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# RadioWorld®



Studio Sessions  
See pp. 17-35

Vol 19, No 2

Radio's Best Read Newspaper

January 25, 1995

## UL Sets Standard For Broadcast Gear

by Thomas Pear

**MELVILLE, N.Y.** Underwriters Laboratories is integrating Standard 1419, a relatively new UL category that certifies the safety of broadcast equipment, into the industry.

The standard is of special concern to station managers and engineers, along with transmitter manufacturers, who claim that broadcast equipment is type-accepted by the FCC and that UL certification is unnecessary and costly.

UL has developed the standard to address safety, which is not the focus of the FCC's type-acceptance procedure. Type acceptance does not mean broadcast equipment is safe from potential fires, electric shock and personal injury hazards, which is the focus of a UL inspection, UL Engineer Tony Bodetti said.

"The FCC does not regulate electrical fire, shock or casualty hazards," he said.

What the FCC does check for when type-accepting a transmitter is whether or not a particular transmitter will interfere with the transmission signal of other transmitters, FCC Engineer George Tannahill said. When asked if the type-acceptance process includes checking for

fire, shock and personal injury hazards Tannahill replied, "It does not."

But federal Occupational Safety Health Administration (OSHA) regulations and state rules do regulate against potential work hazards, and they include broadcasting equipment. Federal law stipulates that employee electrical equipment must be "acceptable to the secretary of labor," according to Richard Thompson of the consulting firm Thompson and Associates, which helps manufacturers prepare equipment for UL certification.

Thompson noted three different ways to make equipment acceptable: sending it to a third qualified party to test; in-house testing, which includes keeping records of all tests; and certification from a nationally-recognized testing laboratory (NRTL) like Underwriters

The equipment inspection issue rose to even greater prominence last summer when a Los Angeles county electrical inspector refused to pass KKLA's transmitter facility during an electrical inspection because the facility's FM transmitter did not have a UL sticker. The question then became "just how far can local governments regulate radio stations?"

Station owners and equipment manufacturers argued that radio is sufficiently regulated by the federal government. Local governments countered that they have the right to protect their residents from possible hazards and fires that could spread and cause property damage.

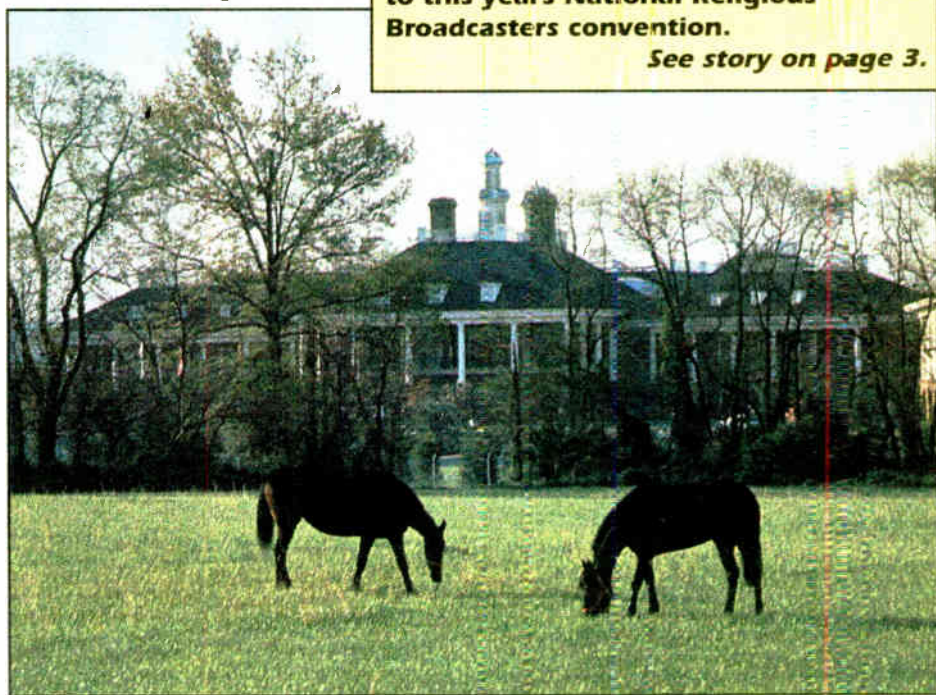
FCC officials acknowledged that state and local governments

have the right to inspect transmitter facilities for compliance to their regulations. "Depending on what the state laws are, they can probably look for anything they want," Tannahill said.

continued on page 10 ▶

**The Opryland Hotel in the cradle of country music, Nashville, plays host to this year's National Religious Broadcasters convention.**

See story on page 3.



## EIA Allocates \$500,000 For New RDS Promotion

by John Gatski

**WASHINGTON** The Electronic Industries Association (EIA) has announced that it will provide \$500,000 to broadcasters in order to further promote the Radio Data System (RDS), or SmartRadio as it is now being dubbed by consumer receiver manufacturers.

Although at press time the EIA had not released details about how the money would be allocated, it is likely that it will be used to equip more stations with RDS encoders—perhaps new stations in the large markets. Receiver manufacturer Denon and the EIA allocated money in 1994 to get stations on the air; many of them were NPR stations. About 200 stations are now on the air. (The actual count could be higher because numbers are based only on RDS encoder manufacturer surveys and stations furnishing the information to RW on their own.)

RDS is a digital subcarrier that enables FM broadcasters to transmit various data streams to RDS receivers, including station call letters, station formats, alterna-

tive transmitter switching, scrolling messages and emergency alerts. The FCC recently endorsed use of RDS technology for the mandated Emergency Alerting System (EAS), citing its ability to automatically turn on receivers and localize alerts.

The EIA believes that the FCC endorsement (not a mandate, however) along with more promotion money given to stations in the form of RDS encoders will solve the "chicken-or-the-egg" dilemma RDS has faced since 1993. Industry insiders believe that RDS' slow growth is the result of broadcasters' unwillingness to invest in RDS equipment until more receivers are on the market. In turn, the receiver manufacturers are not willing to tool up and make more receivers until more RDS stations spur demand for the consumer products.

"This (FCC) recommendation from the FCC should increase the likelihood that RDS/SmartRadio's growth will accelerate by breaking the so-called 'chicken-egg' circle," an EIA press release said.

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# NEWSWATCH

## Broadcap President Steps Down

**WASHINGTON** Broadcast Capital Fund Inc. (Broadcap) recently announced that John E. Oxendine will step down as the company's president on June 30 of this year, concluding 14 years of service as the company's president.

Oxendine, who is also the president of Blackstar Communications, is stepping down from Broadcap to give full attention to Blackstar's acquisition of additional television stations.

An executive search committee was recently established to find a successor to Oxendine.

In other Broadcap news, Lawrence J. Hass started his term as chairman of Broadcap's Board of Directors Jan. 1. Erwin Krasnow began his term as vice chairman and Jeff Baumann started his term as secretary/treasurer.

Baumann is also the executive vice president and general counsel of the National Association of Broadcasters.

## GWU Offers Engineering Courses

**WASHINGTON** George Washington University this year will sponsor a number of continuing education programs geared towards engineers in all aspects of the

communications industry, including radio.

Although a couple of courses will be taught in San Diego and London, the bulk of courses will be taught in Washington.

Some of the course include topics like Integrated Service Digital Network, digital transmission systems, radio frequency spectrum management and modern receiver design.

For more information call Monique Wilson at 800-424-9773.

## NAB's Ferrell, Ramsey Promoted

**WASHINGTON** The National Association of Broadcasters (NAB) last

month announced two key promotions within its government relations department.

DeDe Ferrell was promoted to vice president of Senate government relations, and Kathleen Ramsey was promoted to vice president of broadcast government relations.

Ferrell was previously the NAB's director of House government relations, and Ramsey was previously the director of broadcaster/congressional relations.

## EEA Asks for Pre-emption on RF

**WASHINGTON** The Electromagnetic Energy Association (EEA) recently filed a petition before the FCC claiming that the commission's radio frequency standards (RF standards) should pre-empt conflicting state regulations because state rules hinder the development of communications systems, including new technologies like digital audio broadcasting.

continued on next page ►

When looking for a digital audio system for automation of satellite programming or live assist, there would appear to be many choices. But if you're looking for a system which is flexible enough to give you total control without sacrificing your sanity, there is only one choice. The Phantom by RDS.

You will see the difference as soon as you see the Phantom in action. The display provides you with all of the information you need to see in a clean, concise manner, without the crowded look that you'll find in other systems. If you are familiar with the most popular software on the PC, then you may already know how to use the Phantom. The Phantom's pull-down menus guide you through all of the steps involved in setup and daily operation, from creating and scheduling clocks to creating and editing logs.

## The PHANTOM Digital Audio Automation

The Phantom ends the confusion of automation by keeping everything organized. The Phantom simplifies your daily operations by keeping information such as input changes, voice changes, and clock changes in their own individual schedules rather than in the log. You can leave those liners and other voice drops out of the log because the Phantom will do them for you. The Phantom allows you to date new schedules to begin weeks, months, or even years in advance. When your satellite network informs you that there will be a voice substitution on Thursday, two weeks from today, you can prepare for it *today*.

The Phantom can retime spots to fit them cleanly into a satellite break without inserting silence, overlapping, or running late. The Phantom



can create reports to keep you informed on a number of topics, from a list of expired spots to an analysis of potential mistakes in your log. The Phantom also maintains a history of system activity.

The Phantom has the features that others would want you to believe are theirs exclusively. The Phantom remains *completely* functional during recording, sensing relay closures and starting breaks as easily as it does when it is not recording. The Phantom can fill incomplete breaks with spots from a list you specify without ruining product separation.

While other systems tie your hands and limit your flexibility by only offering 3 or 4 inputs, the Phantom gives you 6 stereo inputs, using its AMX-84 solid state switcher, with the option of increasing the number of inputs to 14 or more. If your station is News/Talk, you know how important this can be.

The Phantom allows you to change the sampling rate, digital format, and stereo/mono settings at will to meet your needs for an individual spot. The Phantom offers a number of digital formats, including the new Dolby AC-2 format, as an option.

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# NRB Show Addresses Key Issues

by Thomas Pear

**NASHVILLE, Tenn.** The staff at the National Religious Broadcasters (NRB) is busy preparing for the organization's convention next month at the famous Opryland Hotel in Nashville.

The convention will feature radio seminars covering topics like EEO (equal opportunity employment) requirements, radio duopolies and recent developments in broadcasting laws.

The EEO session will focus on making broadcasters aware of the EEO regulations and requirements and giving them a better understanding of how EEO regulations work.

"I think the whole thing will be discussed top to bottom," NRB Director of Conventions and Exhibitions Michael Glenn said.

FCC Audio Division Chief Larry Eads previously noted that EEO violations are the number one reason for license renewal challenges and deferments. Broadcasters have also faced FCC fines for "deficient" minority recruitment efforts.

## Discussing duopolies

Bob Lundstrom of Custom Business Systems Inc. is leading the duopolies seminar. Along with a panel from the broadcasting industry, including Don Cartmell of Salem Communications, Lundstrom will discuss duopoly-related complications facing broadcasters.

Recently, the FCC limited the amount of stations that individuals or corporate entities can own nationally to 20 stations, except for minorities who can own up to 25 stations.

The same FCC rules also restrict owners to two AMs and two FMs in markets with more than 15 stations. In markets with less than 15 stations, an owner can own three

stations, with no more than two on the same band, as long as the entire market has a total of at least seven stations (see **RW** Nov. 15 and Dec. 28).

Former NRB president Dr. David Clark, who is also the former Dean of the College of Communication at Regent University in Virginia Beach, Va., will conduct a seminar on how broadcasters can take advantage of the new information superhighway. The seminar will touch on how programming can be sent over Internet and how radio stations can take advantage of the new superhighway technology, Clark said.

Equipment manufacturers will also have a number of technical displays on hand, including the exhibit hall designated specifically for manufacturers.

"As a matter of fact, in this year's exhibit hall we will feature the first designated area for manufacturers," Glenn said. "Over the years, I think we have seen more of an awareness and understanding of how important the technical aspects (of broadcasting) can be, especially with the vast development of technology in the past decade."

As convention attendees enter the exhibit hall's only entrance, they will see the latest top-of-the-line equipment by heading to right side of the exhibit floor, Glenn noted. Companies like Harris Allied, Shively Labs and CCA will conduct product demonstrations.

Harris Allied, for example, will exhibit its digital FM exciter, the Harris DIGIT, which operates with 32-bit precision.

CCA will display a 10 kW FM transmitter and a high performance FM exciter. "I love this show," CCA Sales Vice President Steve McElroy said. "This is a

fun show."

Shively Labs will display FM broadcast antennas along with related equipment like transmission lines, combiners and pressurization equipment, and, of special interest to non-commercial stations, Shively will also display its 6812 circularly polarized translator antenna.

Since FCC rule changes relaxing anti-translator restriction for non-commercial stations, the translator market for non-commercial religious stations "has just been leaps and bounds," Shively Labs Marketing Manager Jon Clark said.

Other manufacturers planning NRB exhibits include: ATI-Audio Technologies; Bext Inc.; Broadcast Electronics; Circuit Research Labs; Crown International; Dalet Digital Audio Systems; Factory Direct Sales; Larcan-TTC Inc.; Radio Systems Inc.; RF Specialties Group/Dalet and Sony.

## Programming

On the programming side, look for demonstrations by SkyLight, NPR Satellite Services and USA Radio Network News.

SkyLight will promote its line of Christian programming, which includes a mix of adult contemporary Christian

music and Standard News.

USA radio network offers a live call-in Christian talk show hosted by Marlin Maddoux, a type of evangelical Rush Limbaugh. Maddoux will conduct his talk show live from the convention floor.

## Other topics

USA's mainstream programming is the USA Radio Network News, a straight-forward hourly newscast comparable to AP News or any other news programming that can be downlinked into stations' programming.

The NRB convention is open to the public for a registration fee of \$490. NRB members can register for \$290 and NRB Associate members can register for \$340. Registration includes NRB general session, workshops, exhibits, an all-media breakfast and an anniversary banquet.

In addition, interested parties can register to attend for specific days through a daily registration. NRB members can register for \$125 per day times the number of days they will attend. Associate NRB members can register for \$150 per day and non-NRB members can register for \$175 per day. The daily registration includes NRB general sessions, workshops and exhibits. It does not include meals, but meal tickets can be purchased separately.

□ □ □

For more information about the convention, call Michael Glenn at 703-330-7000.



# NEWSWATCH

► continued from previous page

Hampering the development of communication technology, says the EEA, interferes with the FCC ability to accomplish its congressional mandate of making communication services widely available.

"The time has come for FCC pre-emption of state and local regulations of RF energy," said EEA Chair Jesse Russell. "Introduction of important new communications services and the continued improvement of existing technologies is on a collision course with increasing state and local activity in the area."

EEA argues that under the Federal Communications Act and the Environmental Protection Act, the FCC has the authority to pre-empt state regulations that hamper the implementation of federal policies delegated to the commission.

The issue of the FCC pre-empting state authority regarding RF regulations falls under the larger issue of how far state and local governments can regulate broadcasters.

Recently, electrical inspectors have been cracking down on stations they believe violate local electrical safety standards (see page 1).

Stations along with the National

Association of Broadcasters (NAB) believe that radio is regulated by the federal government, state and local governments "have no business intruding on broadcast communications," according to NAB Spokesman Doug Wills.

Others, including Underwriters Laboratories, which has written a safety standard specifically for professional broadcast equipment, note that states and localities have the right to protect their citizens against fire, shock and other potential casualty hazards.

## FCC to Auction C Block Licenses Separately

**WASHINGTON** The FCC recently announced that it will auction broadband personal communication service licenses in the C block separately from F block licenses.

The commission will auction the C block licenses (30 MHz) first, and short form applications for C block licenses are due Feb. 28. The C block auction will begin April 17, or 30 days after the close of the ongoing A/B block auction.

The F block licenses will be auctioned off after the conclusion of the C block licenses.

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# Beware of Letters from the Fringe

**WASHINGTON** The letter was post-marked Nigeria, and my name was scrawled in blue ink all over the front of the envelope. I confess, I was curious. As far as I knew, I did not know anybody in Nigeria.

The stationery was imprinted but the paper was that old onion skin stuff my grandmother used to write on to mail overseas letters. Although my name was type-written inside, the letter began, "Dear Sir." And then it said, "Urgent and Confidential Business Proposal."

I was still intrigued but fairly leery of the letter by now. It went on to say that I had been recommended by a Nigerian consultancy as a person of "credibility and capability." The request was so simple. Would I give them my bank account numbers so that they could transfer \$65 million to me?

Someone wanted to deposit \$65 million in my bank account because I am credible and capable? I may be credible, but I'm not gullible, and I certainly do not share my bank account numbers with Nigerians who think I am a sir.

I did share my letter with the U.S. Department of State, and was told these guys are but one of many so-called companies doing business out of Nigeria that try to scam people out of their money.

I figured that these people had gotten my name off of the masthead of **Radio World International**. I soon came to learn that many of you, our readers and writers, were receiving letters from this group as well. It seems they were getting the names from RWI, as some engineers who had written *User Reports* or contributed to stories were also receiving letters

promising big deposits of money.

The State Department warns against doing business with any of these companies. They are only trying to set you up and will wipe you out once they get a hold of your banking information.

This particular company, Sunny Bowen Ventures, goes to great lengths to explain the money is a result of "over-invoiced" contracts, and essentially, the company wants a "reliable foreign company to front as a subsidiary of the original contractor" (you know, the one that got over-invoiced).

In return for all sorts of personal information, the company promises to pay 10 percent of the sum to be transferred into the account—\$6.5 million.

My interest in writing about this in this installment of *Page Four* is simply as an alarm sounder. I have come to learn that there are companies and individuals out there who have responded positively to these letters, and subsequently lost a bundle. Please be very careful, and if someone promises to give you millions of dollars, do not believe them. Send your letter to the proper authorities and let them keep track of the crooks.

★ ★ ★

McCann-Erickson Worldwide's Robert Coen released his evaluation of advertis-

ing expenditures last December. His estimate of the growth in advertising spending in 1994 in the United States totaled \$149 billion—a gain of 7.9 percent compared to 1993.

According to Coen, advertising revenues received a boost early on, partially

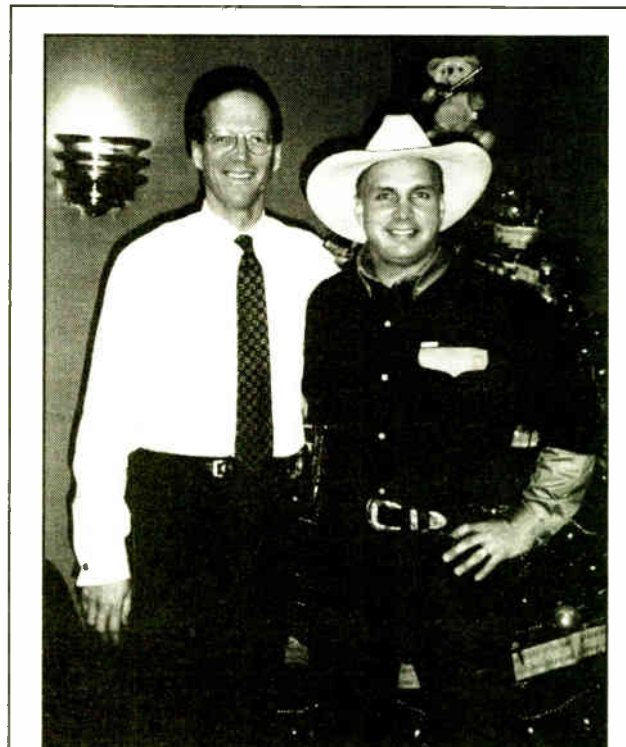
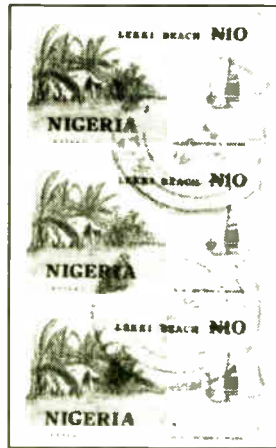
he said, budgets caught up to levels more consistent with "the stage of a post-recession advertising recovery."

What does he predict for 1995—especially in light of a year (1994) in which advertising grew significantly faster than the economy? The extra impetus received from political campaigns and the Winter Olympics will not be present in 1995, so Coen expects "more of the same solid expansion in advertising activity" that occurred in 1994.

Coen expects national advertising on radio to grow by at least 6.5 percent versus 1994, to a total of \$2.5 billion. His outlook for local advertising is even better. Combined, Coen expects to see local and national advertising expenditures in the United States to grow by at least 6.8 percent in 1995, to a grand total of \$159 billion. Sharpen those calculators.

If the overall advertising picture looks good to you, read on for an even brighter report. The Radio Advertising Bureau (RAB) reported November 1994 radio advertising revenue grew at an incredible 16 percent combined local and national. National spot jumped 23 percent over November 1993's figures, and local revenue grew by a consistent 14 percent (local was up 14 percent in October and national, you will recall, grew by 21 percent).

For the period January - November, local revenue grew 11 percent and national at 14 percent. If Coen is right, 1995 should be another banner year for radio.



Garth Brooks stopped by Westwood One Radio Networks during the holidays for an interview on the Westwood Country Radio Network, about his latest album *The Hits*, a collection of his chart-topping singles. He is pictured here with Kirk Stirland, senior vice president/Affiliate Relations.

fueled by the Winter Olympics and primary election activity, particularly in the broadcast media. Overall, Coen believes that the U.S. recovery was delayed in 1993 due to uncertainties about the then-new Clinton Administration, but in 1994,

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Get ready for unattended operation that doesn't hiccup when a source drops out. The Burk LX-1 Stereo Audio Selector offers 6 audio channels in a 1 rack unit switcher that's ideal for remote studio control and EBS operations. With individual channel control signals, main and loop outputs, plus line mixing, the LX-1 is the versatile choice for new studio designs.



The LX-1 will run loops around traditional alternatives like patch panels and relay switchers. With configurable line levels, 100 dB isolation, and common mode rejection that exceeds 110 dB, the LX-1 can actually improve your air chain quality. And the LX-1 is especially easy to interface with existing studios and a variety of remote control configurations, including those from Burk.



Place the Burk LX-1 in your audio chain and you're getting the best mix of features, reliability, and performance. All at a price that truly pushes the right buttons for the 90s. Stow the old patch cords away. And take the first step toward putting the LX-1 to work for you. Call Burk Technology at 1-800-255-8090

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James Koehn was named president and chief executive officer of Marconi Instruments Inc. He joins Marconi from Tektronix in Beaverton, Ore., where he served as vice president. Koehn joined Tektronix in 1980 and held a variety of posts there. He holds a B.S. in Engineering from the U.S. Naval Academy in Annapolis, Md.

Ronnie Pohler was named sales manager of Marti Electronics. Prior to joining Marti, Pohler worked as international sales engineer for Broadcast Electronics, who purchased Marti in September 1994. He joined BE in 1988 as an RF customer service engineer. Pohler will be based in Cleburne, Texas.



# READERS FORUM

If you have comments for Radio World, call us at 800-336-3045 or send a letter to Readers Forum (Radio World, Box 1214, Falls Church, VA 22041 or MCI Mailbox #302-7776). All letters received become the property of Radio World, to be used at our discretion and as space permits.

## AM for the Micros

Dear RW,  
A lot of excitement was generated two years ago regarding the expanded band. But the list only has 79 stations and many of those will probably be driven to bankruptcy because of engineering and construction costs.

The only station in the six New England states to get a 1600 kHz-plus spot already has a history of financial problems and silent periods.

If the main purpose of the expanded band is to reduce interference, then I am sure that the people of Bangor-Brewer, Maine, are planning a Main Street parade next summer in celebration that the 1200 frequency will be vacated in about five years.

Most of the FCC procedures and decisions have followed logic and the public interest, but this one totally mystifies me.

The expanded band was a wonderful idea. But it should have been used for lower-powered stations (like mine) to equalize themselves with higher power stations in the same market.

But now I have an even better idea. Because the FCC recently relaxed ownership rules resulting in the rich getting richer and powerful voices becoming more powerful, then to balance things, the FCC should award expanded band licenses to people or groups who currently do not have any broadcasting financial interest. In other words, let the pirates play.

Perhaps one or two thousand licensed stations at 50 watts would allow people who do not have abundant finances to broadcast. Presently, average Americans are increasingly being excluded from station ownership.

These stations could sail financially if the FCC would permit similar-to-TIS stations (traveler info stations) short stick transmitters. This idea in a different form

has been done before... it is called CB radio.

Bob Bittner, Owner  
WJIB(AM) Cambridge, Mass  
WKBR(AM) Manchester, N.H.

## Paying homage

Dear RW,  
Thank you for publishing Lynn Christian's article on Mitchell Hastings and the other pioneers who made such an enormous contribution to the growth and development of radio.

Too often we get so involved in the day-to-day challenges of this exciting business that we fail to acknowledge the legacies of those who came before us.

Who knows, if it was not for their vision and dedication, all of us might be shining shoes.

Bill Clark, Chairman  
Shamrock Broadcasting, Inc.

## Give locals a chance

Dear RW,  
Let me weigh in with an example and an opinion about WOWO(AM) and the entire question of localism versus clear channels.

Until October 1994, I lived in Moorpark, Calif., just a few miles from Thousand Oaks where KMDY(AM)—now KCTQ(AM)—is located. The station was a Class 1B clear which operated at 850 kHz. The station broadcast local news, sports, information and a pretty decent comedy format.

But at night the station could barely be heard in the city of license (much less 10 miles away). Why? Because KMDY had to protect KOA in Denver, which came in just fine at night.

Because KMDY could not remain financially viable, it was bought out. Initially, it was formatted into a Spanish language station, but now it is no more than a satellite pass-through of an Orange County, Calif., station.

I am here to tell you, this runs contrary to any logical notion of "public interest, necessity and convenience," or localism, and it is just plain stupid.

Why should the people within the Thousand Oaks/Conejo Valley area be denied their local source of information just to protect some station from Denver?

With all of the lip service paid to "localism," there is no reason other than financial protectionism why the old dinosaurs should not be downgraded to let small stations serve their communities.

Brett E. Miller  
Miller and Associates  
Santa Ynez, Calif.

## More on Jingles

Dear RW,  
I thoroughly enjoyed Ken R.'s article about radio jingles and their history. However, I would like to add to the genealogy of the radio jingle, and it starts at the beginning.

The first radio station to use music as a program identifier was WNEW in New York. Although there were two

# Electric Shock

RW has been following the battle between electrical inspectors and radio stations here at home. Now, the European Community joins the fray of regulators who will impose certification codes on equipment—in this case, equipment imported into the EU (see story, page 6).

Yes, local governments have the right to protect their citizenry, and in this country, Standard 1419 spells out just what protections are needed.

In the U.S., it is no longer an issue of "if" but rather "when" does all this compliance have to be in place, what is the fine if it isn't, and who will enforce the codes?

The time is ripe for the SBE and the NAB to jump in and try to control the discussion with U.S. regulatory agencies, or at least help ease the certification process and take steps to help broadcasters before certification becomes a bigger problem. An information service from NAB or SBE that stations could tap into explaining type-acceptance and FCC regulations to local officials would be a nice place to start.

How about working with the certification entities developing standards sheets and forms to help manufacturers certify their equipment at the least amount of cost—thereby saving broadcasters money too?

Although top market stations can boast revenues in the millions, the majority of stations exist outside those metropolitan boundaries. The increased price of buying a newly-certified transmitter may delay or indefinitely postpone a small market station's decision to buy new gear—thus prolonging the life of old and potentially unsafe equipment.

Where is the safety in that?

—RW

"Make Believe Ballrooms" on the air, (Martin Block in New York and Al Jarvis in Los Angeles), the nation's first all-night radio program was aired on WNEW in 1935. It was the legendary "Milkman's Matinee," and had a theme song recorded by Tommy Dorsey with Edith Wright on vocals (later by Les Brown).

WNEW also pioneered the shortened form of the radio jingle with artists recording the station identifier in the style of their popular songs. Nat Cole, Les Paul, David Rose, the Mills Brothers, among others, all recorded these jingles (that were later re-aired on the station when Jack Thayer was general manager). I cannot tell you how thrilling it was to push the button and hear those vintage jingles come out of the monitors.

These jingles were later replaced by the familiar eight-note signature known all over the world.

We also should not forget "Jumpin' with Symphony Sid," whom I had the opportunity work with.

For all my fellow graduates of this now defunct pioneer radio station, I felt I had to set the record straight.

Marty Wilson, President  
WXCT(AM) Hamden, Conn.

*Editors note: Jack Thayer passed away in late December. He was 72.*

## Sins of Omission

Dear RW,  
I always find your publication both interesting and packed with useful knowledge. I can only tell you that the Dec. 14 issue was no exception.

I take difference with only one small sin in Mr. Peterson's fascinating article on useful terms for engineering, and that's the sin of omission.

I find that in dealing with decision makers, whether station owners or managers, a useful term is the "FF Factor." The definition of this is "Furlong's per Fortnight" and the rest is self-explanatory.

This term is applied when one is trying to get a manager off of dead-center and into making a decision, a mode known as "inertia."

This method uses verbal persuasion and is generally considered to be much more humane than a nasal pack of either C-4 or Semtex.

J.I. Sorensen  
Cottrill and Holland Inc.  
Ft. Lauderdale, Fla.

## Help Identify Cable

Dear RW,  
I read with great interest John Bisset's *Workbench* article in the Oct. 19, 1994, issue, "Avoid Headaches by Labeling Cables."

I would like to point out that many microphoned cables are available in colored jackets. These can then be used to identify different lengths—say three-footers are red, 10-footers are blue, etc.

Then it is easy to pull the right length of cable out of a box. In fact, you can often use the color code of the wire to indicate length, such as 10-footers are in black (because black is "0"), 20-footers are in red (because red is "2") and 50-footers are in green (because green is "5").

Beldens standard 8412 microphoned cable, for instance, is available in four colors and our 1192A "quad" cable is available in six.

Stephen H. Lampen  
Advance Technology Marketing  
Manager  
Belden Wire and Cable  
Richmond, Ind.

# Radio World

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**Next Issue of  
Radio World  
February 8, 1995**



# European Rule To Affect U.S. Manufacturers

## Equipment Must Meet EMC Emission Rules To be Imported into EC Countries

by Yasmin Hashmi

**LONDON** In just under one year, a directive will come into force that will affect virtually all broadcast products sold in Europe, from microphones to transmitters.

In a bid to protect the consumer by controlling the electromagnetic environment and to guarantee free trade to manufacturers by ensuring harmonized standards, the Council of the European Communities issued a directive in 1989

on electromagnetic compatibility (EMC).

This concerns emissions and immunity and applies to almost all electrical and electronic devices or products being manufactured in, or imported into, the European Union (EU). With a lot of U.S. manufactured broadcast equipment imported here, companies are starting to pay attention to the upcoming standard that goes into effect Jan. 1, 1996.

### Consumer protection

In general terms, the directive applies to products that have an intrinsic function intended for the end user, which means that unfitted circuit boards fall outside the requirements of the regulations, whereas apparatus supplied in kit form will not.

The directive states that equipment should not produce excessive electromagnetic disturbance nor be susceptible to it when the apparatus is properly installed, maintained and used for the purpose for which it is intended.

This not only covers RF interference but also spurious signals conducted along the main network or connection cables.

There are a few products that are exempt from the regulations, such as equipment designed to study or test electromagnetic disturbance. However, the most notable exceptions are perhaps the largest generators of electromagnetic disturbance—namely monopoly corporations such as the railways, telecoms and power-generating and distribution utilities.

With the growing use of electrical and electronic equipment, the problem of electromagnetic interference is increasing at a considerable rate and raises issues of safety, reliability, warranty and consumer confidence.

As an example, many airlines now prohibit passengers using electronic devices during take-off and landing, while other

examples include radio interference causing anti-locking braking systems to operate in cars travelling at high speed, or the factory in Japan, where two operators were killed by robots which went out of control. The list goes on.

### One year away

The EMC directive was to take effect in 1992; however, this time scale was found to be impractical. A transition period was therefore adopted, and the EMC directive now becomes mandatory on Jan. 1, 1996.

After that date, all products must comply with the directive and carry a CE conformity marking. In the meantime, manufacturers have the choice of complying with existing national regulations or complying fully with the directive, which already guarantees free trade within the EU.

Eventually all new products, albeit designed before 1992, must comply with the directive if they are to continue to be sold from 1996, although enforcement will vary from one European country to another.

In the U.K., for example, enforcement generally will be complaint driven, which has led to suggestions that some manufacturers may use this against the competition. Those failing to comply can have their offending products prohibited or withdrawn from the EU market and can be faced with a heavy fine or even imprisonment.

EMC standards cover two main categories of equipment. The first is residential, commercial or light industrial, and the second is industrial.

The process of generating and harmonizing EMC standards has been subcontracted to the European electro-technical standardization organization, CENELEC, and, in the case of telecommunications equipment, the European Technical Standards Institute (ETSI). The two main classes of standards that exist are product specific and generic; the latter to be used only when product-specific standards are not available.

There are three ways in which manufacturers can demonstrate compliance: The first is self-declaration of conformity with reference to a recognized standard either applied in whole or in part. This can be done by testing in-house, hiring test equipment or using a third-party test laboratory.

The second is to produce a technical construction file (TCF) that includes details such as a product description, photos, wiring diagrams, EMC, shielding and technical rationale. It must be submitted to a competent body for approval. The TCF could be used where no appropriate standard exists and was designed to help those who make large installations or systems with a large number of variants.

The third method is to use a type examination procedure, which is required for some classes of equipment such as radio transmitters.

### Different alternatives

According to the Department for Trade and Industry (DTI) in the U.K., overseas manufacturers who self declare conformity must have their declaration signed by someone in the EU. This can be either an authorized representative or the person who imports the new or used equipment.

continued on page 8 ►

### Question:

Ever wonder why transmitter manufacturers operate Altronic dummy loads at NAB and other trade shows?



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World Radio History

## FCC Debates Satellite Radio

**WASHINGTON** With what could be the blessing of Chairman Reed Hundt, the FCC was scheduled to discuss whether or not to allocate spectrum for satellite digital radio at the Jan. 12 commission meeting.

At issue is Docket 90-357, under which the FCC said it will address with regard to the establishment and regulation of new digital audio radio services (DARS).

The commission could allocate spectrum, seek further comment or even table the topic.

Among the points that could be debated is whether or not radio services have the right to surpass local stations and broadcast directly to listener, regardless of the Federal Communications Act that says radio is a "local medium."

Four companies have petitions before the FCC seeking authority to distribute digital satellite radio. They are Satellite CD Radio, American Mobile Satellite Corp., Digital Satellite Broadcast Corp. (DSBC) and Cue Prime.

They argue that regional and national satellite broadcasting will not infringe on the markets of local broadcasters because they rely on different revenue bases.

Hundt noted at a Networked Economies luncheon last fall that broadcasters have been on a crusade to stop DARS because broadcasters feel threatened by potential fierce new competitors.

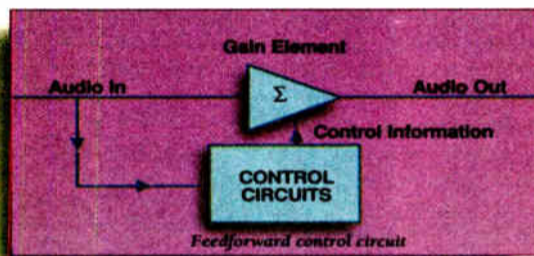
But at the World Media Expo Hundt made it clear he sees satellite radio as a viable lane on the information superhighway.



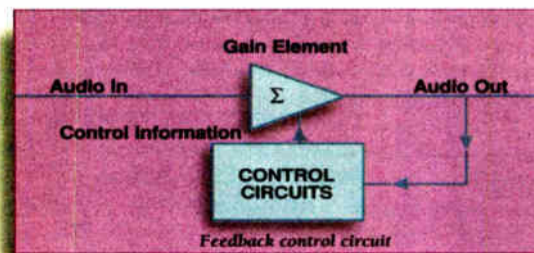
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*A Jeffries*

ANDREW JEFFRIES  
PROGRAMME DIRECTOR  
THE ALLIGATOR 90-100 FM  
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World Radio History



# Truck Knocks Stations Off the Air

by Eric L. Odell

**BEND, Ore.** It was supposed to be a routine delivery. But routine quickly changed to disaster for five FM stations, the U.S. Forest Service and KTVZ-TV in Bend, Ore.

On Dec. 8, 1994, a United Van Lines truck drove up to Awbrey Heights in Bend to deliver KQAK-FM's new CCA transmitter. While passing the tower of the U.S. Forest Service, however, the truck driver said he felt a tension pulling at his truck. The truck had snagged a guy wire attached to the top section of the 200 foot tower. The column twisted and then col-

lapsed. All of the stations were off the air two hours until power could be restored.

KQAK's on-air personality, Rick Evans, summed up the event's impact: "We call it Black Thursday here at the station." While the destruction took place in less than a minute, repairs may take months. According to Keith Clinton of the Deschutes National Forest Supervisor's Office, the accident completely destroyed the forest service tower. "The tower was absolutely destroyed," Clinton said. "As the mast bent, it twisted into a heap on the ground. It will have to be totally replaced."

Clinton said the forest service is operat-

and fire fighting for the whole Deschutes National Forest. The steel column held a microwave dish and several antennas using four frequencies for internal use.

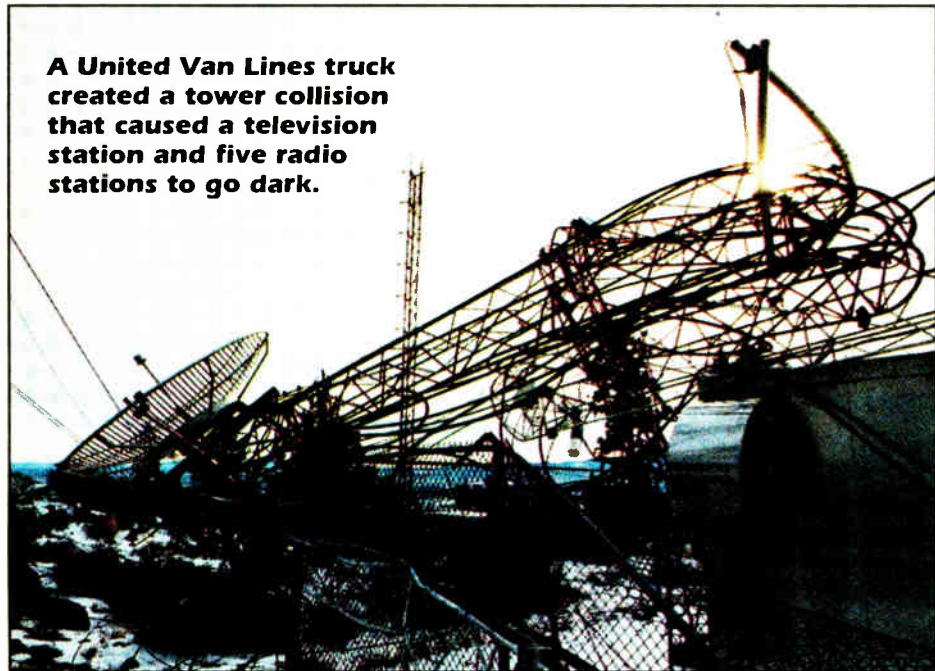
Although the tower for KTVZ-TV is currently running at 100 percent, repair on damages could also take many months. Chief Engineer Ernie Pendergraft said of the top section of the 150 foot structure.

Initially, gusty winds kept engineers from thoroughly inspecting the damage. Tower riggers retreated after climbing 85 feet up the mast. "The wind was blowing so hard we weren't sure if it would stay up or not," Pendergraft said. "We could see the metal flexing and the paint popping off."

A structural engineer from the tower manufacturer, Stainless Tower Inc., flew in from Seattle, to help assess the damage. An extra guy wire was stretched from the top section of the column and tightened until the tower was almost straightened. A 10-foot strongback was then U-bolted above and below the bend in the structure.

According to Pendergraft, these measures were only a temporary solution because two 20-foot sections and one 10-foot section in the top third of the column will have to be replaced. Repairs will be delayed until late spring, however, when weather conditions improve. Furthermore, the sections to be replaced will have to be custom-made by the manufacturer, which will take months to complete.

While KTVZ-TV's tower was on the brink of collapse, it is ironic how the column managed to stay up. As it turns out, the FM radio station which was having its CCA transmitter delivered by the moving company also rents space on KTVZ-TV's tower. KQAK has its six-bay antenna bolted to the outside section of the KTVZ-TV tower. As the back leg of the column buckled, Pendergraft said the rigidity of the FM antenna on the opposite side kept the structure from falling all the way over.



**A United Van Lines truck created a tower collision that caused a television station and five radio stations to go dark.**

Diane Kuplinski, photo chief of The Bulletin, Bend, Oregon.

lapsed.

As the forest service tower came down it crashed into the guy wires of the neighboring KTVZ-TV tower causing its top section to buckle over 10 degrees. To make matters worse, the guy wires of the falling tower landed across the main power line cutting off electricity to KTVZ-TV and five FM radio stations (KQAK, KNLR, KLRR, KICE, KTWS).

ing on a backup system that is limited in frequencies and not quite as far reaching as the one that went down. "If the backup system goes down, we would have nothing."

Ideally, the forest service would like a new tower up and running by the first of May when fire season begins. The destroyed radio tower served as the main communication link for law enforcement

## EMC Rules To Affect U.S. Exports

► continued from page 6

In either case, they must add their name and address to the declaration of conformity, thereby taking legal responsibility for the product. Fortunately, the exceptions to this include importation into the EU for the purpose of re-exportation and the display of the product at trade fairs and exhibitions.

When specific standards may not currently exist for relatively small-quantity products such as studio equipment, manufacturers are faced with a decision as to whether to go through the pain of redesigning to generic standards now, or waiting until newer, more appropriate standards have been developed.

However, as far as official guidelines are concerned, manufacturers should already be incorporating the EMC directive into standard working practices and should be investigating appropriate standards and deciding on their applicability.

□ □ □

Yasmin Hashmi is European co-editor of *Radio World*.

For further information contact the following organizations:

BSI Standards Information Centre in the U.K. at telephone: +44-181-996-7111; FAX: +44-181-996-7084.

U.K. Department for Trade and Industry at telephone: +44-171-215-1408. U.K. Radio Communications Agency at telephone: +44-171-215-2129; FAX: +44-171-928-7027. CENELEC, rue de Stassart 35, 1050 Bruxelles, Belgium.

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World Radio History



# UL Sets Standard for Broadcasters

► continued from page 1

An Underwriters publication written by Bodetti said that "the need for third party inspection is indisputable" and cited cases where improperly installed broadcast equipment caused fire and shock hazards.

Before Standard 1419, radio and television broadcasters complained that local inspectors were looking for certification from a NRTL during inspections, but no nationally recognized laboratory existed for certifying broadcast equipment. This created a dilemma for broadcasters trying to find a simple way to comply with OSHA regulations without incurring the additional cost of con-

sumer product certification.

Prior to Standard 1419, UL-certified broadcast equipment was listed under commercial or household UL categories,

"racks and racks of equipment" that were difficult to verify as safe, Bodetti said. "They (inspectors) have a large burden on them to verify that the equip-

## UL has developed the standard to address safety, which is not the focus of the FCC's type-acceptance procedure.

which has more stringent requirements and higher evaluation costs.

Local electrical inspectors unfamiliar with the broadcast industry said they were frustrated because they found

ment is safe," Bodetti said.

In other cases, inspectors found bare rooms when inspecting transmitter facilities, which, after inspections, were later installed with unevaluated racks of

equipment.

In 1989, a number of manufacturers and broadcast industry workers approached UL to persuade the non-profit organization to include broadcasting supplies in its certification process in a less costly fashion.

In 1992, meetings between UL and the broadcast industry produced the special category, which cuts broadcast equipment evaluation costs 50 to 70 percent, according to the UL. The standard certifies equipment with the special UL insignia, assuring electrical inspectors that the inspected equipment meets certain UL safety requirements.

"If they see a UL sticker on the product, they will not question the product," Bodetti said.

UL 1419 sets special safety standards for power-operated radio and television broadcast equipment handled by trained personnel under conditions of controlled access.

Bodetti said "the (broadcast) industry came to us" to help enable broadcasters to pass local electrical inspections.

### Broadcasters wary

Still, some broadcasters and manufacturers said they are being overregulated.

"It's just another something we have to go through," said Steve McElroy, sales vice president for CCA, a manufacturer of transmitters. McElroy also noted that his company's transmitters are built to National Electrical Code standards and believes that a UL inspection is unnecessary. "We have probably already met anything UL would propose," he said.

KKLA Chief Engineer Mark Pallock said eventually the National Association of Broadcasters (NAB) will have to step into the issue on broadcasters' behalf. Although the NAB acknowledges the right of federal safety regulators to inspect stations, the association is wary of letting state and local municipalities into the broadcast regulatory picture.

"We believe state and local governments have no business intruding on broadcast communication," NAB Spokesman Doug Wills said. NAB Engineer and Director of Technical Conferences John Marino said the NAB is taking a wait-and-see approach because so far disagreements between radio stations and local inspectors have occurred in a "few isolated cases."

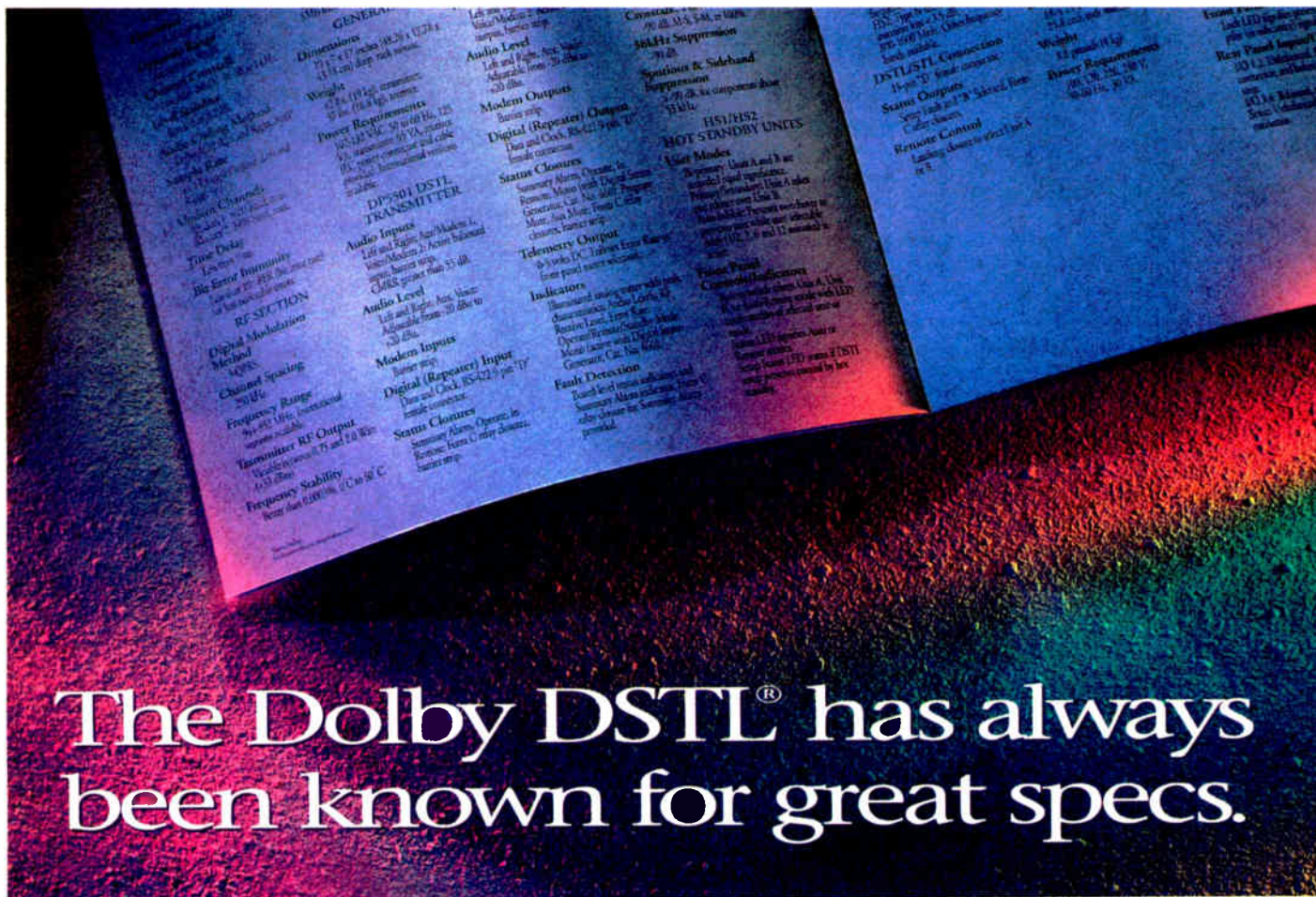
But clashes between local inspectors and broadcasters are increasing. KKLA's sister station KPRZ in San Diego also failed an electrical inspection when three Arrakis consoles it owned did not have UL stickers, and an electrical inspector tried to require Washington station WUST to get UL certification for its Nautel transmitter.

All three stations managed to pass inspections, but other stations, especially in Los Angeles where the city mandated UL 1419 for broadcast equipment the same year the standard came out, also are facing thorough electrical inspections from local governments demanding equipment certification from a NRTL.

"In many municipalities, local authorities are visiting installations, and they are finding that some of the equipment may not be certified," Bodetti said.

Previously, broadcasters and manufacturers expressed concern that requiring broadcast equipment to be certified by a national laboratory inflates equipment cost, an argument which UL denies.

continued on page 11 ►



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FEEDLINE

# Don't Panic, AM Arrays Are Fixable

by W.C. Alexander

**DALLAS** Those engineers that spent their careers building, tuning and nursing DAs have, in large part, retired, leaving a new generation to try and figure out what's going on. Those of us who remain have to sink or swim, and we may well find ourselves drowning when our usually well-behaved am array suddenly gets out of whack.

**Walk, don't run**

Rule number one in this situation is *don't panic*. The tendency is to grab phasor controls and try to correct the situation immediately; this is the wrong thing to do. Don't touch anything until you have enough information to make an educated decision of what to do.

Let's assume that one or more of the parameters as shown on the antenna monitor are at variance with their proper values. Start by making a note of the proper values on a piece of paper with the values as read on the monitor alongside. In this way you can quickly see what parameters are at variance. If only one or two values are out of whack while all the others are normal, there is a good chance that the problem is with the sampling system or monitor and the array is functioning normally.

As a rule, when something changes in an array due to a component malfunction, all the parameters are affected to some degree. This is because of the mutual coupling between the array elements. If you crank the phase of one tower out a couple of degrees and touch nothing else, you will probably see some change in all the other phases, ratios, base currents and common point resistance/reactance as well.

**Don't touch anything until you have enough information to make an educated decision of what to do.**

When one of our engineers calls saying that something is wrong with his array, I always start by asking him if the common point impedance has changed. If it hasn't, we start with the antenna monitor.

If this is the case with your array, you can check the monitor by swapping inputs to the monitor. A common failure mode in some antenna monitors is a stuck or open relay. The mercury-wetted relays in these units should be trouble-free and long-lived but they tend to wear out over time. I have replaced scores of them over the years. When a relay sticks, it may

cause all the tower readings other than the reference tower readings to be incorrect.

To check for this, disconnect all inputs but the reference tower, then connect one of the other tower sample lines to each of the other inputs in turn. You should see the normal indication of phase and ratio for the sample line being used as it is moved from input to input. When you come to a channel where you do not get the correct readings, that is the one with the bad relay.

If there is a stuck relay, it tends to load the other channels so while the phase readings may be normal during this procedure, the ratio readings will often be low for all but the channel with the defective relay.

Occasionally, antenna monitor sample line terminating resistors can become damaged by arcs or lightning strikes. The symptom will be a very high ratio on one of the antenna monitor channels. Check these resistors with an ohmmeter. The detector diode in your antenna monitor is one of those "future failure components" to watch out for. Usually this diode is a germanium type, very prone to damage from lightning. If this happens, hopefully it will open completely. The symptom of

this condition will be a significantly changed loop reference setting on the reference tower. If you have to crank that control more than half a turn to get 100 percent on the loop meter, suspect the detector diode.

**Faulty sample line**

Another possibility is the faulty sample line. You can check your sample lines by running an open circuit/short circuit impedance test on them. This will give you the characteristic impedance and approximate electrical length of each of the lines. You can also bridge the sample lines open-circuit at a quarter-wavelength resonant frequency to determine exactly the electrical length. The best way to check sample lines is with a time-domain

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# UL Sets New Industry Safety Rules

▶ continued from page 10

"The cost of UL investigation is not going to increase the price of a unit significantly," UL Media Relations Associate Teresa Hrones said.

Underwriters Laboratories said it inspects one sample of the company's submitted equipment and, if it passes inspection, the entire line receives UL certification and a sticker. This creates a one-time only inspection for the manufacturers.

The lab also gives "family authorizations," where similar types of broadcast equipment with the same basic components are certified after the most sophisticated piece in the series passes a UL inspection.

"The features may be different, but the power supplies and the safety critical components are all the same," Bodetti

said. "We can cover them under one investigation as a family of listings."

The problem for manufacturers, QEI Sales and Marketing Manager Jeff Detweiler said, is that transmitters broadcasting at different power levels do not share the same components. With different size plate-transformers and high voltage capacitors, each require a separate inspection.

Detweiler also said that when UL makes inspections, the organization runs equipment and then destroys it. QEI transmitters cost between \$24,500 and \$55,000, and the company would likely pass on the costs of losing those samples to broadcasters, he said.

"We would have to add about \$1,800 to \$3,000 per unit," he said, noting that transmitter manufacturing is about a \$9 million industry that cannot afford to lose

expensive transmitters in safety tests.

Hrones disagreed with Detweiler. "We can do non-destructive test," she said. "We know these transmitters cost a significant amount."

Underwriters Laboratories even does field tests where inspectors evaluate broadcast equipment by performance in a natural working environment, Hrones said, noting that this type of testing, obviously, is "non-destructive."

## UL to Give Seminars

**MELVILLE, N.Y.** Underwriters Laboratories (UL) is offering seminars throughout the country to help broadcasters understand and comply with UL 1419, a relatively new UL standard certifying broadcast equipment for safety.

"As part of our ongoing effort to educate the industry regarding our requirements," UL Engineering Group Leader Tony Bodetti said, "we have tried to go out and give presentations and seminars..."


The seminars discuss the history of UL 1419, UL requirements, the UL product submittal process and different UL services like field evaluations, UL follow-up services, and the universal recognition of UL listing.

The follow-up services program includes four unannounced visits to make sure manufacturers with UL-certified product continue to adhere to UL standards, UL Media Relations Associate Teresa Hrones said.

The equipment testing laboratory visited the 1993 World Media Expo to give a seminar, and Underwriters also gave a presentation at the National Association of Broadcasters (NAB) show a couple of years ago.

Currently Underwriters is considering attending this year's NAB show, but at press time the 95's seminars were not yet scheduled.

Radio World will keep readers abreast of seminars as they are scheduled.




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# FROM THE TRENCHES

by Alan Peterson



## Last-Ditch Techniques To Make You Look Good

Dear Luci,

Heyyy, it's another New Year! That means the usual winter tower ice-ups, slow first quarters and competing stations squirting water into the locks of each other's remote vans to keep them from getting to live broadcasts. Normal winter fun.

Trouble is, it is also the time when budgetary considerations sometimes force the issue of staff cutbacks, with only the cream of the crop (or suck-ups to the boss) remaining on the payroll. This means the best, brightest and most indispensable standouts are spared... this time.

So how does one get a seat on a Titanic lifeboat and ride out the wave of layoffs and firings? Countless publications on management and networking are available to explain equally countless procedures, but Luci, the method I think works the best is making yourself look like a genius.

The secret is to maintain a special bag of tricks that gets pulled out only when the earth is about to spin into the sun and burn, and the only hope of rescue is you. It takes a little expertise, some common sense, dramatic acumen and the showmanship of P.T. Barnum, David Copperfield and Star Trek's "Scotty" rolled into one. Take computers for instance...

We've all been called in to save some-

one's career when a DOS-running PC clone burps. Could be the wrong directory, the wrong filename, or the printer plug came loose. Simple stuff. But if the operator isn't DOS literate, knowing a few simple commands leaves you smelling like a rose (one well-fertilized with the following BS).

Type TREE to get a directory list. That alone gets a "gosh" response. Say "hmm, okay" out loud. Type MEM for a cryptic-looking display (which merely shows how memory is being allocated). Nod and say "okay let's dig," and open DOSSHELL. Once here, pick a file randomly and F9 it. This should allow you to look at the code that makes up that file... quite meaningless to me and you, but boy, does it ever look slick.

Cursor down a few lines, point anywhere on the screen and ask incredulously, "what's that doing in there?" Shake your head, exit DOSSHELL, sit and sweat for a few moments and sketch meaningless little logic circuit diagrams on scrap paper. By now, people are gathering around the comatose computer waiting to see if you'll be able to save their jobs. Of course you will; simply open the correct directory, reach behind the computer to tighten the printer connection, then use the right EXE command to start the program. *Voila*, you are a god.

Dishonest? Not at all. You already got

the job, now you're just saving the day. It's only slimy if you charge your general manager any bucks for this dramatic performance. A more lasting impression is made if you make a Jack Webb exit ("just doing my job, Ma'am") and leave them wondering where that burst of brilliance came from.

By the way, this works on DOS-based hard drive commercial storage systems too, when a jock enters invalid info and panics. Extra drama is added if you "repair" it just seconds away from the stopset: This is what always made Scotty the hero on classic Trek.

Ever "save" a music cart that jammed and pulled eight inches of tape out? Pinch the tape close to the feedout side, give it a moderate tug and let go right away. The hub spins and the tape is magically swallowed back inside the cart, ready to be recued. Jocks can't believe this even when they see it. Save the song, save the day.

My favorite "genius" tale involves Bob Shotwell; then chief engineer of WHMP Northampton, Mass., who saved a remote broadcast (and the buy) with some ingenuity after a Marti whip broke and couldn't be used. Bob asked the station boss, "just how badly do you want this broadcast to happen?" When assured it was absolutely imperative, Bob walked over to the boss's automobile, did a fisherman's "about-this-big" measurement with his hands to size up a critical length and clipped off the boss's car antenna to the length of the Marti whip. The remote happened, Bob was a genius and the boss didn't know whether to shake his hand or gut and field-dress him.

I wouldn't necessarily endorse butchering the boss's car to accomplish the goal of looking like a genius (especially because you might be wrong), but it is nevertheless one of those moments of ingenuity that proudly declare "See how lucky you are to have me here!" when it's layoff time.

Admittedly Luci, nothing guarantees a job will be kept, but an edge is an edge is an edge and if any gesture of selfless heroism (real or manufactured) has gone noticed in the past year, it may be the sal-

vation that continues the paychecks.

There are dozens of examples where others have looked like geniuses and "rescued" their jobs and their stations. I invite anyone who's successfully pulled it off to drop me a note and share the story. After all, we all need an edge right now and this way we can all be heroes.

Gotta go now, the dam broke.

- Al

□□□

Alan Peterson writes from WNNK-FM, 3400 North Sixth Street, Harrisburg PA 17110. In December, Alan was welcomed as a new SBE member...clearly not for his knowledge of DOS.

# 65 Years Ago

Reprinted from Radio World (February 22, 1930).

Editor's note:

The RW of old, printed for a time in the 1920s and 1930s and today's RW are unrelated except in name.

## JOB ASPIRANTS FOUND LACKING IN KNOWLEDGE

By RUDOLPH L. DUNCAN

It's about time that the myth of easy radio men be exploded. The idea that mere radio knowledge immediately qualifies one for a position of wealth and affluence is just as foolish as expecting the graduate of the law, engineering, medical or journalistic school to attain fame and fortune overnight. Education is only the first, albeit very necessary step; hard work, constant application, and a specialized training, constitute the second and decisive step.

Radio and allied industries are more anxious than ever before to obtain qualified radio trained men. But it is well to note that they are looking for men with qualifications other than ability to handle soldering iron and pliers, or again the ability to handle a simple home-made radio set.

No Longer an Experiment

Radio today is no longer an experiment: it is a serious industry. With business running into hundreds of millions; with millions of sets to be produced each year; with hundreds of millions of capital and hundreds of thousands of workers, radio no longer can tolerate the handy man of pioneers memories.

Recently I had an opportunity of looking over the calibre of men applying for radio positions of trust. It is appalling to note how few men really know radio.

Operators Deficient, Too

Even radio operators who have been at sea for years, with many hours of leisure time each day in which to study, show a woeful lack of modern radio knowledge. Many cannot answer simple questions readily answered by our young students. Rather than bemoan the lack of good positions, many of our so-called radio men would do well to take stock of their radio knowledge.

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## ROOTS OF RADIO

# Radio Pioneer Fred Waring Remembered

by Read G. Burgan

**LAKE LINDEN, Mich.** Fred Waring died on July 19, 1984. But he has not been forgotten. And his influence extends even to those who have never heard of him.

One example is contained in a recent clipping sent me from the Star Gazette of Elmira, N.Y., detailing how 115 former musicians and singers for Fred Waring's Pennsylvanians met in East Stroudsburg, Pa. to rekindle their memories. They came from 28 states. Ninety-



Radio pioneer Fred Waring

one-year-old Leonard Kranendonk, who had been a featured bass soloist from 1938 to 1981, traveled 1,000 miles from Florida. One thousand people crowded the East Stroudsburg High School to hear the performers sing many of the Waring arrangements. I wish I had been there.

## One of the first

Waring was a radio pioneer. WWJ of Detroit carried some of his very first broadcasts. During the early years of radio, Waring's Pennsylvanians were heard 15 minutes a day, five days a week under the sponsorship of Chesterfield Cigarettes beginning in 1939 and extending to 1944. His show originated from the Vanderbilt Theatre in New York and he treated his studio audience to a one-hour show at the conclusion of every broadcast. For five consecutive years his program was named the "Best Quarter Hour Program" by newspaper radio editors in the United States and Canada. During the '30's and 40's Waring's Pennsylvanians were a staple on network radio including CBS and NBC, and his sponsors included the Ford Motor Company, Chesterfield Cigarettes and General Electric.

Fred was born in rural Pennsylvania on June 9, 1900. A teenage birthday present forever shaped his life: A banjo. With his brother Tom at the piano, and boyhood friends Poley McClintock on the drums and Fred Buck on another banjo, he formed a group called the Banjazzatra.

As freshman engineering student at Penn State in the early 1920s, the Banjazzatra, now called the Collegians, booked a prestigious engagement at the University of Michigan. Even though

they were only a backup band, the crowd went wild. Soon the Collegians were booked for a month solid. Waring dropped out of Penn State, changed the name of his group to the Pennsylvanians, and earned an international reputation.

## Fame and longevity

For several decades, Fred Waring and his Pennsylvanians were a household word. What made him so popular? Why was he different from all the other popular musicians of the '20s, '30s and '40s? For one thing, quality. Waring was a perfectionist. The Waring blend was perfection musically personified.

When he first decided to try a radio broadcast, he rented a sound studio for several days and cut about 200 transcriptions. He was determined to present the best possible sound to the radio audience. All of this was for a single broadcast emanating out of Cleveland, Ohio. But the Herculean effort was a success. Old Gold Cigarettes sponsored his first series of radio programs beginning in 1933 on the CBS radio network on Wednesday nights.

Then the Ford Motor Company picked up his sponsorship in 1934 and by 1935 he was heard on both CBS and the Blue Network. By the time Waring was a national success in 1933, small radio stations all over the country began producing their own Fred Waring programs using phonograph records of his group. To stop them, Waring didn't make another record for 10 years.

Later he had a daily half-hour morning program on NBC sponsored by Johnson's Wax that was probably the highest priced daytime program of its time, costing \$18,000 for the orchestra alone. This program received numerous awards.

In 1949 Waring made the transition to television. Many successful radio personalities floundered when they attempted to bring their shows to TV. Not Fred Waring. Following the same methodical approach to details that made him a success in radio, Waring hired a young Bob Banner to be his TV producer. Banner, who produced the Gary Moore Show, understood the differences between radio and TV.

## Radio with pictures

Radio required little more than the Pennsylvanians singing interspersed with Waring's engaging comments. TV required full-blown skits akin to mini-broadway productions. Elaborate sets, lavish customs, plenty of action, creative camera work and frequent guest stars including Jessica Tandy, Hume Cronyn and Celeste Holm insured a large audience for this weekly Sunday evening program. Surviving kinescopes of his TV programs show a remarkably innovative and sophisticated program for its time.

After five years, Waring quit his weekly TV program, opting for occasional specials.

Waring was quick to recognize new talent, and many professional musicians and singers were first showcased on Waring's programs. They included choral director Robert Shaw, guitarist Les Paul and movie stars Rosemary and Priscilla Lane. Waring's Lumpy

Branahan, whose Little Orley stories entertained young and old alike, went on to become Mr. Greenjeans on Mr. Roger's Neighborhood.

Throughout the years many Miss America's traveled with the Pennsylvanians. His soloists were singularly talented. Gordon Goodman's soaring tenor voice was a featured Waring attraction for 22 years. Jane Wilson's melodic soprano voice enchanted radio and TV listeners for years.

Waring was an innovator. In a 1931 stage production he equipped every member of his chorus with a megaphone, creating a non-electrical amplifier. In the 1960s, he championed the Cordovox accordion, featuring accordionist Betty Ann McCall. At that time the Cordovox included two unwieldy suitcase size units filled with vacuum tubes plus the 24-pound accordion, interconnected with a cable several inches in diameter. He even invented the Waring blender.

## Surrounded by talent

Amazingly, this college dropout was even an educator. Waring's real forte was choral music. He took the popular music of several generations and turned it into lush choral arrangements and seemed to surround you and take you out of yourself. He surrounded himself with extraordinary arrangers, including Roy Ringwald, Hawley Ades, Harry Simeone and Livingston Gearhart. His Shawnee

Press arrangements have been used by high school, college and church choral groups for at least five decades.

Beginning in 1945, Waring established an annual summer music workshop at Delaware Water Gap, Pa. The Waring Music Workshop developed into a hotel-size dormitory, dining room, rehearsal and lecture halls and even included state-of-the-art recording facilities. Each year more than 10,000 choral conductors, teachers and others attended the workshops to learn the Waring technique.

One of Fred's concerns was that people be able to understand the words of the songs. To that end, he created a technique he called, "tone syllable." In his method of enunciation, the group sang every component sound in every word in a carefully defined unison. Choral directors around the world adopted his approach to choral music.

Waring educated through his music, too. He delighted in interspersing classical music in his concerts and records. Almost always in a way that would entertain while still maintaining the dignity of the original piece. But he could have fun with a serious selection. And he was not above creating words for classical numbers that never had any. Waring once stated, "I always felt that the static presentation of 'long hair' material could be enhanced with lyrics."

Liebestraum and The Nutcracker Suite were two of the most successful classical pieces to which Waring added his own words. Rigid musicologists may have cringed at some Waring arrangements, but tens of thousands of Americans had

continued on page 14 ►

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# How Well Do You Know Your AM Array?

► continued from page 11

reflectometer (TDR). These devices are generally available for rent, and many tower riggers now have TDRs in their shops.

Sample loops can cause trouble, with welds and insulators breaking. Sometimes high winds can blow loops around so that they are no longer properly oriented. A sample loop should be positioned so that it is perpendicular to the tower face behind it. A good way to check loop alignment is to stand at the tower base and look up at the loop—if positioned properly, the loop should line up with the guy wire.

## Inspect loops

Inspect the loops up close, looking for corrosion, loose connections and hardware, etc. Most loops attach to the sample line with an N- or UHF-connector of some sort. Check these connectors for water, corrosion, etc. There may be a copper strap or braid used to jumper from the connector to the open end of the loop. This strap can easily break loose from the loop. Be sure that it is well bonded to the metal of the loop.

Toroidal transformers can, from time to time, cause problems when used in a sampling system. Some are prone to arc internally when their output is unloaded. While sample lines should always be terminated in the load resistors in the antenna monitor, it is possible that enough voltage could develop at the tower end of

a long sample line to allow an arc to occur. If a transformer is suspect, swap it with one from another tower (any but the reference tower) and see if the problem disappears.

The most suspect indicating instrument in any radio station is the base current ammeter. These instruments lie like a slick politician. From the moment they leave the factory their calibration becomes suspect. Vibration, magnetic anomalies, temperature, humidity, insects, moisture—everything—affects their accuracy. Toroidal current meters can also lie, but they are more reliable than thermocouple meters. If everything else is okay (antenna monitor parameters and monitor points), suspect one of the meters.

The very best way to keep base current meters accurate is to use one meter at all the towers, carrying it to the towers and plugging it in when needed and storing it in the controlled environment of the transmitter building when not in use. This can be done with either type of meter.

A likely cause of a high monitor point reading is an anomaly at or in the vicinity of the point itself. Re-radiators and other factors beyond the station's control can influence the field strength at a monitor point. If you find a point high, don't adjust anything. Measure five or six points on the radial and see how they compare to the last full or partial proof. If they are in, you can assume the array is

in adjustment and the monitor point itself has become unusable. §73.158 specifies the procedure for changing the monitor point on a radial.

## Needing adjustment

If the entire radial is high, the array may be out of adjustment, even though the array parameters are all within adjustment. This can easily occur in arrays with very tight nulls. Before you start cranking, though, it is a good idea to put the array in the non-directional mode and look at five or six points along the radial both ND and DA. Compare the ratios with those in the last full proof. It could be that a conductivity change is responsible for the high readings and the array is in adjustment.

From time to time, parts do fail in directional antennas. The most common failure component is the mica capacitor. I

always suspect them first, but they aren't always the problem.

A symptom common to component failure is heat. Shut the system down and immediately but carefully touch all the components in the phasor and ATUs. Some components may be warm but none should run hot. Suspect any hot component. Look at all the coils for discoloration caused by heating. Loose hardware can get red hot under current, causing oxidation and an intermittent connection. Look for leaking capacitors as well.

If you have an RF bridge on hand, use it to measure the reactance of any suspect components. If you aren't fortunate enough to have a bridge at your disposal, you can use a capacitor checker. Many stations have the old-style "magic eye" capacitor checkers lying about.

□□□

*Cris Alexander is director of engineering for Crawford Broadcasting in Dallas, Texas. He can be reached care of RW.*

# Waring Remembered For Pioneering Work

► continued from page 13

their first exposure to serious music through his concerts.

Fred Waring was proud to be an American and took every opportunity to prove it. Irving Berlin's "Give Me Your Tired, Your Poor" based on the Emma Lazarus poem on the Statue of Liberty was a frequent number in Waring programs, concerts and records. He produced at least three LPs dedicated to American themes. Roy Ringwald's *The Song of America* may well be the pinnacle of those albums. A musical saga, it chronicles America's history from the landing of the Pilgrim's to the death of Abraham Lincoln.

It was released on both the Decca and Capitol labels. His last patriotic album, *America I Hear You Singing*, was a combined effort with Frank Sinatra and Bing Crosby. Waring himself wrote several patriotic songs, including *Where In The World But In America*, *Army Hymn* and *The Flying Marines*.

Waring always loved an audience. Year after year he took his *Pennsylvanians* on grueling tours of America's heartland, often covering 150 cities. During the radio years, his program originated from towns and cities all across America. I first heard him in concert in Salt Lake City on Jan. 26, 1963. He was at his peak. These were his mature years. He was tall, erect, gray haired and just slightly pudgy. His voice was both authoritative and engaging. His humor was pleasant, sometimes wittingly sarcastic.

Precisely at 8:30 the lights dimmed. Then after a slight pause, he instruct-

ed the person in charge of the spotlights to turn one on those who were still filing into their seats in the now dark auditorium. "We made it all the way from New York on time. Couldn't you make it from your home a few blocks away?" he teasingly asked the now embarrassed latecomers. "Does anyone here know this bald man?" he asked when the spotlight



Fred Waring's Pennsylvanians

singled out another hapless person. "He's apparently lost his way."

Then the spotlight was extinguished and the first strains of "I Hear Music" softly wafted through the auditorium. It was a night of magical music that I will forever remember. As always, the evening ended with the equally soft refrain "Sleep."

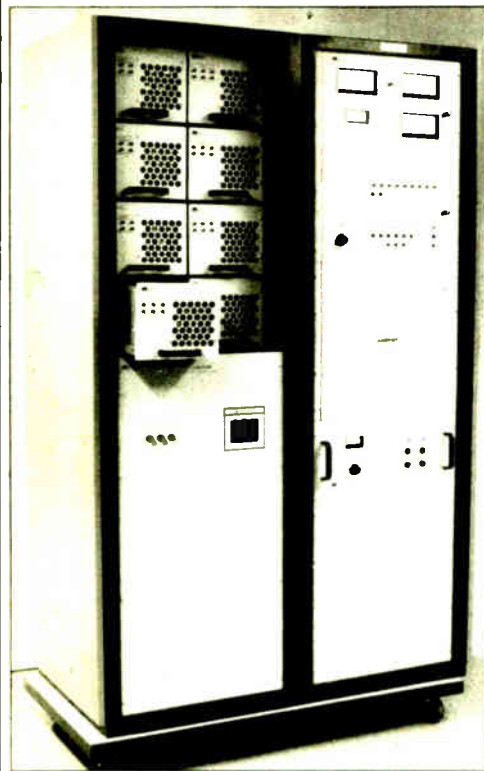
Fred Waring's *Pennsylvanians* no longer tour the country and his program has been off the air waves for more than 40 years. But the quality and excellence of his life and music continue to shape American music through the teachers and conductors who studied at his workshops and listened to his music on radio and records.

I still hear music. And the music I hear is that of Fred Waring and his *Pennsylvanians*.

□□□

*Read Burgan is a writer, producer and photographer and a former radio station manager. He can be reached at 906-296-0652.*

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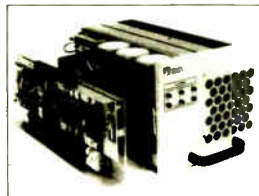
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**PRODUCT EVALUATION**

## Headphone Choices from MB Quart

by Doug Fearn

**POCOPSON, Pa.** MB Quart is a German manufacturer of headphones, loudspeakers, and car stereo components. I recently evaluated two models of MB Quart headphones—the top-of-the-line QP 400, and the more utilitarian QP 75X. These two products share a couple of characteristics: they are very comfortable to wear and they are well-made.

This is a dynamic headphone that carries a retail price of \$299. High-quality plastic materials are used for the ear cups and band, with a velour-like material

where the headphones contact the user. The QP 400 headphone is light, about 11 ounces (without cable), and probably the most comfortable headphone I have ever tried. It is not the sealed type and the isolation from outside noise is virtually nil.

Suspended with elastic cords, the earpieces are free to swing in any plane to accommodate the user's head. The elastic cords are well protected and all but hidden. A "Y" cord connects the two earpieces to a 3-meter (about 10 feet) flat cord that terminates in a beautiful gold-plated quarter-inch stereo plug.

A samarium-cobalt magnet is used, and the manufacturer specifies the frequency response at 14 Hz to 24.1 kHz, but with no indication of the flatness within that bandwidth. The impedance is 300 ohms and they are said to accept a continuous input of 100 mW for 93 dB output. Much of the information is in German, and I was not familiar with their distortion measurement specification. But that's not

400, I felt they were decidedly lacking in bass, but after using them over a period of days, the low-end response seemed to improve. The high-end is quite brilliant and reasonably clean, while the mid-range is very pleasant and easy to listen to.

The lows are comparable to other headphones of this type: they are there and sound fine, but I felt it does not move the

air like a loudspeaker or a sealed-type headphone. The QP 400 will play as loud as anyone concerned about preserving their hearing would want. The character of the sound does not change as the level is increased.

If you are in the market for a headphone of this type, you should listen to a variety of brands and models and pick what sounds best to you. The QP 400 should definitely be on your audition list.

The QP 400 would be used most often for critical listening and monitoring. Its lack of acoustic isolation could present

problems when used near microphones and might not be the best choice if rapid head movement is anticipated. The light weight and minimal pressure makes it easy to dislodge from the ears. But if you want to sit back and enjoy the music, the QP 400 will sound terrific and you might even forget you are wearing it.

the spectrum is somewhat restricted compared to the QP 400. Also, the mid-range is not as un-colored as the QP 400.

That's not to say that the QP 75X does not sound good. It is a fine choice for rou-

time monitoring, studio use (if not operated at high volume near microphones), casual listening, and other less-demanding situations.

Only time will tell how the headphone would stand up in heavy usage, but it seems well-made and sturdy. A three-year warranty (on all models) suggests that the manufacturer has faith in its products' durability.



The QP 75X shares many traits of the more expensive QP 400.

**Product Capsule:**  
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**MB Quart QP 75X**

	<b>Thumbs Up</b>	<b>Thumbs Down</b>	
✓ Comfortable, secure fit	✓ Better acoustic isolation	✓ Three-year warranty	✓ Somewhat "colored" mid-range
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really what's important—how they sound is.

I listened to the QP 400 on a variety of material and was favorably impressed. The sound was comparable to my AKG K-240DF headphones, but not identical. I felt the AKG sound was a bit "faster," but the QP 400 sound was "rounder." Interestingly, when I first put on the QP

Also dynamic headphones, with neodymium/boron magnets and polycarbonate diaphragms, the QP 75X has a molded quarter-inch plug at the end of its 10 foot cord. The published specs are similar to the QP 400, but the 75X does not have the spacious and open sound of the more expensive headphones. The lows are fine, and the highs reasonably clean, although the range at both ends of

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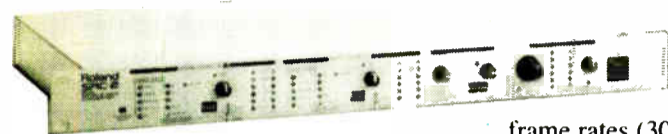


PRODUCT EVALUATION

# Roland SRC-2 Is a Flexible Tool

by Rich Rarey

**WASHINGTON** In your studio setup, you may have a number of digital recorders, workstations, etc. that use differing sampling frequencies. This can create a quandary if you need to convert these digital sampling frequencies so that these various devices can "talk" to each other. Or maybe you need a simple, two input digital mixer? Or you need a way to accomplish both tasks.



Roland SRC-2

The Roland SRC-2 dual sample rate converter may be the right tool for the job. With its ability to digitally mix two distinct digital audio formats into a converted digital output, the SRC-2 is sensibly priced at \$2,000. Further, the SRC-2 accepts a variety of sync sources, including international video sync standards, which will be a welcome feature in post-production houses.

Audio workstation users could plug the SRC-2 output into their workstation, and speed production by sample rate converting audio before it enters the workstation (users would also get a "free" digital input by doing this—essentially a 2-by-1 digital submixer).

The burden of connecting/disconnecting each piece of digital gear to the one house converter would be halved; connect any two pieces of digital gear to the SRC-2's inputs and leave them connected. Selecting the output source "A" input, "B" input, or a converted mix of both is easy from the front panel controls.

Studios and radio stations will find the one-rack unit SRC-2 handy for adjusting digital levels during recording or even for simple mixing, such as from a CD player (using the optical TOS link) and audio from digital tape.

## The input section

In our tests at National Public Radio, we found the SRC-2 front panel controls easy to use, easy to see, and straightforward in operation. Each digital input has a stepped gain control from -18 dB to +18 dB, with an LED indicator when the gain is set to other than "0 dB" (unity). Below the gain knob is a four-switch DIP cluster where switch 1 selects WIDE or NARROW "capture range," switch 2 engages a DC CUT filter that cuts audio below 15 Hz, and switches 3 and 4 select the input digital format: the XLR connector (AES/EBU), "Coaxial" (The IEC-958 SPDIF), or optical (EIAJ CP-340 TOS link). Two vertical strips of six LEDs show Left and Right channel input levels, and if the GAIN is cranked up too much, you'll be rewarded with steady red CLIP LEDs.

According to the SRC-2 manual, a WIDE capture setting will accept any clock from 28 kHz to 54 kHz, and a NARROW setting will lock only when the clock is at 32,44.1 or 48 kHz (+/- 0.2 percent). Once the four input DIP switches are set, the SRC-2 quietly detects and displays the incoming sample frequency, emphasis, protection bit, and if the

incoming data stream is 24 bits long (20-bit audio sample, plus 4 auxiliary bits).

Although the SRC-2 accepts 24-bit data, according to the owner's manual, none of the subcodes (four bits of the audio sample word and four auxiliary bits) will be output. When the SRC-2 locks to the input, the UNLOCK indicator extinguishes.

## The output section

The output section is more complex than the input, only because of the myriad of synchronization selections requires some consideration. Three video frame rates (30, 29.97 and 25) are front panel selectable, and the SRC-2 automatically adapts the video signal format (NTSC, PAL, SECAM or other "house" video format) to its sync needs.

Audio professionals will find the WORD CLOCK synchronization setting handy when converting to the "standard" clock frequencies, such as 32 kHz, 44.1 kHz, or 48 kHz (+/- 0.2 percent). Such WORD CLOCK data output is available from several professional DAT recorders, and when connected to the SRC-2, the recording DAT selects the output sampling rate by sending the appropriate clock frequency to the converter. The SRC-2 SAMPLING RATE control then has no effect.

The last sync choice is "INPUT A," where clock is derived from the digital signal connected to the "A" input. This setting is useful for a "hands-off" conversion, where users may want to convert a digital signal on the "B" input to the clock rate of the "A," and the users might not have access to a WORD or VIDEO sync to accomplish the process (especially handy if the SRC-2 is remotely located and the "A" input frequency is periodically changed, or is a "WIDE" frequency).

What is an appropriate sync source? Why even bother with sync? These questions would deserve a text book-length discussion, and I'll delve into that someday. But we found using the simplest sync source seemed to work the best. In conversion tests, we connected a Sony 7010 DAT recorder ("the source") into the SRC-2, and connected the SRC-2 output into another Sony 7010 ("the destination").

In our first conversion test, we used no synchronization at all; each device used its own free-running oscillator. The result was terrible. The destination DAT recorded glitches that ruined the recording. We switched the destination DAT into EXTERNAL sync, and configured it so that it would use the incoming digital audio for synchronization. This time, no glitches. We realized that when the destination DAT's capture is set to NARROW, a clock rate variation of as little as 88 Hz could cause glitches.

For the remainder of our subjective tests we always linked the destination DAT to the SRC-2, so that the two devices synchronized their clocks. We successfully connected the 7010's digital WORD output to the SRC-2, and the DAT then con-

trolled the SRC-2's clock rate; convenient and trap-resistant indeed, because we needed only to select the desired sampling frequency on the DAT to make a recording, and we didn't even need to know what the SRC-2 input clock rate was. An unlabeled green LED indicates the SRC-2 has locked to the sync source.

According to the signal flow diagram in the owner's manual, the mixing of the "A" and "B" inputs are accomplished after the inputs have been sample converted to the output clock rate, and just before they are "blended." The master output level and the levels of "A" and "B" inputs are controlled by a concentric two-knob assembly; the inner knob controls output level, and the outer ring knob controls the level balance between "A" and "B". This is perhaps the most awkward, but most important, control on the SRC-2.

While each knob is mechanically independent—and they do move smoothly without sticking to each other—it is cumbersome to try to adjust both "on the fly." Two separate level controls for "A" and "B" inputs would have been more tidy.

The output level "ATTEN" (attenuator) smoothly fades left and right channel levels from "unity gain" to "infinity," and should suffice for all but the most sensitive fade outs.

According to the user's manual, the balance control's center detent position sets "A" and "B" level to -3 dB; turning the balance toward "A" increases the "A" level to unity while decreasing the "B" level to infinity.

A six-switch DIP cluster controls less-used output features, such as Type I/Type II (AES/EBU or SPDIF, Optical), Emphasis, Protect Bit for Type II outputs, Peak Hold (Peak indicator LEDs persisting or lasting one second), and CLIP SENSitivity (lights when any one sample reaches maximum level, or lights when three consecutive samples reach

the maximum level).

An OUTPUT SOURCE selector feeds the sample rate converter to the outputs, or the "A" or "B" input can be selected to directly feed the outputs. In the "A" or "B" positions, all digital processing is bypassed, and the digital format at the selected input is fed to the same-format output connector.

It's unfortunate that the three SRC-2 digital outputs cannot be used simultaneously; the user must choose between activating the AES/EBU (XLR) output, or the coaxial (SPDIF) and optical outputs; otherwise the SRC-2 could be used as a convenient universal converter/distribution buffer.

## Sound quality

In making our subjective listening tests on the SRC-2, we found (not surprisingly) that a one-pass conversion from 48 kHz to 44.1 kHz didn't perceptibly change the sound of the original; but we wondered what the result would be if we took the results of one pass, and converted it three more times? When would audible digital artifacts appear?

To test our conversions, NPR Engineer Michael Schweppe provided two of his master DAT recordings that contained music material that we thought would sufficiently test the conversion process.

To summarize the test, it took two complete passes from 44.1 kHz to 48 kHz to 44.1 kHz and back to 48 kHz to cause audio artifacts, and those consisted of a slight increase in noise. One more pass back to 44.1 kHz revealed more noise, some harshness and imaging artifacts. But again this type of testing was extreme,

## Summary

While digital artifacts may be present when using any sample rate converter in such an extreme way, the Roland SRC-2 not only performed well in real world studio conditions with excellent audio, but we found that its easy, flexible controls fairly begged us to test it to the limit.

Overall, the SRC-2 is a quality, useful digital tool that would be welcome in any audio or video studio.

Rich Rarey is technical director for National Public Radio's "All Things Considered."

**Product Capsule: Roland SRC-2 Dual Sample Rate Converter**

 <b>Thumbs Up</b>	 <b>Thumbs Down</b>
<ul style="list-style-type: none"> <li>✓ Flexible studio tool</li> <li>✓ Easy-to-use</li> <li>✓ Excellent sound</li> </ul>	<ul style="list-style-type: none"> <li>✓ Awkward balance/output control</li> </ul>

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# Sweetening the Mix for Broadcast

Last in a series

by Mike Joseph

**KANSAS CITY, Mo.** In article number two, we discussed the general issues surrounding the presentation and/or capture of live music events for broadcast, and took a look at several simple ways to get live music on the air.

In this article, we'll concentrate on the "most correct" of the options: assembling a dedicated mixing stack to capture it the way you want it.

## The right split

Ideally, the following approach is preferred for any stereo mixing (whether live-to-air or captured-to-tape), or serious multitrack recording: Put someone on a separate console far away, with his or her own intercom station, in an acoustically treated environment (truck or room). Listen in on a good set of monitor speakers. Let him set levels, adjust compressors and fiddle with the EQ specific for your recording/broadcast goals, not compromised for the sound reinforcement mix.

This guarantees real-time, high quality mixing and monitoring results away from the performance area. There is just no way to get it completely right without full control, as it is going down, in an environment where you are able to hear what you are doing.

To make your audio equipment function as an extension of the sound reinforcement system's stage microphone package, get yourself a good two or three way transformer splitter, with ground lifts. These can be rented or borrowed from any number of sound reinforcement company or remote broadcasting support outfits. Use the same mics on stage that the sound system operators normally would, augmented by some higher quality units (condensers, DI boxes) for overheads or keys. Use lots of compressors, but don't use them too much.

**If, however, you captured the music to tape, then the fun world of final production is just beginning.**

Why are mic splitting transformers required on each and every mic channel? Generally, you want total electrical isolation from the other audio systems. The monitor console on stage is probably running on the same AC power leg as the FOH (front of house mixing system), whereas your mixing console won't be, and shouldn't be, if you're doing it right. The power leg that the PA system is on is being modulated by one bazillion watts of amplifier juice, all dancing in sync to

the rhythm of the kick. You don't want your gear riding those surges.

Unfortunately, this probably also puts you out of polarity. AC power phase-wise, so you really need the isolation. Ground loops between pieces of gear getting power from different locations cause hum, buzz, and opportunistic light dimmer SCR/triac noise. You can definitely hear junk like that on tape or over the air, noise that you would never notice live when the band is cranked-up.

Improper loading of a mic fed to two or three simultaneous boards alters the microphone's spectral response, reduces output level and increases distortion, all due to capacitive and inductive effects and output voltage division (meaning less drive level). These are bad things. And yes, it happens between two boards also, such as the PA company's on-stage monitor and FOH consoles, if they don't use a buffered or transformer isolated split.

Many get away without them, or will even stand there and argue that they are not required. Chalk it up to ignorance on their part, plus that fact that a full-tilt-boogie PA system is not a laboratory microscope for precision monitoring, the way a studio or home stereo system can be.

Another thing to keep in mind when dealing with on-stage microphones is that only one board can phantom power a condenser mic or active DI box at a time. Which board? It should be your record-

ing/mixing console. Transformer-isolating the other consoles keeps your 48 VDC off of their mic inputs, which are probably active transformerless to begin with.

What happens if you don't follow this transformer isolation rule? Well, ever wonder why your mic level drops suddenly? Maybe somebody hit an input attenuation pad on their less-expensive board, or switched on their phantom power while yours was also on.

Want to see DC offset and the CMRR go out the window? Don't use transformers and passively "Y" cord-split the mic feed three ways while adding phantom power!

## Post follow-ups

If you've taken the mix live-to-air, and all your pre-production panned out (meaning: the inserts were the right length, the on-air jocks knew their stuff, and the matched phone lines, Switched 56 or STL didn't crash), all that's left is to get the mud off the cables and go home.

If, however, you captured the music to tape, then the fun world of final production is just beginning. If your tapes are stereo, you may be in a position to massage some general levels, slip in a little corrective equalization (most often needed to put the low end in the right "slot," as monitoring bass frequencies in a field environment usually leaves much to be desired) and pick the keeper takes before you edit and assemble. Workstations make life much easier here.

If the stereo tapes were cut to DAT, continued on page 27 ►

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## SIGNAL-TO-NOISE

# Innovator Kloss Eyes Radio Market

by Frank Beacham

**NEW YORK** Henry Kloss is a living legend in the consumer electronics industry. In 1952, while at Acoustic Research, he and engineer Edgar Villchur changed audio forever by introducing the original acoustic suspension loudspeaker, the AR-1. For the first time, a "bookshelf" sized speaker could deliver deep bass sounds.

In the early 1960s, at KLH, Kloss built the first high selectivity FM radio—the Model Eight, and the first successful audio product to use transistors—the Model Eleven portable phonograph. Later at Advent and Kloss Video, he became a pioneer in home theater with a successful line of two-piece video projection systems. While at Advent, Kloss also transformed the compact audio cassette from a dictation to a music medium by introducing the Model 200, the very first cassette tape deck to employ Dolby B noise reduction.

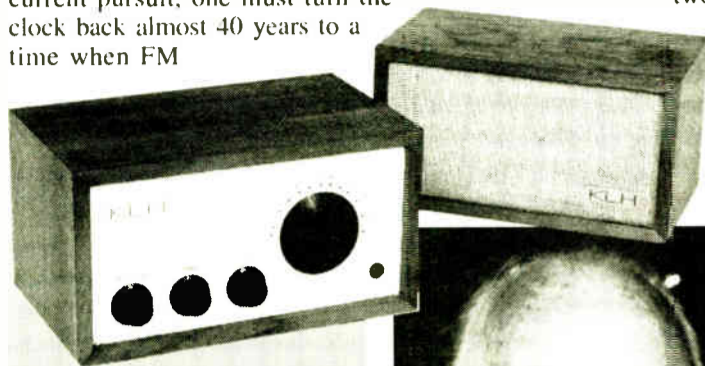
## Refining audio

Now, at age 65, Kloss is still re-defining home audio technology at Cambridge Soundworks in Newton, Mass. There he has created a new line of speakers, powered subwoofers and his latest invention, Soundworks, a new three-channel subcompact subwoofer/satellite sound system that sells for the remarkably low price of \$199.

Ironically, the new Soundworks product, which is targeted for multimedia applica-

tions, has Henry Kloss once again re-thinking radio receivers. That's good news for anyone that cares about the sonic quality of radio broadcasting.

To understand the significance of Kloss's current pursuit, one must turn the clock back almost 40 years to a time when FM



Henry Kloss (pictured at right) designed the first high selectivity FM radio, the Model Eight (above).

radio was still in the development stage. Most "table" radios of the era provided poor FM reception and even poorer sound quality. Decent FM meant purchasing a very expensive, complex, high-end FM tuner, something few had the cash or the desire to do.

All that changed in 1961, when Kloss introduced the KLH Model Eight FM radio. The Model Eight—a now classic minimalist design in a solid walnut cabi-

net—consisted of an advanced FM tuner and a small vacuum tube amplifier, combined with a speaker cabinet that contained two matching speaker drivers.

The Model Eight was the result of pairing two simultaneous technology breakthroughs. The speakers were a product of a study commissioned for a new PA system for the United States

Senate. At KLH, Kloss was assigned the task of designing a very small, highly accurate loudspeaker, one of which would be installed in each of the 100 desks in the Senate chambers.

The bottom line is the speaker—which did a remarkable job of reproducing music—was designed but never purchased (to the Senate's great loss).

## The legendary Model Eight

About this same time, KLH was working on a high performance FM tuner. The research showed that one aspect of FM tuner performance—selectivity—was the key to high quality FM reception. This would be a breakthrough in FM radio design.

So two components—a new tuner design with high selectivity and a compact speaker originally designed for the U.S. Senate—came together to create one of classic FM receivers of all time. The Model Eight was the most expensive table radio ever sold. It originally cost \$159 in an era when a Mercedes Benz sold for less than \$5,000. Needless to say it was not a

mass market product.

To this day, the Model Eight is a prized collectable worth far more than its original price. Hundreds are still in daily use. But Henry Kloss, as proud as he is of his original achievement, is not resting on his radio laurels.

"There are a few people who still want good radios," Kloss said. "I get calls all the time from people asking where can they get a good radio. But these days even the very expensive ones sold aren't very good."

Those persistent requests, coupled with the development of the compact Soundworks system, turned Kloss's thoughts back to radio design.

## The future

"The Soundwork is going to wake a lot of people of what can be done in a very small size," Kloss said. "You could do it in a table radio size. I'm very much desirous of building a radio that's better than we did before. And I don't see anybody else about to do it."

Kloss said his new radio would not be as expensive as the Model Eight but "it doesn't have to cost as much as the Bose Wave radio (\$349) to be very good."

A major design issue facing Kloss in creating a new generation radio is the question of bells and whistles. "There's all the choices to be made about alarms, clocks, bands, pre-programming," Kloss said. "Before it was easy. You had a tuning knob, a treble and a volume knob."

"One of the things holding me up is uncertainty about how simple you make it and then how appealing you make it because of the features it has," Kloss said. "I'm obviously leaning toward simplicity. But I don't know how many people get turned off when you drop off these features."

Kloss—on reflecting back on the Model Eight radio—said it can never be copied because it was a product of a different era. "Today people don't think in terms of buying something that 20 years later they'll be glad they bought and still would be using," he said. "It's the times. Things are so cheap that the attitude is: I'll buy it and if I like it, OK. If I don't I can always get another one."

□ □ □

Frank Beacham is a writer, director and producer. His address is 163 Amsterdam Avenue, #361, New York, NY 10023. E-Mail: beacham@radiomail.net.

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## PRODUCT GUIDE

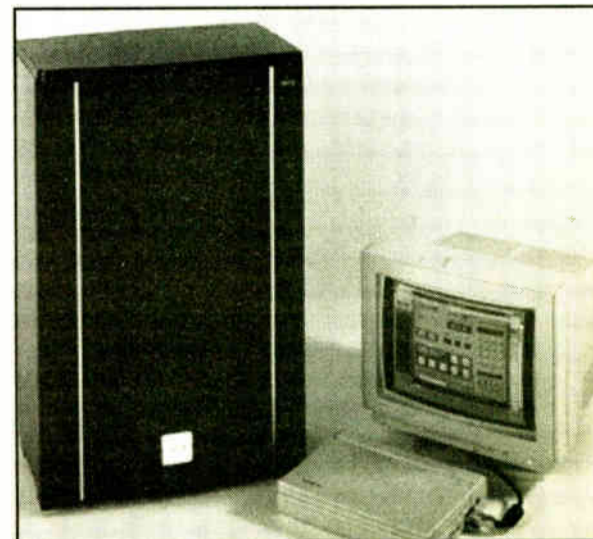
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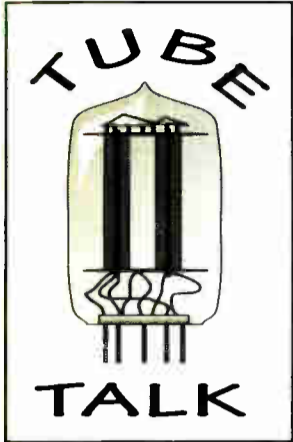
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# Sweet Sound from Sound Values Kit

by John Diamantis

**WASHINGTON** It has been quite a while since I built something from a kit. I'm not counting that little shortwave receiver I built from Ramsey. I mean a *bona fide*, take a couple of days, try your patience, scrape your knuckles on the chassis kinda kit. Ahhh, the smell of burning solder flux and wire insulation brings back fond memories...



tion of a G.E. 6GH8A. The plate is directly coupled to the grid of the triode section of the 6GH8A, which is set up as a split load (cathodyne) phase inverter, which is AC coupled to the output tubes, a matched pair of Russian EL-34Gs. The outputs are run fixed bias, class AB1, which means class A operation up to about 20 watts out. They are connected ultra-linear—with screens connected to taps on the output primary at approximately 43 percent of plate loading. Additionally, 20 dB of negative feedback is used.

The power supply high voltage winding is full wave rectified by solid state devices, and includes the output tubes' bias voltage tap, which allows the bias to track the B+

voltage with line variations. B+ filtering is accomplished with a capacitor-choke network, utilizing high value capacitors for maximum energy storage and minimum ripple. The application of B+ is delayed at turn on by an SCR, which is controlled by a simple timer circuit, set for about 45 seconds. The heater supply is low-voltage AC and has a surge limiter to limit current inrush at turn on.

I first tried the Sound Values M40 at home, on a pair of QUAD '63 loudspeakers, in place of my usual pair of vintage McIntosh MC-30s, which are 30 watts per channel. This was a pretty stiff test right out of the box as the QUADs are extremely natural, clear and unforgiving

electrostatic reproducers. The M40s sounded good, and got better as time went on. The low end was a bit leaner than the Mac's, but reached deeper. The mids were clear, with voices sounding natural.

## A little peaky

The high end bothered me a bit, however. What at first appeared to be very good transient response, turned out to be what sounded like a peak around 8 kHz. After about an hour or so, it became a little tiring. I tried several different CDs, but the problem remained. I even substituted another pre-amp, but no change.

Well, not all marriages are made in heaven, so after a couple of days, I moved the amps to another system utilizing a pair of JBL 4411 monitors. This match was much better. It is a shame the production life of

continued on page 27 ▶

Enter Sound Values. This Columbus, Ohio, company originally bought up the entire parts inventory of Dynaco about 10 years ago, and have been a good source for all of those parts you needed to get your old Stereo 70 running. Now, Sound Values has created a line of tube-based kits. Its first offering is a 40-watt, mono (or as is proper, in today's audio lingo: monoblock) amplifier, the Sound Values M40.

Unless you listen in mono (no laughing, some still do), you'll need two for stereo, or five for your home theater surround sound system. The asking price of \$399 per kit may at first seem a little steep for just 40 watts, but compared to what kind of sound you get from most transistor amps costing under a \$1,000, the price is close to a bargain.

## Like the old days

The kit is packaged very similarly to the Dynakit of yore, with circuit boards pre-wired, requiring the builder to physically assemble the parts, wire the interconnections between the boards, the input and output jacks, and power supply related components. It took me about five hours to build each amp, with no major difficulties, other than one or two tight spots, and an error in the instructions, that was pretty easy to figure out.

If you've never built a kit before, and want to do a neat job, count on a couple hours more. And, if you happen to botch the job, Sound Values will repair it for a nominal fee. For those of you with all thumbs, no time, and/or lots of dough, the M40s are available assembled at \$499 per amp.

The instructions are well written, and most things are arranged in logical order. However, better illustrations of the finished product would be beneficial, especially for the neophyte so he or she could check his or her work. My only real complaint is that the supplied gold plated RCA phono jacks are fragile. While trying to tighten the first one down, the threaded section separated from the connector part. Luckily, there's a Radio Shack around the corner with similar jacks, so down time was minimal. I would suggest, however, that one of those industrial strength phono jacks that bolt on from the front would be more durable.

## Circuit design

The circuit is fairly simple, with a well thought out power supply. The input is AC coupled to the grid of the pentode sec-

## ADX Ensemble

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**Formats *always* stay the same.**

**And Digital is *just* a passing phase.**



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**Damn.**

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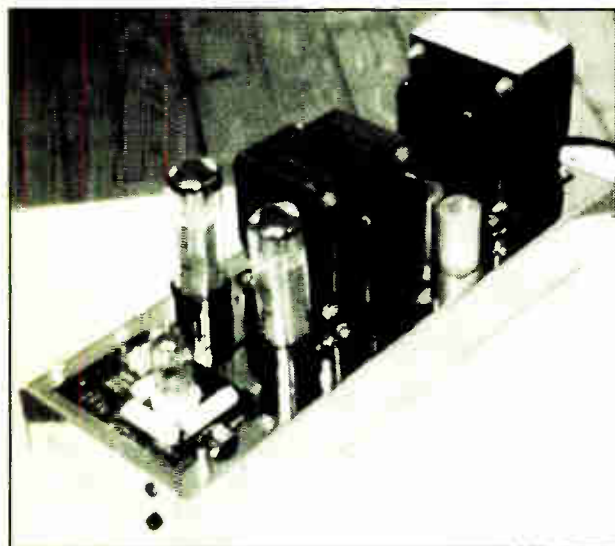
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# Tube Amp Kits Offer Quality Sound

► continued from page 25

the 4411 wasn't longer, because I feel it is the most accurate and cleanest "bookshelf size" monitor JBL ever made. But, as they used to say in the Bronx, "...too bad for you, but I got mine."



The Sound Valves M40 amp takes only about five hours to build.

piped that space is now collecting dust elsewhere. I kept the Sound Valves M40s connected to this system for about three weeks, leaving the system on for days at a time, without encountering any problems.

What about some test measurements? Don't let it spoil your good time, but I've found that most vacuum tube amplifier's spec sheets are somewhat optimistic, if not just a bit of fiction. But that just means we really cannot correlate good sound with simple measurements like THD+N. For continuity's sake, however, here they are:

### Measurements

**Output Power:** Although rated at 40 watts RMS continuous from 20 Hz to 20 kHz with less than 1 percent THD. The best I could get was 33 watts 20 Hz - 10 kHz, with 20 kHz clipping

at 12 watts, 1 kHz clipping was 42 watts.

**SMPTE IMD:** Rated at <0.1 percent at 1 watt, I measured 0.06 percent. Rated at <0.5 percent at 40 watts; I measured 1 percent at 35 watts.

**Noise:** Rated 85 dB below 40 watts out, I measured 81 dB; mostly very low level hum.

**Frequency response:** Rated at 0.-3 dB

from 10 Hz-75 kHz; I measured -3 dB at 70 kHz, no big deal.

While the Sound Valves M40 produced a nice 10 kHz squarewave, there was a single cycle of overshoot, 10 percent high. If I added capacitive loading to the nominal 8 ohm load to simulate a real world speaker impedance, the ringing increased in number of cycles, and in amplitude. In other words, there was a slight stability problem with load. A check of the schematic found only a single small loop compensation component at the first amplifier stage. I added a 470 pf capacitor across the feedback resistor, and while that value wasn't optimum, it reduced the squarewave ringing, and a

quick listen found the high frequency problem mostly gone.

### Summary

With the high frequency problem solved, the Sound Valves M40 is a real nice amp. For use in the studio, it sounds sound nicer than most of the low-to-medium priced transistor stuff out there (not that it's all bad, but most of it is), plus you'll get a good feeling knowing you saved some bucks building them yourself. The Sound Valves kits are simple, appear to be reliable, and are, as the name implies, a good value.

□ □ □

For more information, contact Sound Values at 614-279-2383; or circle Reader Service 125.

John Diamantis is director of technical operations at WBIG-FM, WGMS-FM and WTEM(AM) in Washington, D.C.

Anyway, although there was still a hint of high frequency peak, it wasn't a big problem, and the overall presentation was quite impressive. I could play the system about as loud as I could stand it, and the amps took it all in stride. The sound was powerful, clean, and quite realistic sounding. So much so that the amp that previously occu-

## Sweetening the Mix For Concert Broadcast

► continued from page 21

beware: digital overs (signal which exceeds all bits on) can often pass OK on the original recording machines, but may not necessarily output on a different machine or brand of machine in playback. This is primarily the case when you are transferring digital-to-digital, whether AES/EBU or S/PDIF, going DAT-to-DAT or DAT-to-workstation. It's almost never a problem when using the analog ins and outs. Early Panasonic and Sony DAT machines were notorious for muting each other's over signals.

The lesson here? Watch those levels! Leave at least 3 dB of headroom on the deck's LCD peak meters when recording to DAT. About 6 dB is better. Don't worry about noise levels off of tape: the background noise of the instruments on stage will far exceed any dynamic range reductions caused by lowering the drive levels to digital tape.

### Track tricks

If you've cooked the whole hog and cut your music to 8, 16 or 24 tracks, congratulate yourself. You win the "Do It Right While Going All The Way" award. Take those puppies into the studio and mix 'em up real good. Be sure to add enough audience ambience (including those post-song, appreciative sonics resulting from people's hands being forcibly banged together).

Depending on where the audience

pickup mics were placed (you did put out audience mics, didn't you?), there may be a slight echo (time/distance displacement) or hollowness introduced to the ambient stage sound when the audience mics are potted up. Try equalizing out a general region below 600 Hz. You don't want the extreme low end anyway, but sucking out a little of the 250 to 600 Hz bandwidth will remove the tubular effect. Don't go too far; a too-bright remaining track will sound artificial.

Also, if you have a single-ended noise reduction unit, such as the Behringer, Dolby, Drawmer, RSP or Valley devices, among many others, you may want to let the sweep filters "ride" the audience pickup track. That process, plus a little bit of gentle downward expansion, will add a level of automated control.

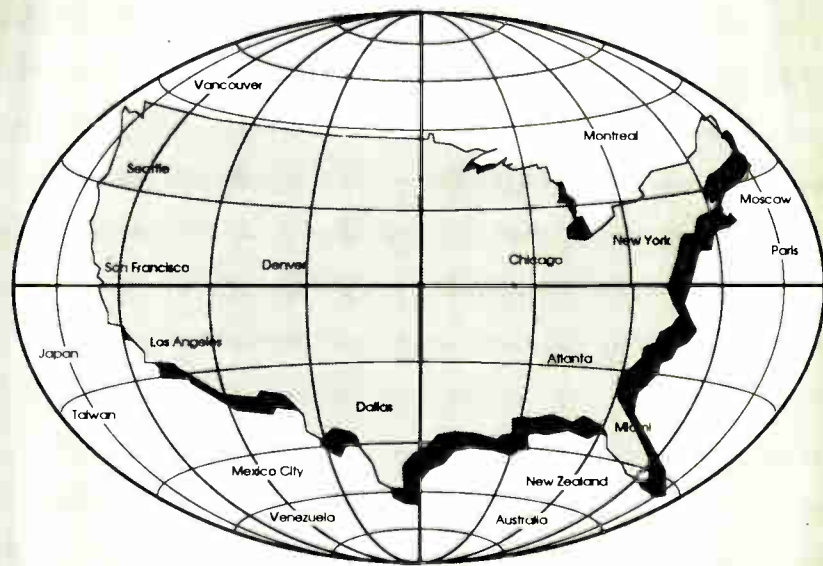
What's left? Back-time the musical segments, assemble to fit, add the intros, outros, announce VO's and inserts, and you've got a show. There. Now wasn't that easy?

□ □ □

Mike Joseph is the owner and a producer/engineer at Rabbit Run Productions, Kansas City. He is the former director of sales and marketing at Valley Audio Products, marketing manager for Electro-Voice professional products, and past editor of R•E•P (Recording Engineer/Producer) and Live Sound! magazines.

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# DAWs Move Toward Radio Production

by Chris Crump

**SAN FRANCISCO** For a radio production guy like myself, the 97th Annual AES convention was just a bit overwhelming. Unlike any other trade convention I have ever attended, the AES show covered every imaginable facet of the audio industry.

While it appeared that the main focus of the majority of manufacturers was the realm of video/audio post production and music production, it was surprising to see how relatively few of these same manufacturers have developed their product lines to address the needs of the radio broadcast industry.

I'm not certain on the number of video production houses in the U.S., but with around 11,000 radio stations in this country, some manufacturers, however, are beginning to realize the potential of tapping into the broadcast market.

Practically every major manufacturer at the show touted some kind of a digital audio editor. Digital audio workstations (DAWs), digital multitrack recorders and magneto-optical disk editors were displayed in abundance. No fewer than 30 exhibitors listed were displaying their version of a DAW. With only four days on the floor, I had the unenviable task of trying to see as many of them as possible.

## Numerous DAWs

I certainly wasn't able to experience all of the DAWs that were on display. The fact of the matter though, was that all of the systems on display did, basically, the same things.

Most instituted graphic waveform editing, performed destructive/non-destructive editing and offered realtime playback from SCSI hard disk and/or magneto-optical drive. The biggest noticeable differences between the various products were in the surface controller options, Graphical User Interfaces (GUI) that each manufacturer provided, the speed and ease of use of some of the various functions and (perhaps most importantly) the cost.

As a potential end user of a DAW, I had to take into consideration how the particular functions of a system would fit my individual production style and the particular needs of my broadcast facility.

Nearly every rep that demonstrated on the machine was more than willing to arrange an in-studio demo or trial on his or her system so I could get a feel for it on my home turf.

Of the 34 companies that I found exhibiting DAW products, only a handful were actually marketing to radio broadcast production. Of particular interest were systems by Sonic Solutions, Studio Audio Digital Equipment Inc. (SADiE), Studer, Korg and Doremi Labs/Pacific Recorders.

Sonic Solutions, based in San Rafael, Calif., offers a package that the company

community. Studio Audio Digital Equipment, based out of Nashville, Tenn., in the U.S., has developed a relatively inexpensive, 2-in/4-out, IBM-based system that starts at about \$9,995 in a standard turnkey configuration. While the SADiE system doesn't have a specific radio version, the fact of the matter is that 90 percent of its functions apply to all media. The standard system comes equipped with a 486DX2/66 MHz PC with a 2GB hard drive but is also upgradable and offers several add-on media options including a magneto-optical drive.

An XS floating point digital audio

feat that I know of.

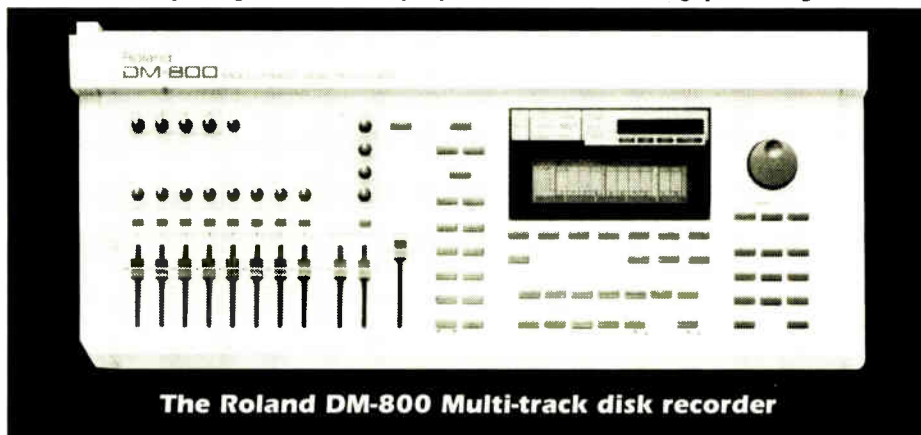
Dyaxis' virtual ergonomic GUI allows the user to view multiple windows on the screen which helps alleviate the need for paging through windows to get to a specific feature. It also supports the Open Media Framework interchange for transfer of audio files between different OMF-supported systems with different file formats. It also offers slick options like an Optical Plug & Play, DAT or exabyte tape backup and Dolby AC-2 4:1 data compression to name a few.

As part of the Harman Group, Studer and Lexicon are currently working on advanced compression/limiter and reverb effects to interface with the Dyaxis II. The system, as are all Mac-based systems, is networkable for file and data transfers utilizing Mac's Ethernet/Appletalk protocol.

## The familiarity of Korg

Korg, a manufacturer known in the music community for its extensive line of electronic keyboards, has been a player in the DAW arena for the past few years with its SoundLink. This proprietary 8-track integrated audio production system has been finding a home in more and more radio facilities these days.

The base SoundLink system starts at \$37,000 and features a 1.4GB hard drive and a high speed 8mm tape back up device. While, in my opinion, the learning curve is a bit higher on this box than others, SoundLink features simple graphic waveform editing, a comprehensive and fully automated digital mixing section, time compression/expansion and some nice internal effects such as three-band EQ, reverb and a stereo compres-



The Roland DM-800 Multi-track disk recorder

calls Sonic Radio Station. Using a standard Apple Macintosh platform, the systems basic package starts in the \$7500 range (without CPU) and features two channels of digital I/O, 8-channel playback from hard disk, complex editing capabilities, real-time EQ, background loading of sound file segment to hard disk and very advanced networking options. Sonic Radio utilizes Sonic Solutions MediaNet technology to link together multiple workstations allowing them to access sound files and data from another workstation in the facility.

## Sonic Radio

Sonic Radio can operate on any Mac PowerPC and is additionally available in 16 and 32 configurations. All of the systems utilize Sonic's UltraSonic Processor card, which provides up to 16 channels of digital I/O, up to 32 tracks of disk playback, and 32 filter sections—the highest performance from any single card.

The British-made SADiE Disk Editor has gained recent popularity within the radio

processor card and a XACT analog converter and timecode card roundabout the internal hardware. It also offers control surface options such as a JL Cooper's CS-10 or the Penny & Giles MM16 controller. The GUI is MS Windows-based and is very user-friendly. It offers an

**I had to take into consideration how the particular functions of a digital workstation would fit my individual production style.**

impressive variety of internal digital signal processing functions and editing features, plus the ability to import/export MicroSoft WAV audio files.

Networking and file transfer is achieved through the use of Windows for Workgroups. SADiE is currently working with Broadcast Electronics in the development of advanced archiving and retrieval functions utilizing BE's AudioVault MTE.

## Studer's setup

The Studer Dyaxis IIbv, another Mac-based system that is growing in popularity, is designed for the radio broadcast industry with a custom version that operates on a Mac Centris 650, but has no timecode in or out. Not being a feature that gets used very often in radio, the exclusion of the timecode dramatically drops the price of the Dyaxis II which starts at around \$14,500 complete with a very attractive peripheral edit controller which has control functions similar to those of a reliable Studer tape deck.

One of the standout features of the Dyaxis is that it allows you to record onto a track that has existing material. In this manner, you can effectively record source material while listening back to what is already on the track. What is equally impressive is the fact that you are able to limitlessly layer tracks, sound effects, etc. onto a single track. This means you can hear all of the events simultaneously—making the Dyaxis the only box currently able to perform such a

sor/limiter. For those interested in MIDI capabilities, SoundLink is equipped with a 16-track MIDI recorder/sequencer which, if you don't use a vast array of keyboards, can be utilized to handle program and control changes on your "MIDIable" outboard gear.

A familiar name to the broadcast industry, Pacific Recorders and Engineering, has teamed up with Doremi Labs. Utilizing DRM's Dawn II Software 4, PR&E has developed a very intuitive and sexy Mac-based hardware package it calls the ADX Ensemble. The system combines full EQ, mix and pan automation with touch-sensitive motorized faders. The self-contained roll-around unit operates on a Mac Power PC CPU and features a 2.4GB hard drive for 6.5 track hours at 44.1 kHz.

It is not a virtual track editor like the majority of other DAWs, but rather chooses to allow for eight discreet tracks that correspond to the external mix interface with twin stereo sends and returns for effects per channel. The self-contained unit is priced at about the \$40,000 range, but PR&E also offers a package that integrates with one of its fully loaded broadcast production consoles for about \$75,000, minus the furniture.

After just a short tutorial, even the most novice user would feel confident enough to venture into some of the systems more advanced features. Its ease of use, combined with 32 levels of undo make the basics of this system pretty much idiot-

continued on page 30 ►

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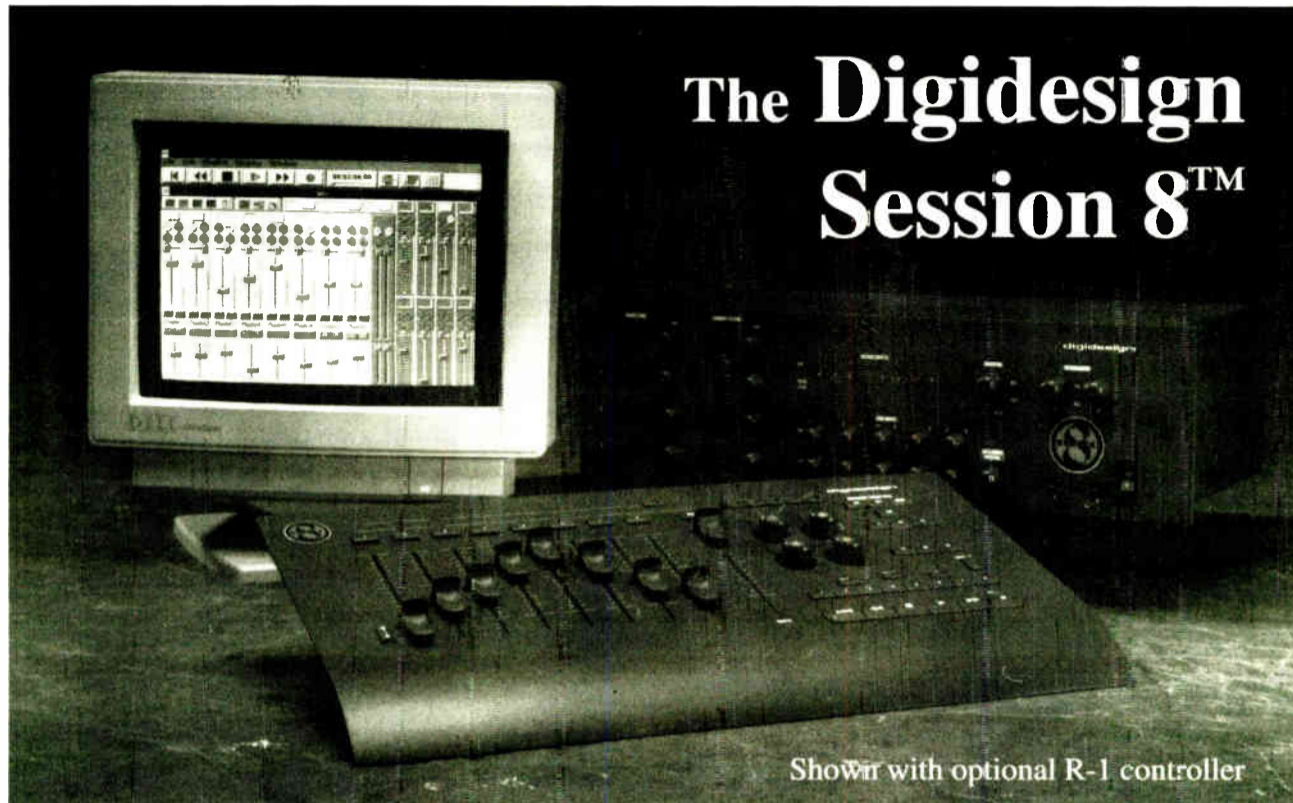
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One of the first things you'll notice about Session 8 is how good it sounds. It supports 16-bit audio for 20 Hz to 20 kHz frequency response. It also has the simplest user interface available in a computer based editing system. If you know how to use a recorder and mixer, Session 8 will be a snap!

There's never been a better time to buy a Session 8 than right now. New software features include **Audio Scrub** that imitates rocking the reels on a tape machine and **Shuffle Edit** for creating automatic butt-splices and inserts. New audio interfaces add even greater system flexibility. Session 8 Mac now supports **Sound Designer II** for advanced features and third party plug-in compatibility as well.

Best of all it's available from Digidesign, the manufacturer with more workstations in broadcast production than any other, and BSW, the industry leader in service and selection, with over 20 years experience in serving broadcasters.

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# Workstations Aimed at Broadcasters

► continued from page 28

proof. It also has very quick time compression/expansion function which is relatively transparent.

## A new Roland

Other notable systems on display include Roland's broadcast-specific DM-800 DAW which, starting at \$5995, offers numerous and powerful features all in a self-contained, lightweight box (12 lbs.). The demonstrator of the system quickly pointed out that the DM-800 has never experienced an "in-the-field lock up," and that it combines all of the features of the DM-80, Roland's most popular piece of broadcast hardware. Plus, it has some advanced interfacing capabilities and hard disk recording options.

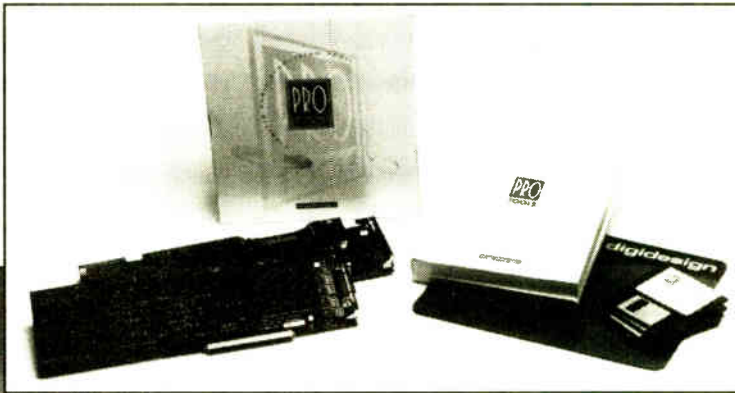
The Synclavier Company was promoting its latest line of products. The Synclavier was formerly the mainstay of New England Digital—since gone bankrupt. The Synclavier Company, formed by a users' group, has been developing a number of products for one of the industry's high-end pieces of gear. They were certainly enough to pique one's curiosity—utilizing Digidesign's Pro Tools, Sound Tools and Audio Media hardware, its own PostPro platform, as well as OMF interchange and a new alliance with Fostex. However, the box and its price certainly aren't geared toward the average broadcast entity.

One of the more interesting products on

the floor was presented by a small company called OSC. The Deck II version 2.1 is a complete DAW software package that runs on any Macintosh Quadra 840AV, Quadra 660AV or Centris 660AV with no audio card or additional hardware required. It also runs on any Mac II or higher utilizing cards from Digidesign and Spectral Innovations.

OSC President and software developer Josh Rosen gave me a tour of his product which had me jumping up and down wishing that my system would do the same

tasks. This very simple to use, well thought out program is available for just around \$600 and will soon be able to run on any Power Mac or PowerBook 500-series.



**Digidesign's Pro Tools III Digital Audio Production System (above) and Korg's Soundlink system (left) made appearances on the AES show floor.**



## Prismatica

While the main thrust of the Spectral Synthesis presence at the AES was on the introduction of Prisma Music, the new, low-cost music production version of its already popular Audio Engine, Spectral was also displaying the Prismatica system.

Prismatica starts at about \$4,000 without a CPU and utilizes the IBM-based Windows format for its GUI. It has many advanced editing features in addition to a newly developed networking software package which will allow multiple users to share and swap common audio files. Spectral's AudioFiler software also allows the user to convert digital audio to and from many of today's standard file formats.

Some other products definitely worth checking out: DigitalAudio Labs Fast Eddie and The EdDitor Plus combined

with the Digital Only CardD works on any IBM-compatible 386 or higher and will record right to your hard disk as well as handle digital transfers from your CD sound effects library right to disk and maintain pure digital signal integrity. The Plymouth, Minnesota-based firm also offers a number of other digital editing products and peripherals.

Digital Expressions out of Bellevue, Wash., featured its Mac-based SoftSplice Digital Audio Editor which starts at \$1985 minus any disk storage. The company also

offer different disk, tape back-up and A/D - D/A converter options.

Digidesign's Pro

Tools III Digital Audio Production System is a favorite among video post user as demonstrated by the throngs of people that consistently crammed its booth. It is a Mac-based system that integrates with and is supported by a large number of Digidesign products and peripherals. It starts at under \$8,000 and it expandable up to 64 analog or digital tracks.

Akai now offers its proprietary 16-track DD1500 DAW that records to multitrack MO or hard drive. The system is comprised of a main audio processor, A/D - D/A converters, the disk drive unit and the system controller. The basic analog and digital 4-in/4-out system is priced at \$17,825 and comes with numerous configuration options.

## Laying the Foundation

Fostex's Foundation 2000 garnered a significant amount of attention from attendees. The system is touted as the fastest non-linear audio system on the market today and assures ease of use. This proprietary system can be configured for up to 24 analog and digital I/Os and can mix 16 simultaneous channels of audio summed to 8-bus or stereo-mix outputs. The Foundation offers many interfacing as well as recording media options.

Another economical workstation (about \$4,000) that is quite capable is the 486-based unit MicroTechnology Micro Sound Professional Desktop System. The previous version was well reviewed last fall in *RW*, and the latest version has even more editing features.

Although the number of companies producing digital audio workstations continues to rise, the question remains: How long before manufacturers provide radio with a complete production system that will allow not only for production, networking and storage—but that will provide a randomly accessible on-air playback format—all of which that will operate using a common framework. Steps are being taken in that direction with the development of the Open Media Framework standard and digital media storage/delivery systems, but it isn't quite there for broadcasters yet.

□ □ □

Chris Crump is creative services director of Paxson Communications of Orlando, WJRR-FM, WMGF-FM, WWNZ(AM) and a soon-to-be-named AM.

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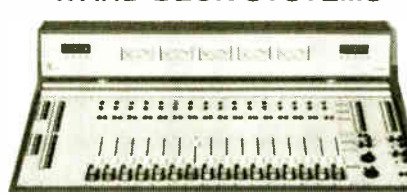
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Chris Clausen, who has lent his "pipes" to the NBC-Network, Federal Express, and Chevrolet, among others, quips "When it positively, absolutely has to be there the next minute,

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World Radio History



## PRODUCT EVALUATION

# Audix Music Mic Can Work for Radio

## Hypercardioid Dynamic Mic Aims to Please With Warm Sound, High Frequency Punch

by John Bisset

**WASHINGTON** Finding a microphone with performance that satisfies the air staff as well as a price that satisfies the general manager isn't always easy.

Billed as a professional concert microphone, the Audix Model OM-5 hypercardioid dynamic fills both of these requirements. It has a warmth found in microphones many times the \$329 list price. Judging by the con-

struction, the microphone is built to last, and Audix backs up the product with a two-year warranty. You'll also find gold plated XLR connector pins, and a design that provides low handling noise. For remote use, the mic comes with a storage pouch. A nylon molded holder, to fit standard mic threads, is also included.

Although not intended for broadcast as its primary market, I recently tried the OM-5 in a variety of broadcast applica-

tions: I was very pleased with the results.

Before I put the microphone out in the field, I used the OM-5 with a factory provided foam "pop" filter that tamed some of the high energy "poppiness" that it exhibited. Once I added the filter, I took to the streets of Washington, D.C.

The greater than 30 dB background noise rejection made it ideal for remote use. At a very crowded (and noisy) remote held on the street, where every restaurant in Washington, D.C., manned a booth selling their wares, the Audix OM-5 did a superb job of defining the talent's voice



The Audix Model OM-5

and rejecting the background clutter.

In addition to sounding good, the mic's sleek body with the matte black finish looks good too. It's not too heavy and not too light. Production folks at other stations including Paxson Communications in Florida, also have tried the OM-5 and complemented the mic on its sonic similarities to the Neumann U89iP48.

I later installed the mic in the production facility for Liberty Broadcasting's WXTR-FM in Washington, D.C. The mic replaced a recently rebuilt EV RE-20. Michael Wolfgang, production voice for many of the Liberty stations, liked the edge he noticed with the OM-5. He said the OM-5 boosted the highs of his voice more naturally, while not compromising the lows.

Wolfgang said he liked the warmth obtained with the OM-5. Because he

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### Product Capsule: Audix OM-5 Dynamic Microphone



**Thumbs Up**

- ✓ Great value
- ✓ Ruggedly built two year warranty
- ✓ Superb background noise rejection



**Thumbs Down**

- ✓ Very "popy" without windscreen
- ✓ No cable/connector or instruction sheet included (assume pin 2 is hot)

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needed a mic that added high frequency punch to his voice to permit it to cut through the surrounding audio in a promo or stager, the OM-5 appeared to give Wolfgang that control.

Because broadcast needs are different from live music, Audix shipped two interchangeable heads: a circular ball head for live vocal music and a flat head designed for broadcasting and recording applications. For our purposes, we couldn't hear any appreciable difference between the two. The pop filter was the real difference.

Although the mic came with a test data sheet, there were no instructions. This was frustrating, because one assumes pin 2 is hot when wiring the connector. That was really the only irritant in an otherwise positive few weeks I spent with the OM-5. (At press time, Audix said it is planning to add a complete owner's manual to the OM-5 package).

In summary, if you add the pop filter and you desire a microphone that has a warm sound, yet with high frequency energy, check out the Audix OM-5. For the money, you can't go wrong.



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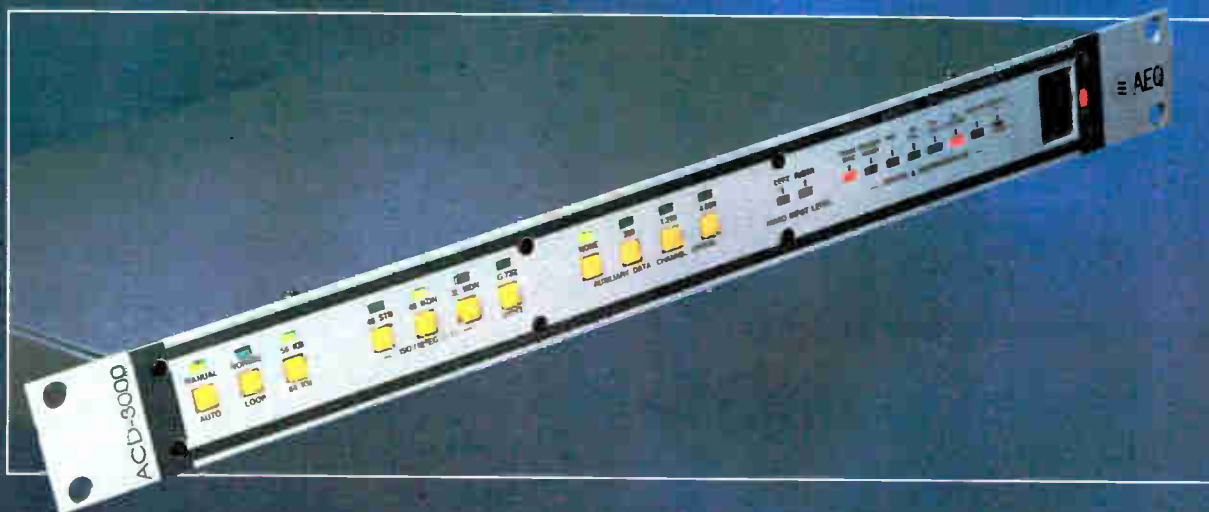
- ▶ Audio coding and decoding in conformity with ISO/MPEG Layer I.
- ▶ Versions for DTMF or Continuous Data Channel telecommand.
- ▶ Automatic News Recording System activated by DTMF.
- ▶ Runs on PC: 386 DX 33 or higher, with 2 Mb RAM minimum, requiring DOS 5.0 or higher.
- ▶ Also operates under many popular LAN's O.S. like NOVELL 3.11, Personal Network Lantastic, etc.
- ▶ Drivers for Touch-screen, mouse or track-ball included.
- ▶ 16 bits A/D and D/A conversion.
- ▶ AES-EBU format digital inputs and outputs.
- ▶ 31.25 seconds of stereo audio per each Mbyte, at 48 MHz and 256 Kbits/sec.
- ▶ Storage capacity from 5. to 60 hours of stereo audio on hard disk.
- ▶ Unlimited storage on optical rewritable disks (capacity for 6 hours of stereo audio each).

### Features:

- ▶ Language selection.
- ▶ Access selection by groups of users.
- ▶ Selectable file sort criteria.
- ▶ Password assignment for remote users (journalists or stations) of the Automatic News Recording System.
- ▶ Automatic News Recording remote controlled by users or journalists.
- ▶ Automatic news edition.
- ▶ Audio file management and edition.
- ▶ Manual and automatic play lists.
- ▶ Multiple templates with up to 24 simultaneous immediate access keys.
- ▶ Printable transmitted advertisement log lists.
- ▶ All work station associated to the System are multitask, enabling the management of the transmission, recording, play list and template edition and automatic transmission from any of these.
- ▶ The System can be expanded from a single basic configuration, incorporating more work stations.
- ▶ The software is PC compatible and also LAN standard, proportioning a maximum flexibility and adaptability of software and hardware.
- ▶ Audio resources are stored in a common server for all users, enabling real time access to any audio file from any work station, even from various of these simultaneously.

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- ▶ The ACD-3000 is a full-duplex coder and decoder offering up to 13 KHz of analog bandwidth simultaneously in both received and transmitted signals, depending on the selected mode of operation.
- ▶ The equipment uses CCITT G.722 and ISO/MPEG Layer II compression algorithms in a wide range of operating modes and combinations.

### Operating modes:

- ▶ The ACD-3000 offers the flexibility of user defined operating modes. The selection is made on the front panel keyboard, and is fully indicated by LEDs, as well as the communication status and alarms.
- ▶ 24 STEREO, 48 MONO, 32 MONO and G.722 modes are available.

### Features:

- ▶ Input / output bit rate selectable at 56 or 64 Kbits, with any of the operating modes.
- ▶ Manual and automatic synchronization. Last synchro. configuration is stored in memory for a fast resynchronization, in the event of a power failure.
- ▶ Auxiliary Data Channel available when the ISO/MPEG Layer II algorithm is selected.
- ▶ LOGP and TEST modes available.
- ▶ Error alarms for digital audio port, synchro status, bit stream, equipment, etc.

### Specifications:

- ▶ Two analog inputs (transformer coupled).
- ▶ Two analog outputs (transformer coupled).
- ▶ Digital interfaces V.35 and X.21 / RS-422.
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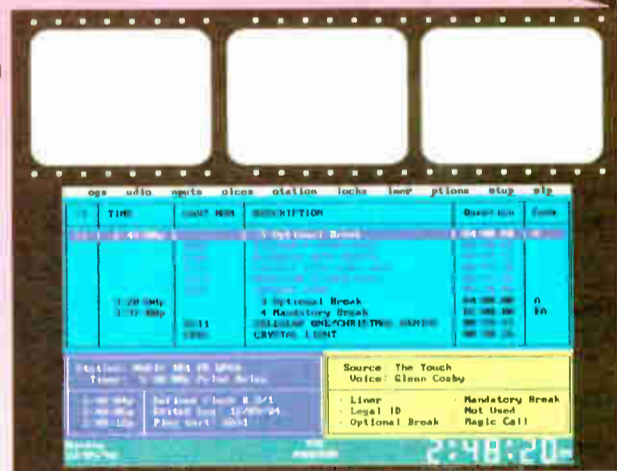
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The Phantom can replace carousels and cart machines in live operation, tape-based or CD-based automation, and especially ideal

for self-contained satellite program automation. It has the flexibility to operate with complete control of all satellite functions. The software is designed for virtually unlimited control of multiple satellite or network input sources.

The Phantom CPU is available in a variety of hard disk configurations to meet your recording storage needs, from 345 minutes to 20 hours and beyond. Multiple compression algorithm choices are standard, including Dolby<sup>®</sup> AC-2. Musicam is available as an option.

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# Tell-all Book on FCC Inner Workings

by Harry Heath

**STILLWATER, Okla.** This book slipped through the proverbial crack.

Too bad, because it deserved a better reception.

Larry King's staff showed an interest in it, then backed off. Was it too tough on the Federal Communications Commission? Was the author, with impeccable credentials but a behind-the-scenes performer, not a newsworthy personality?

Whatever the reason, "FCC: The Ups and Downs of Radio-TV Regulation," should be on every station manager's bookshelf, even these four years after publication.

The late William B. Ray, once director of news and special events for NBC's Chicago division and later FCC chief of complaints and compliance,

has given us a valuable look into a federal regulatory agency's powers and how those powers are used—or sometimes misused.

The book, available for \$26.95 from the Iowa State University Press (Ames, Iowa, 50010), is readable, entertaining, substantive, authoritative and more.

### Modest sales

In spite of all those glowing adjectives, it has had a modest sales record, primarily to radio-TV executives and a limited number of broadcasting teachers and researchers. It's not the hot item it would have been with some talk-show hype.

Bill Ray wrote from wide experience, both in and out of FCC chambers.

After leaving big-city broadcasting, he owned and operated KASI in Ames, Iowa, before joining the FCC in 1961.

This reviewer worked with him both at NBC-Chicago and 15 years later in Ames.

After his 1980 retirement, Ray was hired as a consultant on political broadcasting law by the NAB. It is no overstatement to say that he was one of the most competent executives in the business.

In 171 pages, plus chapter notes and bibliography, this book covers such subjects as news distortion, political clout and FCC favoritism, obscene and indecent language on the air, the Fairness Doctrine, radio's medicine men, the radio preachers, the FCC and Congress, and the cozy Reagan-era deregulation of the industry that the

FCC was created to regulate.

Some examples:

- Two CBS Peabody Foundation Awards for programs in which "news twisting" or deliberately distorted facts were used. The FCC found no cause for action.

- Four well-documented cases of "news staging" at the 1968 Democratic National Convention in Chicago in clashes between police and demonstrators. The FCC asked the networks to make their own investigations then decided to do nothing more.

On the whole, Ray writes, the commission has done less to carry out its stated policies regarding news broadcasting than in any other field. After claiming repeatedly that it would "act to protect the public interest in this most important aspect," it has done little.

continued on page 37 ▶

## Old and New Mic Companies Converge at the AES Show

by Doug Fearn

**SAN FRANCISCO** Many radio stations have recently committed to upgrading their broadcast and production microphones. Microphone manufacturers, old established firms and some relative newcomers, showed their mics at the 97th Audio Engineering Society convention here. Aside from the high quality of the normal EVs, Shure and Sennheiser mics used by broadcasters, here are some others that I found interesting.

Microtech Gefell GmbH, a German manufacturer virtually unknown in the U.S. until just a few years ago, traces its origins directly to the legendary Georg Neumann. The company's product line, which is as impressive as its history, ranges from a "miniature" cardioid condenser (Model M300) at \$495 to a multi-pattern vacuum tube condenser for \$2495. G Prime Limited of New York displayed many of the mics.

Of particular interest to broadcasters is the MT71S (\$895), a cardioid condenser mic with a transformerless output. It features a rising treble response, peaking at 4 dB at 7 kHz, and a slight bass roll-off for proximity effect compensation when used close to an announcer. These response characteristics are designed to improve presence. The output stage is designed for high RFI rejection, a concern that most condenser mics do not address. This could be an important factor for stations with a co-located transmitter. The MT71S requires standard 48 V phantom power. It is available in either black matte or satin nickel finish.

Because Microtech Gefell offers so many models, interested engineers should investigate all of them to find one that fits their requirements.

Josephson Engineering (San Jose, Calif.) is not as well known as the old, established manufacturers, but the company has done some pioneering work in microphone design and is producing cutting-edge technology microphones. The Series Six Interchangeable Capsule mics deserve consideration if you are in the market for top quality studio sound.

The hypercardioid KA25 capsule provides optimum off-axis rejection for use

in less-than-quiet studios. At \$860, this sophisticated microphone is within the budget of many critical users.

Another newcomer to the U.S. is Rode, manufactured in Australia and shown at the AES by Audio Upgrades (Van Nuys, Calif.). At first glance, the Rode NT-2 looks like a Neumann U89. It features omni or cardioid patterns (but not figure-8), a bass roll-off switch, and a switchable 10 dB pad. The solid-state, transformerless electronics appear to be extremely simple and direct. Top-grade components are used throughout.

Although it is not possible to really evaluate any microphone sound on a convention floor, the NT-2 did sound amazingly transparent.

Although Neumann USA (Old Lyme, Conn.) is no stranger to radio stations and production facilities, two recent products deserve mention. The large-diaphragm TLM193 is based on much of the technology of the acclaimed U89 and the newer KM100 series transformerless output mic. The TLM193 offers Neumann quality at a much more affordable price than the "flagship" models. By eliminating the multiple patterns (it's just cardioid), and some of the switchable features, Neumann can offer the TLM193 for \$1295.

Also designed for announcer use is the Neumann KMS150 hypercardioid condenser. It is a departure in appearance from most Neumann mics, looking much more like a traditional broadcast or PA microphone. A 10 dB pad and bass roll-off switches are included. Like all Neumanns, it requires 48 V phantom power.

□ □ □

For more information on these products contact the companies:

G Prime Limited, Jerry Graham, 1790 Broadway Suite 402, New York, NY 10019, Phone: 212-765-3415; Neumann/USA, 6 Vista Drive, PO Box 987, Old Lyme, CT 06371, Phone: 203-434-5220 or 818-780-1229; Josephson Engineering, 3729 Corkerhill Way, San Jose, CA 95121-1421, Phone: 408-238-6062; Audio Upgrades, 6410 Matilija Ave., Van Nuys, CA 91401, Phone: 818-780-1222.

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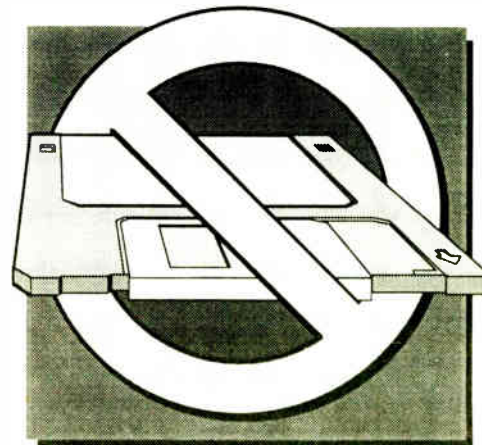
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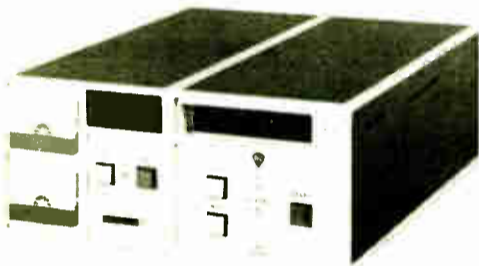
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# Tell-all Book on FCC Inner Workings

► continued from page 35

That the FCC has, at times, been easy prey to political pressures is illustrated by Franklin Delano Roosevelt's intervention with FCC Chairman Anning S. Prall to secure a radio license for his friend Elzey Roberts, president of the St. Louis Star-Times, in spite of legitimate opposition.

Among other cases cited:

•FDR's intervention with the FCC at Postmaster General James Farley's request. This led to reversal of a decision favoring KWKH in Shreveport over WWL New Orleans in frequency assignments.

•Lyndon Johnson's rise to riches beginning with a small radio station in Austin, Texas, KTBC. Through political maneuvering, LBJ in 1943 was able to get what the previous owners could not—CBS affiliation, plus full-time operation rather than daytime only and an increase in power to boot. The profits from KTBC (now KLBJ) were peanuts compared to the millions Johnson later made from TV, with a few assists from the FCC.

•In the Republican '50s, eight outspoken Republican newspapers received TV licenses and 10 Democratic newspapers were denied. No important newspaper that had supported Adlai Stevenson for president won a comparative hearing.

•The historic decision of Feb. 7, 1975, in the Don Burden case, licensee Burden lost his five stations following lengthy hearings that turned upon the mysterious disappearance of evidence. Involved were political favors given to Senator Vance Hartke of Indiana in his 1964 campaign.

## Swept under the rug

It is clear from the author's vantage point that too much time has passed and too much FCC flab has developed since the days of chairmen James Lawrence Fly, Newton N. Minow, Dean Burch and Richard E. Wiley and commissioners of the likes of Freida Hennock. Burch had assumed the FCC chair shortly before the Burden case, one of the few in which a licensee has not been favored.

A more recent example involved Evangelist Jim Bakker. In 1982 the FCC swept under the rug what it discovered about Bakker. He continued to bilk his TV followers out of millions for five more years before a sex scandal brought his money machine to a screeching halt.

In evaluating the FCC rulings on obscene and/or indecent language, Ray takes the reader from the Radio Law of 1912 and the Radio Act of 1927 through such court tests as the Roth case (1957), *Memoirs v. Massachusetts* (1966) and *Miller v. California* (1973).

As FCC policy was evolving, based in part upon these decisions, the author tells of seven specific cases in which the commission maintained its on-again, off-again record in dealing with obscenity and indecency. In at least one case, George Carlin's "seven filthy words," it struggled with the fact that some language, although not legally obscene in the context of the broadcast, might well be indecent depending upon the time the subject was aired.

Ray notes the FCC's effort to get clear-

er court definitions of obscenity, followed by detachment from the issue for years, mainly because the commission during the Reagan years was lax on any enforcement. Then came a few letters of reprimand and once again a hands-off attitude.

## "Chilling effect"

The book devotes 24 pages to the Fairness Doctrine, one of the most controversial policies in FCC history. It required stations to cover important public issues and to try to present contrasting views on those issues.

It did not, as was generally believed, require equal time. Nor did it require that opposing sides of an issue be broadcast on the same program, or even the same series of programs. In addition, the broadcaster could choose anyone he deemed competent to present the other side.

Although opponents cited the doctrine's "chilling effect" upon journalists, few complaints passed preliminary inquiry by the FCC. The commission made it difficult for complainants by imposing at least nine hurdles that must be cleared before consideration was given the complaint. These stringent requirements discouraged capricious charges and minimized the danger that the doctrine would have a chilling effect on broadcast journalism. The FCC did not want to discourage stations from dealing with controversial issues.

Shortly after Ronald Reagan appointed Mark Fowler FCC chairman, the commission sought to abandon the doctrine along with many other regulations, despite the fact that the Supreme Court in the *Red Lion* case "re-affirmed the basic validity and soundness of these principles and policies."

In February 1989 the FCC's decision to kill the Fairness Doctrine was upheld by the Circuit Court of Appeals for the District of Columbia.

## No time to regulate

While the author predicted that subsequent administrations would push for a renewal of the doctrine's principles, President Clinton has thus far been too busy with higher priorities to push for major changes in FCC policy-making, despite Rush Limbaugh's attacks upon him. Recently there have been hints that change is on its way.

Some who once opposed the doctrine's "chilling effect" on news and news-related programs now think that at least a cooling effect with respect to some talk shows might be in order.

Whatever one may think of today's radio programming, it has come a long way since the early years when fortune-telling for a fee (sometimes divvied up between the fortune teller and station manager) as well as fraudulent advertising reached large audiences. Such advertising made millions for some opportunists.

Except to a few old-timers among *RW* readers, John Richard "Doc" Brinkley's "goat-gland surgery" and mail-order elixirs will seem unbelievable. But aging males, including a famous Los Angeles publisher, submitted to Brinkley's surgery in the hope their sexual vitality would be restored.

The public's gullibility made Brinkley a

multi-millionaire, thanks to his radio salesmanship over KFKB in Milford, Kan., before his station's license was revoked.

Later he continued to bilk the public with broadcasts over 500,000 watt XERA in Villa Acuna, Mexico, just across the Rio Grande from Del Rio, Texas.

Bill Ray also tells the story of Norman Baker, who became rich using his station, KTNT, in Muscatine, Iowa, to claim cures for cancer, goiter and appendicitis, all "without surgery or radium."

After five years, his license was not renewed in 1930 and an appeals court effort failed. He moved his operation to his station in Nuevo Laredo, Mexico.

across the border from his new headquarters in Laredo, Texas. Eventually he spent four years in prison for using the mail to defraud. Out of prison in 1944, he left broadcasting for good.

The book's chapter on radio preachers ranges from the 1920s when the controversial Aimee Semple McPherson and Robert Shuler held sway over large audiences to the more recent impact of Carl McIntire and Jim Bakker, with a passing reference to Jimmy Swaggart and others.

This book is a valuable addition to the literature of broadcasting. A foreword by the late Clark Mollenhoff, who was one of Washington's most respected journalists, is an added plus.

□□□

Harry Heath is professor emeritus of the University of Oklahoma.

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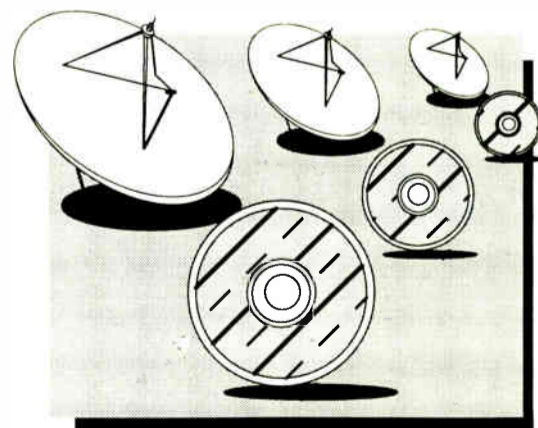
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Circle (57) On Reader Service Card



# WORKBENCH

## Easy Comparitor Circuit from Alaska

The Circuit Detects When the FMO Control Voltage Is Beyond Its Normal Range of Control

by John Bisset

**SPRINGFIELD, Va.** We will welcome you to the new year with a resolution—no schematic errors in *Workbench* tips during 1995. Last year, a schematic for adapting a mono mic cable to a stereo mic input on a Sony portable DAT had the pin numbers mislabeled. Guess it was too much anticipation of *RW's* Christmas Party. Thanks to the readers that called our attention to the error.

No, we weren't trying to start a policy making pin 2 of the XLR ground! The schematic should be re-labeled to show pin 1 ground, pin 2 high, and pin 3 low. One of the readers calling the error to our attention was Mr. DAT himself, John Reiser from the FCC. (Talk about embarrassing phone calls from the FCC.)

John spends much of his spare time devoted to digital recording, and wanted readers to know that Sony manufactures a

relatively inexpensive stereo mic that takes the place of the mono adapter. Stations looking for a true stereophonic sound may want to consider this alternative.

\*\*\*

Roy Hansen's full time job is handling communications for the Trans Alaska Pipeline. In his spare time, he is building an FM station in Valdez, Alaska. As part of that project, he recently obtained a used CSI EX-20F FM exciter. The previous owner informed him that the exciter had a history of just dropping lock and wandering up the band to some other frequency. (Talk about frequency agile!)

During inspection, Roy found the TX INHIBIT transistor (Q-105) was not in its socket. Initial tests indicated that everything was working fine, but there still was some concern about the loss of lock. When Roy reinstalled Q-105, he soldered it and the companion transistors in place. The TX INHIBIT/LOCK circuit was then tested by tweaking the FMO beyond its

lock range. Everything worked fine. During burn-in, the unit failed, drifted off frequency, and to Roy's surprise, the lock detect did not inhibit the transmitter drive. The unit was set to run on 102.3 MHz, and here it was, running full power on 107.5 MHz. The metering showed that the REF OSC was reading zero, and a quick check with a scope verified that the REF OSC AMP transistor had died, and the PLL circuit wasn't getting any reference pulses.

A closer inspection of the lock detect circuit revealed that this circuit can *only* detect an out-of-phase condition of the divider and reference circuits, and cannot detect the *loss* of one or the other of the pulse streams.

Roy found that when the PLL loses the REF OSC signal, the FMO control voltage rises to the 13 volt range, and that when it loses the DIVIDER pulse output, the FMO control voltage will drop to around 2 volts or so. To solve this in the easiest and most reliable method possible, Roy built up a simple comparitor circuit that will detect when the FMO control voltage is beyond its normal range of control.

Shown in Figure 1, the circuit is a simple High/Low comparitor circuit. The pots set the high and low limits. An LM-339 was selected, because it is a single supply comparitor, with open-collector outputs. This comparitor will also run with a supply voltage of up to +20 VDC. The open collector outputs made for

activated. Because the front panel metering is sufficient for indicating an initial problem, there was no need to remote the LED to the front panel, besides, it could be seen through the top screen of the exciter.

Construction specifics are not critical. Roy built the circuit on a piece of pad-per-hole pertboard, mounting the IC in a gold plated socket. The wiring was soldered wire-wrap wire, soldered to the pads. The board was mounted vertically on the main PCB of the exciter, right behind the FMO. Roy chose ten-turn horizontal pots, which face upward from the board, for ease of adjustment.

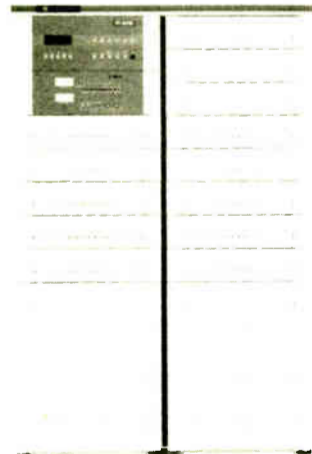
To test the board, Roy powered up the exciter with various combinations of U-110, U-111, U-112, and U105 through U-108 removed from their sockets. This simulated failure of these chips. In each case, the LED was observed on the comparitor board to verify that transmitter drive was being inhibited. The comparitor functioned perfectly in every combination of PLL failure that could be devised.

For those engineers who have an EX-20F, and hate the big D-size print that requires half a football field to open up and spread out, Roy has re-drawn the circuit into an electronics CAD (Wintek), and can print it out in standard 8x10 pages. Roy adds that his service manual was a thousandth generation Xerox copy. He has retyped the entire manual into WordPerfect 6.0 format, and is willing to share the manual with whomever needs it. Roy's remake of the CSI manual also includes a component

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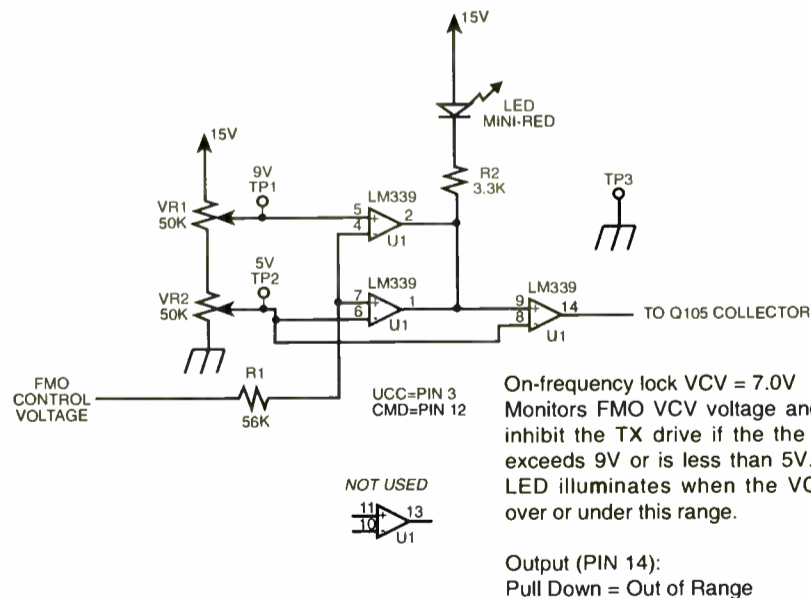
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Because the CSI spec calls for an "in lock" FMO control voltage of 7.0 volts, Roy set the range pots for a high limit of 9 volts and a low limit of 5 volts. This would allow for a considerable deviation of the FMO control voltage, yet will still catch a failure of either one (or both) pulse streams feeding into the phase detector of the PLL.

Roy also included an LED on the board for an indication of when the circuit is

layout drawing for the main PCB, because his photocopied manual did not include this. If you are interested in a copy, send a 3-inch disk, along with return postage, to Roy Hansen, 614 Pacific Street, Valdez, Alaska, 99686.

□ □ □

John Bisset is a principal with Multiphase, a contract engineering and special projects company. He can be reached at 703-323-7180. Faxed submissions can be sent to 703-764-0751, and when printed by *RW*, qualify for *SBE* certification credit.



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## INSIGHT-ON-RULES

# FCC's NPRM on Unattended Operation

by Harold Hallikainen

**SAN LUIS OBISPO, Calif.** On Dec. 7, 1994, the FCC released a Notice of Proposed Rulemaking (NPRM) that proposes vast changes in the operator requirements for broadcast stations. At this writing, the full text is available on Internet at <http://fcc.gov> or <http://slonet.org/~hhallika>. It is also available via fax at 805-541-0201 (the H&F fax server) and may be available on the FCC fax server at 202-418-2830. Comments were due Jan. 20, 1995. Reply comments are due Feb. 6.

After Congress amended the Communications Act of 1934 in 1992 to

allow the FCC to waive the licensed operator requirement for broadcast stations, the commission has been looking at allowing unlicensed operators to operate broadcast stations and allowing broadcast stations to run with no operator at all. The NPRM also makes an attempt to clarify various rules regarding transmitter control and operation with parameters at variance. Presently, all stations must have an operator in control of the transmitter whenever it is operating (even if the station is operating under ATS).

It appears that the FCC is proposing to require stations to almost continuously monitor certain parameters (the examples of power, DA parameters, and modulation

are given; continuous monitoring of frequency is questioned). Should a parameter deviate to where it could cause interference, either an operator or a control system must correct the problem or shut down the transmitter within three minutes.

In paragraph nine of the NPRM, three control methods are suggested. These are manual control with an operator, the use of a highly stable transmitter permitting unattended operation, and an automatic control system that monitors a less stable transmitter permitting unattended operation. The "highly stable transmitter" option does not appear to be mentioned elsewhere in the NPRM.

Paragraph 10 suggests allowing unattended

operation *only* on ATS equipped stations (instead of relying on stable transmitters). I believe the requirement that independent equipment monitoring the transmission system would be a more reliable method of insuring operation within licensed parameters than relying on equipment stability. Even stable equipment is eventually going to fail causing out-of-tolerance operation.

It is likely that both the transmitting equipment and the monitoring equipment would fail simultaneously and in a manner that hides out-of-tolerance operation. Such a monitoring system could, of course, be included in the transmitter cabinet, or could be external equipment. To me, the key is the use of independent references (reference frequencies, etc.). This would possibly cost more than the design of a stable system to begin with, but it seems that while costs may be additive, the increase in reliability is multiplied as additional measurements with additional equipment are made. We assume our transmitter is on frequency. If a frequency monitor indicates the transmitter is off frequency, we *know* there is either something wrong with the transmitter or the monitor.

### Unattended non-approved DAs?

Paragraph 11 of the NPRM questions the use of unattended operation by directional AM stations without approved sampling systems. It suggests unattended operation may be acceptable if an ATS system measures and *records* the directional parameters at least every three hours. This is comparable to the current station log rules which require logging of parameters of non-approved DAs. While recording the parameters does establish a record of the array (or sampling system) stability, the distinction from approved DAs in routine operation seems arbitrary.

Each station has the same procedures to follow if the indicated parameters (which are assumed more accurate on an approved system) go outside of tolerance. The recording of parameters by stations with non-approved sampling systems seems to make little difference in preventing out-of-tolerance operation. Recording of parameters by *all* stations is certainly desirable, but singling out these stations seems inappropriate.

Paragraph 12 of the NPRM asks if there are specific types of stations that may not be appropriate for unattended operation. Many AM stations must change power or pattern at specific times. A failure of a control system to bring about this change would cause significant interference. The failure of a control system in stations that do not have a mode change would most likely cause the transmitter to just continue operating as it was, which is within tolerance. We can argue whether a machine or an operator is more reliable at changing pattern (I've seen several of cases where operators have not changed mode). Again, it may be desirable to have one clock actually change modes and a second clock check to make sure the mode change was accomplished.

### Safety of life

In paragraph 14, the FCC points out that the law still requires the use of licensed operators where international agreement or safety requires. They seem to imply that because of the high power used by international stations, perhaps licensed operators should be required because of safety. I believe the "safety of life" provision of the law deals more with ship and aircraft radio

continued on page 43 ►

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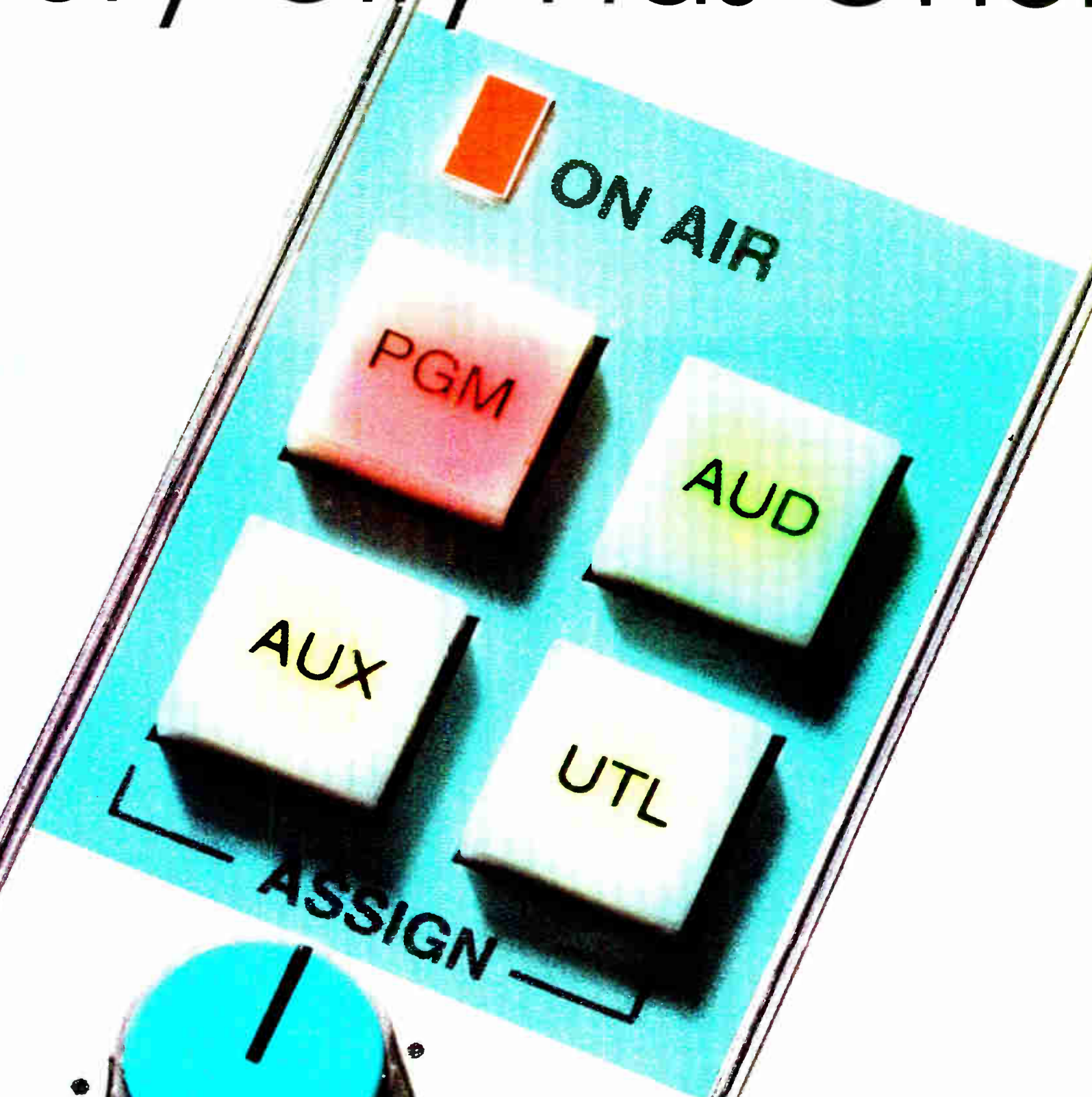
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# FCC's NPRM on Unattended Operation

► continued from page 40

where proper operation of the radio can help save lives, as opposed to the safety of operators because of high voltages used in transmitters. While operator safety is certainly important, this could perhaps better be handled by OSHA.

Paragraph 15 raises a very interesting question. On all transmission system parameters, failure to keep a specific parameter within tolerance results in the station being shut down within three minutes. No operator intervention is required. In the case of tower lights, however, the FAA *must* be notified of a failure in the lamps. Turning the transmitter off because the lights do not work just doesn't do it.

Perhaps the local Flight Service Station could be given a computer that waits for each station to call in each day reporting that the tower lights are operating. The current once-per-day human inspection of tower lighting could also be continued.

Paragraph 16 recognizes that the existing EBS system cannot be run without an operator (mostly because of a lack of End Of Message signal to return programming to normal). As such, it is proposed that implementation of unattended operation is to be synchronized with the phase-in of the recently adopted Emergency Alerting System.

Starting in paragraph 18, the FCC asks for arguments in support of retaining operator requirements for specific functions or classes of stations. It asks for information which demonstrates tangible benefits derived from such requirements. Should operators be required for specific stations (such as those not using ATS)? Should those operators be required to have a Restricted Permit? Since no exam is required for the RP, does it insure any operator qualifications? Perhaps the RP can be thought of as a form of operator registration. An operator continuing to hold an RP has not been found by the FCC to be unfit to operate a station. An operator who continually violates the FCC requirements could have his/her RP suspended, preventing continued operation in licensed stations.

## Extension Meters

The current rules require the operator to be able to observe significant deviations from normal operating parameters from the duty position. This requirement allows for the use of remote control and extension meters to make the parameters available at the duty position.

The FCC points out in paragraph 23 that the rules do not specify how often system parameters must be checked. The distance between the operator and the transmitter control *could*, therefore, be variable dependent upon how frequently the station licensee decides to have operators check meters. As such, the FCC proposes to eliminate the extension metering requirements. They would allow meters and controls to be "down the hall." One might make a loose interpretation of this, however, and decide that meters need to be checked once a week.

The licensee doesn't mind a 50 kilometer drive to the transmitter site to check those meters. I don't believe this is what the FCC has in mind. Because it requires a three-minute shutdown in other sections of the proposed rules, it seems appropriate to require transmitter monitoring and controls to be accessible to the operator with-

in three minutes at all times. For example, if an FCC inspector calls up and says your FM is making airplanes crash, you could shut it down within three minutes.

In paragraph 24, the FCC discusses station contact persons. They discuss the possibility of an FCC database where station licensees would keep their own record current as to how to contact a station representative at all times. This is an

## It appears that the FCC is proposing to require stations to almost continuously monitor certain parameters.

interesting idea. Perhaps it should have fields for several contact persons so the station need not update it when someone goes out of town for the weekend. I'd suggest contact phone numbers and locations for the station main studio, the manager, the chief operator and the assistant chief operator. Again, I'd suggest that the FCC should be able to contact someone who can shut down the station within three minutes of being contacted.

Starting in paragraph 25, the FCC proposes clarifying what a station is to do if it finds itself operating out of tolerance. Generally, something that can cause interference (overpower, overmodulation, excessive frequency deviation) that is not corrected within three minutes is cause for a shutdown. Out of tolerance conditions that do not cause interference (underpower, undermodulation, etc.) may continue as efforts are made to correct the problem. If the problem exceeds ten days, the FCC would have to be notified. If the problem remains for 30 to 90 days, the station would have to request a Special Temporary Authorization.

The FCC realizes that it is possible for directional array indicated parameters to be out of tolerance yet radiated fields remain within tolerance. This may be due to a failure in the monitoring system or small deviations outside licensed tolerances. As such, they propose to allow continued operation as long as monitor point field strengths remain within tolerance. They'd allow stations 24 hours to complete the field strength readings. Stations could then reduce power as necessary to keep the monitor points within limits.

This allowance does seem to allow for up to 24 hours of major interference. A catastrophic failure of a directional array could cause major interference (considerably more than operating 10 percent over power) for 24 hours. This proposed rule may require a little fine tuning.

Further, paragraph 31 proposes that monitor points be rechecked during out of tolerance operation "whenever any array parameter changes." I believe the amount of change should be specified. I doubt we want to recheck them when a tower phase changes 0.1 degrees.

## Monitor which parameters?

In paragraph 33, the FCC points out that it has received many inquiries (including some from me) as to what transmitter parameters must be monitored near-continuously (be available immediately to an operator or be monitored by an ATS system). It proposes that modulation, power and directional parameters deserve the attention of an operator or ATS. However, the wording of

the proposed 73.1350(c) does not specify any minimum frequency of checking these parameters. It requires licensees to "establish monitoring procedures and schedules" for the station. It does not specify whether these procedures and schedules are in writing and subject to FCC inspection.

As worded, a licensee could establish a schedule of checking the specified parameters once per week and operate with no telemetry. I don't believe this is what they have in mind.

Paragraph 36 notes that the FCC does not currently require frequent checking of carrier frequency. They ask if this is a para-

meter that should be checked on some minimum schedule. I was once cited for not checking an STL frequency often enough. I was checking it once a year. In my response, I demonstrated that based on the history of the transmitter, it would take seven years for it to drift out of tolerance. Yearly checks seemed adequate.

Of course, a few years later, the crystal oven thermostat failed, taking the transmitter off frequency. It would have been months before that was noticed had I not lost the remote control subcarrier because of it going outside the receiver bandwidth. It's amusing that the crystal oven, whose purpose is to keep the transmitter on frequency, is what caused it to go off frequency.

Further, we must look beyond stability of equipment and look at failures. Should we have checked the frequency weekly,

even though it shouldn't drift out of tolerance for seven years? That particular STL receiver had discriminator metering. We could have made that available to the operator (or an ATS) to detect radical frequency variations.

## Instrument accuracy

Paragraph 38 proposes that stations take instrument calibration accuracy into account when determining compliance with licensed parameters. As mentioned in a previous installment of *Insight On Rules*, the specified tolerance for AM antenna meters is loose enough and the specified power limits tight enough (90 to 105 percent of licensed) that it would be impossible to insure a station is operating within licensed power limits using an approved ammeter.

If we further include the allowed tolerance of antenna resistance measurements, transmitter efficiency variations, etc., we find more problems. Perhaps the FCC tolerances should be relaxed to allow reliable measurement with existing instrumentation. Currently, if the antenna current indication is within an ideal 90 to 105 percent power limit, and the remote ammeter is within 2 percent of the local meter, and the local meter meets its specs, it is assumed that the power is within limits. This may or may not be the case.

In paragraph 39, the FCC proposes allowing transmitter adjustments to be made by anyone designated by the licensee. This follows the FCC's path of shifting the determination of station technicians from the FCC to the station licensee.

Paragraph 40 addresses the use of temporary circuits between a control point and

continued on page 46 ►

## Local News Rates High

by Thomas Pear

**HOUSTON** The importance of local news to listeners surpassed the importance of national and world news in a traffic and news study taken by the Metro Networks. Ninety-two percent of surveyed listeners said world and national news is important while 95 percent said local news is important.

The same survey also revealed that 85 percent of radio listeners believe that traffic reports are important.

In regards to news, Frankie Foxx, the assistant program director of WHAV(AM) in Haverhill, Mass and the program director for its sister station WLYT(FM), confirmed the survey results in her market when she said her listeners are more concerned with what's happening in Haverhill than what is happening in other parts of the country and abroad.

"As far as I'm concerned I think people are interested in what's going on in their back yards," she said.

Listeners are a little more interested in local news, she said, because world and national news is abundantly available to anyone who can flip on a television set. But good local coverage is a little harder to come by, so the demand is there, she speculated.

WHAV has found a niche in the large Boston market by covering Haverhill news, which is usually neglected by the larger news/talk sta-

tions and television stations in the Boston area.

"It has to be a really big story before it is covered on Boston's big channels," Foxx pointed out.

In the traffic portion of the survey, 83 percent of listeners surveyed said traffic reports are important during morning drives, while only 80 percent said traffic is important during their afternoon commutes.

Foxx noted there are more commuters in the morning than in the afternoon. Although most people start their day in the mornings, they work different hours and leave work at different times during the day, she said.

Also, most people have deadlines to get to work, but unless they have kids to pick up from day care centers, they usually do not have a specific deadline to meet when leaving work.

The survey revealed that, in the mornings, the bulk of listeners tune into traffic reports at the 6 a.m. hour; 19 percent of listeners tune in during the 5 a.m. hour.

Fifty-five percent of music listeners, according to the survey, prefer to get their traffic information from music stations, while 45 percent will flip to a news/talk station. However, 47 percent of music listeners will channel-surf through numerous stations if they get caught in a traffic jam. About 64 percent leave their preferred music station for five or more minutes to get the latest traffic information.



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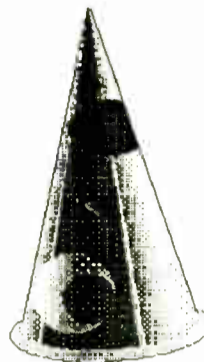
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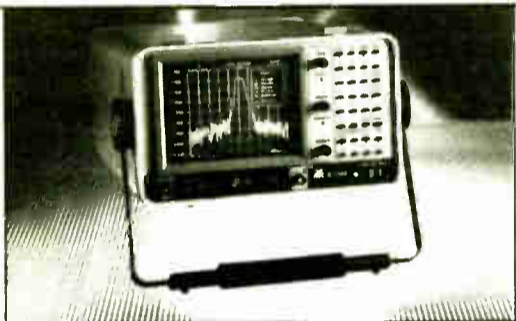
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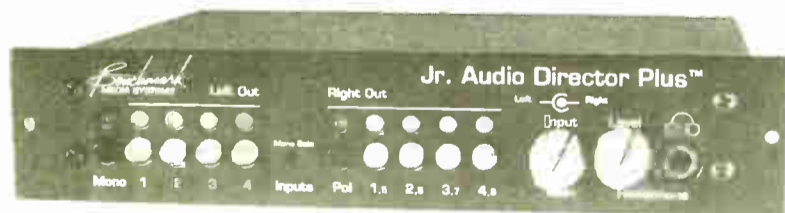
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PRODUCT EVALUATION

## Fluke Scope Powerful, Affordable

by John Bisset  
Principal  
Multiphase Consulting

**SPRINGFIELD, Va.** Anyone who has spent any time at all in broadcast engineering has learned to associate test instrument quality with the name **Fluke**. Though not cheap, Fluke instruments are certainly reliable workhorses, packed with useful features. Imagine the surprise when Fluke added analog/digital oscilloscopes to its product line.

The PM 3300 series includes four models. Each combines the benefits of a real-time analog oscilloscope with the features of a digital storage scope. Pressing a button quickly selects the mode of operation.

The PM 3394A is a four-channel, 200 MHz bandwidth scope, with a selectable 50-ohm/1M-ohm input impedance. I had some reservations when I first put the scope on the bench, simply because it appears that the goal of equipment designers today is to pack as many different features into a product as possible, include a poorly written manual, and expect the user to "wing it." Today's busy broadcast engineer does not have time for a crash course of trial-and-error learning, especially when he's using his scope to look for a problem.

Fluke's instruction manual is far from slipshod. These guys did their homework and included plenty of pictures of the front and rear panels, as well as the control button clusters.

The operational layout is easy to understand, and for first-time scope users, the 10-minute tutorial, entitled "Getting Started," is great. In addition to an explanation of the operating controls, a useful mode switching chart can be found in this section. The chart sets up a matrix to determine which operational mode—digital or analog—is best for the signal you are measuring. For those new to using a digital storage scope, this chart is invaluable.

Most of the front panel controls are soft-key pushbuttons. Channel amplitude is selected using up/down arrow keys arranged in a 1,2 or 5 sequence. The amplitude per division for channel 1 is displayed at the bottom of the screen. If all four channels are turned on, the amplitude per division for each channel is displayed on the scope screen. To preserve precious space on the front panel, most of the control functions are described on the scope screen, similar to a spectrum analyzer. We found this useful when measuring, because you do not have to take your eyes off the screen to determine the amplitude per division or the time base.

We used the PM 3394 in conjunction with Delta Electronics' High Power Pulse Reflectometer to measure some rigid transmission line. The resolution of a 200 MHz scope made analyzing the 20-foot sections of line ideal. More importantly, the Magnify pushbutton, which can expand the display up to 32 times, allowed us to record and store each bullet sounding in the system's memory. Each

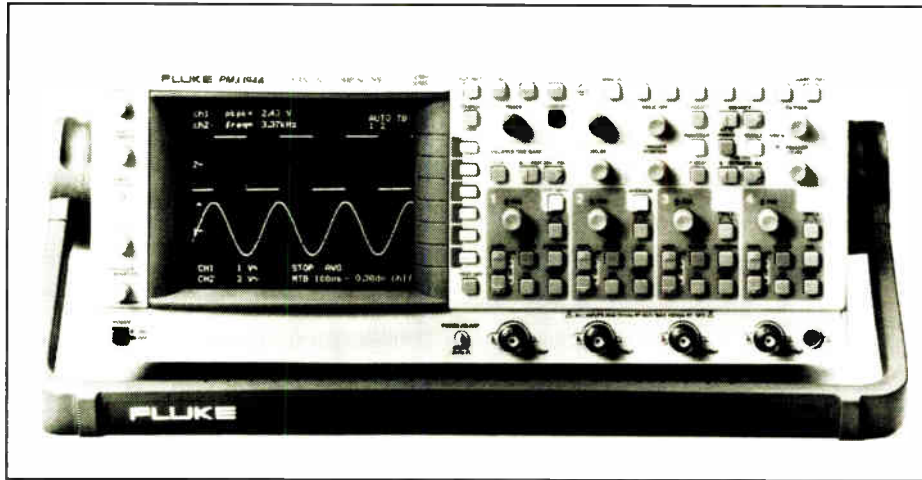
connection of line was then visually inspected and compared for anomalies. In using the scope with an instrument like a TDR, the ability to expand the waveform to a variety of sizes, without compromising the time base, assured reliable measurements.

The PM 3394 is called a "combiscope" because it combines analog features with digital precision. Perhaps the most powerful digital feature is the ability to capture and view signal contents prior to the actual trigger. Using a front panel knob,

Some of the tech writers for spectrum analyzers should read Fluke's manual to see how it should be done!

As for the operation of the instrument, we were not disappointed. The PM 3394 displayed crisp and concise waveforms. In cases where we wanted to document settings by taking scope pictures, the display of the settings on the screen was very useful.

The PM 3394 allows control via the RS-232 serial interface, using the Compact Programming Language. CPL is a simple



Fluke's PM 3394A combines analog features with digital precision.

the trigger position can be adjusted, giving you a pre-trigger view. The time base can be delayed as well. In the digital mode, logic triggering is possible.

Fluke includes hundreds of user-assignable features and capabilities in this family of instruments. In each case, a very clear and concise description of the feature is included in the instruction manual. Each description is augmented with a drawing of the controls, setup or display,

programming language, with a forgiving syntax, similar to BASIC. Some sample programs are also included.

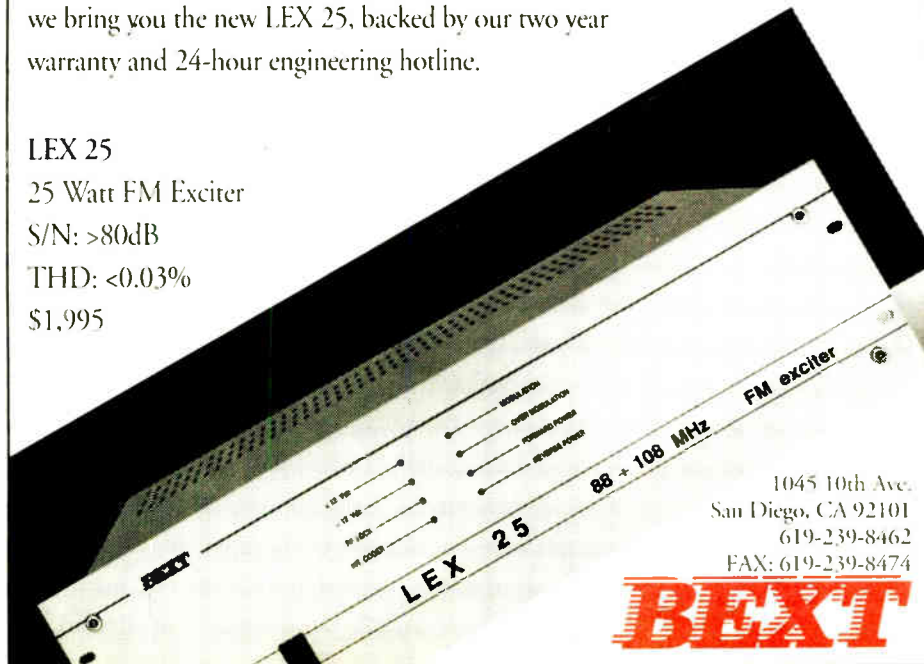
The Fluke PM 3394 is a powerful instrument, at a price within the reach of most stations' equipment budgets.

For information, contact Debby Coyne in Washington state at 206-347-6100; fax: 206-356-5116; or circle Reader Service 47.

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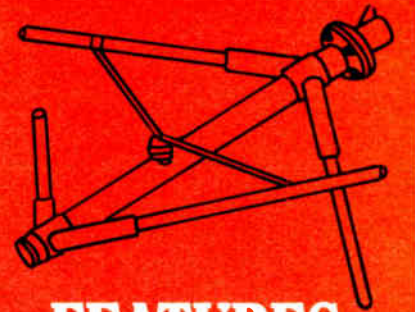
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Product Capsule: **Fluke PM 3394A Combiscope**

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<ul style="list-style-type: none"> <li>✓ Hidden AC cord storage in rear</li> <li>✓ Easy-to-understand soft-key pushbutton control</li> <li>✓ Quick selection between analog and digital modes</li> <li>✓ Excellent tech manual</li> </ul>	<ul style="list-style-type: none"> <li>✓ No probe/manual storage pouch mounted on scope body</li> </ul>

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## USER REPORT

# AA-51 Upgrade Worthwhile Investment

by David P. Hebert  
CPBE

Dave Hebert & Associates

**PASCO, Wash.** Not long ago, audio measurements were a tedious, far-from-precise process. Typically, the audio oscillator had an intrinsic distortion of 0.5 percent, and one had to be a safe-cracker to tune and null the distortion analyzer.

When the FCC required equipment performance measurements for AM and FM stations, the first hour of the measurement process usually was spent trying to get RF out of the test equipment.

## Exercise in frustration

One set of measurements was run to obtain frequency response, another set for distortion. With each distortion measurement, the distortion meter had to be relevelled, tuned and nulled all over. A simple proof could take two hours. Audio frequency response resolutions of better than 0.5 dB were hit and miss. I always worried afterwards if I could duplicate my measurements if necessary. The whole process was an exercise in frustration.

In 1979, I borrowed a Potomac Instruments AT-51 test system from a local television station to conduct FM equipment performance measurements. The AT-51 system consisted of a low-distortion AG-51 audio oscillator (with built-in decade switches calibrated in dB for precise frequency

response signals) and a model AA-51 audio analyzer to measure noise and distortion.

The AA-51 required a tuning dial to null the fundamental signal, then automatically nulled itself further to complete the process. This equipment was precise, accurate and a sheer joy to use. Frequency response and distortion measurements could be completed in one run, and the RF elimination process was long past.

I bought my own AT-51 system in 1984. I could use this equipment for routine audio measurements and to equalize telephone lines and align tape machines. Having the ability to measure wow and flutter, differential audio phase and level, and IMD was a bonus.

In two compact, lightweight boxes was all the measurement capacity I could hope for. When measurements required the

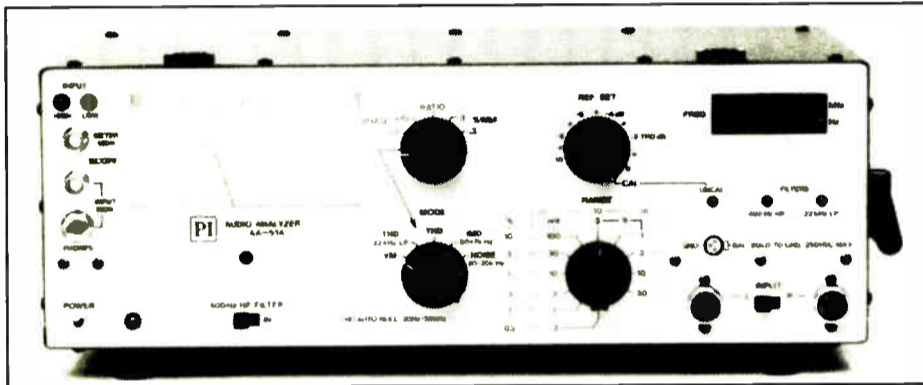
announced an upgrading.

It was hard to imagine how the new units could be any better than those to which I was accustomed. Believing Potomac would not enhance this piece of equipment unless the improvement were significant, I decided to ship my AA-51 back to the factory.

## Worthwhile investment

When my AA-51A returned, it was clear the investment was worthwhile. The changes were immediately discernible. Gone was the old frequency dial for nulling the fundamental frequency and its associated frequency range switch. An auto-ranging frequency counter had been added to the front panel. Some not-so-obvious changes on the front panel included a headphone output and a buffered BNC signal output for oscilloscope monitoring.

The new model includes a 400 Hz high-pass filter to demonstrate the effects of power supply hum or ground loops on the distortion display. Further, harmonic distortion measurements can be made with a 22 kHz low-pass filter for accurate analysis of quantizing noise in



Potomac Instruments' AA-51 audio analyzer

oscillator at one location and the analyzer at another, it was not hard to train an assistant to provide the audio signals I needed.

In the spring of 1994, I learned that Potomac Instruments was introducing a model AA-51A, with new features and improved audio performance. For those of us with the "older" analyzers, they

digital audio signals.

Residual distortion of the instrument is reduced dramatically; the lowest distortion range is now 0.03 percent, full scale. IMD measurement and wow and flutter sensitivity are improved dramatically as well. A front-panel level set control now allows for setting convenient reference levels when necessary. Indicators show the operator when the high- and/or low-pass filters are in the circuit.

Applying these new features to audio work in the field can be another matter. Shortly after my unit arrived, I had occasion to work on a local AM transmitter. Measuring the harmonic distortion was easy. I just set the range switch once and set the frequencies and modulation levels with the AG-51 oscillator. The whole measurement process was instant and repeatable, with almost no adjustment of the AA-51A required.

Occasionally, I had to move the distortion range switch to a more appropriate scale. Although the transmitter's noise floor was acceptable, I tried switching the 400 Hz high-pass filter on to detect just how significant the noise level was in my distortion measurements. In working on devices with differential audio outputs, measurements are more accurate because of the AA-51A's true transformerless balanced input.

My only criticism of the AA-51A is that the higher distortion ranges are now gone. This trade-off is worth the increased ability to accurately measure the lower distortion levels found in newer audio equipment. Potomac Instruments plans to introduce a new AG-51 oscillator. Users of older units will have the opportunity to upgrade to keep their AT-51 test systems truly state-of-the-art.

□ □ □

For information, contact David Harry in Maryland at 301-589-2662; fax: 301-589-2665; or circle Reader Service 3.

# FCC Issues NPRM for Operators

► continued from page 43

the transmitter, typically dial-up. They propose that the time it takes to establish a circuit (dial the remote site) be included in a three-minute maximum for transmitter shutdown (shut down the transmitter within three minutes of request).

Because it rarely takes three minutes to establish a dial-up telephone connection, this seems quite appropriate. However, they continue (as in the rule clarification of a few years back) to require a backup means of shutdown when nondedicated circuits are used. This, to me, seems unnecessary. I'd suggest a requirement that all remote control systems shut down a transmitter if they cannot verify the ability to communicate with the control point at least every three hours (which corresponds to the time limit allowed for loss of telemetry under the current rules).

Systems that utilize a processor-based studio unit can do an automatic handshake over any circuit, dedicated, packet switched (such as packet radio) or circuit switched (such as dial-up). Systems that rely on a telephone as the "studio end" of the remote control system could have a three hour timer that is reset when the operator calls the site and keys in a code. Both automatic and manual systems would typically initiate a handshake at least every two hours, sound an alarm on its failure, and shut down the transmitter after three hours.

Failures of the dial-up telephone network are very rare. Failure of the network simultaneously with out of tolerance operation of a station would be even more rare. Under this approach, stations would manually check to insure they could shut down the transmitter within three minutes. Failures of the telephone network or station control equipment would result in a station shutdown in three hours.

The absolute worst case of interference would be three hours, if the telephone network and the transmitter failed at the same time. This is considerably less than the 24 hours permitted for directional stations while they check monitor points.

I hope I've given you a summary of the NPRM and some thoughts on what it all means. Please read the actual text (obtained as detailed above) and comment to the FCC. I'd also like to hear your comments.

□ □ □

Harold Hallikainen is president of Hallikainen and Friends, a manufacturer of transmitter control and telemetry systems. He also teaches electronics at Cuesta College, San Luis Obispo and is doing lots of contra dancing. He can be reached at 805-541-0200; fax: 805-541-0201. He can also be reached on Internet at ap621@cleveland.freenet.edu.

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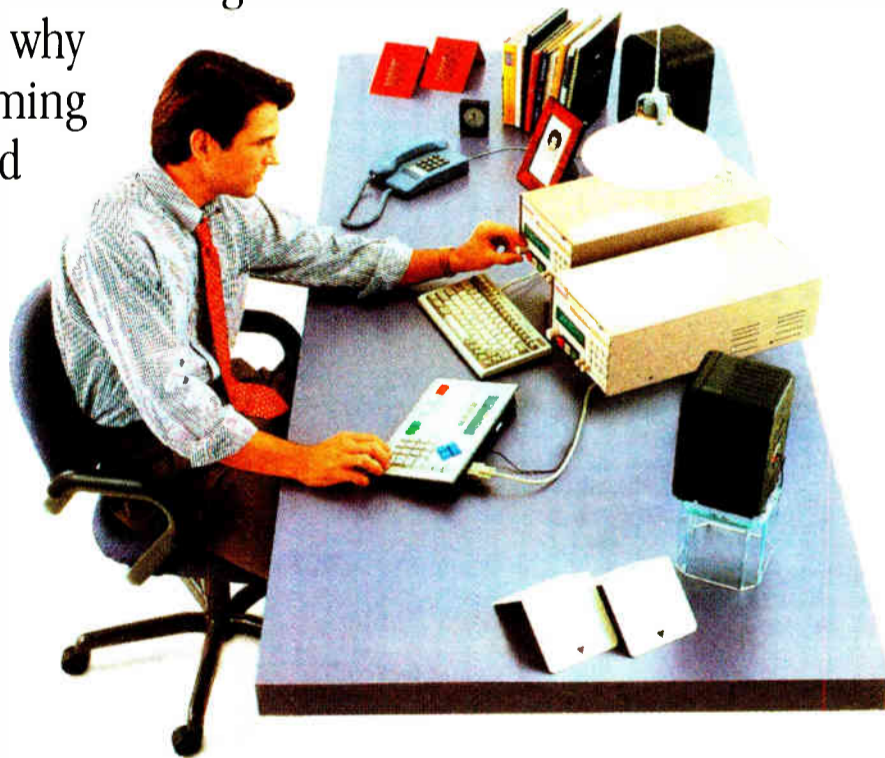
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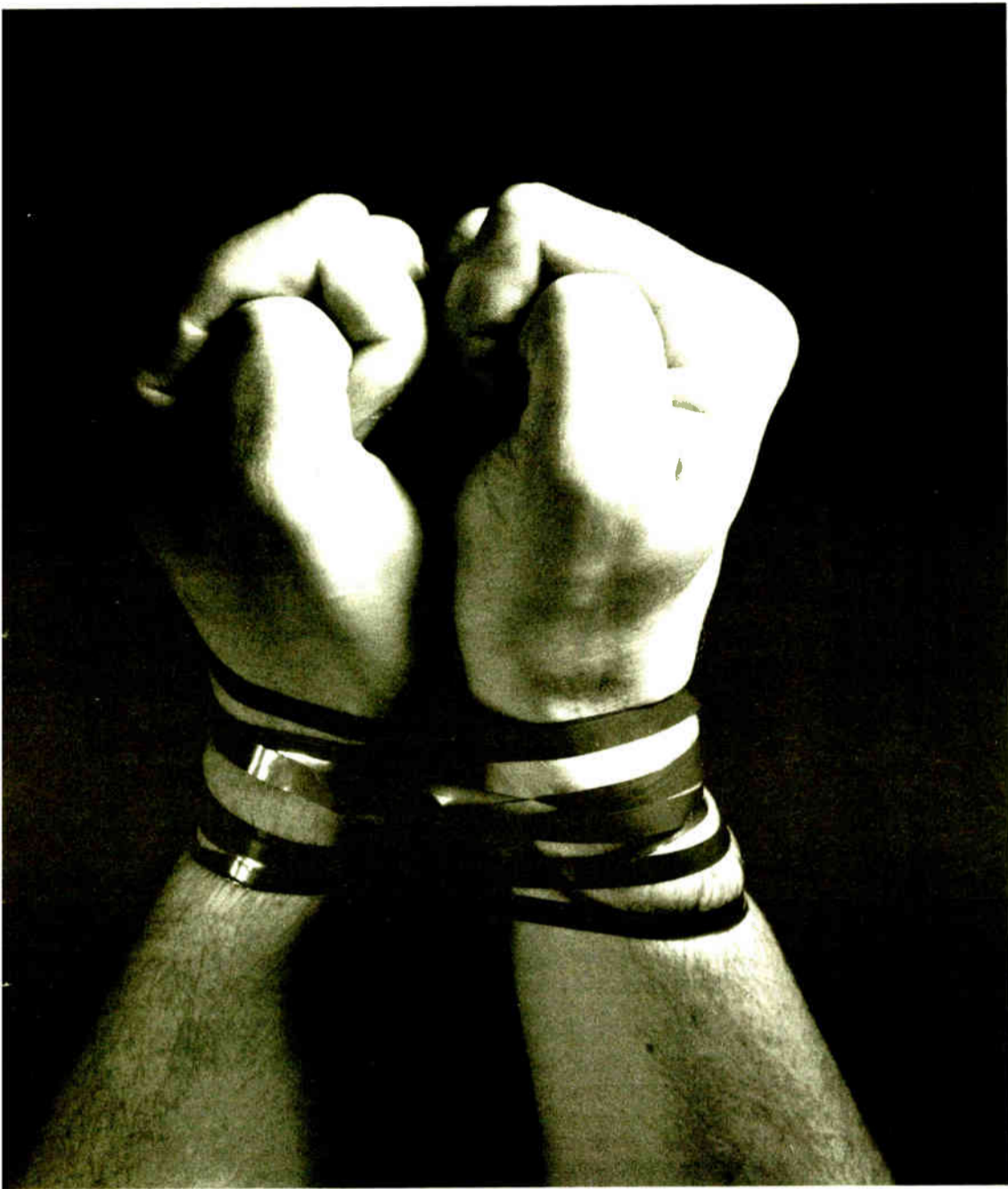
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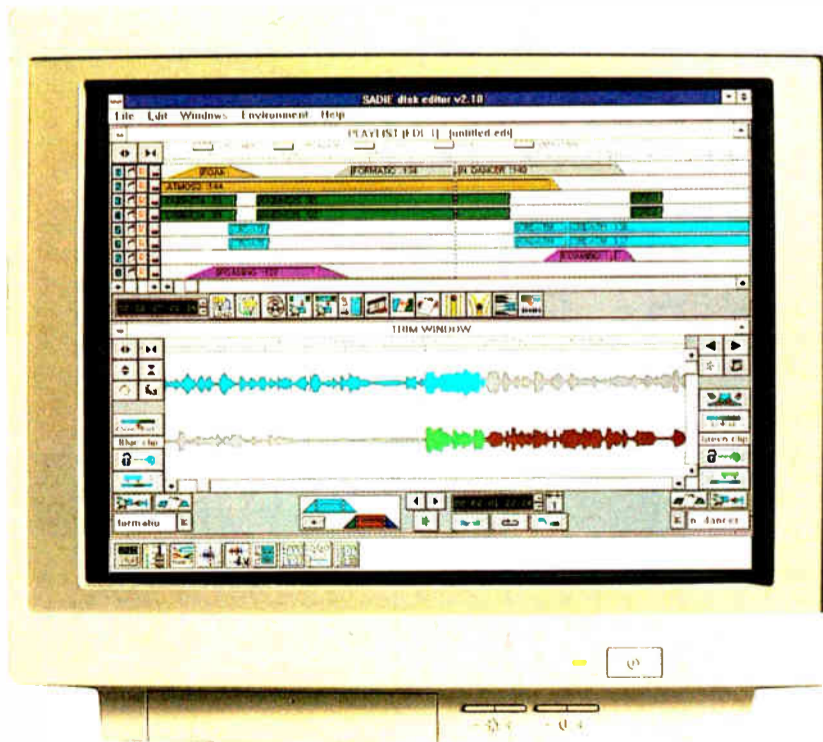
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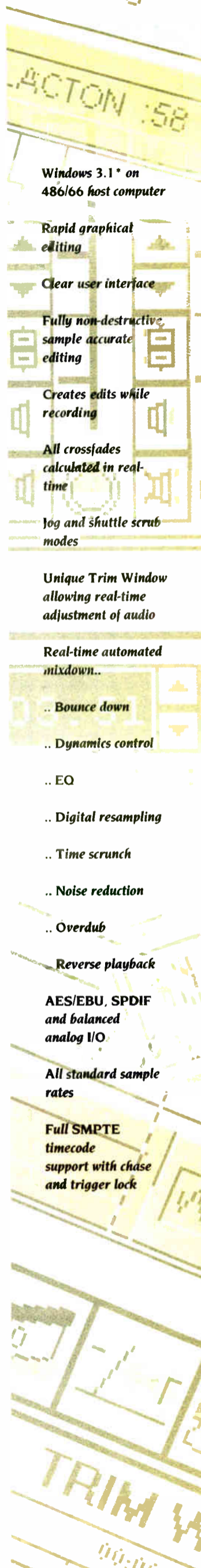
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Circle (71) On Reader Service Card



USER REPORT

# System One: No Knobs Attached

by Terry Denbrook  
**Chief Engineer**  
**KUOW Radio**  
**University of Washington**

**SEATTLE** The Audio Precision System One audio test system, working in conjunction with an IBM-compatible computer, automates routine audio measurements and has proven to be an extremely accurate system at our station.

If you do not like working with computers, then this is not the test set for you. Everything is controlled by computer. System One makes graphs of frequency response, distortion, phase shift, etc., on the computer screen, prints them out on a supporting printer and saves them to a computer disk for later use. Audio Precision also offers a series of training videotapes, as well as a written manual, that explain how to set up each item in the test.

Before you begin any testing, the System One can test itself so you know that it is working properly. Frequently used tests can be automated using pre-

**Frequently used tests can be automated using "procedures."**

programmed tests and test sequences called "procedures." Procedures are created by recording your steps in the system and then playing them back the next time you need to run the test series. These procedures can be edited, or even programmed from scratch using a computer language similar to BASIC.

One special test, called Fasttrig, allows a specially configured burst signal to be sent through the equipment and, in a second or so, you have everything needed to make frequency response, distortion and signal-to-noise measurements.

Fasttrig allows you to check your transmission path with almost no interruption of programming. This test can be automated as the Audio Precision waits, listening to the audio, until it hears the special tone and then records the measurement.

We use our System One primarily in the shop, although we do occasionally take it to the transmitter site, which has two full-power FMs, two full-power VHF TV and a high-power UHF TV, plus several low-power transmitters within 300 feet of us. We have never had a problem with RF. The one drawback here, however, is that the system is not readily portable; it is about as large and heavy as a desktop computer, and requires a PC to run.

The basic System One, which we bought about four years ago, only performs analog measurements. It scored big points with us because it could execute a complete alignment (except for head azimuth) of our Studer 807 tape recorders automatically. It set the frequency response, both play and record, as well as bias, automatically.

We have since moved to DAT recorders, ending up with fewer reel-to-reel recorders than we expected. Digital signal processing (DSP) options have made digital audio and other measurements possible.

We purchased the digital segments of

the System One about a year and a half ago. We have never had any problems with either the analog or digital parts of the system.

The unit we have is contained in one box, although you can get a two-box system. When we need to send a test signal from a different location, we just record the signals we need in advance on a DAT and then send it. This has been accurate enough for our work.

The biggest disadvantage of the System One is its lack of versatility. If the system is not used regularly or if you do not have a procedure for a particular test, it

may take you a while to set it up to do what you want. Also, the learning curve for the System One is high unless you only run procedures someone else has set up. There are no knobs.

Overall, the System One is one of the most accurate test systems available and makes it easy to document your test, either by printing out a graph or a list of readings automatically, or by saving the measurements to disk for later use.

□ □ □

For information, contact Tom Mintner in Oregon at 503-627-0832; fax: 503-641-8906; or circle Reader Service 69.



System One up and running

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World Radio History



USER REPORT

# FMSA-1 Attuned to Digital Systems

by **Dennis J. Martin**  
**Chief Engineer**  
**KBIG-FM**

**LOS ANGELES** Advancements in stereo generators, STL systems and transmitters have challenged, and sometimes even eclipsed, contemporary modulation monitoring equipment. It is impossible to test or adjust, say, a stereo generator if its performance exceeds the capabilities of the monitor.

Belar has introduced the FMSA-1, a digital FM stereo modulation monitor and analyzer. The FMSA-1 digitizes the composite waveform, then decodes the stereo multiplex signal using DSP (digital signal processing) technology.

The front panel of this rack panel device is uncluttered because most functions are fully automatic. Two three-digit displays indicate left and right channel modulation in percent, or, in the Crosstalk mode, L+R and L-R, respectively.

A 16-character alphanumeric display is used to select operating parameters and to indicate all other measured values. Two Menu pushbuttons and two Parameter pushbuttons select functions and change operating characteristics. A Pilot LED illuminates at the presence of at least 6 percent injection.

**Unique features**

The device achieves and maintains its precise operating parameters even though most internal calibration controls have been eliminated. Unlike analog monitors, DSP circuitry is not susceptible to component tolerance, aging or environmental factors, such as changes in temperature. Phase distortion is nonexistent because of DSP-based FIR (finite impulse response) linear phase filters.

Because measurements are digitized by the FMSA-1, many readings can be displayed in percent or dB. Any measurement that is available as a dB value can be made with or without de-emphasis, selected from front panel pushbuttons.

Besides traditional stereo measurements, the Belar FMSA-1 offers three new features: pilot modulation, separation and crosstalk direct/matrix.

Pilot modulation displays AM modulation of the 19 kHz pilot, in percent, over a 127 percent range. This function is a good indicator of multipath in off-air monitoring situations. It can also be used to investigate the effects of composite clipping or other aggressive processing, or to determine whether or not a stereo generator adequately protects the pilot region.

Separation is a direct-reading indication of the difference, in dB, between left and right channels. It is unnecessary to first measure the signal in one channel, then the residual in the other, and algebraically add the two values. Separation can be used as a quick check of true RMS channel balance using program material.

When Crosstalk Direct is enabled from the menu, the left audio output switches to the L+R signal, and the right to L-R. The L+R output is particularly useful in verifying mono compatibility. You can also evaluate processing or examine abnormalities by listening to the demodulated L-R component. Otherwise, Crosstalk Matrix displays the measured value but does not disturb the audio outputs.

These new features provide valuable

information previously unavailable. Tests are simplified as a result of direct-reading measurements and because the unit can be configured for automated proofs of performance.

**Operating modes**

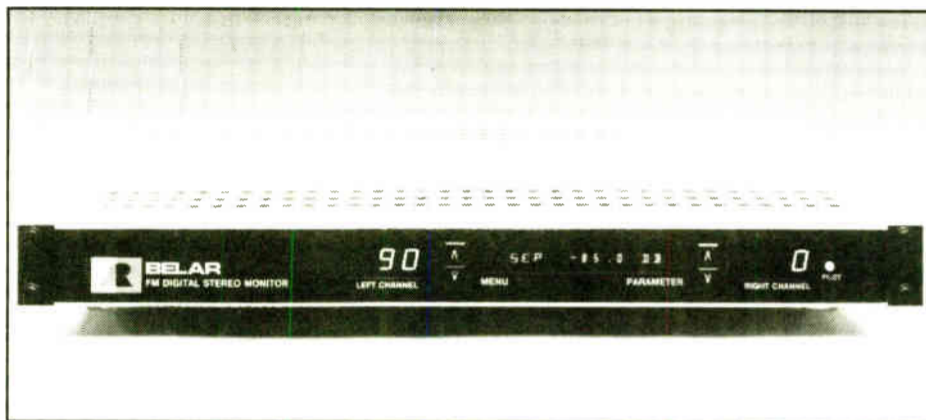
All user-selectable options can be saved to EEPROM, making them impervious to power failures. Three settings—Hold, Time Mode and Infinite—control operation of the digital displays.

Hold is the time interval that readings can be held or updated, and is adjustable in half-second increments, from 0.5 to 10

seconds. It affects peak modulation only because dB measurements are updated as rapidly as the detector will allow.

**Remote display capability**

Using the supplied software, a Wizard and a 2400 baud modem-equipped PC, the Belar FMSA-1 can be controlled remotely. On-site connection requires only a null modem cable and a PC. Because the software is DOS-based and operates in text mode, PC hardware requirements are modest—an 8086, or better, with 512KB RAM. However, a color display is recommended because the wealth of information is easier to interpret at a glance. A CGA, or



Belar's FM Digital Stereo Monitor

better, is acceptable.

The intuitive software can be operated using the keyboard or a mouse. (At times, we found the mouse to be more efficient.) All features are accessed from easy-to-understand, pull-down menus. Even though the software runs under DOS, you can still Tile, Cascade and Move/Size many on-screen display windows.

A PC is a worthwhile addition because it augments the analysis power of the FMSA-1. Selecting the software's bar graph mode, for example, allows six parameters to be simultaneously viewed on-screen: Total, Pilot Modulation, L, R,

measured and updates it if a higher peak is detected, until the option is disabled.

seconds. It affects peak modulation only because dB measurements are updated as rapidly as the detector will allow. Time Mode offers two choices: Real and Past. In the Real-time mode, the displays are updated immediately when a new peak is measured and the Hold timer is reset. In the Past mode, the unit waits for the end of the Hold interval, then displays the highest value peak that occurred during that period. We use the Real-time mode when we need to correlate measured peaks with program material.

The Infinite mode is, in essence, a peak hold function—it displays the highest value

L+R, and L-R. The color-coded bar graph for each shows peak, average and minimum modulation values. This mode reveals how program material is being altered by processing, especially when L-R enhancement is used.

A histogram plot, which is an X-Y presentation of modulation in the time domain, also highlights processing effects. Modulation vs. Time, the third display mode, plots real-time modulation in a scrolling time window.

Any graph can be printed by using the PC's print screen function. Histogram and Modulation vs. Time data, which includes peak, average and minimum modulation values, can also be saved to disk for later analysis and comparison. A supplied conversion utility converts log files into ASCII text that can be imported into spreadsheet or graphing applications for further manipulation.

**Lab-quality analyzer**

Left and right channel analog audio output specifications (50 Hz to 15 kHz) are impressive: frequency response -0.05 dB; SNR 90 dB; and THD and SMPTE IMD 0.01 percent maximum. Separation (L to R and R to L) is 80 dB, 10 Hz to 15 kHz. Crosstalk (L+R to L-R and L-R to L+R) is 80 dB, and subcarrier crosstalk is 90 dB.

In addition to left and right channel balanced outputs, and unbalanced audio and pilot outputs, an AES/EBU digital output, sampled at 48 kHz, is provided.

Although the FMSA-1 can be used with any demodulator that supplies a composite output, its capabilities are best realized when mated with the Belar FMMA-1 digital FM modulation analyzer, known as the Wizard.

The FMSA-1 digital FM stereo modulation monitor isn't just a tool for ensuring FCC compliance. It's a precise and comprehensive analyzer that can be used to fine-tune system performance, which is essential in today's competitive broadcast environment.

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For information, contact David Hirsch in Pennsylvania at 610-687-5550; fax: 610-687-2686; or circle Reader Service 127.

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USER REPORT

# Dorrrough Units Monitor Digital Path

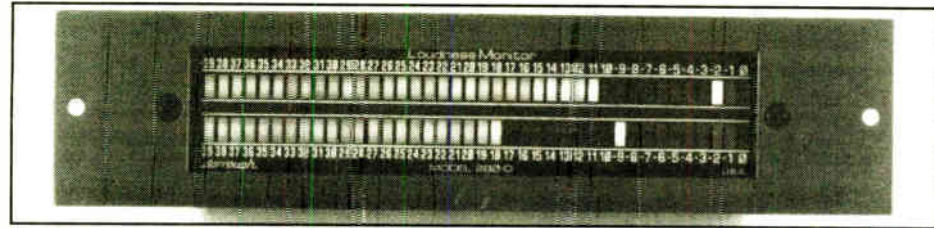
by John Morris  
Chief Engineer  
WLYF/WAXY-FM

**MIAMI** Now that the radio industry is finally making the transition from analog to digital in systems rather than just individual devices, the need to measure and monitor levels and loudness in the digital path is becoming as important as it has been in analog paths. **Dorrrough Electronics** has introduced the 280-D digital audio AES/EBU meter to fulfill this need.

Fifteen years ago, Dorrough gave us the 40-A, which changed the way many of us measured and monitored levels, peaks and loudness. With this device, we have been able to reduce the workload on limiting and compression systems with a resulting cleaner and more consistent on-air sound.

Until recently, seeing the analog audio input and output of a digital device was sufficient, and we had no real need to see

red. This function can be programmed by changing an internal jumper. There is



Dorrrough's 280-D digital audio AES/EBU meter

disagreement in the recording industry as to whether the "crash" warning should be a few counts under the top or should only indicate conditions over the maximum. The difference is less than one thousandth of a dB, so for practical purposes, the setting of the jumper is moot.

Another programmable feature is the peak display, which can be set with either internal jumpers or an external switch (supplied with the meter) that can be connected at the rear panel jack.

same digital signal tracked exactly.

Dorrrough's meters were the first to

give a true visual indication of what we hear from the speaker and, in doing so,

they have made mechanical and electronic VU and PPM meters obsolete. Now that the all-digital radio station is in the foreseeable future, we will need to have indicators of the audio represented in digital systems.

Although digital systems solve a lot of problems we could never totally conquer in analog, working in digital sometimes produces unexpected results, further complicated by our inability to see what is happening. Because Dorrough's digital meters let us look at digital signals in the same way we look at analog, we have a tool that enables us to master the new beast as well as we mastered the old one.

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For information, contact Kay Dorrough in California at 818-999-1132; fax: 818-998-1507; or circle Reader Service 72.

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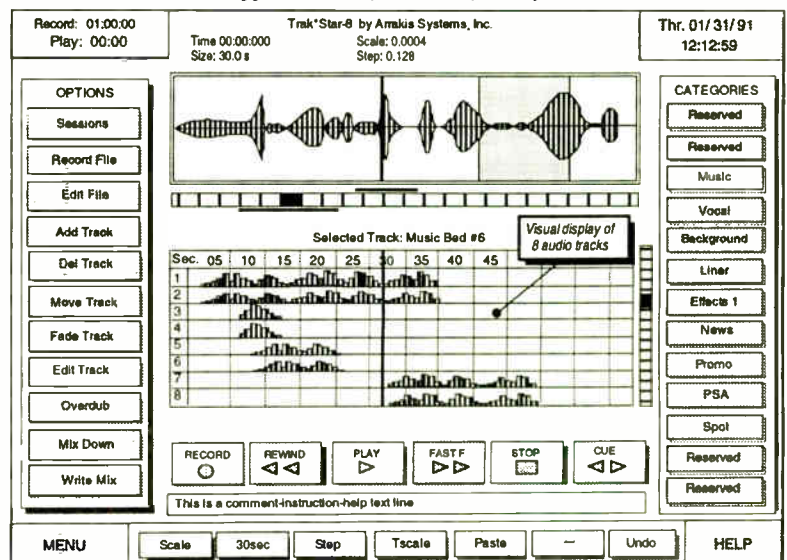
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### Now that the all-digital radio station is in the foreseeable future, we will need to have indicators of the audio represented in digital systems.

what was happening in the digital path. Now that we are interconnecting digital devices, we still need to monitor inputs and outputs, but if the output is AES/EBU, our analog meters are useless.

We need to be able to see the output as audio rather than a data stream. To interpret the digital material as audio, we need to see the peak and average levels, with the same ballistics we see on analog signals. We can then make the same determinations of loudness and openness that we do with our analog meters.

Dorrrough offers four models of its digital meter: 280-D, 280-E, 380-D and 380-E. The only difference between the 280 and 380 models is that the 280 is designed for horizontal mounting, the 380 for vertical mounting. The "D" models cover a 40 dB audio range, whereas the "E" models cover 60 dB. All have 40 LEDs per channel, scaled in 1 dB increments, except that the "E" models have 3 dB increments below -30 to expand the scale to 60 dB. The meter comes with a 20-page manual that fully describes the features and operation of all models.

Input, output and power are all brought to a single eight-pin screw-terminal Euroconnector, which makes changing out meters extremely simple. Power is provided by a 7 V AC adapter that comes with the meter.

The 280-D synchronizes to either the professional 24-bit or the 16-bit consumer format, and accepts sample rates of 32, 44.1 or 48 kHz. The format and sample rate are automatically detected and require no setup. The input can be balanced 110 ohms or unbalanced 75 ohms. It reliably responds to an input level as low as 500 mV.

Features unique to the digital meters include a warning when audio hits the digital "brick wall," when all data bits are 1. In this condition, the top three LEDs change from their usual yellow to

The options are for normal peak indications (similar to that of the analog meter), three-second maximum peak hold or indefinite peak hold.

In the indefinite mode, the LED representing the highest peak remains lighted after the peak has passed. If there is a higher peak, the LED for the first peak is extinguished, and the LED for the new peak remains lighted. The highest peak is retained until the meter is reset by switching to another mode. This is especially useful for monitoring a program line over long periods of time to determine how close the high peaks are coming to the crash point. The three-second mode works exactly the same, except the maximum peak indicator is reset every three seconds.

Another useful feature of the meter is the buffered output. The output is transformer-isolated, conforms to AES/EBU specifications, and remains at a constant 4 V, regardless of the input level.

The function of the meter is completely digital. It does not have a D/A converter to provide an analog display. It uses DSP processing on the digital signal to provide an accurate display of peak levels and audio energy. Because there is no analog section to the device, there are no calibration controls.

The units received by WLYF were first bench-tested and compared to a 40-A, using signal sources with both analog and digital outputs. The test with a 16-bit, 44.1 kHz CD player showed the digital and analog meters to track within 3 dB.

Tests with a professional 24-bit, 48 kHz A/D converter had the tracking much closer, within 1 dB at the upper end of the scale and 2 dB at the lower end. This leads me to believe that the error was in either the A/D converters or analog amplifiers. On program material, the error from either source was unnoticeable. Two 280-D meters on the



**CRL**

**DAA-50 Complements Bench-top Analyzers**

**TEMPE, Ariz.** The DAA-50 digital audio analyzer from **Circuit Research Labs (CRL)** receives and decodes audio data according to AES/EBU, IEC958,

S/PDIF and EIAJCP-340 interface standards. The DAA-50 identifies signal format, channel status, sample frequency, copy protection, etc. It also checks transmission links for various errors and reports the status. The unit contains a digital-to-analog converter that allows the user to monitor the audio through headphones.

**MODULATION SCIENCES**

**PRD-3000 from MSI Turns PC into RDS Monitor**

**SOMERSET, N.J.** MSI Model PRD-3000 monitor from **Modulation Sciences** turns a PC into an RDS monitor. The PRD-3000 enables broadcasters transmitting an RDS/RBDS signal to check the information content of the signal, measure the injection level and monitor the RDS signals of other stations.

Its features include analyzer functions, statistics functions, selectable error correction (none or 1-5 bit correction) with menus and mouse support.

Because PRD-3000 software decodes and displays the entire RDS data stream, the user can focus in on specific types of RDS data for maximum clarity. Any selected portion of this data may be stored on the computer's hard drive for later analysis. One potential use for the PRD-3000's data logging capability is to provide proof of delivery for data broadcasting customers.

Input to the PRD-3000 is composite, typically provided by the output from a conventional modulation monitor or from an FM tuner with composite output.

The PRD-3000 is connected to the serial port of any IBM-compatible computer using a standard cable. The PRD-3000 software is an MS-DOS program and features an interface design similar to that of Microsoft Windows.

When the PRD-3000 is operated from 12 V DC power, it can be used for portable field analysis. If it's connected to a laptop computer, a user can drive around a station's coverage area and analyze error patterns or analyze the RDS data being transmitted by other stations.

For information, contact Eric Small in New Jersey at 800-826-2603; fax: 908-302-0206; or circle Reader Service 16.

Designed to complement traditional bench-top analyzers, the DAA-50 can be used behind a rack or in the field. Slightly larger than a standard pager, it can be carried in a pocket or clipped to a belt. The DAA-50 is battery-powered but comes with an AC adapter, which can charge the batteries and supply power to the unit at the same time.

For information, contact Kent McGuire at Preco Inc. in Arizona at 602-874-0000; fax: 602-874-0390; or circle Reader Service 2.

**QEI**

**QEI Adds VPDT Option to 691 Modulation Monitor**

**WILLIAMSTOWN, N.J.** The QEI 691 modulation monitor offers bessel null calibration and contains the circuitry necessary to convert any X-Y input oscilloscope into a spectrum analyzer.

The baseband portion of the 691 contains a total modulation meter that is switch-selectable to display either positive or negative modulation peaks. The peak mod thumbwheel peak flasher and peaks-per-minute numeric LED display provide peak modulation indications from 1 percent to 199 percent in 1 percent increments.

The addition of QEI's VPDTO (variable peak duration test option) allows the 691 peak flasher to display peaks which are weighed by a combination of duration of the peak or the total number of peaks within a 5 millisecond window.

The baseband of the 691 also contains the carrier frequency thumbwheel, RF level indicators, power switch, mute switch and baseband test output. These outputs include BNC connectors to drive the oscilloscope as either a spectrum analyzer or vectorscope.

For information, contact Jeff Detweiler in New Jersey at 800-334-9154; fax: 609-629-1751; or circle Reader Service 92.

**SINE SYSTEMS**

**Sine Systems Gives the RFC-1/B System a New Voice**

**NASHVILLE, Tenn.** Sine Systems updated the RFC-1/B dial-up remote control system. The robot-like synthesized voice of the RFC-1 has been replaced by a digital storage device that contains actual recorded human speech. The RFC-1's microprocessor concatenates these recorded words to form phrases and sentences that relate telemetry, status and other information in a clear human voice. All other operating characteristics remain the same as the last System 4 software release.

Using surface-mount technology, Sine Systems has also developed a plug-in module that allows owners of older RFC-1s to field-upgrade their units with the new voice and latest software. The SU-5 synthesizer/software upgrade kit can be installed in a few minutes.

For information, contact Barry Ariaz in Tennessee at 615-228-3500; fax: 615-227-2367; or circle Reader Service 96.

**SESCOM**

**Sescom Meets Basic Test Needs with PO-71, PO-72**

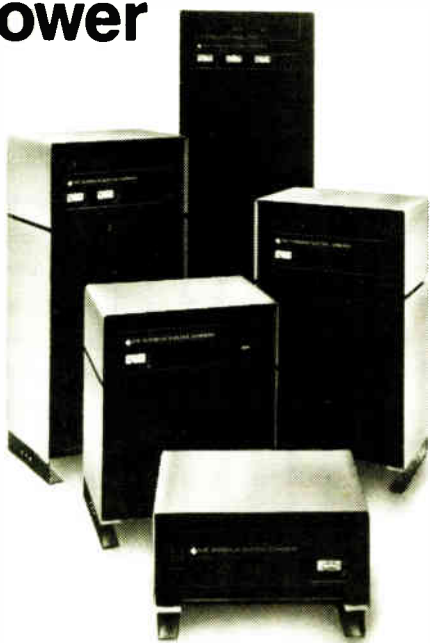
**HENDERSON, Nev.** Sescom has designed two new pieces of audio test equipment to meet basic testing needs at an affordable price. The PO-71 audio oscillator has three preset output levels: 0 dBm, -10 dBm and -50 dBm, and six selectable frequencies: 50, 100, 400, 1 kHz, 10 kHz and 15 kHz. The companion unit, the PO-72 AC voltmeter, measures AC volts from 10 mV to 10 V, with a meter scale calibrated in mV/V and dB and a dB range of -40 to +20. The VU meter scale is calibrated in a standard VU configuration.

Both boxes are battery-operated, requiring two nine-volt transistor batteries. The units are designed to help the user get a system or component up and working without a lot of knowledge. Sescom also sells a 14-minute instructional videotape for these units.

For information, contact Franklin J. Miller in Nevada at 702-565-3400; fax: 702-565-4828; or circle Reader Service 211.

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The DCR's simple cart-like operation requires little or no training. The player has only three front panel buttons — START, STOP and CUE. START and CUE are literally instantaneous.

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The MX Series Console offers the quality you demand, all the features you need, and a price you can afford.

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SPECIAL REPORT

# Tektronix AM70 a Time-saving Tool

by Susan Hammond  
Senior Service Engineer  
and Terry Murphy  
Senior Field Engineer

Customer Service & Eng. Center  
Sony Electronics Inc.

TEANECK, N.J. Sony's Customer Service and Engineering Center in Teaneck is one of the largest of Sony's five regional service centers in the United States. With our proximity to New York City, we provide both depot

and field service to many of the nation's major broadcast and production studios. Some 12,000 units come through the center each year to be tested, repaired and rebuilt.

We service or troubleshoot a variety of DAT player recorders, digital VTRs, digital audio editors and other audio equipment. One of the newest additions to our service toolkit is the Tektronix AM70 digital audio analyzer/generator, a compact version of Tektronix's AM700 mixed signal audio measurement set.

One of the first things you notice about

the AM70 is how small and practical it is. A hand-held device, the AM70 weighs just a pound and a quarter and operates on alkaline batteries or AC current. It's a convenient tool to keep close at hand on the workbench or toss in the tool bag.

With three operating modes, the AM70 is versatile as well. It can act as a source of analog and digital test signals, producing 14 audio test tones and a sweep that addresses all audible frequencies. The AM70 also decodes and allows us to modify a machine's channel status bits.

Before we had the AM70, testing the dig-

ital input and output of a DAT machine meant we had to have a second DAT machine on hand—a consumer-level DAT to test a consumer machine, or an AES/EBU format DAT to check a professional or broadcast-level machine. Because the AM70 decodes consumer as well as professional audio signals, we no longer need a second machine as a digital test fixture.

Similarly, because the AM70 provides both analog and digital test signals, it lessens the need for separate diagnostic analog and digital signal generators.

With the proliferation of the new digital consoles, field engineers have a greater need than ever for a digital generator. The AM70's portability and high-quality digital sources make it a handy troubleshooting device in this situation.

Because the AM70 lets us decode and modify the channel status bits, it provides an easy way to pinpoint interfacing problems that can crop up in multivendor environments. A quick check of the channel status bits is often all it takes to find out

## Touchscreen Plays Music and Spots Instantly from Hard Drive

### Play Anything at a Touch

Nothing else makes radio as fast or easy as having all your songs, spots, sounders and sweepers start with your fingertip—always on-line and ready to play from hard disk. And nothing else is better for fast, exciting radio than the new Scott Studio System!

Here's how it works: Six buttons on the left of the computer touchscreen play what's on your program log. Your songs, spots, promos, PSAs and live copy come in automatically from your music and traffic computers. You can rearrange anything by touching arrows (at mid-screen), or opening a window with the entire day's log. On the right, 18 hot keys start unscheduled jingles, sounders, comedy and sound effects on the spur of the moment. You get 26 sets of hot keys for your jocks' different needs.

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12:21:38A	Can You Feel The Love Tonight Elton John :15:3:57/C HIT HM105 10:14:47 # 1 for 3 Weeks in July, 1994	:14	Delete	Jingles & Spots	Music Library
Start F2	But It's Alright Huey Lewis & the News :12:2:44/F HIT HM2608 12:24:40	Auto	Jingles	Applause	Sweepers
Start F3	Win It Before You Can Buy It Q: The Sound of the Tones :00:0:18/C PRO TO2214 10:21:14	F7 Move Up	Weather	News Open	News Close
Start F4	McDonald's 2 for \$2 Special JT Q: Thru Saturdays Only :00:1:00/C CM DA1103 10:21:33	F8 Move Up	Morning Jin.	Oldies Jingle	Legal ID
Start F5	Bob's Bargain Barn BW Q: At Westland & East Park :01:1:00/C COM DA4310 10:22:01	F9 Move Up	Top 8 of 8	Crowd Boos	Happy B'day
Start F6	Uptempo Jingle Q: Kiss FM :00:0:06/C JIN DA1037 10:23:01	F10 Move Up	Contest Theme	Crowd Cheer	Wealthy Service

ABCDEFGHIJKLMNPOQRSTUVWXYZ

1:23 Love Birds 1:23:13 1964	A Heart Don't Beaten 1:23:23 1964	A Thousand New Babies, Young 1:23:33 1964	Autumn 1:23:43 1964	Alan's New Sound With 10 Minutes 1:23:53 1964
4:00 Reach Back 1:24:03 1964	A Little Bit of Mischance 1:24:13 1964	A Snowy Day Love Play 1:24:23 1964	Alan's Midnight Like a Captain 1:24:33 1964	Alan's New Sound From East 1:24:43 1964
6:00 The Boys 1:24:53 1964	A Little Bit of The Journey 1:25:03 1964	A Million More Practical Moments 1:25:13 1964	Alan's Sound With Spring 1:25:23 1964	Alan's New Sound From East 1:25:33 1964
8:00 The Movers 1:25:43 1964	A Little Bit of The Journey 1:25:53 1964	A World of Pleasure 1:26:03 1964	Alan's Sound With Spring 1:26:13 1964	Alan's New Sound From East 1:26:23 1964
10:00 The Movers 1:26:33 1964	A Little Bit of The Journey 1:26:43 1964	A World of Pleasure 1:26:53 1964	Alan's Sound With Spring 1:27:03 1964	Alan's New Sound From East 1:27:13 1964
12:00 The Movers 1:27:23 1964	A Little Bit of The Journey 1:27:33 1964	A World of Pleasure 1:27:43 1964	Alan's Sound With Spring 1:27:53 1964	Alan's New Sound From East 1:28:03 1964

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12:21:38A	Without You Matchless :00:0:00/F HI 100105 12:21:47 # 1 for 2 Weeks in March, 1994	:11	Delete	Jingles & Spots	Music Library
Start F2	Search of Philadelphia Bruce Springsteen :00:0:00/F HI 100105 12:21:47	Auto	Jingles	Applause	Sweepers

Audio: 32768.000: 2768: Stereo exp188

Audio: 32768.000: 2768: Stereo exp188



Tektronix's AM70 provides both analog and digital test signals.

### World's Fastest Requests!

Touch the Music button at the top right of the main screen to see our "Wall of Carts" with 1,000 songs (or more) on-line! They're displayed by title, artist, year, length, category, or any way you like. Touch the song you want and Scott Studios' digital audio hard disk plays it instantly.

In addition, all your comedy bits, spots, jingles, promos and PSAs have their own "Wall of Carts" so they start immediately. Or, you can pick any unscheduled song, spot, sweeper or promo and put it anywhere you want in today's log.

### 1, 2 or 3 Touchscreens

Teams of personalities can add touchscreens to share control. Jocks choose whether to handle sweeps themselves or let the Scott System sequence automatically.

### Simple and Paper-free

Weather forecasts, live tags, promo copy, contest winners' lists and programming memos automatically pop up on your Scott System's screen. As an option, we can also work with your news wire to update and display selected weather, news and sports copy.

### The Best Digital Audio

When spots, promos, PSAs, songs, or any other digital audio events are recorded, they're immediately playable in all your Scott System air studios. Nobody wastes time carrying carts down the hall or redubbing spots for additional stations.

Scott Studios will even pre-record your music library from CDs at no extra charge. You choose double- or triple-overlap playback (or more) while recording.

### Improve Your Production

Scott Systems pay for themselves in increased efficiency on-the-air and in production. Our graphic waveform editor quickly cleans up out-takes and works wonders with big productions.

### Disk Prices Plummet

Compared to mere months ago, hard disk prices have dropped dramatically! Dave Scott and his team has more digital audio and automation success and experience than anyone else in the business! We also offer excellent leases. Call for details.

**Scott Studios Corp.**  
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why a VTR and an audio console are not communicating.

The AM70 also has an internal digital-to-analog converter that lets us listen to a digital audio signal via headphone or an internal speaker, another feature that makes for quick diagnostics.

On a recent field call, for instance, an improperly connected cable was causing sound breakup. We used the AM70 to generate a signal, fed it into the system under test, and could easily hear the sound breakup over the AM70's speaker.

The AM70 has proved itself as a time-saver in a busy, state-of-the-art service environment. It cuts the time needed to diagnose and repair audio equipment, and enables us to diagnose situations not just quickly but conveniently. It has become a valued member of our service team.

□ □ □

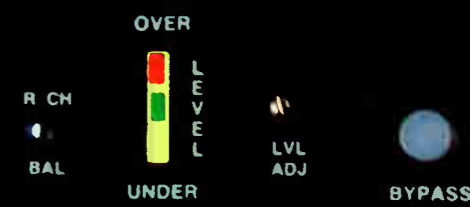
For information, contact Heather L. Wyse in Oregon at 503-627-4697; fax: 503-627-5801; or circle Reader Service 183.



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# GET LEGAL

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## GET LEGAL with FM ModMinder®

When you need accurate modulation measurement, you need ModMinder. With accuracy within 1 percent, FCC-approved ModMinder ignores brief audio peaks and often lets you increase modulation - legally. Internal calibration guaranteed for two years means you'll know where 100 percent is, right out of the box!

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BGW-150 stereo amp, w/impedance matching module, \$400/BO. TVNY Productions, 800-606-8869.

Crown D-60 new cond, silver face, w/manuals, \$300; Crown IC150 & DC300A preamp & power amp, exc cond, w/manuals, \$400. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Symetrix SX204 4 chnl headphone amp, indiv volume controls, \$100. Ken R, 1808 Madison Ave, Toledo OH 43624. 419-243-1000.

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Utility type 540 tower (200'), galvanized and painted, with guys and turnbuckles, already dismantled. G Peterson, KIQK, POB 1680, Rapid City SD 57709. 605-343-0888.

Windjammer AM, 185' tower, free to good home, needs paint, all hardware included, take it down and it's yours, also have extra guy wires, johnny balls. B Dunkle, WTYS, 2725 Jefferson St, Marianna FL. 904-482-2131.

4 Bay FM 91.5 antenna; Rohn UNR 64' free standing tower, \$1000. M Taylor, KHFO, Rt 1 Box 1821, Neosho MO 64850. 417-451-5636.

Phelps-Dodge CP6 6 bay hi pwr FM on 93.1, \$4000. S King, KMML, 1703 Avondale St, Amarillo TX 79116. 806-355-9777.

ERI FMH-1AE CP FM, on 100.3 MHz, good condition. G Peterson, KFXX, POB 8205, Rapid City SD 57709. 605-348-1100.

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Working 0-10 amp thermocouple RF ammeter. R Miller, KUAU, Box 575, Lahaina HI 96767-0575. 808-572-5534.

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### AUDIO PRODUCTION

#### Want To Sell

DBX 150 type I NR, 2 chnl, \$75. Ken R, 1808 Madison Ave, Toledo OH 43624. 419-243-1000.

Mayer HFX 2 chnl, ambient NR unit, rk mt, \$775. E Toune, Audio Etc, 525 W Stratford Pl, Chicago IL 60657. 312-975-6598.

Potomac FIM-21 field strength meter. A Sutton, WBCU, POB 70, Union SC 29379. 803-427-2999.

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Shure FP-11 portable mic/line amp, \$125; Shure FP-12 portable headphone amp, \$125; AKG N66E 6 mic phantom pwr sup w/rack mt adapter, \$125. D Glassner, Airshow, 703-642-9035.

Aphex Expressor, mint/new cond. \$350. R Crabtree, 6201 Grandview Ave, Erie MI 48133. 313-848-6453.

dbx 157 prof 8 chnls, NR, exc, \$500; 2-trk, \$200. H Fenster, Universal R & R, 17 W 20th, NY NY 10011. 212-929-3277.

Dolby 363ASR noise reducer, \$600; Dolby SDU-4 surround decoder, \$350/BO. TVNY Productions, 800-606-8869.

Henry Engineering Mix Minus Plus, \$90; Henry Engineering LogiConverter, \$90; Valley Int'l HH2X2B level matching interface. C Scherer, WMMS, 200 Skylight Office Twr, Cleveland OH 44133. 216-781-9667.

Phase Linear auto corrolator, single ended NR/expander, exc cond, \$200. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

ADC 1/4" patchbays and cords, NEW, UNDER HALF PRICE, ADC TT patchbays, \$129 up, NEW cords, \$9.95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Good used studio tape 1/2" \$15, 1" \$30, 2" \$55. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

UREI LA4 mint pr, \$1095; Lexicon Alex, \$295; bulk eraser, \$49; Stewart direct boxes mono, \$50; 4 Ch, \$95; Cue command decoder, \$125; ABC Network decoder, \$125; NEW Tascam midiizer MTS1000, \$750; Dyna stereo 120 rack mt amp, \$229; Sherwood FM tuner, new tubes, \$49; Infonics 7" reel copier 3 copies, \$125 ea; Crown & Furman elec crossovers, \$95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

#### Want To Buy

Advent MPR-100 line stage for music. A Levinson, Sprucehill Music, 1002 S 49th St, Philadelphia PA 19143. 215-729-0941.

Esoteric Sound, re-equalizer. J Hawtt, Hawtt Audio, 2418 36th Ave W, Seattle WA 98199. 206-282-0720.

Telephone to cart deck interface, Henry Engineering TelecartII, BE PC-1 or similar device. Andy, Ski Areas of NY, 315-696-6550.

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Ampex tube mixers, plug-in mic pre-amp modules for PR10's. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

### AUTOMATION EQUIPMENT

#### Want To Sell

ITC 750 series automated PB R-R, \$50. Ken R, 1808 Madison Ave, Toledo OH 43624. 419-243-1000.

Wegener 1630 for CNN news, \$450. P Bridges, KGKO, 202 East Cross, Benton AR 72015. 501-778-8257.

Printed circuit cards for model 452 bi-directional Carousels, DS-20 switcher, ITC SP & RP cart machines. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

SMC 24 cart mono (6), in racks, \$300/all. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

SMC DP-2 complete w/350 (3) and 450 (1) Carousels, ITC reel (4), ARS1000 reel, will part out. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

SMC DX-20 switcher w/PDC clock, pwr sup, encoder w/video terminal, sell as pkg or by piece. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

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ITC Delta R/P, almost new, \$1000/BO. C Scherer, WMMS, 200 Skylight Office Twr, Cleveland OH 44133. 216-781-9667.

ITC 3 deck mono w/spare motor and top bearing, \$950. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

Tascam MSR-16 16 trk analog w/dbx, less than 25 hrs, \$3000; Teac A-3440, nds work, good for parts, \$150. T Dupuy, Holbrook Media Prod, 108 Exchange Pl, Lafayette LA 70503. 318-234-3768.



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Revox B-77 Reel 7 1/2 & 15 IPS -	REBUILT	\$ 895
Teac X1000R 1/4 Track Stereo Reel Auto Reverse -	REBUILT	\$ 595
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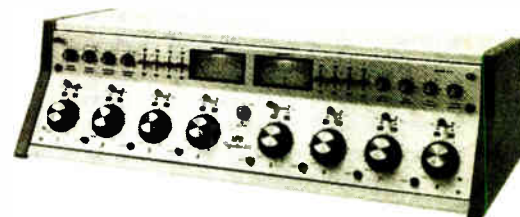
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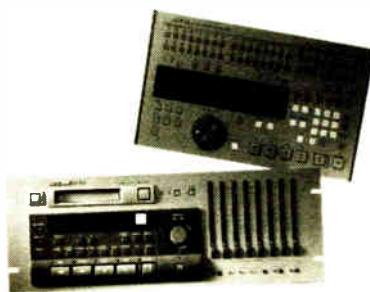
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**ITC SP (2)** mono PB, some new parts, \$250/ea. A Switzer, 60 Second Prods, RR2 Box M430, Monroe NY 10950. 914-496-5371.

**ITC PB decks (4)**, \$125. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

**Tapemaster 700P** some VGC, \$195; older 700P, \$125. A Ishkanian, Focus on Truth, 132 Arbor Oak, Ashland VA 23005. 804-752-6942.

**Want To Buy**

**Harris Criterion 90** rk mtng. P Gray, KJDY, POB 399, John Day OR 97845. 503-575-1185.

**Tapemaster R/P, PB**, that need repair. A Ishkanian, Focus on Truth, 132 Arbor Oak, Ashland VA 23005. 804-752-6942.

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**Ampex AG 350**, mono r-r w/solid state electronics, rk mt, \$500; Ampex 350 (2), mono r-r w/Novonics electronics, solid state, \$300. A Baker, Bdct Prod of America, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

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**Otari SX70** 8 trk, 1" r-r, new remote ctrl w/25 ft cable interface, 6 1/2" tape reels and maintenance tape, all books and specs, BO. B Giordano, WODS, Boston MA, 617-728-1957.

**Pioneer RT 707** as new, \$350; Reac A33405 4 chnl little use, \$500; Teac A2300 4 chnl, \$300; Teac A4010, low hrs, \$200; Akau GX77, \$200; Akai 4000D, \$100; Marantz 7T like new w/box & book, \$400. J Parsons, Parsons Sound, 2781 Fayson Circle, Deltona FL 32738. 904-532-0192.

**Sony MDS-101** mini disc R/P, in orig box, \$450. R Dewese, WJYM, 8761 Fremont Pike, Perrysburg OH 43551. 419-748-8430

**Ampex/Schafer AG 440 (2)**, 2 trk repro decks, rack mt, \$200/ea. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

**Ampex 601** portable tape recorders (3) & Ampex 620 portable speaker/amps (3). Working when retired, BO + shipping. Mel Crosby, 408-363-1646.

**Audio Technica RMX664** 4 trk, R/P, 6 chnl mixer/rcdr, 2 cue sends, phantom pwr, low speed/high speed R/P, parametric EQ shelving, w/schematics, \$600. G Fitzgerald, Fitzmusic, 37-75 63rd St, Woodside NY 11377. 718-446-3857.

**ITC 750 (2)**, R-R, R-P, exc cond, w/spare PB PC card, \$400/ea or \$750/both. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

**Otari MX 5050**, 1/2" 8 trk, \$1000; Otari MTR 12, 1/4", 2 trk w/time code brd, \$1500; Otari 5050 MKIII, 1/2", 4 trk, \$1000. D Gaydos, WNYU, 721 Bdway, NY NY 10003. 212-998-1663.

**Panasonic SV-3700** DAT machines (2), \$1200/ea. M Seaver, KUQA-TV, 510 Maine, Quincy IL 62300. 217-222-6200.

**Scully 280**, 2 trk, PB only, 7.5 & 3 3/4 ips, \$200; Teac A-2000, 1/4 trk R-P, exc cond, \$200. L Wagner, POB 1788, Orlando FL 32802.

**Otari Mark II-IV 1/2"** 4-track, multi-track, mint, less than 50 hours, Best Offer. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

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**Ampex ATR 100 (2)** 4 trk \$3500 ea, 2 trk 1/2" \$4000, (2) 2 trk 1/4" \$2500 ea. 212-343-0265.

**Tascam TSR-8 1/2"**, 8 trk, mint, less than 10 hrs, inc remote, \$1900/BO. R Crabtree, 6201 Grandview Ave, Erie MI 48133. 313-848-6453.

**Otari 5050-SHD** 8 trk 1/2" newly rebuilt, heads have full, life left, \$1800. W Gunn 619-320-0728.

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**Marantz PMD-221** cassette recorder, \$175. Troy, 612-443-3637.

**Want To Buy**

**Ampex 440C** parts; ITC 850 parts. J Parsons, Parsons Sound, 2781 Fayson Circle, Deltona FL 32738. 904-532-0192.

**Ampex ATR100** taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

**CD PLAYERS**

**Want To Sell**

**Technics (2)** mint cond, \$550/ea. B Giordano, WODS, Boston MA, 617-728-1957.

**CONSOLES**

**Want To Sell**

**Arrakis** 6 pot, 12 input mono, \$500 or trade for Cart rcdr. A Switzer, 60 Second Prods, RR2 Box M430, Monroe NY 10950. 914-496-5371.

**Calrec M Series MiniMixer**, 12 inputs, stereo, mono, and 4 aux outputs, flexible talkback and monitoring facs, xlrmt balanced I/O, 196 pt TT patch bay, vgc, \$9500. D Glassner, Airshow, 703-642-9035.

**Gateley** 16 x 8 w/EQ 4 effects buss quad monitoring cannon connectors for line & mic inputs adn cannon connectors for outputs, \$850. A Baker, Bdct Prod of America, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

**Alesis 1622** 16 chnl mixer, \$425. G Fitzgerald, Fitzmusic, 37-75 63rd St, Woodside NY 11377. 718-446-3857.

**MCI JH416** 18x4x2 rcdng console w/patchbays and producers desk, updated w/5534 chips, \$3000. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

**Micro Trak Sports Remote** mixer, almost new, \$100. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

**Quad-eight 248** series, 6 stereo w/4-to-one stereo mix line inputs, 3 mic/line EQ inputs, 4 output chnl. B Maxwell, Maxwell Productions, 412-441-2020.

**Soundtrax FME-12/4/2** stereo mixing console, 5 yrs old, \$4500/BO. TVNY Productions, 800-606-8869.

**Mackie 1604**, \$575; Soundcraft Spirit 24x24, \$3950; Ramsa 820 20x8x16 w/meter bridge, \$1950; Quantum 23x16x24 as used by LA Philharmonic, \$4950. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

**Tascam 106** 6 in, 4 out w/EQ. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

**Yamaha MC-802** 8 channel mixer, \$365. Troy, 612-443-3637.

**Want To Buy**

**Console**, 8 chnl stereo in gd cond, for high school, donation or low cost. M Buescher, WKNT, Kent School, Kent CT 06757. 203-927-3501.

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**Intersonics** Sub-woofer, hi pwr servo sub woofer, 15" servo drivers (2) in large enclosure, will trade for 77 or 44 RCA, \$750/BO. S Horner, KPPZ, 9255 Town Center, San Diego CA 92121. 619-535-1210.

**Opcode Studio 3** MIDI interface, \$150. G Fitzgerald, Fitzmusic, 37-75 63rd St, Woodside NY 11377. 718-446-3857

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**Want To Sell**

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**CBS Volumax 4000A** AM limiter, \$75. A Switzer, 60 Second Prods, RR2 Box M430, Monroe NY 10950. 914-496-5371.

**Orban Optimod 8000A**, 8100 and 9100 w/compost clipper, \$1200+. Steve, CBP, Box 411, Alexandria KY 41076. 312-509-8523.

**Orban Optimod 8100**; also XT2 chassis, Texas Audio Prisms and Texas card for 8100. P Slatton, WBTG, POB 518, Sheffield AL 35660. 205-381-6800.

**Sony C-74** condensor sholgun, battery or phantom pwr, exc cond, short sholgun, \$600. E Toune, Audio Etc, 525 W Stratford Pl, Chicago IL 60657. 312-975-6598.

**CRL FM4** system consisting of SP800, SEP400A (2), SMP800 and Orban Optimod 8000A, \$2500. G Peterson, KFYS, POB 8205, Rapid City SD 57709. 605-348-1100.

**Want To Buy**

**Optimod 8000 & 8100** in any cond; FM xmtrs in any cond. G Evans, Evans Communications, POB 7762, Amarillo TX 79114. 806-355-3517.

**Fairchild 670** or 660 tube compressor/limiter, Teletronics LA-2A tube compressor/limiter or UREI LA-3A solid state compressor/limiter, call after 3PM CST. 214-271-7625.

**MICROPHONES**

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**Neve 1066** preamp, 3 band eq, lo pass filter, recapped, \$1500; Summit Audio TPA-200B dual chnl tube mic preamp, still in box, \$1700. Bob, Clockwork, 606 Mamaroneck NY 10543. 914-381-0661.

**Sennheiser MKH-40** cardioid; Sennheiser MKH-30 Figure 8; M/S mounting clip; shock mt cradle, exc cond, \$1600. D Glassner, Airshow, 703-642-9035.

**Symetrix SX202** 2 chnl mic preamp, \$100. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

**Audio-Technica AT 831** lavalier mics (5). C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

**Sennheiser HMD 224** headset mic, \$175; Beyerdynamic DT109 headset mics, \$75 ea; Electro-Voice RE11 mics, \$50; Shure SM82 line-level mic, \$110. Troy, 612-443-3637.

**EV RE20's**, \$275-325; Sony ECM377 large dia. cond mic, \$495; RCA 44BX matched set of 3, \$3950; Shure new SM7, \$395; AKG new D112, \$295; Crown GLM200 lavalier like new, \$125. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

**Want To Buy**

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**77-DX's, 44-BX's, WE KU-3A's** On-Air lights, recording lights & audition lights. Top price paid. Fast response. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131, FAX: 615-292-3434.

**RCA 77DX's/44BX's** ribbon, chrome/TV grey, gd cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

**RCA ribbons**, AKG 451's, Neumann KM84's, EV 635A. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

**MISCELLANEOUS**

**Want To Sell**

**Cases** 10 space Anvil rack, 18" deep, foam lined outer case, heavy duty casters, front & rear rails, vgc, \$275; HD rack cases (2), 8 space 26" deep, shock mounted inner rack, HD casters. \$375. D Glassner, Airshow, 703-642-9035.

**Equipment racks** 7", 17", 35", 72" P Bridges, KGKO, 202 East Cross, Benton AR 72015. 501-778-8257.

**Instruction manual**, Federal 193-A 10 kW FM xmtr, \$35. R Humphrey, WVVVA, 1015 Main St, Wheeling WV 26003. 304-234-0057.

**Rotron Blowers** for Elcom, Harris, CCA, CSI, McMartin, rebuilt & new. Goodrich Enterprises Inc. 11435 Manderson St Omaha, NE 68164 402 493 1886 FAX 402 493 6821

**AT & T Partners**, 2 line x 6 set telephone system, incl 5 sets, new. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

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Sun, Beaches, Fun! 100kw Florida FM seeks energetic team player who has strong transmitter and studio knowledge. Good communications/people skills a must. Good benefits. Send resume, salary history, references to Radio World, POB 1214 Falls Church, VA 22041 Attn. Box 95-01-25-02RW-EOE

**Cape Cod's "ClearClassical" W FCC** is seeking an ANNOUNCER!  
Must have minimum 3-5 years' of commercial broadcast experience, a pleasing voice, good diction, and board and commercial production skills. Classical programming and computer skills also helpful. Salary will be commensurate with experience and capability. Please send resume, with references and a demo tape to: The Manager, WFCC, One Villages Drive, Brewster, MA 02631 Cape Cod is a beautiful place to live!  
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**Air/Prod** for new guy on block, ready to travel, any fmt. Lee, 918-627-2586.

**Ambitious anncr/prod** whiz, will work any shift in any market, real, conversational delivery for your country or rock format. Johnny, 918-224-2468.

**Expd Small Mkt** manager, sales, programming, production, I can do it all. Technical savvy too. C Waller, 919-330-2210.

**Fresh out of school**, aggressive, attitude, want to relocate. Veronica, 405-354-6854.

**HELP WANTED**

**Assistant Chief Engineer** for St Louis FM/FM/AM trombo. Prior experience in all areas of studio and transmitter maintenance required. FCC license, SBE certification and computer knowledge a plus. Resume and references to Bob Hoffman at WKKX-FM/WKBQ-FM/AM, 111 West Port Plaza, Suite 1000, St Louis MO 63146. EOE. MF.

**Expanding Christian FM network** needs experienced ministry minded CE knowledge of low and high power FM transmitters, FCC rules, studios, and satellite systems a must. Send resume and salary requirements to Directory of Engineering, Oasis Network, PO Box 1924, Tulsa OK 74101-1924.

**Opportunity knocks** for responsible person with good pipes. Computer literate. Send tape to: KEMM-FM, Box 1292, Greenville TX 75403. Available Immediately!

**Anncr** seeks FT or weekends, will relocate for FT. Mike, 904-255-6950.

**Bdct grad** seeks on-air/prod/news slot. Rick, 405-348-6816.

I know **Christian music** inside and out, ready now for air, prod. M Pittman, 918-451-9436.

**Innovative and experienced**, OM/PD/Morning AT seeks midwest challenge. Ron, 612-774-0673.

**Need organized**, enthusiastic, behind-the-scenes, staffer? Recent bdctng school grad seeks FT sales/traffic/new etc. Western US preferred, anywhere okay. Jackie, 405-741-3631.

**New man** on the rise, ambitious, dependable, recent grad seeks small/medium mkt, on-air, copywriting, prod, sports, any format, will relocate. Kenny, 405-672-2756.

**Pro Bdct Engineer** w/25 yrs exp seeks CE/Dir of Eng position w/stable, debt free stn. Prefer IL, IN or WI. Jeff 719-392-5745.

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**Very sharp** air, creative prod for country or easy listening stn. Andrew, 918-425-2120.

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I want to make money for myself too, 27 yrs exp, will turn your station around. Vic, 800-779-4737.

**Ready to win** in '95! I'll give you numbers, mornings, eve, news, talk, whatcha go? Experience, references/tape. H Adams, 904-694-2283.

**Versatile, intelligent**, great for start ups or existing stns, want FT airshift, first PD gig. Janet, 502-895-5888.



## MISCELLANEOUS...WTS

Onan 7.5 kW natural gas gen set with transfer switch, low hours, \$7250. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

## Want To Buy

Acrosound TO-350 or Peerless S-268-Q. B Leslie, Pro Poding, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435.

B + O Ribbon, mono or stereo. A Levinson, Sprucehill Music, 1002 S 49th St, Philadelphia PA 19143. 215-729-0941.

Pacific Recorders SDA-8 DA w/ALR connectors. J Miller, KABC, 3321 S La Cienega Blvd, Los Angeles CA 90016. 310-840-4946.

ABC, MBS or Liberty Bdct 1940's and 50's promo mats, or affiliate lists, programming. P Gray, KJDY, POB 399, John Day OR 97845. 503-575-1185.

Phonograph records from 1950 - 1970, all types of music, 45s, 33s, 78s and transcriptions, top prices paid. B Berry, Karavan Bdcting, 13 Montgomery Place, Carrore TX 77384. 800-321-2920.

Jazz record collections, 10" LP/12" LP be-bop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, Nyny 10003. 212-674-3060.

## RECEIVERS &amp; TRANSCEIVERS

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## Want To Buy

McKay Dymek DA9, amplified AMLW/SW antenna. J Hawtt, Hawtt Audio, 2418 36th Ave W, Seattle WA 98199. 206-282-0720.

## REMOTE &amp; MICROWAVE EQUIP

## Want To Sell

Marti STL on 102.1, exc cond, \$1000. L Pascoe, KBIX, 5107 32nd St, Tulsa OK 74129. 918-742-2228.

Moseley TRC-15 rmt ctrl subcarrier UP/TSL return, gd cond, \$500. B Eddy, WRRR, Box 374, St Marys WV 26170. 304-684-3400.

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MCI PRS-10 composite STL, 945.0 mHz. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

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Moseley TRC-15, remote control, gd cond, will trade for 77DX or 44 series RCA or \$500. S Horner, KPRZ, 9255 Town Center, San Diego CA 92121. 619-535-1210.

Davis Communications Group Cellular prod unit to interface broadcast remote mixer to a cell phone, incl docs and adaptor for Uniden CP2000, good cond, BO. G Peterson, KFXX, POB 8205, Rapid City SD 57709. 605-348-1100.

## Want To Buy

Marti RPU gear, either VHF or UHF w/matching rcvr, state price and cond. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-250-4464.

Composite STL's (2). P Gray, KJDY, POB 399, John Day OR 97845. 503-575-1185.

## SATELLITE EQUIPMENT

## Want To Sell

DX 500 antenna, consumer model for TV or audio subcarrier, \$50. D Littleton, WAZF, 875 East 15th St, Yazoo City MS 39194. 601-746-7735.

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Wenener 1601-50 mainframe, 1605-03 power supply, 1638-08 RX translator 9.69 MHz, 1606-21 block converter, 1646 dual 35 Hz tone decoder, 1645 dual 25 Hz tone decoder and 1622 dual demod, BO. G Peterson, KFXX, POB 8205, Rapid City SD 57709. 605-348-1100.

Tru-Spec LA-915 LNB line amps, 20 dB gains, low noise, 2 dB, \$11/ea. A Wudel, ILCC, S 18th St, Esterhill IA 51334. 712-362-4119.

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10k AM, non dir, C-QUAM stereo, N Central AZ. 602-774-0864.

Building, property, xmtr in Takio MO, \$50,000. K Wolf, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

MANCHESTER NH 5kw-U WKBR, \$290k. Additional 46-acre site option. Bob 617-449-5618.

## Want To Buy

26 year radio veteran with good references seeks co-signer to purchase a going small market AM or silent partner to put dark AM on the air, stn to serve 2 counties that need stn. B Rachels, 516 Colton Ave, Thomasville GA 31792.

Midwest bdct veteran seeks AM/FM or FM only, owner-operator situation, \$1 million and under considered. B Holtan, 3619 Greendale Ct, Eau Claire WI 54701. 715-831-8110.

Purchase or lease to O & O your dark, nearly dark, troubled or redundant AM, FM or LPTV in Western US. J Mann, 509-248-6623.

Small AM or FM in college mkt. Mr. Ford, 310-423-3899.

Purchase, Lease to purchase, O&O - your dark, nearly dark, troubled or redundant AM, (FT,DT) FM, LPTV in Western U.S. Reply to Radio World, POB 1214, Falls Church VA 22041. Attn Box #: 95-01-25-01RW.

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## Want To Sell

Altec 604E speakers; Roberts 770X recorder, 2 trk amps in consol; Scully 284-B 8 trk, Sound Work 1280-B shop bnd, 12 in 8 out, Ampex 351 remote cntrl; Nakamachi stereo deck; Tascam 122MKII; Lexicon PCM-60 echo unites; UREI 1176 LN (2) limiters; wired patch panels (3); much more, for list: Lee, Oakridge Music, 2001 Elton Road, Ft Worth TX 76117. 817-838-7623.

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Audiopak (100) 3.5, 5.5, 10.5 minute carts. G Barinowski, Good News Network, 3213 Huxley Dr, Augusta GA 30909. 706-736-1269.

Pams Jingles ref tapes, 1951-1976, BO R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

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Tektronix 7118 analyzer, plug in, freq ctrl knob damaged, microwave components are in gd cond, digital storage and video output sections nd repair. BO. Barry, Downeast Mac School, RFD 1 Box 388, Machias ME 04654. 207-255-4735.

FIM-21 field strength meter, like new, \$2800. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

**Want To Buy**

Hickok 605A tube checker operating manual, copy ok. B Leslie, Pro Rcdng, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435.

PALKW 1SWR Meter, 2 scale 0-100W, 0-1000W W, gd cond. F Fabre, WFVL, POB 201, Lajas PR 00667. 809-899-4934.

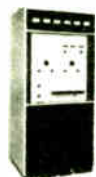
**TRANSMITTERS**

**Want To Sell**

Collins 20V-1, gd cond, BO. E Pendergast, KAOK, POB 19090, Lake Charles LA 70615. 318-436-7541.

LPB 20-T 20 W AM w/spares, solid state, \$200 R Dewese, WJYM, 8761 Fremont Pike, Perrysburg OH 43551. 4-9-748-8430.

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Continental 317C2 gd cond w/some repairs needed, 50,000 W AM, \$15,000; Gates FM 20H3, 20 kW in fair cond, \$15,000. P Christenson, Prism Radio, 3101 University S, Jacksonville FL 32216. 904-721-8223.

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Harris plate xfmr for MW5, \$500. S King, KNML, 1703 Avondale St Amarillo TX 79116. 806-355-9777.

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**Want To Buy**

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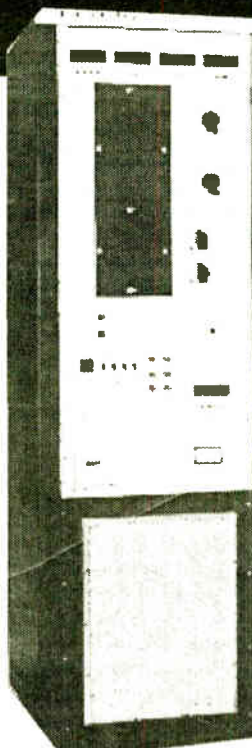
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