy – is never an overnight decision. To that end, our company's personnel compared several competing systems before settling on the RCS NexGen Digital.

Furthermore, to ensure that we made the right choice, engineering, programming, and on-air staff from both stations in our Atlanta facility – WSTR-FM and WQXI-AM – participated in the selection process. The result was selection of RCS's NexGen Digital automation system.

PUTTING IT TO WORK

The NexGen became our primary on-air automation system at WSTR-FM, Star 94, when we installed it in June 2006. Sister station WQXI-AM followed suit in July. Presently there are seven stations in the group using NexGen – two in Atlanta and five more in Denver.



The Star 94 studio in Atlanta.

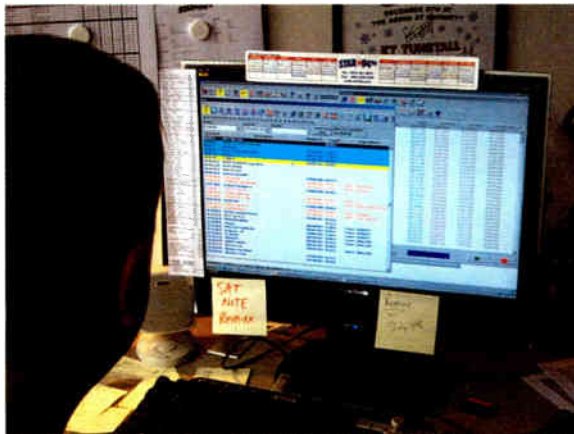
During our install, users were trained before the system went live, so there were no on-air disasters. When the system arrived, NexGen was already installed on Dell Precision workstations, which shortened our install time at the stations. The servers are very robust Dell's with RAID and 600 GB (WSTR) and 300 GB (WQXI) of storage respectively, giving us plenty of room to grow.

Each station's system runs on its own dedicated network, although NexGen can run on a single shared network as well. The ability for us to share audio with a sister station in the future is very appealing. NexGen's WANCasting would even allow us to share whole logs with a sister station.

A STAFF PLEASER

Here are some of the other reasons our NexGen experience has consistently pleased our staff:

- On-air personalities love the flexibility of the Button Bar compared to the previous system, which includes three audio outputs with touch screen capability.
- The ease of use in Voice Tracking is a bonus. The previous process would take about an hour to an hour and a half; now it takes about 20 to 30 minutes. The staff hears the audio exactly how it will playback on-air, which gives them a lot of confidence.
- The production of music, spots, sweepers, and other elements is not as cumbersome as it was in our previous system.
- The ability to make changes to the log without having to go into the studio makes it much easier for the programming and traffic/continuity departments.



NexGen gives Star 94's Music Director Michael Chase the ability to load music logs directly from his desk.

- Importing commercial and music logs separately is a key feature for us. This gives us much needed flexibility; if the music director goes on vacation he can produce music logs in advance and load them into NexGen. Then the traffic/continuity departments can import the commercial logs as they become available.
- My engineering staff enjoys the flexibility of being able to run the system in live, voice tracked or satellite mode.

HD READY

The system's ability to export data (Song Title, Artist) for RBDS, HD, and Internet Streaming is great. NexGen handles it flawlessly.

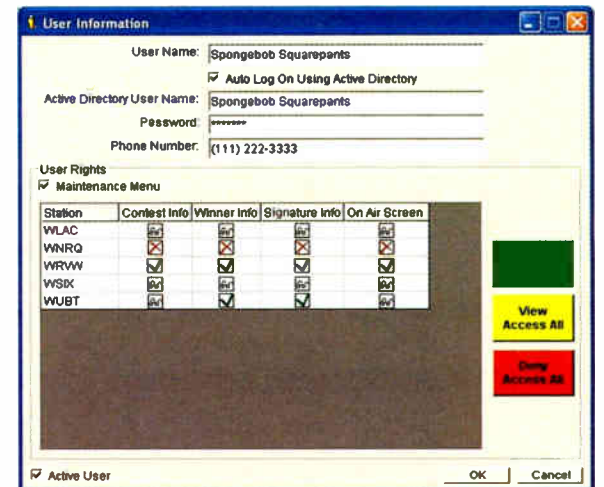
As we configured the station for HD, being able to play the audio in WAVE format was important. We were looking for a system that could provide us with uncompressed audio for HD, with the added ability to export Song Title and Artist information to multiple sources.

NexGen has full PSD support for the HD Importer, so you can depend on title and artist information appearing on the radio's display without using any external applications.

EXPANDABLE AND FLEXIBLE

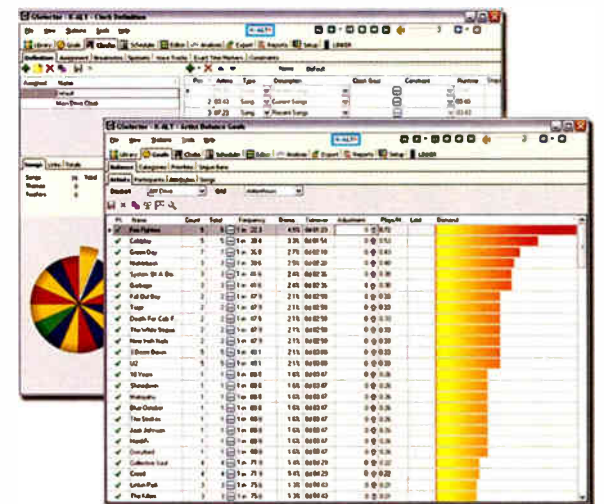
NexGen has provided us with the flexibility we need to launch and provide HD radio in the Atlanta market. As an example, our HD2 now is broadcasting as an unattended NexGen operation.

It is worth noting that NexGen was originally developed by Prophet Systems before it was acquired by RCS. Since the acquisition, RCS has worked to integrate both RCS and NexGen applications into the packages.



PrizeWatch is an application to track contest winners and prize distribution.

Among the applications, music scheduling, news copy and production, and contest and prize tracking are all available to the user.



A screen from GSelector, which offers advanced music scheduling.

Scott F. Trask is Director of Engineering for Lincoln Financial Media's WSTR-FM / WQXI-AM in Atlanta, Georgia. Contact Scott at sttrask@star94.com

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SINCE 1963

by Stanley Adams

Part 4 – GE Leads the Way to Commercial Transmitter Production

This month, Heavy Metal returns to the story of General Electric's progress in bringing high power broadcast transmitters to market in the US. As Stan Adams shows us, the engineering achievements were impressive indeed.

It is absolutely astonishing to consider that from the primary implementations of alternator power by Reginald Fessenden to the development of the high vacuum tubes that rendered the mechanical method of transmission obsolete, it only took a single decade (give or take a bit).

A LEGACY OF MAJOR ADVANCES

It was a time of discovery after discovery, development upon development. Although we might now consider that "really old technology," those men were giants, and they set the electronic foundations that helped to provide the resources later researchers would turn into those magic elements of the Earth-Moon-Earth projects. Tubes gave way to transistors to microcircuitry, leading to our modern computers, cell phones, the Internet, HDTV – even, dare we say, to HD radio.

Fundamentals are fundamentals, however. They can only lead to new discoveries and technology when brilliant scientists and engineers combine to make the kind of breakthroughs necessary to achieve advancement. The people of GE were of that type.

Before we launch into this installment of our Heavy Metal series, let me express my continuing appreciation to the large group of people who have helped me, by many means, to reconstruct history from the little smatterings of original documentation. It is clear most of the pioneers were more interesting in solving problems than writing contemporary history. Your helpful suggestions and encouragement have made this project more than I could have done alone.

BROADCAST SKUNKWORKS

Let us now turn our attention to the progressive elements of the GE Company's further development. As we discussed last time, those early GE breadboard-type transmitters developed in 1921 to 1923 led finally, in just a few short years, to a commercially made unit that was capable of upwards of 20 kW of power.

In the meantime, as GE built its own radio stations, it was the supplier of transmitters to many other broadcast stations. Many of the large orders came by way of RCA, which was actively selling to the large concerns which wanted stable, commercial equipment. Until the early 1930s, GE produced the whole RCA line of commercial transmission equipment.

The RCA logo also kept popping up all over the South American countries as the United Fruit Company upgraded their radio equipment. The U.S. Navy and commercial press concerns were also among RCA's first customers. It was in this environment that GE learned a great amount that would serve them in the commercial broadcast medium. In fact, until the early 1930s, WJY/WJZ, and WRC were the perfect examples, running parallel sets of the 500 Watt RCA transmitters made by General Electric.



David Sarnoff at the WJY microphone.

and WRC were the perfect examples, running parallel sets of the 500 Watt RCA transmitters made by General Electric.

GE AND RCA

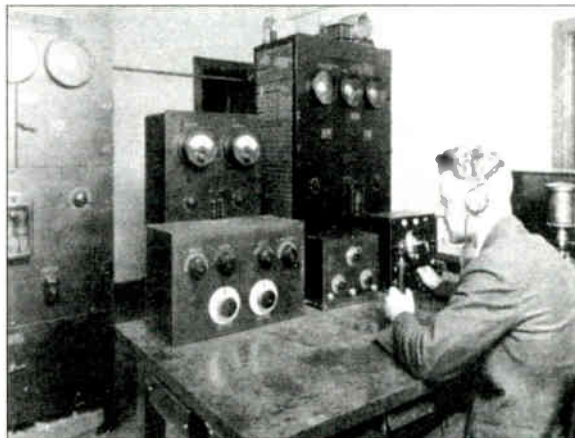
The cooperative arrangement with RCA was not new. RCA had been involved with GE in the development of WDY, a station based at a GE plant in Roselle Park, NJ, as well as WJY/WJZ at the Westinghouse plant. (RCA bought both stations and turned them into what has become 770-ABC, New York City.)

These stations used the earliest of the GE broadcast transmitters. One of them, WJY, operated for only one day, to broadcast the Dempsey-Carpentier prizefight.

The second generation transmitter, another 500 Watt unit, was brought out the following year. As regular broadcasting began to ramp up, RCA installed several of these transmitters at Transmitter House, Broadcast Central, in New York City, as well as in other cities.

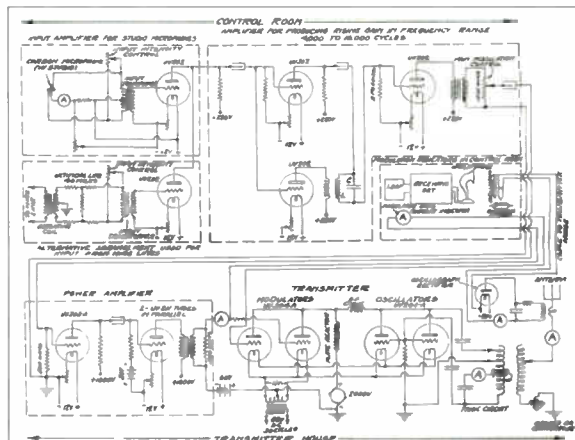


RCA Transmitter House in NY, with four GE transmitters installed in a row to feed the RCA stations.



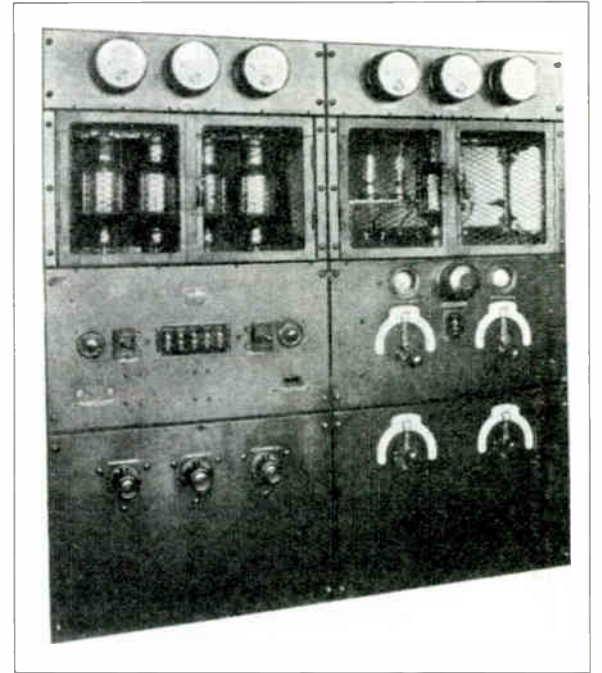
Washington, DC broadcast facility with duplicate GE transmitters.

Perhaps you might like to see a schematic showing the studio and the transmitter of the time. This mid-1920s schematic ties the studio circuit to the transmitter.



A complete radio station in the mid-1920s.

By the mid-1920s, powers were starting to increase. The GE ET-3633, 1 kW transmitter was among the first to feature a quartz crystal control to keep the station on frequency. This mid-1920s photo shows a version of this transmitter that was installed at CYJ in Mexico City and then later at Cornell and St. Lawrence Universities.



The GE ET-3633 predates the RCA 1-A.

THE PATH OF TECHNOLOGY

General Electric engineer I. F. Burns wrote in 1928 that broadcast equipment history had three fundamental periods.

First, 1917-1920 saw the development of the fundamental circuits for oscillation, modulation, power, aerial match and the like. The more advanced second generation development of those basic circuits in 1921 through 1924 or 1925 brought about the Master Oscillator-Power Amplifier with high level or low-level methods of modulation, greater frequency stability and lower degrees of carrier shift and other distortion products. In addition, the overall ease of operation was greatly enhanced along with reliability.

From 1925 and onward (until about 1929-30) we witness the full development of quartz crystal excitation, thus allowing transmitters to remain within a 20-cycle window of their assigned carrier. This was a great event, alleviating some of the cacophony of noise on the broadcast wavelengths at the time.

The development of better tubes, components and better-understood principles of parasitics helped to refine the overall performance, ease of maintenance and serviceability of the transmitters. For all practical intent, by the year of 1930 the basic design of broadcast transmitters was set until close to time of the Second World War (see IRE, I.F. Burns. Recent Developments in Low Power and Broadcasting Transmitters, 1928.)

GE AND WGY

The history of WGY, the primary testing ground for GE, demonstrates how far and how fast the technology was now moving.

The original site for WGY was the flat-top antenna on the roof of Building 40 in Schenectady, New York.

Inside Building 40, high power operations started at about the same time a new building was being readied. The engineers increased WGY's power in steps, to assure stability, and soon began to achieve a 30 to 40 kilowatt level, then a full 50 kilowatts.



Although nearly invisible in this 1923 picture, WGY was transmitted from this horizontal antenna.

(Continued on Page 28)



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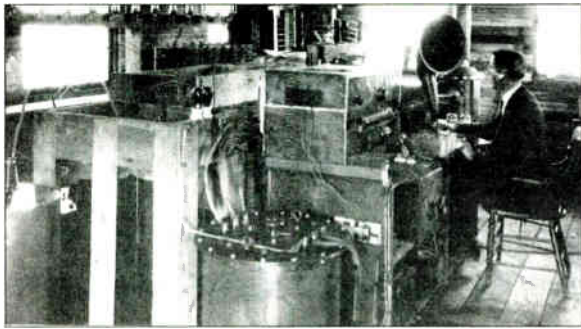


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Heavy Metal

Continued From Page 26

GE Leads the Way to Commercial Transmitter Production



An operator at WGY's first 50 kW transmitter.

The tube line up of this station was: UV-207 tubes as RF amplifiers (each capable of 10 kW dissipation) and 18 more UV-207s as modulators.

OVERCOMING LIMITATIONS

In those days, with this type of lash up, there was an inability to fully modulate those early Heising or constant current radios. One of two things would have to happen: (1) either decrease the amount of RF drive to the finals as an inverse function of the modulation depth, or else (2) really crank up the amounts of modulation. That is why many more of the modulator tubes were placed together. One can only imagine the efforts it took to overcome parasitics, tubes going bad, etc.

AC Power consumption was in the order of 240 kW. But to help in the power consumption department, there came along a young farm boy from the state of Arkansas. His name was Loy Barton.

A student while working for his doctoral dissertation in the Science of Engineering at University of Arkansas, Barton wrote a paper on a new mode of class B modulation – and in particular offered various circuit drawings showing how this form of high level modulation could serve by raising efficiency as well as performance. Although not associated with GE in any way, it was his work that was to significantly aid in the development of efficiently modulated transmitters and audio amplifiers.

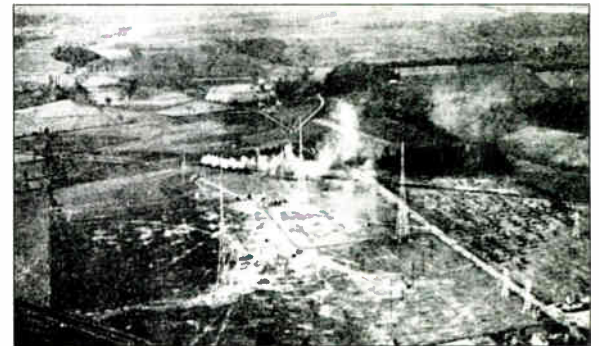
WGY MOVES

By the early months of 1924, construction work began for a new series of buildings and a multiple tower antenna farm which was to be called the South Schenectady site. The Federal Radio Commission describes the property as “the International General Electric Company, 1 River Road.”

WGY remained in Building 40 for several months longer, until the new site was ready. The transmission operations would transfer back and forth for a period of time while new circuits were constructed, so as to keep their listening public unaware of all the progress at GE.

The South Schenectady transmitter laboratory covered 54 acres. Facilities were available for suitable aerial and counterpoise systems, and for the power and cooling requirements of a large number of transmitters – or for a single very large transmitter.

There were, for example, four steel aerial towers, three of them 300 feet high and one at 150 feet high, in addition to a large number of smaller masts. There was also a rectifier capable of supplying 750 kilowatts of direct current power at 15,000 Volts.



The South Schenectady transmission site.

“SUPER POWER”

By the late spring of 1924, personnel and material were transferred to the new facility. Some of the very first work done at South Schenectady was in the construction of several shortwave and longwave transmission systems.

W2XAD and W2XAF were the commercial short and longwave call signs. Some of the transmitters were running as much as 40 kW or so, all based upon the previous year's work with WGY and the UV-207 tube.

By the time that WGY itself moved into this new building, W2XAG awaited them as the experimental license and the first work on “superpower” transmitters was about to begin.

The new transmitter started testing with a power level of 40 kW in late July of 1925. This transmitter wound up to be like many of the coming transmitter designs: a low-level power amplifier driven by a low-power oscillator (later replaced by a quartz exciter). The power was soon raised to 50 kW, serving the largely rural area of upstate New York – but was also heard in most states of the union.

100 KW AND BEYOND

In an article dated the 5th of October, 1927 *Wireless World* reported that a new peak in high-power broadcasting had been reached on August 4th 1927 when WGY switched on a new 100 kW transmitter for the first time, to broadcast a test program.

(Continued on Page 30)

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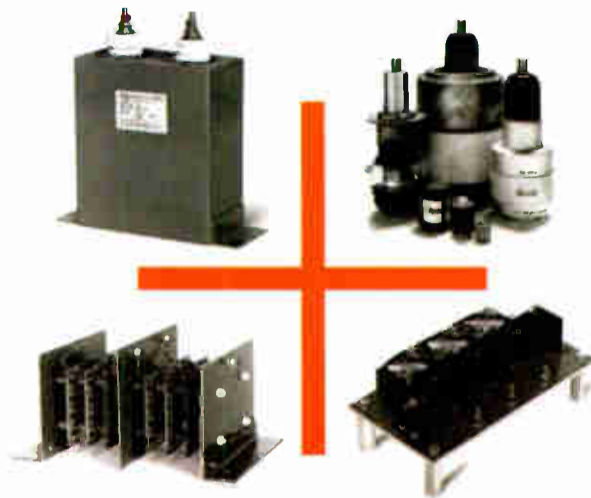
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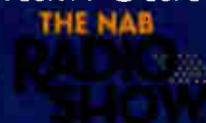
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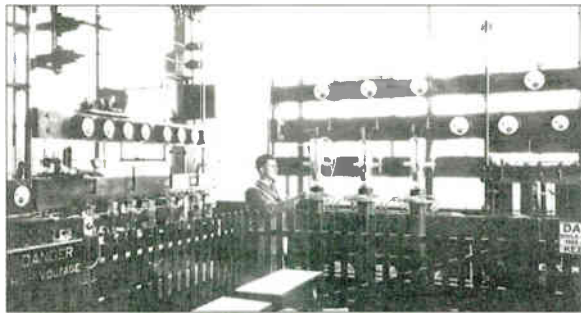
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Heavy Metal

by Stanley Adams

Continued from Page 28



Part of WGY's 100 kW transmitter. (Note the garden-type fence for safety.)

It is interesting to note the way the GE engineers pushed the state of the art. The first attempt at the 100 kW level used only two PA tubes. A third (as shown above) was added for better operation. Still, the new transmitter occupied less than half the space taken up by the original 50 kW transmitter.

Wireless World was a grand paper written in England, but informative in all matters radio. They let the world know that, for a period of thirty days from the August 4th date, WGY would continue these tests, which lasted from midnight to 1 a.m. EST, in accordance with a special license granted for the purpose by the Federal Radio Commission.

These test transmissions, which included measurements of signal strength, audibility and modulation, were part of an extensive development program. The engineers of the General Electric Company hoped the results would improve the broadcast service.

The object of these tests was to determine, by means of measurements and reports from trained observers and ordinary listeners situated in all parts of the United States, just exactly what would be the effect from this enormous increase in power. During the week commencing August 14th comparison tests were made between the new 100 kW transmitter and the existing 50 kW transmitters, which latter was run typically at 30 kW, in accordance with the authority granted by the Federal Radio Commission.

THE 862 HIGH POWER TUBE

The development of high powered transmitters had been hastened, to some extent, by the production of a 100 kW transmitting tube based on the earlier research of the UV-207. The General Electric UV-862 developed at this time really became the major high power tube for the high power age of broadcasting.

Westinghouse had built a similar tube (the AW-220) for use in their KDKA transmitter and their other stations, but the 862 was the 100 kW tube of choice for the GE stations and the 50-B, as well as the mega-transmitter at WLW and the RCA *Aspidistra* transmitter (a never used WLW-type 500 kW transmitter designed for WJZ, but later sold to Britain for the propaganda war during WW1).

The previously mentioned 50 kW circuit for the WGY transmitter was for all practical purposes the basic circuit that WEAF received in the RCA 50-A. (It was not until the B series that the 862 tubes were used.) One has to wonder though as, during the research for this paper, the author ran across information about the Westinghouse AW-220. According to the write-up, the AW-220 seemed to be free of parasitic operation and dynatron action that was found on the grid of the 862.

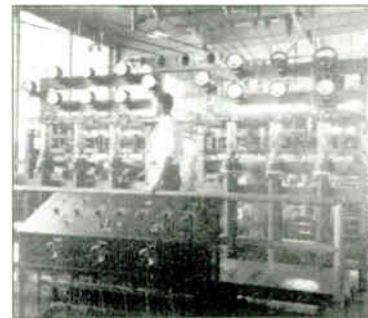
BIG TUBES, BIG OUTPUT

When the really "super-power" transmitters were developed, a total of six of the UV-862s were used in parallel. The new 100 kW tubes were of conventional metal anode construction, but bigger. From the written records regarding these tubes, it is clear that they were impressive achievements.

The anode itself was of copper, approximately three feet long by 3-1/4 inches in diameter. The grid and filament leads were brought out through a glass cylinder at the top, the glass part being approximately 19 inches long by five inches in diameter. The overall length of the tube was 50 inches.

The filament required 210 amps at 33 volts. During normal operation, two such tubes were used in parallel in the power amplifier, which was connected to a closed, or "tank" circuit, which was, in turn, inductively coupled to a 240-foot antenna by means of coupling coils and a high frequency transmission line.

GE's 200 kW transmitter (W2XAG) was the final experimental setup for WGY. The six UV-862 tubes would easily peak at 800 kW with modulation. And there were times that the station would operate well over 300 kilowatts.



The PA section as GE experimental broadcasts reached 100 and 200 kW.

HEAVY METAL BECOMES COMMON

By now the broadcasting industry had progressed to the point that there was a market for 50 kilowatt broadcast transmitters. They were sold by RCA but manufactured by GE and Westinghouse. An October 1930 article in *IRE Proceedings* discussed a 50-A transmitter for a "network" station that had been installed in 1927.

Replacing an historic Western Electric 5 kW transmitter, the 104-A (the first of its kind), the 50-A used eight UV-207s in the PA section and twelve UV-207s in its Heising modulator. The IPA driver ran at 1 kW, using a UV-851 driving a UV-207. This was the first commercial 50 kW broadcast transmitter marketed under the RCA name; the RCA 50-A was installed at WEAF in New York City.

(Continued on Page 32)

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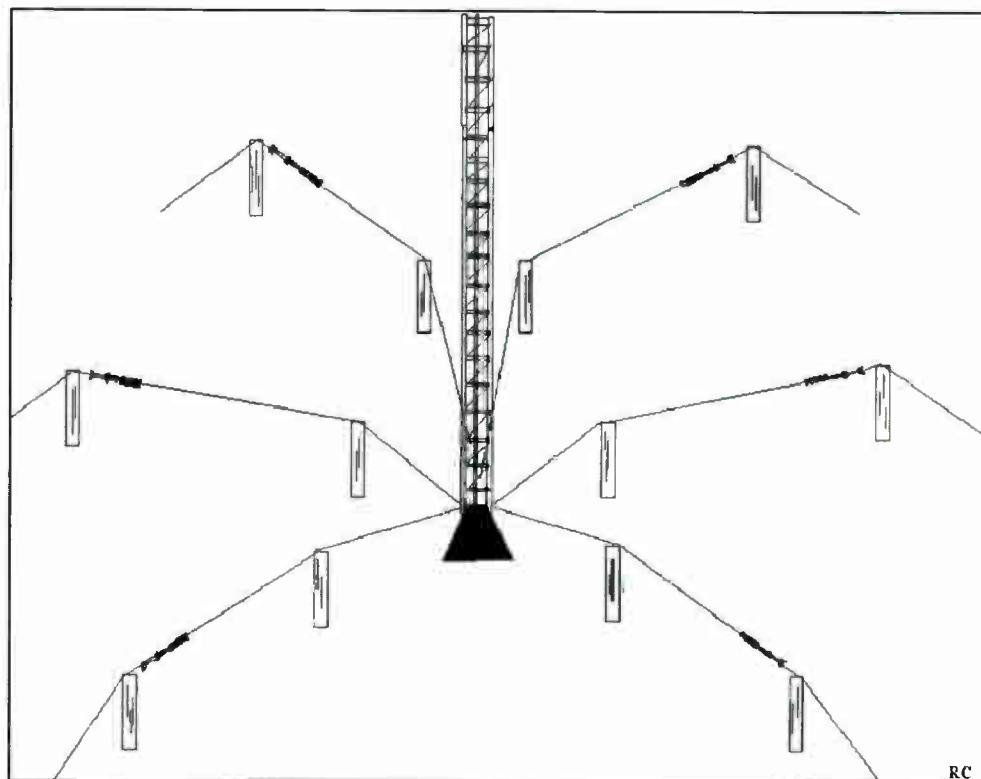
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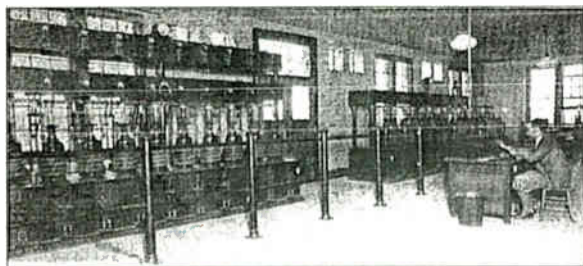
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Heavy Metal

Continued From Page 30



The first commercial 50 kW transmitter. The RCA 50-A at WEAF, made by GE.

As with the "mother" transmitter at WGY, the 50-A was open frame, and a barrier was installed to keep engineers away from high voltage. It is interesting to note that a very similar looking transmitter (a 50-A open frame unit) was at WENR Chicago and can be seen in a photograph with their newly installed 50-B.

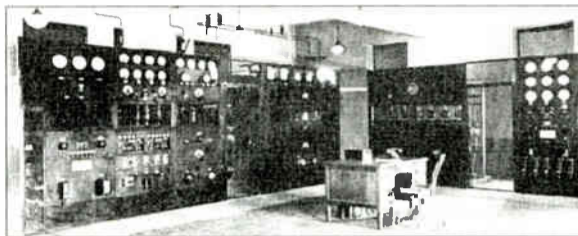
FROM OPEN FRAME TO CABINETS

In the past, GE and Westinghouse each had their own designs, but now RCA wanted one standard design that they could order from both companies. This led to what was called "coordinated design," where teams from both companies divided the work and mutually agreed on every detail, even signing each other's drawings. (There are some documents in the Edmund Laport collection in the Smithsonian Institute, where Mr. Laport discusses the RCA thinking at this time.

The design of the 50-B, 50 kW broadcast transmitter started in June of 1928. Using fewer tubes than the 50-A, it was driven by a 5 kW modulated exciter. The 50 kW power amplifier was linear and the first to use two of the GE developed UV-862 water cooled tubes (100 kW each) operating push-pull class B.

The RCA 50-B used was decidedly a step up from the 50-A. In all manners of operation, efficiency and performance were greatly enhanced. Other stations receiving this transmitter included WTIC, Hartford, CT (serial #1, installed in 1929), WEAF, KFI, WJZ and WBAL. At least 34 50-Bs were built and operated for over 30 years.

Meanwhile, the first Westinghouse-made production model came off the line, being installed in Rome, Italy in 1929 by Laport.



Old "Number One" - WTIC's 50-B.

In 1931, WGY replaced their experimental rig with a commercial one. Additionally, lower-power versions of RCA transmitters made by GE went to a number of stations, including then future 50 kilowatt WBT and WWL. This was also called the GE RT-152G as installed at KPO/KNBC.

GE AFTER RCA

By the mid-1930s, RCA had purchased the Victor Corporation and was setting up its own manufacturing plant for broadcast units. GE continued to be active in manufacturing radio and television transmitters well into the 1970s.

When Major Edwin Armstrong made his epoch-making speech and demonstration before the Radio Club of America in March, 1934 he ushered in what is today's

most listened to form of aural broadcasting: FM Radio. General Electric was there to assist and to help develop the first radio receivers that were used as demonstration receivers by Major Armstrong and his W2XMN station at Alpine.

The last radio transmitter manufactured by GE in the US was the BT-50 delivered to Sacramento, CA station KRAK. Due to its innovative design and air handling, engineers often remark on how quiet a transmitter the BT-50 was for a 50 kW unit.



One of the last AM transmitters built by GE, the BT-50C.

GRAND LEGACY

While GE has faded into the background of the industry and is just a memory to most broadcasters, we certainly owe a lot to the talented engineers and designers who built those early transmitters and were leaders in the Heavy Metal part of the industry. Their legacy is found in the solid state transmitters of today.

As we close out our look at the GE contribution to high powered broadcast transmitters, I wish to offer a special thanks to John T. Lyles, John Burns, Jeff Glass and several others for their help; Barry Mishkind has been an excellent source of encouragement and helpful suggestions, and should share some of the credit this little bit of writing might produce.

Stan Adams and his family have been involved in broadcasting since the 1940s. He currently works at Sprint's Memphis RF Engineering department. If you have information on the men and manufacturers who produced the "heavy metal" or questions on this series, Stan would love to hear from you. Email him at: stanleyadams@yahoo.com



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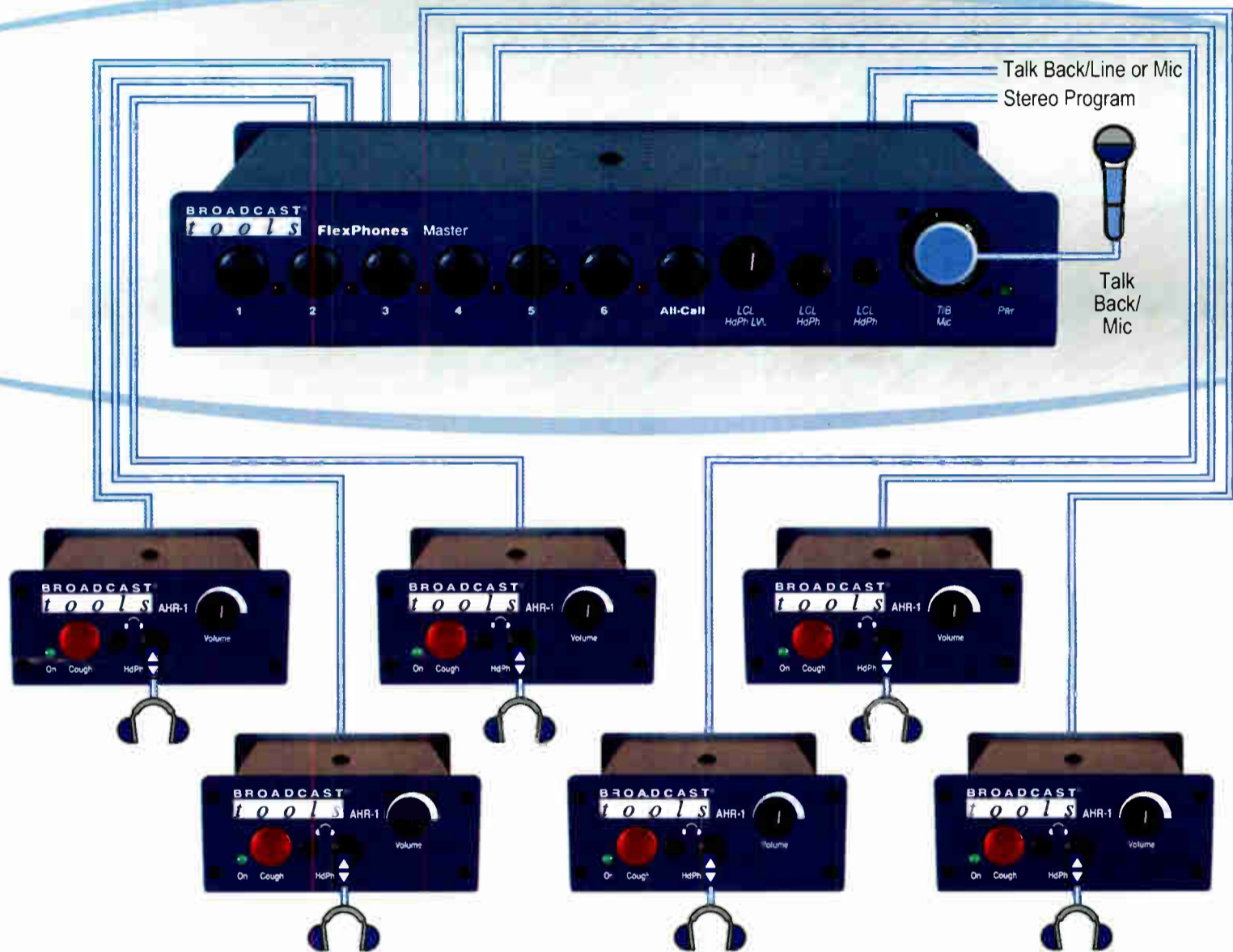
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The FlexPhones Master is equipped with inputs for stereo program and talkback audio. Rear panel program and talkback trimmers are provided to pre-set maximum input levels. The microphone/line level talkback input is available via a rear panel plug-in euroblock connector, while the front panel XLR connector facilitates the use of a user-provided gooseneck microphone or headset. The front panel is equipped with a level control for local headphones with both 1/4" and 1/8" stereo headphone jacks. The six front panel talkback switches allow the user to independently communicate with each AHR-1 listener and can be configured to insert talkback audio into only the left or both ears and dim either or both program channels. Any combination of switches may be pressed, while the "All-Call" interrupts all listeners. The Talkback function can be remotely controlled. Six RJ45 jacks are provided to distribute audio and power via CAT5 cable to the AHR-1's, which conform to the Studio Hub+ format on this and all other FlexPhones products. Low-Z balanced audio distribution is used to preclude audio degradation with long cable runs.

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Survival Guide

by Bob Burnham

The Care and Feeding of Your General Manager

Are sparks flying between you and your general manager? You have tamed your transmitter; now learn how to tame your boss. Bob Burnham tells us how he has established successful relationships with management to the benefit of the entire organization.

I always have had to prove my value to every General Manager for whom I have ever worked.

It could be a single "working a miracle" event or many little ones. Or simply just being in a good mood amongst the staff and – from the bottom up – winning over the Big Guy. Once you have won the GM over it can become a turning point in your relationship.

General Managers are a different breed. The notion that "it's lonely at the top" may be true, but most GMs are regular people as well. It is worth the effort to forge an amicable relationship, even if they seem unapproachable at first.

The trick is keeping that relationship from becoming adversarial, especially since so many GM's see engineering solely as an expense.

PRESSURE POINTS

A GM is constantly being squeezed on both sides. The owner or Regional Manager is demanding a better bottom line, more sales, etc. Meanwhile, the engineer often is presenting things that must be budgeted for if they are to stay in operation, not be subject to violations or present hazards to the staff, and remain competitive in the market.

Any good GM will actively trust and allow the engineer to help him in determining budgetary priorities. That means realizing and respecting the engineer's knowledge and experience, plus treating the engineer with respect so that the engineer actually cares about the station. It is a two-way street, but this scenario may not be possible until the engineer has in fact, "proven" himself – or his prior reputation is evidence enough of his integrity.

If the GM and the engineer cannot not work together in this respect, even after the engineer has "saved the day" more than once, it is time for the engineer to look for work elsewhere. The GM will not be there long with that attitude, but the Engineer should not have to tolerate such a situation in the meantime.

Of course, some GMs have to be educated about some things they need to know. If the new GM really only knows how to sell spots, the engineer may have to teach him or her a little bit about the basics of a physical plant and its needs. But he has to do it carefully. Engineers know a lot about many things, but they are not always the best businessmen. An arrogant engineer will never communicate well with a GM.

BE GOOD – NO MATTER WHAT

The GM's with big egos are much bigger challenges, but they are not impossible to "conquer." Either they like you or not. If they are neutral, you are still in a good position if you play your cards right.

Some engineers may make it a personal mission to "knock the socks off" of everyone with new studio, a new on-air sound, or cosmetic things that "really" do not cost the company anything extra but are the products of better engineering.

When I was a Chief Engineer for one of the major groups, I built a talk studio from scratch with a non-existent budget. It was for a new morning show. Everyone seemed to love the new studio, and the GM even circulated a memo among the staff and carbon-copied

corporate management commending me by name. Some time later, a successful surprise FCC inspection a week before my last day scored even more "brownie" points.

I could have won the GM over even more if I had stayed. However, there was very low morale at this station for various reasons beyond my control. Fortunately, I had other plans and sought a situation that was more rewarding.

BUILDING BRIDGES

The feelings of accomplishment once a project is done – and listening to it on the air the next morning – are among the rewards for what might be a particularly tedious task. But to complete the process, let the GM know what has happened.

While only a couple of my colleagues with whom I have worked share this passion, the physical appearance of a newly wired rack can look like a "work of art." Taking a photo of such a rack and showing it to a non-technical person can be impressive, compared to a "rat's nest" wiring job, particularly when you did it in the same amount of time as the sloppy job would have taken.

Appearance matters. They may not understand the purpose of each wire, but when you take a photo "suitable for framing" it sends a positive message to that GM or the PD or whomever you are trying to win over. It demonstrates the amount of pride you take in your work.

DOCUMENT THE JOB

Each major accomplishment such as a completely re-wired rack should be documented and submitted in a brief bullet-point report either monthly or, even better, twice a month. It is not so much a "bragging" letter, but a communication tool that gives an effective progress report as well as proving the cost of your salary is a good investment.

If there is a regional engineer, it is also a good idea to cc: him on all such reports.

(Continued on Page 36)

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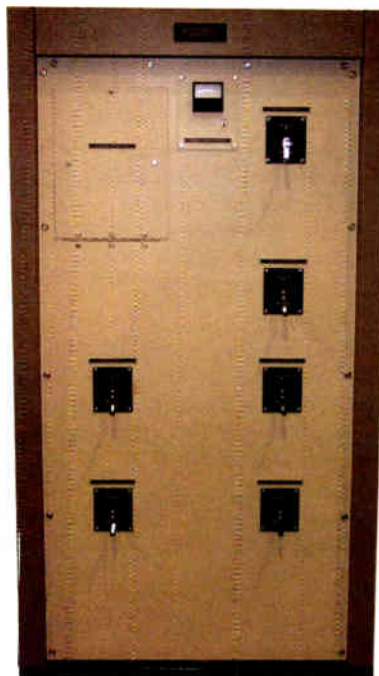
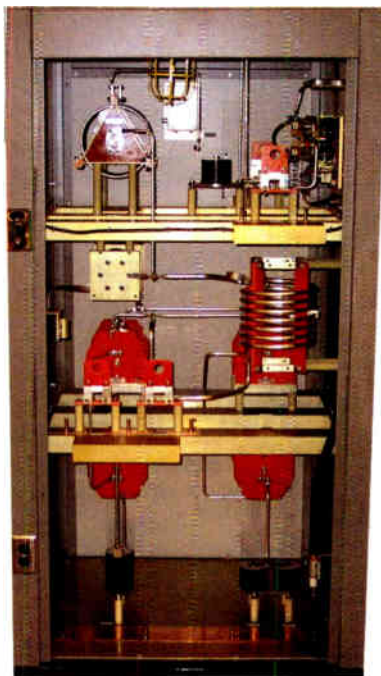
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Survival Guide

by Bob Burnham

Continued from Page 34

This serves to align the engineer with the GM in such a way that points out common goals are being reached and that you both are on the same team. Again, it verifies the value of the engineer to the station, proving you to be not just a good engineer, but a detail-oriented engineer who actually cares about the station.

EXTRA EFFORT PAYS OFF

Eventually, you will find a good GM may reward you with comp tickets to concerts, sporting events, dinners and other freebies he may only share normally with the sales staff. And yes, he will go to the station owner during the holidays and convince the owner to throw an extra hundred bucks (or two or three, or more) in with your holiday paycheck. I have been very lucky in that regard, but nothing came without work and effort on my part.

Doing favors for station clients on personal time, such as duplicating program or spot files, helping station clients set up their own studios, etc. always "leaks" back to the GM. If clients are raving about his Chief Engineer, you can bet when the opportunity comes to reward his engineer he will be generous, indeed, even if only in small ways.

THE JOB INTERVIEW

The best GMs have a knack for hiring the best people, but do not necessarily have what it takes to hire the best engineers.

One GM had a unique approach: Before I got officially hired, he also asked me to interview with the

stations' Contract Engineer (who would later become a good friend and share many projects in later years). Following that second interview (which was more like a swapping horror stories session) I was hired within a few days.

Interestingly, the GM asked me, "If I find an engineer more qualified than you, would you agree to let the better engineer have the job?" I thought that was a nervy question, but I respected his quest to *only* have the best people working at his station.

As it turns out, apparently I *was* quite suitable as I would work for that station for the next ten years. Under his direction, we would eventually celebrate the first successful "surprise" FCC inspection of my career and made some long-term friends in the process.

HANDLING A REALLY BAD SITUATION

There are really only two options if a new GM comes on board who thinks you (or engineers in general) are nothing but a pain and a liability with which the station must deal. One can either use their best efforts to prove again how good they are – or simply quit (at least getting their resume in order, in preparation for an eventual exit).

Nevertheless, while getting your "ducks in order," you do not want to flash any kind of an ego in front of anyone at the station – especially the GM. You just never know when things could change, or that this GM could be your colleague at another facility at another point in your life.

You already know what you can do, and have the confidence to handle, whatever gets thrown your way. You already know how crucial some of your knowledge and ability is to the station operation. You are obviously, their insurance policy. That knowledge should keep you from a loss of confidence.

A COMMON BOND

In reality, you want to be a regular person. You respect your current GM's management position,

but you are both human. You probably have common interests, whether it is just enjoying a good steak or more work-related topics such as pursuing a great air sound.

But that relationship is important because it will also help you to solidify your personal reputation. Obviously, that GM has many friends in the industry himself. There is no reason you should not be one of them.

This sort of gets back to proving yourself. If you prove your GM has the best engineer in town for what he wants to accomplish, you will be rewarded with the highest salary that the station can support. Whether that salary is sufficient for *your* needs is a secondary consideration. But that consideration is yours only.

The result could be that you have set yourself up for a job for the next 10 to 20 years – then actually being among the first the GM confides to when he decides its time to resign himself (I have actually been in that position!). When that happens, just repeat the whole process with a new GM.

As I tell others, although I have worked for stations where things were not so good, I have been fortunate most of the time. The key is to ignore the "badness." Just bringing an upbeat attitude to any situation – *no matter how bad it may be* – will always go farther than being an "Oscar the Grouch!"

In the end, being the "Cookie Monster" will always go farther. After all, who does not like cookies and something cold to drink, when faced with the prospect of doing Monitor Points for a directional AM on a humid 90 degree day? When the staff and GM appreciate what you do, they will buy you all the cookies you want – or at least work a trade-out with a client for you to get a whole case of "something good."

A frequent contributor to Radio Guide, Bob Burnham has consulted a wide range of stations and GMs. He has emerged with most of his sanity intact. Contact Bob at bburnham@specshoward.edu

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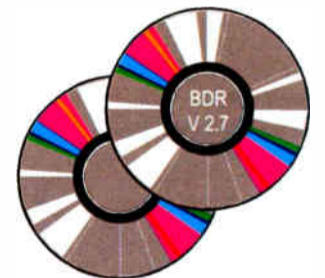
Recent additions include the archives of the BROADCAST mailing list from www.radiolists.net, going back over seven years. Using your reader, lots of tech tips from the field and other helpful info are quickly searchable.

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

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

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

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ity options. These include an Ethernet port for LAN or WAN access, an RS232 serial port and an 802.11 (WIFI) Wireless interface. If you don't require a full user interface a remote trigger port is available that allows preset selection through contact closures.

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www.bwbroadcast.com

World Radio History



The Worst I've Ever Seen

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

Can You Spot the Problems?

Anyone who has built a transmitter site knows that a lot more work goes into putting a transmitter site together than just showing up with the transmitter on a truck.

Making sure there is a secure building, proper utility connections are available, enough room to mount the transmission cables, filters, switches, ensuring access is sufficient for future maintenance needs, and all sorts of other myriad details require a lot of close attention. As experienced engineers will attest, costly mistakes can happen quite easily. A few inches here or there, and real hassles ensue.

And, of course, the complexity – and opportunity for problems – is increased greatly when we are talking about a shared site. Your plumbing and wiring might be neat and accurate, but another tenant might “toss in” a system that could put both your systems at risk.

REASONS TO REVIEW

For those reasons, it is valuable to take time regularly, perhaps as part of your Quarterly Inspection (you do have regular inspections, right?) to survey your site. Use a “fresh eye” (perhaps even have a friend come by and help) and take a look at the whole installation with a view to potential problems.

For example, take a look at the following picture, submitted by John Stortz, which focuses on just one corner of the transmitter room. What do you see?

FIXING THE PROBLEMS

John immediately pointed out three things in the picture that he termed “wrong.” There are a couple of addi-



Would you be satisfied with this installation?

tional things you may notice in the picture that may or may not rise to your level of what is unacceptable.

First of all, the nitrogen bottle should catch your attention. It is unsecured, and therefore quite hazardous.

Given its position, someone could easily tip it over, especially if they were coming around from behind the rack. All it would take is for the regulator to be damaged in the fall and you might have an unguided missile banging around the transmitter room!

In the case of the site in the picture, the nitrogen bottle is now secured to the wall, and is no longer a danger. As well, the connection to the Heliac is routed a bit more “out of the way” of hands and shoulders.

KEEP IT DRY

Perhaps you also noticed that the Heliac termination is placed above the High Voltage power supply. If water were to get in between the copper shield and the inside of the black jacket, it might be possible for it to drip into the High Voltage cabinet.

Additionally, lightning strikes can burn the jacket, melting it, which again could allow water to drip out.

Perhaps the quickest solution for this facility is to mount some sort of “shield” or catch-basin under the connectors. Obviously, the lesson is to ensure that when installing a transmitter, the connectors are not located over any critical gear – especially of the high voltage variety.

KEEP IT SAFE

While we are looking at the place where the coax cables enter the building, you will notice that there is one more significant issue: grounding. There is no link to the coax as it enters the building.

Lightning is both a danger and unpredictable. Every coax line should be grounded as it enters the transmitter building to reduce the potential for damage to equipment in the transmitter room.

What else do you see that could improve this site? Feel free to forward your comments to John Stortz at KA4FLX@aol.com. Creating a discussion that leads to solving problems before they go critical is in all our best interests.

If you would like to contribute a picture to help others “see” how they can improve their transmitter sites, please send them to us at editor@radio-guide.com

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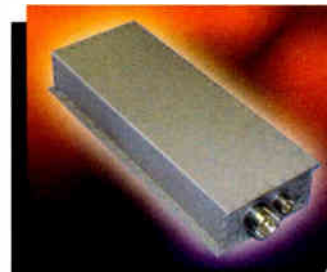
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IT Guide

by Steve Lewis

Winning on the IT Battlefield

Some computers can be more easily "locked down" than others, especially those with dedicated purposes. But anytime a computer is live on the Internet, keeping that machine running smoothly can be a challenge.

They say the war on terror is being fought in the Middle East. I do not completely agree – as we here at home are in a constant battle to keep our computer systems free of terrorists. Solutions to these problems range from simple and free right on up to complex and expensive.

HELPING OTHERS TO UNDERSTAND

Most *Radio Guide* readers already know the basics. Our goal today is to present the issues in such a way that other less-technical managers can be helped to understand the IT battlefield and what must be done to keep their machines running.

We start with the assumption that most of your desktops and servers are of the Microsoft variety, although most of the ideas presented here will also apply to Linux and Mac environments.

Consider a typical problem at many radio stations: Jocks have access to the Internet in the Control Room. Legitimate uses are many, but the temptation is always there to take a peek at something that your corporation may frown upon. Or wet-behind-the-ears computer users may click a popup promising them a faster Internet connection.

FIRST LINE OF DEFENSE

In larger IT settings you will already have a firewall and possibly additional coverage from additional equipment designed to limit access by individuals. Microsoft's ISA server (Internet Security and Accelerator) is able to allow or deny access to the Internet by user and policies designed to keep the internal network safe.

At the other end of the spectrum are smaller IT shops where all users sit behind a simple router providing NAT (Network Address Translation) much like a typical home network. Routers work by directing traffic based on IP and MAC addresses and services. (Each computer has both a unique IP address and MAC address.)

As you surf the web, packets from your computer pass through the router destined to a distant location. Your router remembers your outgoing traffic and expects responses to be returned back to your machine. Others inside your network may be surfing or sending email or listening to streaming audio. As traffic enters from the outside, the router can keep the data flowing smoothly to the intended destination.

KNOCKING AT THE DOOR

What about that traffic entering the router from the outside? Maybe a hacker is attempting to gain access to the traffic computer or pushing a data payload containing viruses. The router is able to identify this traffic as unsolicited and will not allow the traffic into your internal network.

Many manufacturers now offer multi-function appliances to replace the traditional router and offer firewall, virus protection, spyware detection and routing combined.

These devices are first line of defense to protect the internal network. The units tend to be a bit pricey but the peace of mind and protection they offer may well be worth the cost. With no endorsement intended, take a look at <http://www.ntsecurity.com/> to learn more.

Ignoring intentional exceptions to the above rule (such as opening unsolicited access for a web server or mail server) your internal network is safe from intruders. Viruses, Trojans, hackers and spies must find another (indirect) way into the network.

ADDING MORE DOORS

In a perfect world you would need no more protection than that just described. But we do not exist in such a world and must provide another layer of protection for the computers on the inside wire. At every workstation you should provide an additional line of defense by installing an additional firewall application.

The workstation firewall program works by blocking access to and from each individual machine by using

filters. This effectively blocks traffic to and from other computers on the inside network except those explicitly declared safe. This layer prevents intrusion by viruses and spyware which have gone undetected and have then launched on another user's machine, trying to spread within the protected network.

As an added protection, most decent firewall programs disallow access outward from the protected machine as well, preventing evil software from gaining access to other computers within your network or even out to the Internet (potentially calling home to transmit private information to evildoers).

USE A DEDICATED TOOL

Firewall programs are available from many reputable manufacturers. Although Microsoft includes such software within its XP and Vista operating systems, I prefer a third party application from developers who concentrate their efforts on security products.

(Continued on Page 42)



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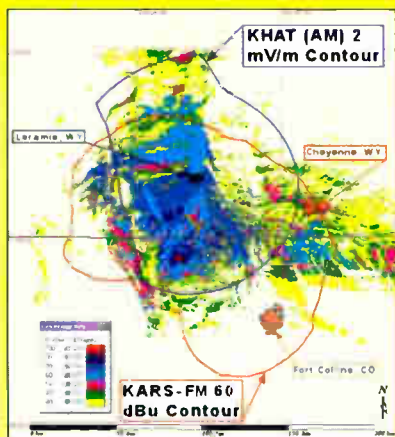
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World Radio History

by Steve Lewis

Continued from Page 40

My favorite is Zone Alarm, free to use at home with feature limitations, and reasonably priced for corporate environments. PC Magazine reviews this and other programs; start at <http://www.pcmag.com/article2/0,1759,1836241,00.asp>

PROTECTION FROM SPYWARE

The second and third lines of defense are spyware blockers/protectors and antivirus software. While very similar in operation, these programs typically operate on distinctly different threats.

Spyware typically installs itself and does its best to run undetected in the background. These programs collect information about your software, your hardware, data from other programs such as email, email addresses, account information including credit cards, bank accounts, and brokerage accounts, plus whatever else the collector of this information finds useful to him. Then it tries to send it out.

Ad Aware and Spy Sweeper (both available for download from the Internet) are good choices. Microsoft offers its Windows Defender to control spies, but this program is generally regarded as being ineffective.

After installation, have the application deep-scan all local drives for spies and adware that have previously installed themselves on your machine.

ANTIVIRUS SOLUTIONS

Viruses are a different matter entirely. Viruses tend to attempt to replicate themselves and spread as widely as possible with the purpose of disrupting the computer systems themselves. Viruses can do little harm and simply annoy the user, or they can embed themselves deeply into the operating system and common software making themselves difficult to detect and sometimes impossible to remove without reloading the operating system and reinstalling application software.

Antivirus software should be installed which will provide detection of incoming viruses before they can do harm and, as an additional line of defense, will scan the machine on a regular basis to detect viruses which have already attached themselves to files on your system.

Sometimes the antivirus software can fix the damage done but do not count on it being able to repair all the files which have been affected. These files will generally be removed from their proper location and quarantined where they are rendered impotent.

BUY ONE OR GET ONE FREE

Norton and McAfee virus protection have been around for ages. Each product has its committed followers, but there are serious contenders nipping at the heels of these two leaders.

I seldom receive viruses so it is difficult to rate the effectiveness of various products. I have tried Panda, the free version of Kaspersky that AOL distributes, the full Kaspersky version that will allow a free trial period, and Avast. Features vary by product, some offering firewall, spyware and virus detection.

The free version of Kaspersky was the only product to detect a text file which had a virus based on VB script, in both plain text and Zip archives. I was impressed. The full version of Kaspersky, installed on a different machine also functioned as a firewall. I am used to firewalls having to be trained, but

this program is excruciatingly annoying and not for a neophyte to use.

Panda was fine until the free period expired, then it became as annoying as a used car salesman. When I uninstalled it the software asked why. I replied that the conversion process to a paid program was unacceptable.

Just recently, I have installed Avast and, so far, no problems have been detected.

WHEN GOOD MACHINES GO BAD

I offer you one last suggestion if you have to deal with certain computers which become infected on a regular basis: install a partition or entire-disc backup system such as Norton Ghost.

After a rebuild, back up the fresh drive up to a network share (or install a second drive and use it only for backup). When the system toasts itself, it should be a simple matter to insert the original CD for booting purposes, then restore the backup you have made, and in just a few minutes the machine will be ready to use again.

Of course, this will not replace any spreadsheets or word processing documents, but the machine will not require half an afternoon to rebuild.

SECURITY HAS SOME COST

In the final analysis, the decision on just how secure your network needs to be—and how much time and money it will cost to keep it secure—will probably boil down to dollars and cents at the GMs' level.

In addition to the cost of hardware and licensing you must consider lost revenue, lost computer users' time to repair, and of course your own department's cost (and unavailability for other issues) when its services are required for several hours to rebuild a machine from scratch.

Next time out, I will offer some suggestions to assist you in dealing with a spyware or virus disaster. Stay tuned.

Steve Lewis is an IT Manager and programmer in Phoenix, although he tries to keep his love for radio glowing. Contact Steve at mwmv@myvb.net



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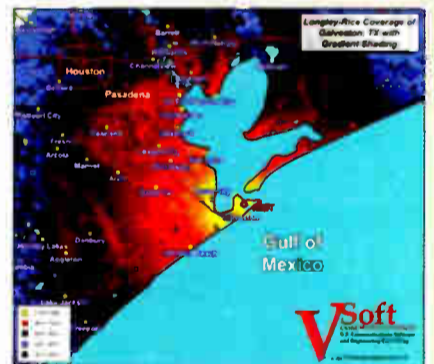
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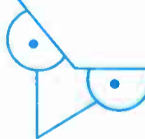


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