Radio Guide

Radio's Technology Resource

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Including Radio Shopper

November 2002

Volume 10 Issue 11

ERI Loses a Family Member

Scott Beeler, Director of Worldwide Sales for ERI, was killed in a traffic accident Thursday morning, October 3, 2002, near his home in Cincinnati, Ohio.

Scott coordinated the ERI sales force, which specializes in antenna and structural systems. Scott played a major role in forming new partnerships with suppliers and end users, and in enhancing existing distribution paths.

Jim Meleski, ERI's Chief Operating Officer, will temporarily assume the leadership duties vacated by Scott's death.

"We are all dismayed by the untimely, accidental death of Scott Beeler," said Tom Silliman, President of ERI. "His expertise and energy will be missed, but his momentum will carry forward as ERI continues to grow."

Starting his career with Allied Broadcast Equipment, Scott had over 20 years of broadcast and communications equipment sales experience. Prior to ERI, he served most recently as Director of Radio Sales for Harris Broadcast and had many professional and personal friends throughout the industry.

Donations to the family can be made to Kim Beeler, and sent in care of Diana Combs, ERI, 7777 Gardner Rd, Chandler, IN 47610.

Radio Moves Ahead

SBE Convention, New EAS Codes, RG Feedback

Fall has definitely arrived, and then some. Parts of the country are already showing white. And, as the leaves have gone through their changes, so the broadcast industry continues to change as well.

It was interesting to listen in on the discussions at the SBE national convention, held in Phoenix in Mid-October, in concert with the Arizona Broadcasters Association. EAS, IBOC and the continuing consolidation were key topics.

SBE organizers Jerry Grunig and Robert Reymont, from Chapter 9, certainly were successful in getting everything arranged for the approximately 400 who were registered for the convention, which included the national membership meeting and an exhibit hall with 50 some booths. The SBE President, Troy Pennington, heads a strong board of directors, who are already making some important changes in the SBE and its relationship with the members.

Meanwhile, stations around the country are grappling with the problems of implementing the new EAS codes approved by the FCC earlier this year, while trying to integrate the AMBER programs that have become popular with politicians, yet still have some bugs in the procedures to work out.

Add that to the IBOC decision in October, and stations all across the country are starting to look at where the transmission part of the equation is going.

Radio Guide is also moving ahead. This year has brought some interesting changes as we have brought a new emphasis on the history of the industry. But any publication that *only* looks backward is not going anywhere. The radio industry has had more change in the past 10 years, perhaps than in the 90 years previous.

Technology has already changed the way many parts of the station look, and now we are going to see major changes in our transmission plants. RG is firmly committed to helping the engineering community understand and deal with the changes.

Of course, for us to achieve that goal, we need to continually seek out your feedback to make sure we are on track. What is it that you like about Radio Guide? What is it that you don't like? What would you like to see added to the "mix?" Please take a moment and let us know. Just send your comments to radio@broadcast.net.

Your voice is very important to us.

Radio Guide

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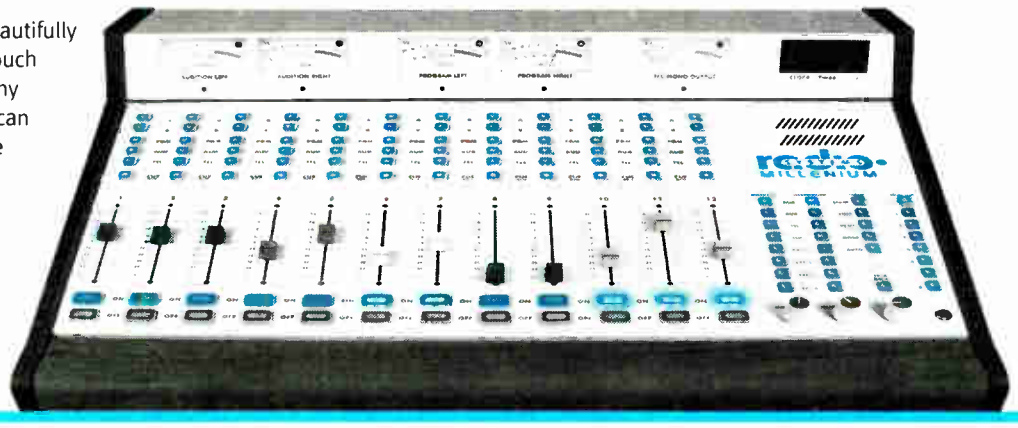

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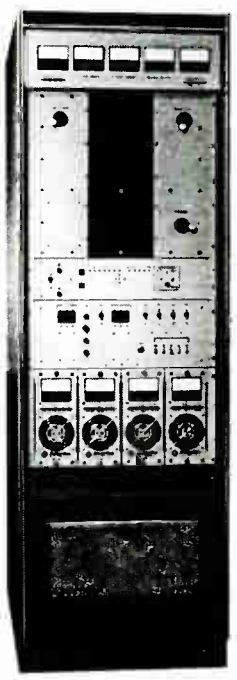

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In the Public Interest

By Ken and Kelly Orchard
Email: pifile@aol.com Phone: 760-243-4733

The FCC Can Rock Your World

The FCC has proven that they can definitely "Rock Your World." The FCC Enforcement Bureau just celebrated its third anniversary last month, and reported their major accomplishments. Many broadcasters must be relieved that they haven't been targeted by the FCC Enforcement Bureau yet, but beware: if they haven't visited you yet, you must be on their list.

One of the main actions taken seriously by the FCC is Public Safety enforcement: the enhanced 911 operation of the Emergency Alert System, tower painting and lighting for aviation safety, and unauthorized operations or equipment that can interfere with air traffic control frequencies. The Bureau also provided assistance to federal, state and local public safety and law enforcement entities to determine the source of signals causing interference on public safety frequencies, and served as a focal point for FCC Homeland Security related work.

In the month of August alone, the Enforcement Bureau's Field Offices issued twenty-two Notices of Apparent Liability, in the amounts totaling $211,000. Twelve involved violations of the Commission's safety-related rules (e.g., antenna structure, AM station fencing requirements, and Emergency Alert System). There were even a few Local Public Inspection File violations.

The FCC has their own term for "AOR." Once, AOR simply stood for Album Oriented Rock format, but it has an all-new meaning with the FCC. In their terminology, it is "Area of Responsibility," and each Enforcement Bureau Field Office takes their area of responsibility very seriously. California has the most, with three Enforcement Bureaus, and last month we had the pleasure of meeting the FCC representatives in Hawaii.

We apologize to our readers who had an issue with us reporting that we were on our way to Hawaii. Upon returning, we had several comments about it: "Tough duty," or "Must be nice." It was a great pleasure to have the opportunity to work in "paradise," but believe us, it *was* work! We were initially contracted to come over and inspect ten stations for the Hawaii Association of Broadcasters. Due to the efforts of the organization, they rallied the broadcasters to participate, and we actually inspected a total of sixteen stations while we were on Oahu! It was quite an experience! But, we managed to fit it all in! Mercifully, many broadcast transmitters are located at the same place, which eliminated a good deal of travel time to the transmitter site, which is usually the most cumbersome part of performing multiple inspections.

As expected, there were a percentage that passed, and a percentage that needed to "take corrective measures." We continue to find the broadcast industry in this condition, so do not be alarmed. We never "fail" any station, but rather give them a full report on what corrective measures need to be taken. And, according to the agreement with the FCC, stations then have a period of sixty days to bring their facility up to FCC Compliance before their "grace period" ends.

Once again, we must continue to remind you, that the Enforcement Bureau is celebrating (and yes, they do consider themselves successful) three years in existence. If you have any expertise in statistics or odds, you can bet that if you haven't been inspected yet, you will be in the near future. It is crucial to begin looking in to your FCC Compliance now, as many states are nearing the "half-way" point toward license renewal. Stations are also undergoing ownership changes, mergers, acquisitions, frequency swaps and so forth.

That list alone could possibly include nearly every broadcaster in the country! You should really get busy! There are two ways for you to accomplish this task. 1) Go to the FCC website at **www.fcc.gov**, download the FCC Inspection Checklist, and go through it item by item. It's a very educational and eye-opening experience that every manager or engineer should go through. 2) Call your state association and elect to participate in the Alternative Broadcast Inspection Program. Most states have a program in place now, and the FCC not only endorses it, but they highly encourage it.

Recently, a client of ours provided us with a memorandum from a seminar they had attended. This session was hosted by one of the many Washington D.C. law firms that specialize in broadcast law, and was specifically centered in the area of FCC Compliance, including Public File Rules. We appreciate the chance to utilize the expertise of others in the industry to get our point across to our readers and clients. The following is an excerpt from the memo:

Broadcast Licensee Public Inspection File

"As part of its obligations as a public trustee, a broadcast licensee must make available for public inspection and copying certain materials and records. Recently, the Federal Communications Commission announced that Public File infractions constituted one of the most frequent violations noted by Field Office Bureau personnel when making routine inspections. This Memorandum discusses the nature of the materials and the procedures, which must be implemented to insure that public access is uninhibited. Failure to maintain a Public File, or keep it updated, can subject a licensee to monetary forfeiture. Refusal of all public access to the Public File can result in more severe sanctions."

(Continued on page 4)

In the Public Interest

Continued from page 3.

Telecommunications Act 1996 in regards to your Public File.

When license renewal comes around, it really isn't as simple as allowing your attorney to just fill out the necessary paper work. Any broadcaster who has been through this process knows, people wanting to view your Public File will visit you, in hopes they will find a reason to file a petition to deny the license renewal of your station. These visitors could be that of a "coalition group," a non-profit minority organization, your competition, or even some former (disgruntled) employee with an axe to grind, who may know the rules!

In cases where a petition to deny your station license, or a delay of a possible transfer, the FCC will consider the following:

(1) Continually served the public interest, convenience and necessity;

(2) Committed serious violations of the FCC's rules or Communications Act;

(3) Committed other violations which, taken together, would constitute a pattern of abuse.

The only evidence in these cases is found in your Station's Public File, Station Log and FCC compliance of all rules and regulations. This is a very important file! It is your *only* documentation that proves what you have done to serve the community, and your only tool to ward off a delay or potential problem.

As we go to press on this November article for 2002, we have received many emails inquiring about "Pirate Operations" of both AM and FM stations. The following is an amusing little story, but one that we feel is important to pass on to broadcasters, as it is a lesson not only about "Pirate operations," but the FCC's policy on "willful and repeated violations."

The FCC recently visited a station broadcasting on a "pirated" frequency and discovered they had no proper license to operate this station. When the FCC agents arrived, they took field strength measurements of the station's signal and determined that the station required a license to operate. The FCC agents then interviewed "Mr. Pirate," and learned that the station was used as a Ministry for minority church in that area. "Mr. Pirate" admitted that his ministry owned the radio station equipment and operated the station. The FCC agent asked "Mr. Pirate" if he had a license for the station and "Mr. Pirate" replied that a friend had submitted an application to the FCC and had advised him that he could operate the station while the paperwork was being processed.

The FCC agent again advised "Mr. Pirate" that he could not operate the station without a license and directed him to place the station off the air. Although "Mr. Pirate" asked for time to let his listeners know that the station was going of the air, the agents said "no" and "Mr. Pirate" than directed another person to turn off the transmitter. The FCC agents then hand-delivered to "Mr. Pirate" a warning letter which advised him that operation of a radio station without a license violates Section 301 of the Act, ordered him to cease operation of the unlicensed station immediately, and listed the penalties for unauthorized operation of a radio station.

Would you believe that this station went back on the air again within two weeks of the original inspection? A licensed broadcaster filed a complaint with the FCC that their signal was interfering with another, so the FCC once again went out to inspect.

The station had moved to another location, and the FCC found the transmitter by using a mobile direction finding vehicle. Again, field strength measurements were taken and of course it was in violation. The station again was taken off the air. The pastor of the ministry now explained to the FCC that Mr. Pirate was the operator of the station and leased the space from the church. Mr. Pirate had purchased 50% of ownership from the person who had applied for the station. The FCC now issued a NAL to Mr. Pirate for "$10,000, for operating a station without a license, and willful and repeated violation of Section 301 of the Act.

"Mr. Pirate" and the "ministry" tried to argue with the FCC that they were "duped" by a third party, and that they "didn't have to worry" about operating the station, especially after the FCC had been out once. This third party assured them that the FCC would not be back, and even if they did, they would only issue another warning. *Wrong!* The FCC slapped them with a $10,000 fine, and now they are scrambling to determine who is ultimately responsible to pay the forfeiture. They asked the FCC to waive it, but the FCC responded with a resounding "NO." Now that can rock your world.

The reason for bringing this particular case to your attention is simply to let you know that the FCC isn't going to accept ignorance of the rules, being "duped" by someone else, or willful violation of broadcast rules and regulations. The Enforcement Bureau is just that, it *enforces* the rules to make broadcasters abide by them.

If you need help with your FCC Compliance, there are several ways that you can achieve it. We always appreciate your calls and emails, and we will do our best to lead you in the right direction, but you must put your compliance on your priority list, before you too, get inspected by the FCC's Enforcement Bureau.

Avoid FCC fines. Orchard Media Services can help you with your FCC Compliance obligations. Call for rates on all services. OMS will come to your station. We can perform a "mock" FCC Inspection; evaluate your Public Inspection Files, Political Files, Station Logs, EAS Compliance and other FCC rules and requirements. Call Orchard Media Services for questions and information, at 760-243-4733 or via email @ PIFILE@aol.com

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The Good, the Bad, and the Unsafe

The Webster's dictionary defines an accident as "an unforeseen and unplanned event or circumstance" and as "an unfortunate event resulting especially from carelessness or ignorance." Couldn't have said it better myself.

The most common thread in an accident is the "unforeseen and unplanned event" part. Having been in a few accidents myself over the years, I'm struck by the unforeseen nature of the situations. When pondering the events surrounding the accident, it's easy to see how all of the elements necessary for an accident have to be in place. Many times, people talking about an accident may say something like, "If only I had left the house a minute later," or "If I had only taken an extra second to be sure the ladder wouldn't move." My brother-in-law (who's an insurance claims adjuster) says if he had a nickel for every time someone said, "I never saw the other car," he could retire. Of course! If they'd seen the other car there wouldn't have been an accident!

The armchair quarterbacking that goes on, following an accident, hopefully will result in a person being more conscious of "unforeseen" possibilities that follow us around in our everyday life. Just thinking of unforeseen possibilities forces them to become "foreseen," and may help to eliminate them from the equation of elements that sum together to create an accident event.

Learning to See Problems

My seven-year-old son has caused me to realize that this is a unique and learned process. Recently, his second grade class read the story of the little boy in Holland that plugged a hole in the dike with his finger, to prevent the sea from wearing away the dike and ultimately flooding his home and country. His homework required him to talk about the part of the story that he found most interesting. He told me that it was the part where the boy is trying to decide whether to leave to find help (which would surely jeopardize the integrity of the wall) or stay through the cold night, all the while keeping the hole plugged with his finger.

My son felt the thought process of the little boy was very interesting, since he could imagine various outcomes to the situation at hand. It struck me that for an adult, much of this thought process is automatic, while still unique in the world of a seven year old.

The thought process of the little boy with his finger in the dike is a little like the process of changing unforeseen events into foreseen events. Once someone has entertained the possibilities of "unforeseen" outcomes from a situation, they are well on their way to preventing an accident.

Trust No One and Carry a Big Grounding Stick

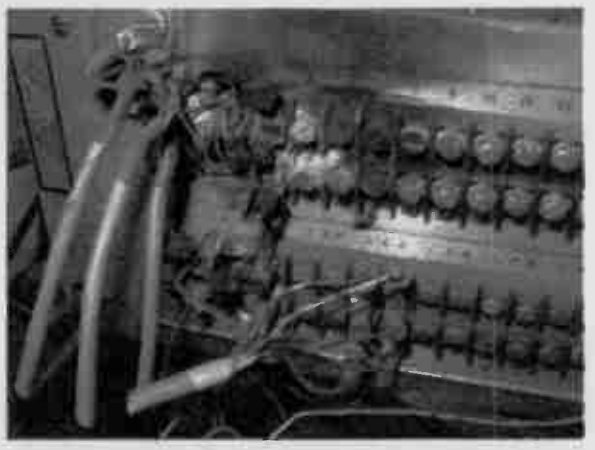
When working on equipment, especially high voltage broadcast transmitters, it's critical that we try to imagine the unimaginable. When troubleshooting equipment, or just doing regular maintenance, avoiding an accident means not only following manufacture's safety recommendations, but also looking beyond the normal operation of equipment and imagining what sort of unplanned event might occur.

Over the years, we've learned not to trust circuit breakers that say they're "Off" or bleeder resistors that are supposed to safely discharge high voltage capacitors. With the proper amount of skepticism, you can imagine these devices not doing their jobs. It would follow then, that a voltage test on the output of the breaker and careful use of the grounding stick on the capacitor would prevent those obvious unplanned events and the resulting "accident."

Some may accuse me of being overly cautious, but it comes with having a vivid imagination, I guess. I tend to look at a situation and imagine all of the things that are possible, and some that aren't even possible. A good example of this is my caution around plate voltage and current sample lines that exit a transmitter, and connect to your benign remote control system. Some of the newer transmitters have wonderful circuits that sample the voltage and send out a buffered sample through an op amp circuit. These seem to be safe enough. But take a look at some of the sampling circuits on older transmitters, and imagine the failure of a component or two, or a bit of dirt in the right place, and you've got an accident waiting to happen.

High Voltage "Gotcha"

We'd been nursing along a mid-seventies vintage 2,500-watt transmitter that uses a simple solid state IPA and a tube final. Everything about this transmitter is funky, from its vacuum caps for output tuning and loading, to the plate circuit that has a ground reference through the sample circuit and plate current meter. I studied the schematics to the transmitter and decided to give this beast a wide birth anytime it was on.



A failed plate sample melted the back of a Moseley remote.

(Continued on page 7.)

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Free Radio Guide Subscription

As of January-2002, **Radio Shopper** is now **Radio Guide**. We have changed our name to better define our primary focus.

Radio Guide is a name that you may be familiar with. A few years ago, I published this nuts-and bolts, service-oriented publication for the radio industry. As this industry developed, it became apparent that there were fewer "wire and solder" broadcasters out there, and the need for a publication, dealing with such focus, became less apparent.

While that may still be true, I've found that there's an even greater need for a "radio tools," or problem-solving approach. So much technical knowledge is becoming lost, for lack of an effective venue. It's not so much the component-level problems we face today, but equipment and system installations and wiring, digital audio techniques, and proper maintenance and repair procedures. So that's where we're headed.

You've got to deal with what you have in the rack right now – and every day. Yes, we'll cover the new gear, because you will always need that knowledge – but not at the expense of keeping your current gear operational. Our focus will show you how to select and install the new, but we will also reveal how to keep the used gear functioning *like* new. There won't any less of what you've been getting – just more of it – and more useful.

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Contract Engineering

Continued from page 5.

I became really concerned about our safety when on one occasion, pushing the "plate on" button caused the Plate Current meter to explode and fling it's plastic cover, meter scale and movement across the transmitter room. It's makes for a funny story now, but it narrowly missed the face of the engineer working on the rig and put a nice divot in the wall several feet away. From that point on, we turned the transmitter on using the handle of a broomstick while standing to the side.

The transmitter was later retired, when a failure in the plate sampling circuit sent high voltage though the wiring harness and out to the poor old remote control. The result was truly amazing to see. Imagine working around the remote control when this failure occurred. I've never liked the way that some manufacturers choose to get a high voltage sample available to the outside, and this incident only confirmed my suspicions.

You Think PCB's are Bad – Try Mercury!

At another transmitter site, we were charged with maintaining another "off brand" transmitter. This transmitter was a true one-of-a-kind. The height of the transmitter building's ceiling was barely over seven feet, which required the manufacturer of the transmitter to cut the box in half and locating the halves side by side. The transmitter was then about the size of a large chest type freezer. Working on this beast required a contortionist with a set of very small tools! Besides the mechanical nightmare this transmitter presented, it also contained a few design techniques that can only be described as "unique." One of the most unusual aspects of the transmitter was the mercury switches that were used to switch line voltage to the primary of the plate transformer.

Exploded 3-phase plate transformer contactor using mercury switches.

The mercury switches consisted of a sealed cast iron container partly filled with mercury. When a coil around the switch was energized, the mercury is squeezed up into a chamber where it completed a connection between the AC power line and the input to the PA transformer. All goes well until one of the three mercury switches fails and the transformer no longer receives the proper three-phase power. The resulting imbalance of power stresses the transformer, rectifiers and remaining mercury switches. Eventually something's got to give. Some times it was the transformer, sometimes the rectifier – and once in a while a mercury switch.

When these mercury switches blow, it's absolute devastation. There are chunks of cast iron and exploded mercury all over the inside of the transmitter. The clean up is nothing short of a toxic chemical spill (which it is). In the midst of this mess, you have to wonder why anyone would ever design a piece of equipment like this.

We've all been warned about insuring capacitors are discharged with a grounding stick, and making sure that all power to an equipment cabinet is turned off at the breaker. We've learned our lessons about proper safety grounding and keeping one hand in the pocket while working electrical circuits (just in case). But what about those "unforeseen events?" What about exploding plate current meters and mercury relays? Or failed plate sample circuits that put plate voltage onto low voltage sample lines? Or what about a chuck of ice falling from 200 feet up a tower?

We would be wise to consider the "unforeseen" before venturing into a project or situation, especially if it's something you've done "a thousand time before." Like the little boy sticking his finger in the dike, you need to consider the myriad of events that may result from your activities.

A failed mercury relay.

Radio Chronicles

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What is This Thing Called Broadcasting?

Part-10 – WWJ Brings News to the World

In 1920, listening choices were limited for the few radio enthusiasts who owned receiving sets. Most transmissions that could be heard were from commercial stations involved in sending and receiving private messages. Amateur stations, for the most part, operated sporadically and usually with low power – usually only a watt or three.

Although there was much less RFI in those days, that low power level, coupled with the typical crystal detector sets of the time, generally limited reception to stations within about 25 miles.

It also was not a cheap hobby: Just the parts alone for a receiver cost around $8.00, and transmission gear was an additional expense. Nevertheless, the Detroit Amateur Radio Association (D.A.R.A.) was an active group of several score of local amateurs who had been active in wireless transmissions since the earliest days of the century.

One of these amateurs was Frank Lyons. His station, 8AM, was well located with a high antenna, and could be heard further than most of the other local stations. Lyons, his brother Michael DeLisle Lyons, and Thomas (Ed) Clark were in the forefront of the amateur community, Michael Lyons being the editor of the D.A.R.A's Detroit Radio News.

Thus, when the 200 meter (1500 kHz) spot of the dial crackled to life with 20 watts in August 1920, it was indeed something "special" for residents of Detroit. The new sounds came from the Detroit News Building, which had opened 8MK with a series of concerts, leading up to what some would credit as radio's first scheduled newscast on August 31, 1920. WWJ refers to itself as "America's First Commercial Radio Station." Re-licensed the next year as WBL, and then changing in 1922 to WWJ, 8MK was clearly one of the pioneer stations in the U.S., if not the world.

But, before we explore the issue of first-ness, let us enter the "Wayback Machine," and listen in to the airwaves on August 20th, 1920. That evening, at 8:15 p.m., Frank Edwards first leaned into the transmitter mouthpiece and announced, "This is 8MK calling." After a musical program was transmitted, Edwards called out "How do you get it?" Interestingly, unlike modern day listeners (aside from pirates) some of those listeners in 1920 had their own legal transmitters, so as soon as 8MK had made its announcement, and turned off the carrier, other stations began calling back, "It's coming in fine," and "We're getting everything loudly and distinctly." Talk about getting instant listener feedback!

Founders

Of course, this did not come about by accident. It all started in 1902 when William Scripps, son of Detroit News founder James Scripps, became interested in the experiments of local wireless enthusiasts, especially Ed Clark.

Convincing his father to offer Clark financial assistance, William continued his interest in radio, eventually acquiring the 20 watt DeForest OT-10 transmitter and a license from the Department of Commerce.

Of course, there were those in the newspaper business who were less than enthralled with the new technology. For example, there was fear that if radio became popular, people would stop buying newspapers and drive them out of business. On the other hand, if radio failed to become popular, there would be ridicule. So, newspapers tried to put some distance between themselves and wireless. Jeff McQueen reports the original license for station 8MK named his great-uncle Mike Lyons and Radio News and Music, Inc. Even the first printed announcement of the inaugural broadcast was held until it was clear the station would operate.

Nevertheless, the Detroit News decided to put the necessary resources behind the fledgling station, so it would be more than an amateur curiosity. News and weather copy came directly from the editorial department at The News. Speakers were set up outside the building, so those without receivers could come and hear news and sports reports as they were received. Top level talent was hired, and the newspaper began printing the station schedule on the front page each day. 8ML became WBL, and then in March 1922, WWJ.

Photo from www.wwj.com website.

As the station became noticed and popular, WWJ moved to improve their facilities. From the 20 watt DeForest transmitter, the station quickly transitioned to a Western Electric Type 1-A, and 110, then 500 watts. Soon, WWJ was at as much as 1,200 watts.

With such a commitment, it is no wonder that WWJ became synonymous with innovation, being the first, or among the first, in many categories of broadcasting. The list is long. In its first two years, WWJ introduced sportscasts, live symphony, the first radio orchestra, religious broadcasts, the October 1920 World Series, a wedding and more. There was even a special broadcast of music for a local dance party on September 4, 1920.

(Continued on page 9)

Radio Chronicles

Continued from page 8.

Over the years, the station continued to pioneer with play-by-play sports, broadcasts from an airplane (1928), university courses, a part in the first coast-to-coast network broadcasts, and, of course, entry into FM in 1941 and TV broadcasting in 1947.

Some of the most famous names in the country began their radio careers on WWJ. Among them were, Fanny Brice, Will Rogers and Fred Waring and the Pennsylvanians.

However, from its inception until today, WWJ has been known for its news product. From the pioneering news and election returns in August 1920 to today, WWJ has put a lot of resources into its coverage. Already by 1922, the station had provided a link with other cities, including Toledo, isolated when a sleet storm cut the phone wires. Local papers were able to print, by receiving the reports over the air. WWJ also helped find a missing 13 year old en route to St. Louis, locating the young boy in Ohio.

Clark and Frank Lyons convinced the police in Toledo to install a radio in one of their cars. The rapid apprehension of a burglar, after a radio call, sparked quick demand for radios in the patrol cars and in turn to the first police radio station, with the interesting call sign: KOP.

Radio Autobiography

A couple of years a go, I was delighted to acquire a copy of a book printed in 1922. "WWJ – The Detroit News," is a fascinating look at how the station itself viewed the infant industry. Starting with the station's first two years of activity, including pictures and descriptions of the radio facility, its staff and the newspaper plant, the book included WWJ's schedule, as well as a list of other stations on the air in early 1922.

The chapter "Behind the Scenes" is especially interesting to modern broadcasters. Discussing studio construction, the book explains the studios were made "echo proof" by special "walls and ceilings, padded with felt two inches thick." Friar's cloth was hung over the walls and doors, to "deaden all sounds save those to be transmitted." And, the "newer type" of microphone was described as "much like a bronze mantel clock, except that it has no dial."

The resulting vibrations were said to be "impressed on the transmitter, which then projects them through the ether . . . on errands of intelligence and entertainment." Apparently they had no "liner cards" in those days!

Some of the "new" concepts that had to be taught to performers seem almost comical. The unresponsive microphone intimidated some artists who simply couldn't perform. Many were "spooked" by the lack of applause or laughter when they finished their part. The Detroit News reported one singer, Ernie Ball, was so surprised the microphone didn't offer applause after his performance that, in a rage, "he stuck his tongue out at the instrument, which seemed to relieve his feelings a lot!"

Others continued to perform in formal dress as they talked or sang on the air until they finally understood the audience couldn't see them. Also described was an "enunciator" which the engineer could illuminate to tell the performer, "Farther from the phone," "Louder," "Softer," and "Stop."

Very interesting were the chapters explaining in 1922 terms how radio worked, including instructions on how to build "Elementary," "Intermediate," and "Advanced" receivers. Diagrams and parts lists were included. An "elementary" radio might cost $8, an "advanced" $100.

For safety, a pictorial section on antennae gave advice on installing a lightning arrestor. There was even a question and answer section to help anyone wanting advice on how best to receive WWJ.

That such a book was published in 1922 by the station itself really shows the level of commitment to broadcasting on the part of the Scripps' and the Detroit News. It is a wonderful look at the beginnings of our industry. And even viewed from a modern vantage point 82 years later, this history of WWJ was truly befitting of such a pioneer.

Over the years, like many stations did, WWJ jumped around the dial. In 1923 they moved to 580 kHz, in 1925, they moved to 850, then 800, 850, and 920. In the mid 1930's, the power was raised to 5 kW, and in 1941 the frequency was finally fixed at 950 kHz.

WWJ·950 NEWSRADIO

Owned by CBS/Infinity Radio since 1989, WWJ took advantage of deregulation to increase its power on the formerly "regional" channel to 10,000 watts days and 25,000 watts nights. Two more increases brought nighttime and then daytime power to 50 kW in April 2002.

The "First" Question

Was WWJ the first Commercial Radio Station in the US? WWJ's claim took on added significance in 1936 when Lee DeForest got into the act, in 1936, proclaiming WWJ as the "First." However, DeForest liked to style himself as the "Father of Radio" and anointed several stations as "First" depending upon where he was. And, as we have noted in the past, the term "commercial" did not mean the same in 1920 as it does today.

What is clear though, is that the Scripps family and the other players involved in 8MK and WWJ helped foster the birth and growth of one of America's true Pioneer stations. From the original news reports in 1920, to the book published to popularize radio, to today's All News format, WWJ can proudly point to well over 82 years of service to Detroit. And that is certainly an accomplishment worthy of our attention.

Barry Mishkind, aka "The Eclectic Engineer," can be reached via email at "barry@broadast.net". You can find his home page at "http://www.broadcast.net/~barry/" Of course, please do visit The Broadcast Archive at www.oldradio.com

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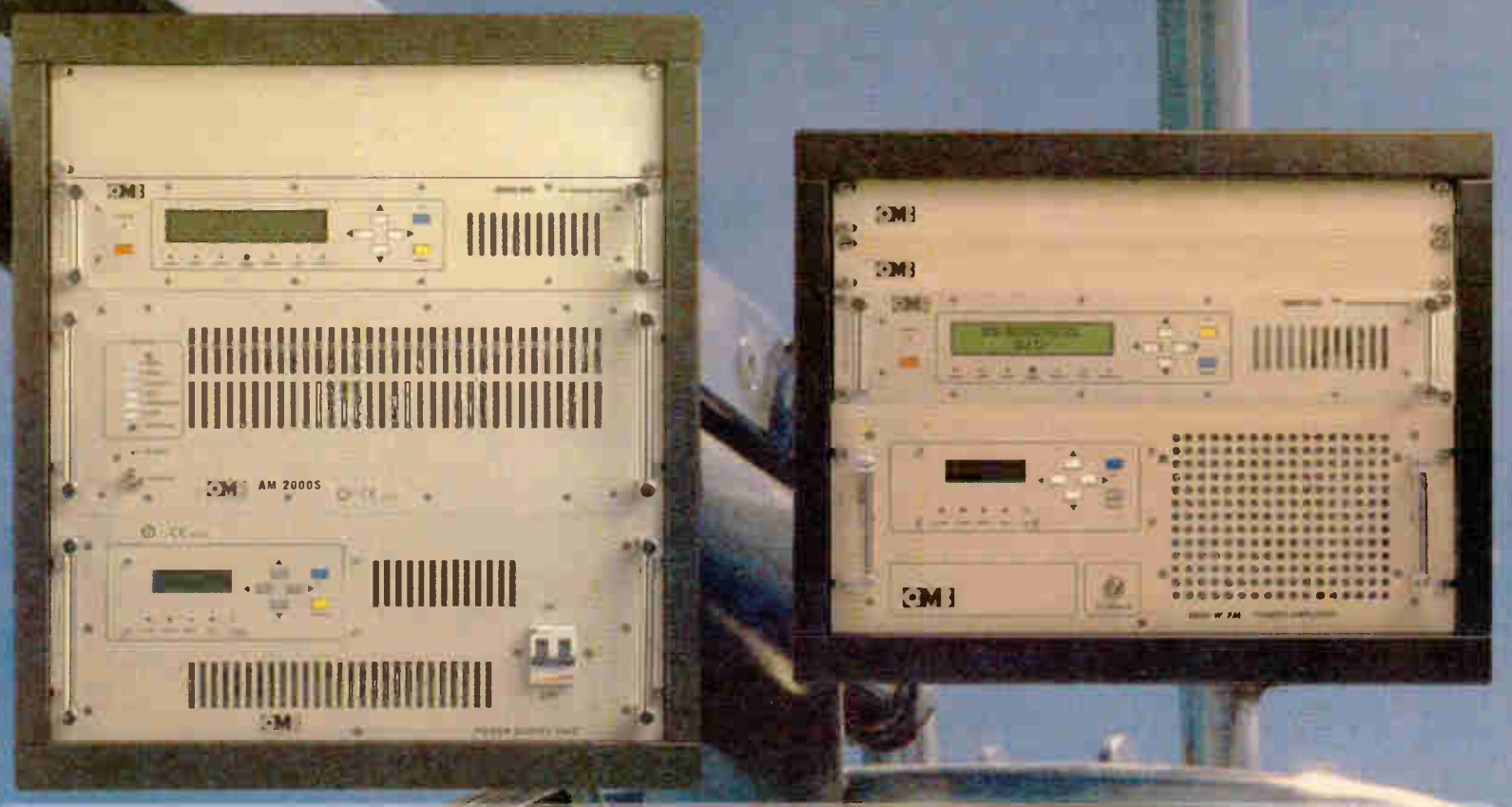

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The Studio Site

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Clean Audio is Happy Audio

We have touched on many different aspects of renewing, upgrading, and re-equipping the broadcast studio. Let's have a good look at the basic studio infra-structure – the wiring systems between studio and control room, or studio and rack equipment. Specifically, we'll focus in on maintaining quality pathways for signals and ground return. Physical/mortal danger may exist if wiring and grounding are improperly performed. Your local electrical code serves to protect you – obey it without compromise!

All of us have heard of 'those' studios where everything seems hot to the touch, pops, cracks and hums emanate from the monitors and talent is constantly getting little shocks from the mic. Believe it, there are more deathtraps of this description around the nation that one would like to know about!

Installing wiring, that complies with both local codes and common sense safety is not a difficult thing to do. One should start by drawing up a list of all the needed circuits and runs. Include as many AC circuits as needed and provide lots of extra audio runs – you will congratulate yourself on this wise move, later on. This is the planning stage that will be amended and changed around as often as different folk give input. Get everyone's opinion and include as much of all suggestions as your budget allows for. It is always easy to ignore pairs of wires not needed right now, but very difficult to cope with when you need two more signal pairs and they aren't there.

When planning and executing new wiring and interconnection, there are four major areas that must be addressed to achieve outstanding audio:

* PROPER POWER SYSTEMS AND GROUND INSTALLATION
* GOOD INTER-CONNECTION METHODS
* RF IMMUNITY
* SUFFICIENT HEADROOM AND S/N RATIOS

Let's jump right onto the AC power question. After determining how many individual circuits are needed, be sure and install wire and fixtures rated *above* your average current draw. For example, if you are running 20-amp circuits, ensure that your wiring and componentry is rated for 30 amps. You will never have to worry about overheating and fire dangers, if your circuit breakers are 20-amp tripouts. The slightly larger wire will also offset any annoying voltage drop due to line length.

Grounding is absolutely critical here. If you are unfamiliar with safe AC grounding, leave this to experienced pros, or get the right textbooks and inform yourself. All AC must be in steel conduits for shielding purposes. The largest contributor to audio noise and interference is still the AC line, and power line related stuff. Separate the physical AC conduit run from all other signal pairs by at least 12 inches – much more if space permits. Save yourself hassles and potential shock hazards, and *never, never* try to include AC supply voltages on punch-down blocks with audio and other signal lines.

Aside from the illegality according to the code, it's a damned unsafe practice that still exists in far too many stations. For the sake of a few dollars (probably less than $10.00), use the proper terminal strip and some insulating covers for on-air lights and convenience AC supplies. A better suggestion would be to use low-voltage DC for warning lights and remote start functions.

For some critical installations, separate AC feeders and transformers are utilized, to isolate inductive noises from audio paths. It is essential that, when separate AC circuits are employed, all high power switching equipment be kept off these lines – stuff like SCR lighting dimmers, motor switching, air conditioning, high power vapour lamps, even fluorescent lighting. All of these are sources of electromagnetic interference (EMI). To further isolate noise producing sources, all audio and other signal-related pairs should be enclosed in a separate (from the AC lines) steel conduit, with appropriate grounding.

It's not sufficient to depend on the third wire ground of rack components, etc. Using a ground wire to a ground lug or connection point, and tying that together with AC grounds (third wire) and all conduits, will guarantee a good clean ground. If something is installed that causes a hum, then you know its ground is improper. Never clip the ground lead off the power plug, or use cheaters (three-wire to two-wire adapters). That manuver is both illegal everywhere, and is potentially a lethal shock hazard.

Tie all equipment together in a star-ground configuration with *insulated* grounding lines, to prevent random connections to other grounds (and thus prevent ground loops). Review star-ground practices if you are not sure, but they are fairly simple. Start at one component on the rack, or use the console as start point, Run an insulated line from this ground point to the next component's ground, continue until you have returned full circle to the first point, then extend the ground to true earth ground at one point only! Don't cheat, use real ground wire, approved for that purpose. Do not allow this 'summed' ground to contact anything other than the main building ground, at the utility entrance. Use your own clamp. Include in this star the grounds for all AC lines, and all audio runs or other signal runs.

Do not create a ground where one does not exist, simply extend the star to include any ground on a component or cable that already exists. Since you are connecting all these components to the same AC phase, then all ground potentials should cancel out, and with one ground, no loops should exist. This should cancel any hum induced by varying ground potentials, and also ensure safety between components (no shocks when touching two items). In the unlikely event that the utility ground is not there, make sure that an actual ground is properly prepared – long ground rod, buried deep in earth, with appropriate soil conditioning for conductance as needed.

(Continued on page 12)

The Studio Site

Continued from page 11.

Signal Interconnection

Volumes are now written about modern impedance matching of equipment. Suffice it to say that the old Bell phone standard of 600 ohm line matching has ceased to be relevant with modern audio gear. Although many of us have been trained to think in that fashion, it's time to wake up and smell the fresh coffee brewing. Modern broadcasting goodies tend to have low impedance output drives, typically 50 or 60 ohms, with input impedances of 100K, or higher. The output Z of 50-60 has been found ideal for the current type of foil-shielded audio cabling in use. Some advantages of this new standard are less generated heat from the source equipment, lower noise pickup by interconnect lines because of the lower line impedance, and a much greater length of cable available before high frequency roll-off – up to ten times as long!

A word of caution: Before changing all your build-out resistors on DA's etc., to change the output impedance, consider what each power supply can safely deliver – more current will be needed at higher frequencies as the output impedance drops down to new low levels. Do the math and check specs before making any sweeping changes. Use low loss cabling in all new runs to be safe. Watch out for double grounding (only one end of audio shields is to be tied to ground). Connect only *one side* of audio ground (or foil or shield) to the star system. The other end (on audio lines only) is left unconnected to prevent injection of hum and noise. It is typical to ground the "send" end of an audio cable, rather the "receive"end. Again, consult a manual or experienced tech for proper grounding techniques.

Wiring jackfields can present a unique challenge to the double-grounding situation. The best way is to tie all ground drain lines together at the equipment ends – both input and output – but *not* at the jackfield. Then, at the jackfield, one can buss all grounds together and tie them to the star ground, with insulated wire. Even better would be to use ground switching jacks. ADC, Switchcraft, and Audio Accessories make them.

RF Immuity

Nothing on earth is totally immune to the interception and conversion of RF energy. When we say that a circuit or line is RF immune, we are really stating that the intercepted Radio Frequency energy is being dissipated before detection and further amplification. The presence of RF problems can sometimes sound like increased high freq. noise, an unusual 'burbling' sound, and may even include audible detection of the RF signal. In today's wireless-mad society, it is inevitable that some form of stray RF attempt to find its way into your studio wiring. Of course, close proximity to one's own transmitter sets the stage for a host of these problems. The open-at-one-end shield is great for grounding, but can act as an effective antenna. One cure is to tie the open shield end to its own chassis ground through a high-quality ceramic capacitor, about 0.01uF.

Specialized circuitry using op-amp configurations, LC filters, and Common Mode Filters may be called for in difficult cases. Employing special ferrous conduits for audio cabling and using EMI preventative seals and gaskets on conduit fittings may be mandated at some transmitter installations. In extreme cases, where a studio must be built in a very high RF field (especially like that found near a TV transmitter) a screened room must be constructed.

S/N Ratio Matching

The ideal studio install will have all audio components running at a maximum of a 'nominal' 0 VU audio voltage amplitude of +4 dBu. Do not confuse this reference point with digital recording levels, and other input or output readings. The actual measured audio output voltage at the output terminals (when the meter hits that '0' point) should be +4. When your studio is properly set up in this manner, typical output noise floors can sink to -93 dBu, and a potential dynamic range (signal-to-noise) of 120dB can be obtained – more than sufficient for crisp, clear, punchy audio sent to the transmitter! Reference books such as the Audio Cyclopedia, or Yamaha's audio manual offer good instruction in level matching for audio chains. If the demand warrants, perhaps that subject can be dealt with here in a recap article in the future.

One of the common problems is the existing dependence on the VU meter, an outdated and outmoded instrument at best. VU's can only indicate slow, average program material, and were really invented and developed by Bell Telephone Labs back in the 1930's for speech only. Music, a very complex waveform, was not given serious consideration in the makeup of radio programming, back then. The instrument of audio measurement that is far more accurate and useful is the peak program meter, or PPM.

Using these meters exclusively, or next to regular VU indicators, will give the operator superior indication of program material levels, but with a new and more exact control over excessive program peaks. PPMs can be obtained in either standard meter form, or as LED 'ladders.' Another worthwhile addition to a good studio would be a specialized loudness meter, which combines the ease of reading of VU-type meters, but offers the accuracy of PPMs. Dorrough Labs puts out such a meter, and it is invaluable in judging true peaks and loudness, versus average program material. Adjusting station compression becomes much easier when observing the final audio on such a loudness indicator.

Let me repeat my earlier caution: This article is intended as a refresher for those who have done studio wiring previously, or as an explanation of the work involved. If you have not yet had experience in safe wiring and grounding practices, I urge you to seek competent professional guidance before attempting anything described herein. Physical/mortal danger may exist if wiring and grounding are improperly performed. Your local electrical code serves to protect you – obey it without compromise! This writer and Radio Guide waive all responsibility for any incorrectly performed wiring, and any resulting hazards or accidents.

As with all electronic systems, there may be more than one acceptable method of achieving the same result. Just remember to employ the safest method, and that all applicable codes and regulations must be followed. Like the car salesman says, your mileage may vary.

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Computer Connection

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Building a New Station Computer

Over the last few months we have talked a lot about maintenance, upgrading, and proper system care. In this issue, we will discuss building a new machine for your station. If you are like a lot of folks, you have been running "Old Faithful" for several years, and barely escaped the Y2K thing. Now, all of a sudden, you are starting to feel like you are "Driving a Dinosaur." At home, and just about everywhere else, you are using more powerful and much faster machines. Budget considerations are the reason a lot of stations are still running older DOS-based systems, or older Windows 95/98 machines.

In the past, it could be an expensive proposition to build a good machine for your station. Now, with hardware prices dropping to respectable levels, you are in a much better position to build that long-awaited system. There are a few things to note here, with regard to that system, before you go out and get that bargain, only to find out that "you get what you pay for." On television, and in magazine ads, these days you see a lot of system manufacturers selling complete systems for just a few hundred dollars. At first glance, these systems may seem like a great find, but by the time you add in all the necessary hardware to make these machines perform to broadcast specs, you fill soon find that you have not saved much at all.

Operating System of Choice

No one will argue that the old DOS systems were usually reliable and very stable. The DOS operating system was somewhat limiting in the amount of system RAM you could consume with a program, and thus programs tended to be smaller and operated more efficiently in general. These days, the Windows™ operating system has opened up a whole new ballgame in system capabilities. At one time, the only "Multi-tasking" (being able to run more than one application at a time) we had, was limited to UNIX style operating systems. However, with each new version of Windows™, we have seen more and more capability in this department.

Today's professional versions of the Windows operating system are proving to have the inherent stability that was found in the DOS systems. What the older Windows 3.1, Windows 95, and Windows 98 lacked in crash recovery and reliability, Windows 2000 Professional and Windows XP Professional make up for.

There were several problems with Windows 95/98 (usually called Win9X these days) that were never resolved. These problems included kernel memory leaks, and a host of other problems too numerous to mention. Traditionally, in Windows, the way you were supposed to be able to recover the system from a crashed program was to simply hit Control-Alt-Delete on the keyboard once, and then select "End Task." The problem was (especially with Windows 95) that even though you could, many times, end a crashed program, you seldom recovered all the failed program's memory. This, coupled with the aforementioned memory leaks, led to the eventual necessity of rebooting the system to recover all the lost system memory.

Since I've mentioned "Memory Leaks" several times, let me define that for you who. A memory leak is basically a problem in an application, device driver, etc., which causes memory loss. Here is how it usually occurs. You start a program, or a system device driver, and the system has a certain amount of available memory. After a period of time the program loses memory that is unrecoverable or the device driver does the same. Over a period of time, this "small" loss or "leak" is not too much of a problem. Left unchecked, however, and you are in for an eventual crash or lockup when the available amount of system RAM is no longer sufficient to properly operate the system. This is when the crash or lockup happens. The only way to recover the memory with Win9X systems was usually to do a reboot.

Better Crash Recovery

Here is where Windows 2000 and XP professional shine. Though Windows 98 was a little better with crash recovery, it still was not totally clean. Though reboots were less frequent than with Windows 95, they were still inevitable. There is also another problem that is not mentioned too often. That is the 47-day thing. It is said by Microsoft (or was a few years back) that Windows had a problem in many versions that would not allow it to operate longer than 47 days (I think 47 was the correct number) without a reboot. I won't get into the specifics of this right now as I seem to recall this was corrected in service packs. Try as they might, Win9X was still a little short in the reliability department, though some would say that Windows 95 OSR2 was better.

Windows ME was so short-lived and buggy that I won't even waste time talking about it in this article. Microsoft quickly abandoned it and came out with 2000. Windows 2000 professional was strictly that. It was, and is, a professional operating system. It only comes in two versions. There is the Windows 2000 Professional which is the successor to Windows NT Workstation, (but a lot better IMHO) and Windows 2000 Server, which replaced Windows NT4 Server.

The real beauty of these systems, and now the XP professional line as well, is that if you somehow crash a program, and lock it up tighter than a drum, you still can get out of it with the Control-Alt-Delete keystroke combination.

This time, select "Task Manager" and find the program in the "processes" list, highlight it and click "End Process." This will end the program, recover the memory, and your Windows system is still running. Occasionally, you may have to try the end task thing more than once, but it is usually good about recovery without reboot. I had a Windows 2000 Professional machine that ran for over 3 months nonstop, playing music without a reboot.

(Continued on page 14)

Computer Connection

Continued from page 13.

That machine was run for over 6 months without rebooting. The thing finally went down in a power bump, but came right back up and went on it's way quickly.

If you are in need of building a new machine for your broadcast operation, then I'd strongly recommend that you don't consider anything else but Windows 2000 Professional or XP Professional for your operating system.

You can use Linux, which is also very stable, but then you are limited to the software you can run, and will have to get ready for a lengthy learning curve cutting over to the Linux OS.

For that reason, we will not go into Linux at this time. If you are a hacker or a UNIX/LINUX buff, then by all means go that route, if it makes you happy. For the average Windows user, however, there is entirely too much in the way of technical stuff to deal with, for average daily station operation. (No please don't send in your hate mail, all you Linux gurus!).

Different Versions of the Windows Systems

Many major manufacturers use special versions of the Windows operating systems that are not the same as what you get across the counter. Many of these "specials" actually contain portions that are built into the hardware (BIOS, etc.). They accomplish faster booting, and have special functions available via keystroke, which are not normally available in standard Windows systems. These can deal you some misery with compatibility and subsequent upgrades of the Operating System. What this means is that your upgrades will probably have to be purchased directly from the manufacturer at prices that are usually considerably higher than a generic system would be. Be warned!

Hardware Choices

If you look at the system requirements for most quality broadcast software, you will usually see the recommendation for an Intel Pentium-based system. There is a very good reason for this. Over the last few years, though there have been a lot of other choices to hit the computer market, the Pentium has shown through as the best and most reliable system available. You will see the Pentium in virtually all of the good systems. Manufacturers that have tested different systems will tell you that with the Pentium, they get fewer service calls, and experience fewer unexplained problems than with any other chip.

Yes, you can save some money with something else, but trust me on this one. You *do* get what you pay for in Pentium processors. The chip of choice right now, though there is a new variety or two coming on the scene, is the Pentium IV. In building up your new machine, I strongly recommend that you stick with a professional operating system, and an Intel based system (Intel Chipset on the motherboard, and a Pentium processor).

Twist It and Shine a Light Through It!

With regard to motherboards, let me share something with you that a colleague in the computer business told me a few years ago, that I've still found to hold true in most cases. Now mind you that this is not entirely scientific, but based rather on his years in the computer service business. To spot a good motherboard, it should be stiff and not flex easily, and when you hold it up to the light, light should not pass through it.

Cheap boards usually are thinner and flex easily. They are usually built out of cheaper material, and the untrained eye can actually see through it. I personally compared several manufacturers' boards and sure enough – almost without fail – the better boards are stiffer, usually not able to be flexed at all, and are non-translucent to direct light. Now take this with a grain of salt, if you will, but it is a good rule of thumb when picking out hardware.

Power Supplies

One other thing to consider, when looking at that "Bargain Computer," is the quality of the power supply. Though we don't see it as much as we used to, there is a thing called "UL Listing" that you should remember here. Many an unwitting engineer has searched for ways to get rid of that awful hum in the audio in the control room, after installing that low-priced sound card, only to find out that it was not the sound card at all – it was that new computer. The power supplies that come in most cheap (and sadly to say, a lot of the higher-priced ones as well) can be real hum producers.

UL Listing

It has only been a few short years since almost everything we bought had the Universal Laboratories Listing "seal of approval" on it, meaning that it had undergone standardized testing and had met certain criteria before being sold. Computer power supplies are not usually one of these UL-tested items. When buying that new computer, or building your own, remember to ask for 'UL Listed" power supplies. Then you will get a unit that is very low in EMF, and will minimize the interference with other equipment such as your audio console.

Next Time

In the next issue, we will discuss other hardware considerations, such as the kind of RAM you choose. We will also explain the differences in the kinds of hardware available for you out there. So come back next month for the next installment in 'building up your new computer"

Until next time . . . "Happy Computing!"

The Transmitter Site

Transmitter Site Maintenance, Installation & Repair

ECONCO Tube Topics – Part 3

This is a reprint, of the 2nd edition their popular Tube Topics publication. You can receive your own free copy, direct from Econco, by calling them at: 800-532-6626.

The following photos illustrate the process of power tube rebuilding, as practiced by ECONCO.

Incoming tubes are checked and, based on the measured results, they are routed to the proper rebuilding station. There, the vacuum envelope is opened; the internal elements are then removed as required for inspection and analysis. Experience has shown that many operational problems leave physical evidence within the structure and a thorough examination of the internal topography provides valuable information regarding the reason for failure, exceptional life, or outstanding performance.

Tube Test

Carburizer

The emission of a thoriated tungsten filament depends on a complex chemical process. One of the carbides of tungsten protects the filament from ion bombardment and acts as a catalyst to lower the temperature for efficient emission.

Operation to new performance specifications requires careful measurement of internal dimensions and duplication of the original component configuration when the tube is rebuilt. Through analysis of a large number of tubes that have failed in the field, ECONCO engineers are sometimes able to improve on the original design and thereby extend tube life.

Leak Detection

Tube Opened on Glass Lathe

Proper operation of a tube depends on a good vacuum within the envelope. The structure of the tube involves many different materials that are joined together. These joints must be vacuum tight. Here, seals are being checked on the mass spectrometer leak detector before further processing.

The operational life of a tube is highly dependent on the degree of vacuum in the envelope; the better the vacuum, the longer the life.

Although ceramic has been replacing glass in power vacuum tubes, in many high voltage applications, glass is the preferred material. The above tube has been opened on a glass lathe and is being prepared for rebuilding.

Vacuum tube manufacture requires special materials and close-tolerance matching of parts. In the rebuilding process, all original tube specifications are met or exceeded.

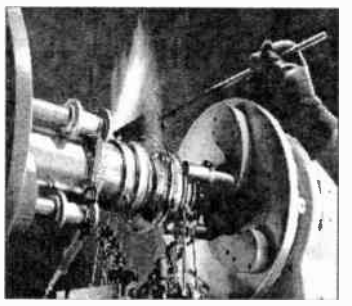
Glass sealing can be done either in a horizontal or vertical lathe. Here a technician is sealing a 6696. With such glass lathes it is possible to manufacture new envelopes. which enable the rebuilding of tubes once considered irreparable. After being sealed, the envelopes are annealed to relieve stress.

Tubes with cracked ceramics were previously considered unrebuildable. Here, a 4CX3500A is prepared to have the cracked output ceramic removed and replaced.

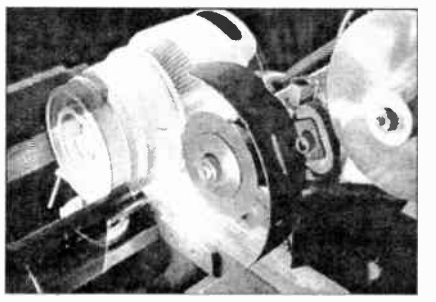
(Continued on page 16)

The Transmitter Site

Continued from page 15.

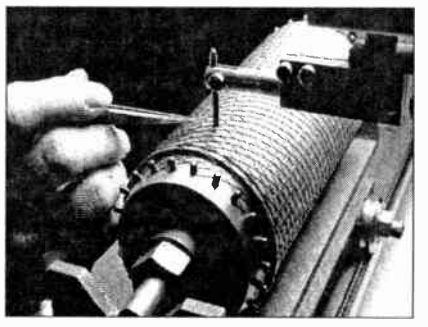


Glass Lathe Sealing a 6696

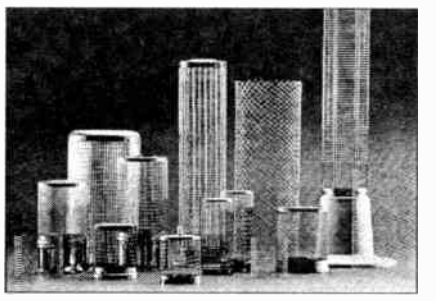


4CX5000A Ceramic Replacement

High temperature atmosphere furnaces are used to braze new ceramic onto prepared stem assemblies. Other furnace applications include heat-setting of metals and processing materials



Mesh Filament on Mandrel



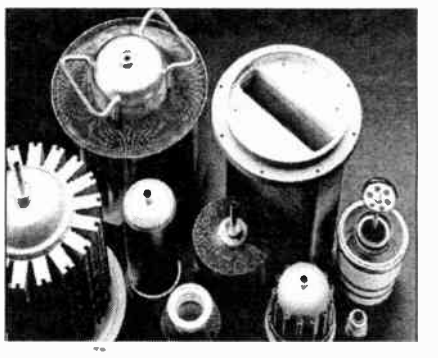
Grid Structures

Normal operation subjects the filament and grid structures to thermal and electrical stresses that can render them unusable in a rebuilt product. Modern tube technology requires extensive use of mesh cathodes, and special fabrication tools and jigs are used to replace the worn out cathodes. Here, a new mesh filament is being wrapped on a mandrel.

The original tube design establishes the overall performance characteristics. Replacement parts exactly duplicate the original parts in form, fit, and function. Jigs and fixtures aid in the production and assembly, but skilled tube technicians are the brains and hands that do the job.

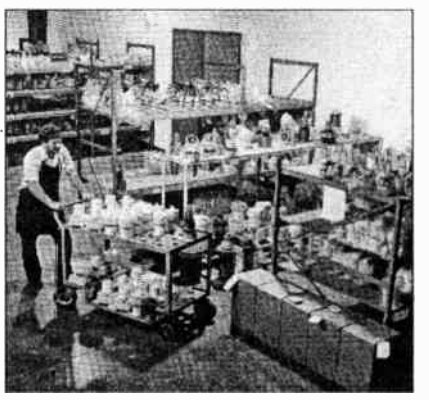
Anodes

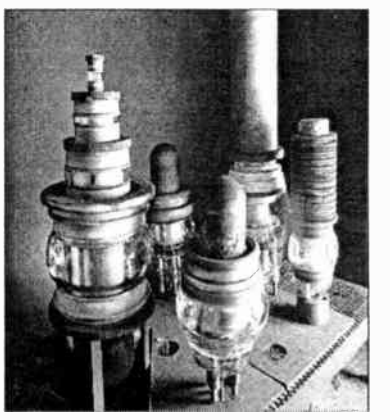
It is possible in the operation of certain industrial tubes that the anode can become damaged, and replacement with a new component is the only solution. ECONCO has the capability of manufacturing new anodes when necessary for a variety of tubes. The anode of a typical tube consists of four primary parts: the internal cup, external fins, the external anode band, and sealing rings.



Tube Bank

ECONCO buys duds whenever possible for the purpose of having an inventory of the most commonly used types already rebuilt and in stock for delivery. The customer has the option to have a tube from stock (when available) or have a specific dud rebuilt.





A Tradition of Excellence

The exterior finish on a tube contributes to proper operation. ECONCO believes that silver plate is the best finish for tubes unless other environmental considerations dictate another treatment. At ECONCO, we have the technology to rebuild a wide range of power tubeas. Our tubes are used in numerous applications, including radio and TV broadcasting, defense industry, and other areas. RG

State of the Art

By Chip Morgan
Email: chip@cmbe.com Phone: 800-801-2623

Low Power FM Signal Optimization

When a radio facility is licensed to operate with very low power, such as a translator, booster, LPFM, or high altitude station with de-rated ERP, proper system design is very important so that every licensed watt of power is delivered to the target audience. In this article, we'll take a look at some of the most important things that you can do to insure maximum performance in a low power system.

With a low power system, it's easy to think that the performance won't be very good because there's so little radiated power, but keep in mind that early communications from the moon to the Earth used about 5 watts of ERP, and cell phones operate with extremely low power at relatively great distances.

There are stations in "hilly" top 10 U.S. markets that have had great commercial success with under 100 watts of ERP. The most interesting part of low power facility design and operation is that the components are small and less massive, so there can be more budget for higher performance design, where physical limitations would be a problem with higher powered systems.

Let's review some basic, and advanced concepts for low power systems design and operation. You may not be able to apply all of these concepts on every station, but where budget permits, the difference in achievable signal quality can be very noticeable.

The Transmitter

These days, almost all low power transmitters are solid state, broadband systems. This means that they are designed to be easy to operate, typically with front panel frequency controls. Because of this, transmitter efficiency may be low, and output power may vary over various portions of the FM spectrum. Measure the efficiency at the frequency in use, so that you can factor it into power calculations.

Use a calibrated meter to measure operational output power, and compare power indicated there with the calculated power using the FCC indirect method of calculating output power. Resolve any conflicts between measured and calculated power. Measure the losses in any in-line devices such as filters, combiners, switches, etc. These can add up fast and rob the system of final ERP. Control the temperature and humidity of the operating environment to keep performance stable under all weather conditions.

The Transmission Line

Use a single cable, chosen for its electrical characteristics, when possible. Know the exact loss of the line by measuring it on the licensed frequency at typical temperature of operation, not by using factory loss calculations. Include all connectors. Use high quality line with maximum shielding to minimize line radiation. Keep the line as short as possible, with minimum bends. Test the line after installation of the antenna with a network analyzer to insure there are no problems in the line itself.

The Tower

Be sure that the tower itself is not hurting the signal by causing undue reflections, signal distortion or signal absorption. With a low power system, you may be operating with horizontal, vertical or circular polarization, and as with any FM system, the mounting structure will have a great deal of effect on the performance of the system.

Tower weight and wind loading can be minimized with low power antennas, and you can use this to your advantage so that you can choose the best system for your application. For example, it may be easy to eliminate guywires, or to use non-metallic guywires for the whole tower. This would be a good way to eliminate the effect of guywires on the signal. You may also find that a small pole, a non-metallic pole, or a wide faced tower may work best, depending on your given situation.

The Antenna

Use a wideband antenna when possible. At low power, the difference in cost of a wideband antenna and a narrow band antenna is nearly insignificant. If you can use a balanced input antenna, it will almost always out-perform an unbalanced input antenna. If you don't, you may want to consider using a balun at the input of the antenna to be sure all power delivered at the antenna input is transferred to the antenna itself and none is radiated by the unbalanced transmission line leading up it.

A non-directional station built with an array of directional elements such as Yagis or Log Periodics will usually outperform a single element or collinear array of elements when carefully designed and installed. In all cases, antenna orientation is critical, again depending on desired target area and mounting environment. Low power stations can benefit greatly from antenna pattern studies. As with all antenna installations, be sure that the environment around the antenna is consistent and not causing near field problems. In general, don't use radomes if you can avoid it, as the material in the radome will absorb energy that isn't typically accounted for in power calculations.

If you can account for radome loss, do it, but note carefully that some radome antennas are modified to fit a smaller footprint to reduce windload, and performance of the basic antenna design itself may suffer. Don't just estimate connector losses in an antenna system, measure them! Get accurate, measured data on antenna gain at your frequency. Don't just use a published gain spec for a non-specific frequency. Overall antenna gain is much more important than pattern symmetry or shape, unless deep nulls fall on specific target areas. Some manufacturers publish patterns with no gain reference. You need to know what the gain of the antenna is! (Cont. on page 18)

State of the Art

Continued from page 17.

Polarization

If you have the option of choosing polarization of the transmitting antenna, there can be some major advantages to different polarization plans. These are very site specific, so be sure to study them carefully. Antenna height above ground has a very strong impact on choice of polarization. Antenna gains are affected greatly by the height of the antenna, depending on polarization, especially when close to the ground. This can be used to your advantage or disadvantage, depending on attention to detail. Polarization can help fight interference, can provide isolation between systems, and can affect reception on different kinds of radios. Polarization may be one of the least understood antenna parameters in broadcasting, even though it seems simple to say that for car radios, you need good VPOL signal and for homes you need good HPOL. It's much more complex than that!

Audio Quality

Strive for pristine audio quality, with no phase linearity problems to minimize mono cancellation problems. Consider reducing stereo separation to maximize loudness and reduce noise in the stereo channels. If you can get away with it, a mono signal will go farther with lower noise. Be sure your STL is not causing problems which get re-transmitted by your main transmitter. Use the best audio processing you can afford, and carefully monitor modulation levels to be sure you are running loud and clean.

Frequency Allocation

Many times a low power facility may have a choice of frequencies. When this is true, spend time to identify the best frequency to use. Interference is far more detrimental to coverage than almost any other problem. A nice clean channel can work quite well for a low power system. If the system is operating near a highly populated area, it can be worth taking time to identify what changes could influence future interference as part of the initial frequency study. Now that IBOC is approved by the FCC in the US, the impact of adjacent channel interference from US stations is also a concern.

Sometimes the best way to identify the cleanest channel when you have options is to simply drive around the target coverage area and listen. Keep in mind, though, that weather conditions have a great effect on extreme fringe coverage of distant stations, so testing must be done over a long period of time in various weather conditions. There's always the possibility that the interfering stations are off the air, operating with temporary facilities or are at lower than normal power. Modern coverage mapping systems can quickly identify and rank the quality of various frequencies when there are options.

Site Location

Low power systems usually have much greater latitude in location, and you need to take advantage of that flexibility. Sometimes low power systems can use directional antennas, and the prime location for a directional site may differ from that for a non-directional site, which tends, generally, to be best located in the center of target population. As in all FM systems, the best location has good line of sight to the target area, is as high as necessary for good Fresnel zone clearance to the target area, is easily accessible, has power, and has minimum other broadcast facilities on site.

Installation

Installation of a low power station is fairly simple. Control the utility input power with a UPS, power conditioner or battery bank. Use a remote control that can accurately read with high resolution. Use good grounding techniques, including tower and line bonding, careful layout of power and RF penetrations in the building, and overall lightning protection as appropriate. After installation, measure the exact power delivered at the antenna input, and then compare it to your original line tests and calculations for the line. Measure the VSWR or return loss of the antenna during installation and fine tune the mounting configuration and actual antenna tuning for the best match with the transmission line. This insures maximum power is transferred from the line to the antenna.

Summary

Low power systems need every available and licensed watt to be delivered to the target areas. Be sure that you aren't wasting any of that precious power on heating portions of the antenna system, or sending it to unimportant areas. Since low power systems use so little power, they can many times be run using alternative energy sources, such as wind and solar power.

The flexibility of low power FM stations makes them perfect for filling in small target areas or regaining coverage in areas that are theoretically covered, but actually have terrain shielding problems. When properly designed and operated, low power systems can and should sound as "big" as high powered systems, with the only limitation being the area that the signal covers, which is naturally determined by the height and power of the station. Innovative antenna designs can really make a low power system work well, and the cost for more exotic antennas is usually not very high when working at low transmission powers.

If you're an experimenter at heart, low power systems can be a great way to learn techniques and systems with minimal risk that can be directly applied to bigger systems. The physics are all the same, the only real difference is the power level at which the systems melt down!

Chip Morgan's company, CMBE, Inc., provides high performance support and services to broadcasters worldwide. For more information, please visit www.cmbe.com.

The Public Necessity

By Clay Freinwald and Barry Mishkind

EAS Q&A

Most manufacturers of EAS equipment have brought an upgraded EPROM to the market, so stations can take advantage of the new CAE (AMBER) code. However, questions persist about this and the other new codes, and if they are the "final version" of EPROM upgrades. (At least one manufacturer has acknowledged problems with their upgraded EPROM and is exchanging them for newer new ones.)

Barry: Clay, just what is the status of the EPROMs? Are they really ready for stations to purchase?

Clay: Unfortunately, not all EAS boxes operate the same way, therefore each is upgraded differently.

For example, those running a TFT 911 can take advantage of the new event codes and other features by purchasing a new chipset from TFT. The cost is $100.

For those with SAGE ENDEC equipment, most of the changes can be accomplished by communicating with the unit via free software, as it makes understanding these units a whole lot easier. For goodness sake, don't try and communicate with this unit via the front panels buttons. While Sage will be releasing new EPROMs in the future, it's best not to wait to make the changes. Jim Tharp has posted some great step by step instructions at **http://www.eas-wa.info/**

The common rule is to check with the manufacturer.

Barry: Of course, the majority of the "buzz" relates to the new CAE code. What can you tell us about it?

Clay: CAE is the new event code for Child Abduction Event and is likely to be the most talked about of the new Event Codes. CAE is used with the Amber program we have all heard so much about.

Barry: When should stations start using the CAE code in EAS alerts?

Clay: The date will differ according to local plans. But we need to remember that the Amber program started in some places well ahead of the FCC's release of the new list of Event Codes. In those areas, they chose to use the CEM code (Civil Emergency Message).

Barry: Doesn't the use of CEM create problems?

Clay: Yes, there have been some problems around the country with the use of CEM for Amber, most of them related to Television.

EAS messages have two parts. First there is the digital information contained in the 'header codes.' The second is the voice portion of the EAS message with specifics about the event. TV stations often generate their 'crawl' from the information in the 'header codes,' and have no way to transcribe the voice message into additional crawling text.

In some cases, TV stations end up running the Civil Emergency Message crawl over and over and over. For the deaf, or folks not hearing the voice message (it's only run once) it's easy to get a confused alert. Just imagine what it would be like turning on your TV set in a major city after the voice portion of an Amber message has been run, to see only "Civil Emergency" scrolling across your screen – and having no additional information to tell you what's going on!

This is just one of the reasons why EAS Committees are urging everyone to upgrade their EAS equipment now, so the proper Event Code can be implemented. Many areas have set January 1, 2003 as the deadline for this upgrade. Oregon has a creative system of tracking these upgrades for all to see. They may well be one of the first states to have CAE completely operational.

Barry: Do you have any comments on the other codes being added to the EAS system?

Clay: Yes there are some very useful codes in the new list. Here are a few:

DSW - Dust Storm Warning. With drought conditions getting worse, especially in the Southwestern part of the country, this may well be put to good use.

FRW - Fire Warning. This code would have been very useful this past summer fire season in states such as Arizona, Colorado and Oregon.

EQW - Earthquake Warning. This isn't quite like it sounds. It's not to be used to warn of an impending earthquake, but rather used in dealing with the aftermath of one.

TOE - 911 Telephone Outage Information. Every once in a while a 911 center or Telephone CO goes down and authorities are frantically calling around to all the media with information on what number to call while the telephone techs re-boot their system.

SPW - Shelter In Place. This is going to prove to be one of the most useful tools in the new collection from the FCC. In many situations, authorities may want citizens to stay home and perhaps close the windows (think Hazmat).

VOW - Vocano Warning. I have to admit the idea for this came from the Pacific Northwest where we have had to be creative and come up with methods of using EAS in dealing with our 'mountains of fire.'

Barry: Are any proposed corrections or additions to the EAS codes still pending?

Clay: In the FCC's latest revisions to the EAS rules (Docket 01-66) a number of suggestions were made for upgrading the system. Not all ideas submitted are adopted. In some cases, they're put on hold with an invitation for more input.

And that's the case with the matter of being able to transmit text information. Many proponents would like a method whereby the information presently contained in the voice portion of the EAS message could be sent also in text. This would certainly help Television. The FCC left the door open to this idea, for someone to develop a system, submitting their data in the form of a proposal for rule making. However, I don't look for any further changes to the EAS rules for several years.

If you have a question on any aspect of EAS, please feel free to contact us at radio@broadcast.net.

Gear Guide - New Equipment, Repairs, Services, Parts

Listings on this page are provided at no charge, as a service to the industry. The deadline for submissions is the 21st of each month.

The Jingle Book – By Ken R.

The First Book About Radio Jingles is Available

This new book is the first dedicated to the hot nostalgia topic of radio ID jingles.

Written by veteran journalist and jingle producer Ken R., "The Jingle Book" includes an audio CD. It will appeal to radio buffs and the growing number of enthusiasts who like to swap stories, CDs and tapes featuring sounds from the "golden age" of jingles in the 1960's and early '70's.

The author interviews dozens of the creators of radio ID's including Johnny Mann, Anita Kerr, Tom Merriman and many others. He tells the story of why Dallas was a jingle hotbed, and he tracks down the most famous jingle singers including Trella Hart, Jim Clancy, Gleni Rutherford and other luminaries whose stories appear in their own words.

The book includes behind-the-glass studio stories of how jingles were made, the personalities of the people involved and numerous stories and candid comments that have remained secret until now.

Ken R. also includes several feature stories about the colorful people he met in radio, including larcenous general managers, flaky jocks, a sexually unrepressed female independent record promoter, and other characters.

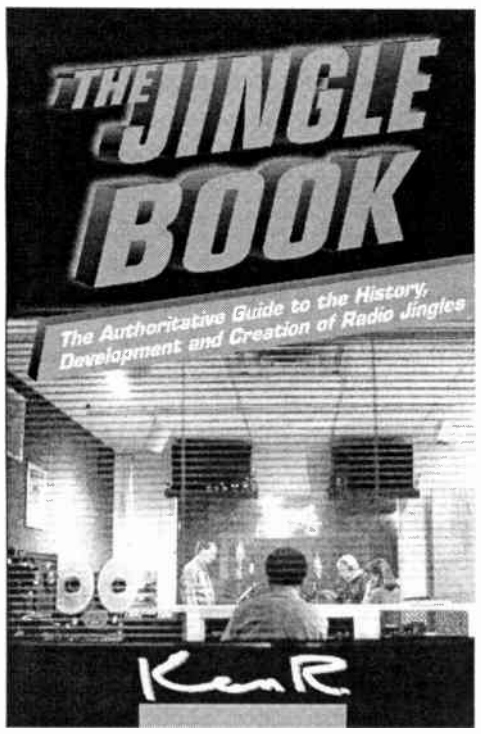
"The Jingle Book" is a 250-page paperback with eight pages of photos. It includes a one-hour audio CD featuring the best jingles from 1960 through 1974 from companies such as PAMS, TM Productions, Pepper Tanner, CRC, Spot Productions and dozens of others.

Written for fans of radio, airchecks and jingles, in a breezy, non-technical style, "The Jingle Book" is an insider narrative that captures the essence of the jingle industry and puts it into historical perspective.

Jingles are the short, sung identifiers used by radio stations to communicate their call letters, frequencies and slogans. The first was written in 1947; they are still used today.

"Radio A Go Go," "More Music More Often" and "Boss Radio" were magic phrases people remember from top-40 stations in the 1960's and early 1970's. Those short little musical ID jingles said them best. WABC(AM), New York; WLS(AM), Chicago; KLIF(AM), Dallas and KHJ(AM), Los Angeles were some of the pioneering radio outlets for the most creative of these jingles.

While the names of companies and people who produced these 10-second wonders may not be known, their work was famous. Their sound blasted from transistor radios and from the dashboard speakers of cars at every sock hop and drive-in restaurant. If you listened to radio then, you heard these jingles.



ORDERING INFORMATION

The book retails for $49 plus shipping ($5 within North America, $12 anywhere else in the world) which includes the audio CD. It is available through Ken R. LLC.

Details including the full-color front and back covers and table of contents can be viewed on the Internet at www.kenr.com.

Ken R. LLC

6640 Salisbury Rd, Ste 310, Maumee, OH 43537

Phone: 419-866-5399 Email: ken@kenr.com

Website: http://www.kenr.com

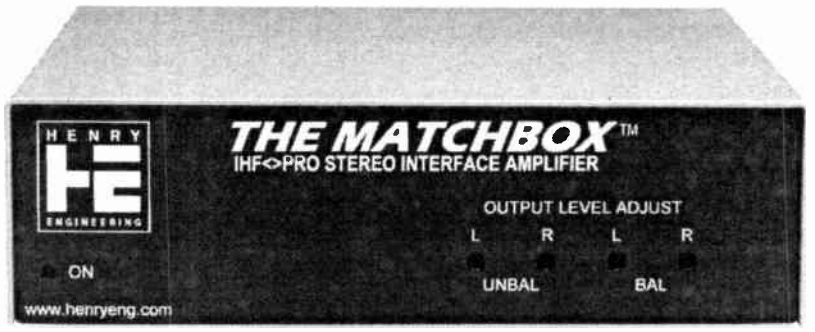
Henry Engineering Announces New MATCHBOX Product

An Updated Version of the "Original" Matchbox

The MATCHBOX is the industries most popular level & impedance converter. It permits consumer or semi-pro audio equipment to be used in a professional studio system. It features direct-coupled active circuitry for superb audio performance with over 100db of dynamic range. The AC power supply is built-in, so no "wall warts" are needed.

The new MATCHBOX is rack-mountable in 1/3 rack width by 1RU high. Up to 3 units can be mounted in a 1RU rack shelf, which is optionally available.

The new MATCHBOX is now in stock at all Henry Engineering dealers. For technical specs, pricing, and dealer information, please visit www.henryeng.com.



Henry Engineering

503 Key Vista Drive, Sierra Madre, CA 91024

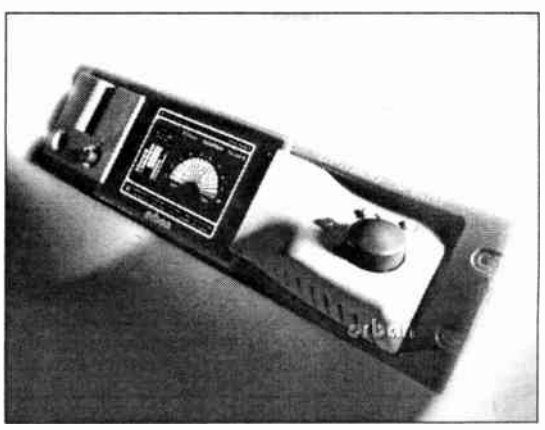
Phone: 626-355-3656

Website: http://www.henryeng.com

Orban Releases Optimod-FM Version 2.1 Software

Orban has announced the release of version 2.1 software for its flagship FM audio processor, Optimod-FM 8400. All new 8400s are now shipping with version 2.1 software. It is also available via free download from www.orban.com (click "Downloads") to upgrade any existing 8400.

The new software offers a new low-latency mode that reduces delay to 15 milliseconds with minimal trade-off in performance. Operation modes can be switched between the new low-latency and the 20 ms delay mode, first introduced with version 2.0 software for those who want the best possible combination of loudness, presence, and low distortion. Both modes provide the excellent source-to-source consistency, and low speech distortion that are hallmarks of 8400 processing.



Version 2.1 also introduces a new family of IMPACT presets. Oriented towards contemporary hit radio and other mass-appeal formats, these presets provide very loud, crisp audio with plenty of presence and bass punch. Version 2.1 also adds presets in the LOUD-HOT family that take advantage of the low-latency mode.

Version 2.1 allows users to administer the 8400 using ASCII command strings. Users can set up remote communications and recall presets. It is also easy to interface the 8400 to any automation system to recall 8400 presets. Such a connection could change presets to complement the program material on-air, and Orban has customers using automation to change presets between music programming and commercials.

Orban

1525 Alvarado Street, San Leandro, CA 94577

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Website: http://www.orban.com

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You can post your own gear immediately, and make changes and additions to your listings as often as you like. There are no limits to the number of items you can post, and there is no charge for this service.

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You can also have radio-classifieds.com email you whenever there is equipment of interest, posted on the website. Just enter your email address, and tell the system what you're looking for. When an item matching your keywords is posted, you'll be immediately notified by email.

Used Gear Parts & Service Information

The radio-classifieds.com website provides you with the best used equipment listings anywhere. We've also added parts and service information to the website, to help you maintain and repair your older and vintage gear.

Radio-classifieds.com is your one-stop resource, for all your used equipment needs – with links to every used equipment service and dealer across the country.

If you have suggestions for improving this website, please let us know. We'll do whatever it takes to make this your #1 stop for used gear.

Welcome to **Bay Country** BROADCAST EQUIPMENT

ANTEX SX-23e digital audio card (simultaneous record & play).
ANTEX SX-9 digital audio card (play only version of SX-23e) 2 available.
APHEX Model 720 Dominator audio processor.
AUDIO-TECHNICA AT4033SM Cardioid Mic (with spider shock mount).
COMREX Nexus ISDN audio codec.
COMSTREAM ABR-200 Digital satellite receiver (7 available).
COMSTREAM LNB Downconverter, C-Band 3.70 to 4.20 GHz.
DENON DN-961FA tray loading CD player.
GENTNER DH III Single line digital phone hybrid.
MARTI CR-10 UHF dual frequency RPU receiver.
ORBAN Optimod 8100A/1 Analog FM audio processor.
ORBAN 8100A/ST Studio chassis (2 available, one with LED meters).
POTOMAC INSTRUMENTS AM-19-5 5-tower antenna monitor.
QEI 691/01 FM modulation monitor/test set.
SYMETRIX A-220 20 watts per channel stereo power amplifier.
UREI LA-4 Compressor/limiter (black face plate).
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Used Equipment List Updated Daily on the Website

Bay Country Broadcast Equipment Inc.
Phone: 877-722-1031 Email: info@baycountry.com
Website: www.baycountry.com

Big "D" Broadcast Exchange

Ampex Model 440C, 2-track reel to reel in roll-around cabinet. $695
Ampex Model PR-10, 1/2-track stereo reel to reel. Needs work. $395
Digicart II random access digital audio reorder. $695 each.
RCA Model BTE-10B, 10 watt FM exciter (tube type). $495
Comrex Model DXP.1 G.722 digital audio codec w/ power supply. $600
Comrex Model 3XP.1, multi-line frequency extender (encoder). $300
Tektronix Model 422, dual trace oscilloscope. $300
Carver Model TX-8, AM/FM tuner. $179
ATI Model DA-1000, 1x8 audio distribution amplifier. $75
dBx Model 760X, microphone pre-amplifier. $125
CBS Model 4450, Audimax, FM stereo AGC. $300
CBS Model 4110, Volumax FM stereo limiter. $300
Studer Model A725, CD players. $325 each.
O.C. White Model 51900, black 29-inch mic arm with riser. $60 each.
Electro-Voice Model 309A, shock mount for RE-20 mic. $50 each.
Electro-Voice Model ELX1-R, rack mount mixer with limiter. $250
Shure Model DFR11EQ, feedback reducer, limiter and delay. $300
Shure Model SM-5B, on-air microphones. $600 each.
Shure Model SM-53, dynamic cardioid microphone. $90
Denon Model DN-950FA, CD cart players. $250 each.
Wheatstone Model A300, 20-channel on-air console. $3,895
Wohler Model AMP-2, audio monitor panel (2RU). $695
Wohler Model VM-2, audio monitor panel (1RU). $250
Audiometrics Model ST-3, studio timer. $40

Big "D" Broadcast Exchange
Phone: 765-935-2443 Email: darrin@bigdmc.com
Website: www.bigdmc.com

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The Pre-Owned Broadcast Equipment Solution

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MARTI CR-10 UHF receiver, tuned to your frequency. $895
MARTI UHF Yagi antenna. $100
ORBAN 8100A Optimod audio processor. $2,700
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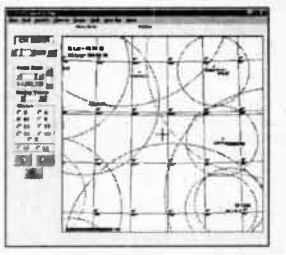

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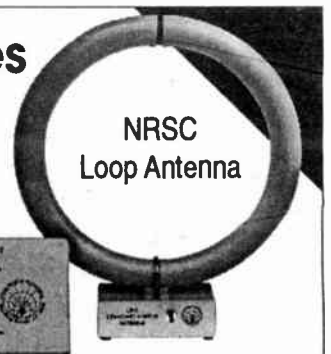

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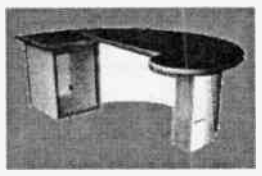

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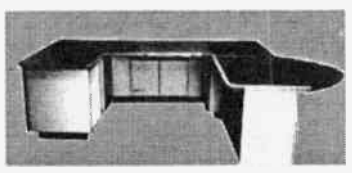

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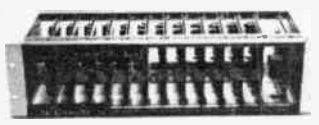

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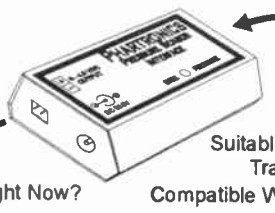

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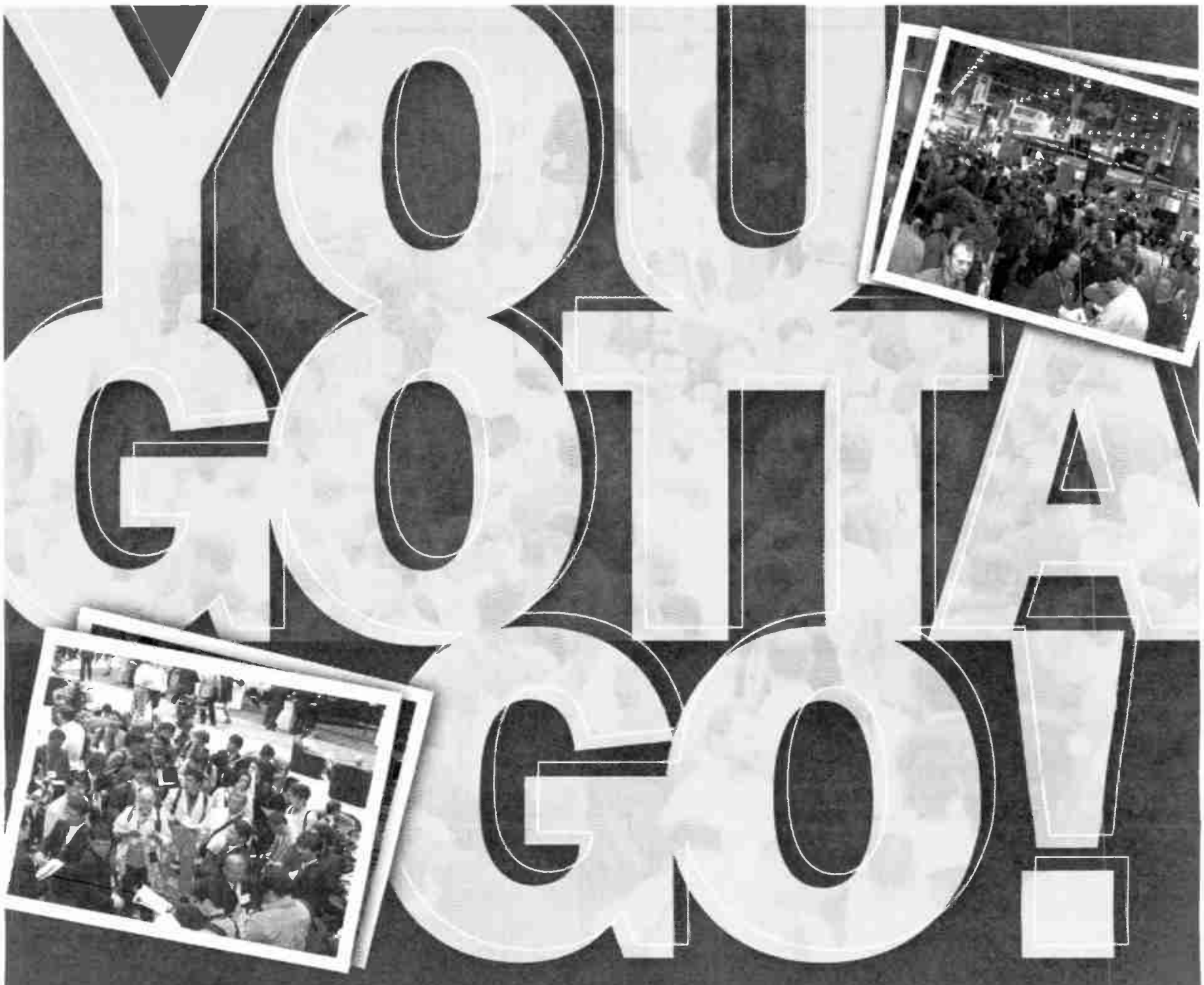

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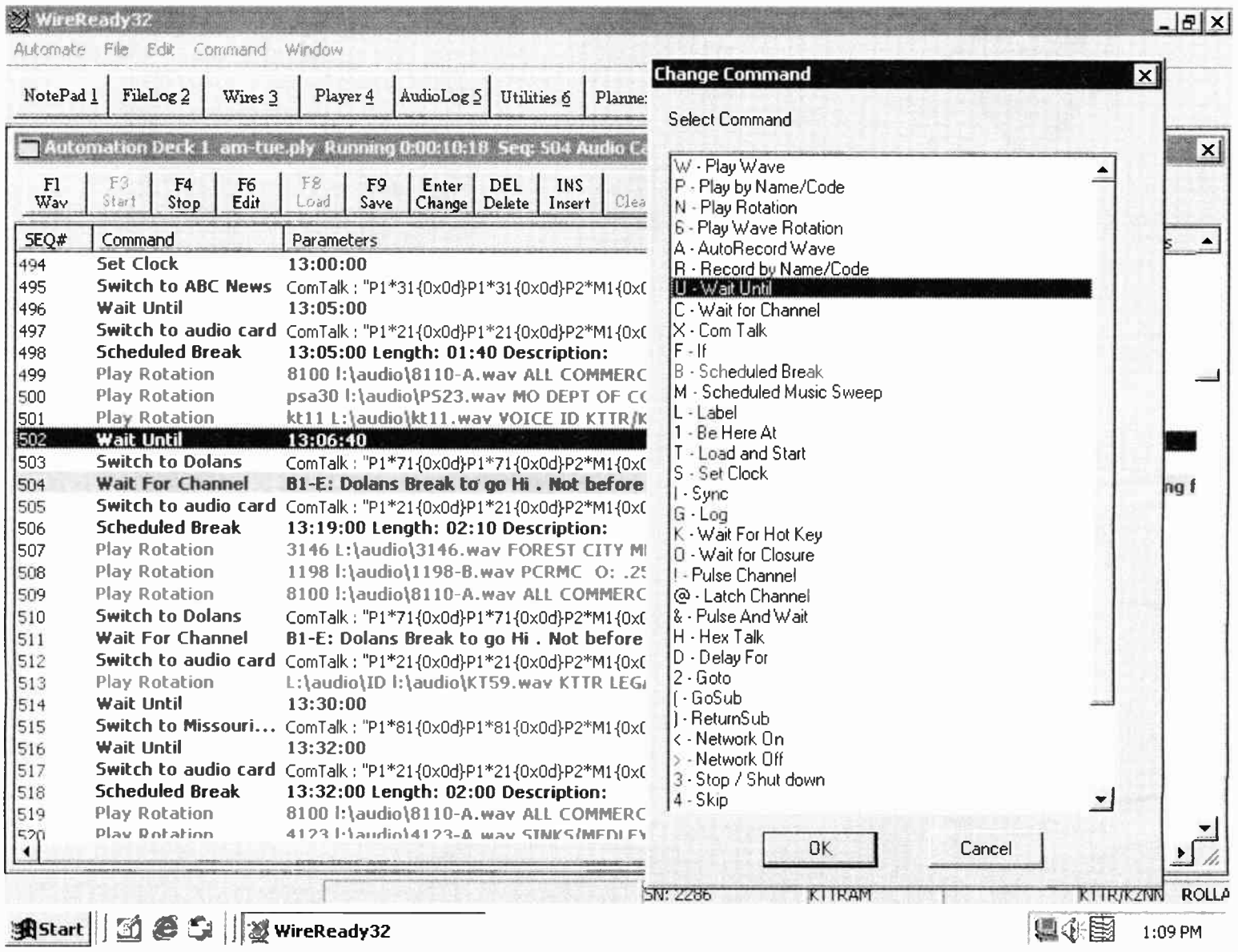

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