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AES and SBE Show Wrap-Ups, pp. 23-36

AM Standard's Impact Uncertain

by John Gatski

WASHINGTON Although hailed for its potential to restore some quality to AM, some industry analysts believe a new law requiring the FCC to select an AM stereo standard may not have a big impact on AM stations or equipment manufacturers.

Nonetheless, if at least some stations decide to convert as a result of a mandated standard, AM stereo equipment may get a mild sales boost, according to equipment manufacturers.

Doubts about a major impact are fueled by AM stations' financial woes, a feeling a standard is too late in coming and the allure of more modern technical enhancements, such as digital audio broadcasting (DAB) on the AM band.

Currently, the majority of stations transmitting AM stereo use Motorola's C-QUAM as opposed to Kahn Communications' ISB system. Still, such stations—fewer than 700—represent a small fraction of the nearly 5,000 AM stations on the air today.

The FCC declined to approve an AM stereo standard in the 1970s and the early 1980s, opting instead to let the marketplace determine the best system. Critics contend that without the guidance of a standard, AM stereo never caught on.

The NAB predicts that a standard may convince a few AM mono stations to convert, but not many.

No flood of converts

"It's hard to say," said John Marino, NAB's manager for technical regulatory affairs. "But (a standard) probably won't bring a lot of stations over to AM stereo."

Most AM stereo equipment companies agreed that a stereo standard is not likely to convince a large number of stations to convert to AM stereo.

Motorola, Broadcast Electronics, Nautel, Delta and Harris manufacture stand-alone AM stereo generators. Broadcast Electronics, Nautel (and soon Harris) produce transmitters with built-in generators. Other companies also build equipment that completes the stereo equipment chain.

Tim Bealor, sales manager for Broadcast Electronics, said a standard will not persuade numerous mono AM stations to convert to AM stereo.

"I don't think you are going to see a big rush," Bealor predicted.

Other answers were similar. "I wonder if it (a standard) is too late to have much impact," Nautel Sales and Marketing Manager Jorgen Jensen mused. "It may change a few more stations' minds. But I don't see a great rush to invest more money."

Delta's Marketing Vice President Joe Novak agreed. "I don't think that this is going to have a large effect. I wish it would, but I'm trying to be practical."

An added expense

Bealor said many AMs cannot afford to convert to AM stereo because of financial difficulties. Not only would mono

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Mob Scene: Large crowds and scores of new products marked the 93rd AES show. See pp. 28-36.

All Quiet on the Western Front: SBE show attendance was down from last year. Convention coverage, pp. 23-28.

Stereo Litigation Predicted

CARLE PLACE, N.Y. Suspicions that AM stereo might stay locked up in the courts were bolstered by recent comments from Leonard Kahn, inventor of the ISB AM stereo system, a competitor to Motorola's C-QUAM.

Fear of legal entanglement has marred AM stereo standard talk for a decade. The potential threat of litigation from losing system proponents was once thought to be an underlying reason for the FCC's refusal to select a standard in the early 1980s.

Kahn Communications has been in litigation with Motorla and General Motors for several years, alleging patent infringement by Motorola.

Although he said he intends to submit his ISB system to the FCC for consideration under its congressionally-mandated standard process, Kahn predicted that litigation will continue if the FCC chooses either ISB or C-QUAM.

"The net result will be years of further delay in the final free implementation of a workable AM stereo system," Kahn said in a faxed written response to several questions posed by **RW.**

Kahn indicated he actually opposes the FCC setting a standard. "...All Americans should favor economic freedom because it goes hand in hand with all types of freedom," he said.

Despite signs of implied threats of possible litigation involving the standard process, Terry Haines, chief of staff for FCC Chairman Al Sikes, said the standard process cannot be disrupted because it is required by federal law.

NEWSWATCH

CCS Beams Election News

HOLMDEL, N.J. Swiss radio stations sent U.S. election reports back home using the Corporate Computer Systems (CCS) Micro 66i audio codecs and AT&T's Switched Digital International Service (SDI).

The service enabled Swiss reporters to send and receive information between the two countries via 7.5 kHz audio line. Correspondents in the U.S. were able to dial up different locations in Switzerland, at a cost of only $2.50 per minute.

Stern Show Brings Fines

WASHINGTON The FCC appears to be going after the nationally syndicated "Howard Stern Show" for alleged indecent programming violations, levying a $105,000 penalty on KLSX(FM) in Los Angeles and upholding $6,000 in fines against three other stations.

The Stern morning show, with its bawdy discussions of numerous subjects including sex, is simulcast in several markets, including New York, Philadelphia, Los Angeles, Cleveland and Dallas. Several other markets are also being considered for the show.

Because of its wide market coverage, complaints have been made to the FCC about certain show segments considered obscene.

KLSX's fine came shortly after the station moved into number one during morning drive time. Besides KLSX's mammoth fine, the FCC upheld fines of $2,000 each for New York City's WXRK(FM), Stern's originating station; Philadelphia's WYSP(FM) and Washington, D.C.'s WJFK(FM) for other alleged violations of the indecency rules.

Studio Rule Eased

WASHINGTON The FCC has eased studio staffing rules by allowing a management-level employee to only be based at the main studio, report to work there every day and only spend a "substantial" amount of time there.

In 1991, the FCC said a station had to have at least one management employee physically present at the main studio during business hours. The NAB had opposed the rule and lobbied for its softening.

Satellite CD Radio Application Progresses

WASHINGTON The FCC has accepted for filing Satellite CD Radio's application for authority to construct, launch and operate a digital audio radio service.

Satellite CD Radio plans to launch two geostationary satellites and install urban repeaters to provide subscription and pay-per-view digital audio services.

Ad Sales Surge

NEW YORK National spot and local radio advertising shot up in September.

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according to the Radio Advertising Bureau.

Local revenue was up by 10 percent compared to September 1991. National spot sales, suffering from months of decline, posted a healthy two percent increase.

"This the first month that we've seen an increase in both the local marketplace and national spots, and it bodes well for the continuing gradual recovery of radio," RAB President Gary Fries said.

Fries said that if the upswing continues, 1992 radio revenue should finish with an overall two percent increase.

COMSAT Relays Debate

WASHINGTON National Public Radio broadcast the second presidential debate from Richmond, Va. using the COMSAT mobile communications 56 kilobit per second (kbps) audio feed vehicle.

The Digital Audio Feed Vehicle (DAFV) is a four-wheel drive vehicle equipped with an INMARSAT terminal that enables radio reporters to send high quality 7.5 kHz audio anywhere in the world. COMSAT's earth stations route the signals to their destinations. The vehicle was designed by WolfCoach.

Businesses Get Census

WASHINGTON The U.S. Census Bureau deadline for returning the 1992 economic census forms is Feb. 15, 1993.

More than 3.5 million forms have been mailed out by the Census Bureau in what it calls the most comprehensive business survey ever undertaken.

Taken every five years, the economic census identifies trends in business activity that are vital to measuring and encouraging growth in the American economy.

CCA Offers Service School

FAIRBURN, Ga. CCA Electronics has announced its annual service school to be held Dec. 7-8 at the company's plant in Fairburn.

The school will cover transmitter maintenance, operation and trouble-shooting. The cost is $150 which covers meals, work materials and certificate of completion. For a reservation, call CCA at 404-964-3530.

WVGR Gets Grant

ANN ARBOR, Mich. Public radio station WVGR(FM) has received $94,624 from the U.S. Department of Commerce's Public Telecommunications Facilities program to upgrade Michigan Radio Network's signal to western Michigan.

WVGR has operated continuously since 1961 as a satellite of the University of Michigan station, WUOM(FM). The WVGR transmitter serves about a 1.3 million population including Grand Rapids, Kalamazoo and Battle Creek.

The grant, which is nearly half of the $200,000 project, will help replace the transmission system with state-of-the-art digital technology.

FCC Ponders AMAX Mandate For Receivers with AM Stereo

by John Gatski

WASHINGTON Along with selecting an AM stereo standard, the FCC is considering whether to require AM stereo receivers to meet provisions of the "AMAX" standard, which so far has been voluntarily implemented by receiver manufacturers.

Legislation was approved in October mandating that the FCC select an AM stereo standard within a year after embarking on a selection process. A standard is likely to be chosen by the end of 1993.

The odds-on favorite is Motorola's C-QUAM, the system that has prevailed in the marketplace.

But along with preliminary work on the standard-setting process, sources said the FCC staff is discussing whether to further require that receiver manufacturers add AMAX enhancements.

AMAX performance enhancements for AM include noise blanking, ex-ternal antenna connection and extended frequency response. The standard was approved by the National Radio Systems Committee in 1991 as a way to get receivers to produce better AM radios.

FCC Chairman Al Sikes' office declined to detail what features it would require if it decided to implement a receiver standard, but confirmed that requiring some or all AMAX features is a possibility.

"That is certainly something we are looking at," said Terry Haines, chief of staff for Sikes.

The possibility of setting receiver standards is contrary to the position taken by the FCC when mulling over its expansive AM improvements rule-making earlier this year. But there may now be a feeling that AM stereo radios need to meet a minimum quality standard in order to have acceptable performance in the stereo mode.

The Electronic Industries Association (EIA), which supports both AMAX as a voluntary standard and the government's involvement in the AM stereo standard, said it has not heard about a possible AMAX mandate for AM stereo receivers, but would oppose such action.

EIA Consumer Electronics Group Vice President Gary Shapiro said requiring AMAX compliance for AM

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Passing on Convention-al Wisdom

by Alex Zavistovich

WASHINGTON Home again. I've survived another fall convention season none the worse for wear—except, of course, for my suits, which have been dry cleaned nearly to pieces.

October was a hectic month for me, covering both the AES show in San Francisco and the SBE convention in San Jose. Still, I've had it a lot easier than some of the manufacturers, who are only just now getting back from their trade show tours of duty.

As far as the AES show was concerned, of all the trends I spotted in the exhibit hall, the most interesting one was not in the booths, but in the aisles.

There, amongst the studio owners, musicians and other regular AES show attendees, were some easily recognizable faces from some of the broadcast industry's better known companies. Dan Braverman and Mike Sirkis of Radio Systems, Bob McNiell of Fidelipac, Gordon Stafford and Nick Krassowski of audiopak, Jack Williams of Pacific Recorders & Engineering, Tim Bealor of Broadcast Engineering...

What were all these broadcast industry manufacturers doing at one of the nation's biggest pro audio shows? Detective work, probably. It seems like smart businessmen are always looking for a new market, a different approach to broaden a narrow niche, maybe even working relationships with some other manufacturer whose name may be better known in the professional audio arena.

For almost all of the folks I've just mentioned, one of the most important pieces of detective work they had to do was to examine some of the new technology that might eventually compete directly with their own products. Remember, the AES show debuted two new so-called "cart replacements": the Sony MD and the Digital Broadcast Associates dB-Cart.

Both of these products have some cash behind them (the Sony connection, of course, is obvious; the dB-Cart uses the "Floptical" disk drive supported in part by 3M). Because Fidelipac and BE each offer their own floppy disk cart replacements, and all the companies offer some NAB cart-related products, the AES show was a crucial event for strategic intelligence gathering.

Hmm...professional audio guys getting involved in the broadcast industry, broadcasters scoping out professional audio...it only goes to show you that the two markets are, as we've noticed, starting to overlap more and more. Add to that the additional crossover taking place with the musical instrument industry, and you have to conclude that audio electronics manufacturing is really starting to see its own version of the "global village" concept.

We at **RW**, having spotted this trend coming some time ago, will be taking a closer look at the convergence of these industries in upcoming issues. It really *is* getting to be a small world. (But, as comedian Steven Wright says, "I'd sure hate to paint it.")

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The folks from the broadcast industry weren't the only recognizable faces at the AES gathering, though. Part of the fun of going to a pro audio show is seeing all the music industry notables that come to play with this year's toys.

Regrettably, I blew my chance to meet someone whose work I've admired for some time. Somewhere into the second day of exhibits at the AES show, I noticed Jeff "Skunk" Baxter prowling the aisles. I'm sure most of you remember Baxter from his guitar work with The Doobie Brothers, as well as his other studio exploits. A hot guitarist, and a tech-head to boot.

Well, to make a long story short, I never got to say hello, because *I completely forgot his name*. Maybe I was star-struck, or maybe my short-term memory isn't what it used to be, but I just couldn't place it.

The only thing I was sure of was the "Skunk" part. Of course, you don't want to roll up to some guy you've never met before and greet him with a cheery, "Hi, Skunk." Even, "Hello, Mr. Skunk" doesn't cut it—especially if you're wrong about who you're talking to. What a nightmare *that* would be.

So, discretion being the better part of valor, I bravely decided not to introduce myself. I missed the opportunity. But I guess it was better than calling someone I've never met a skunk.

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Ten days later, I was back on the west coast, this time for the SBE convention in San Jose. I wanted to give the event the benefit of the doubt, because I knew the controversy over last year's show would make the society work harder to make this year's a success.

In a nutshell: The sessions were good, but sparsely attended. There was nothing like last year's Canadian L-band propagation test results that really stood out as a show-stopper.

In the exhibit hall, very few new products were to be seen, and traffic was light. Some exhibitors, like Clark Wire & Cable, did report good leads from the show, but many complained of the painfully slow pace. Two exhibitors even compared the event unfavorably to the SBE convention held in Denver a few years back. For those who didn't make it to that one, things were so slow in Denver that people were actually pitching pennies in the aisles.

So I was surprised to see the SBE press release of Oct. 28, calling the convention successful. Attendance figures for the four days were listed as "1,005," which John Poray, the SBE's new executive director, said was a cumulative number based on people through the door each day.

That number differs considerably from the actual registration total, which as of the last day of the show was 460—250 paid and 210 or so exhibitor guests.

I think the society would have been better off citing the 460 figure. That way, attendance was off by about 20 percent over last year. Comparing cumulative totals, the decrease is actually closer to 50 percent. Makes you think, doesn't it?

That's it for now. Tune in next time,

Alex

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.

Spectral manipulation encouraged

Dear **RW**,

I'd like to add my two cents' worth on the subject of changing the spectral balance of recorded music. Bruce Bartlett of Crown International points out recording engineers and producers work hard to create a certain spectral balance on their CDs. He wrote, "Why tamper with it?"*Easy*. Because you're letting the personal preference of each individual recording engineer or producer tailor the sound of your radio station.

If there are a thousand songs on your station's playlist, then a thousand different people EQ your audio. They can't all have it right. I feel the time and effort spent on developing good multiband compressor/limiters is time and effort well spent.

Dave Stewart, Disc Jockey
WPLJ(FM)
New York, N.Y.

CCA was there

Dear **RW**,

Your coverage of the 1992 NAB Radio Show in New Orleans failed to mention CCA and the line of products we had on display.

CCA featured its time-tested, rugged, dependable FM4000G 4 kW grounded-grid FM transmitter. CCA has long been a proponent of grounded-grid technology. With its corporate philosophy "Reliability through simplicity," CCA has long known that fewer parts means fewer problems, higher quality and increased reliability.

Grounded-grid technology is still considered state-of-the-art around the world. Eliminating one complete power supply means less to go wrong. Having the transmitters' RF output tied directly to ground provides a path for harmless dissipation of corona charges associated with lightning.

CCA transmitters exhibit among the lowest figures for AM synchronous noise in the industry, and word has it that the longest documented tube life was with an Eimac tube operating in a CCA transmitter. It lasted over 180,000 hours—that's over 20 years!

CCA also entertained its distinguished circle of South and Central American friends and clients. Having this year's show in New Orleans provided them with the opportunity to meet face-to-face with many of the names behind CCA that previously were only known to them through the phone. Everyone had a good time discussing CCA's design and manufacturing convictions.

Howard M. Ginsberg, Sales Engineer
CCA Electronics, Inc.
Fairburn, Ga.

Someone is watching

Dear **RW**,

There are many other stories related to our (my) association with "ghosts" Rudy Rubin and Bob Mettler, as mentioned in your article "Texas AMs Run on Phantom Power" (**RW**, Oct. 7, 1992). Many of them are more interesting and revealing, but then who wants to "scare the reader" with stories of three Shafer spot locators starting simultaneously and going in opposite directions or a transmitter that can go to high or low power and then correct itself before entry to the transmitter site can be completed?

There was one incorrect element in the article. Rudy's protective entity (instead of ghost) has never been sensed at the KMND(AM) transmitter location. Rather, all of the references made to KMND correctly would have read KNFM-FM throughout the article. I mention this because we don't want to "upset" the protective element at KMND...do we?

This morning on KNFM they were *funning* your article at 6:42, when the station went off the air. Need I say more?

Max Howard
KMND/KNFM
Midland, Texas

Rethinking the SBE Convention

The Audio Engineering Society (AES) and Society of Broadcast Engineers (SBE) national conventions and trade shows were each held in California in October. Both offered a slate of technical sessions and exhibitors displayed their wares.

Unfortunately, it is the differences, not the similarities, between these two shows that suggest the SBE bow to the opinions of many in the industry—including members of the society itself—and discontinue its national convention.

The AES show boasted thousands of attendees throughout its exhibit hours, even on the last day of the show. The SBE show, on the other hand, netted only 1,005 attendees (according to the SBE) over four days, a significant decrease in attendance over last year's event.

Exhibitors at the AES show (by appearances, a near sell-out) also boasted a large collection of product introductions and innovations. Conversely, nearly all exhibitors at the SBE convention instead used the NAB's fall gathering in New Orleans to introduce new products or refinements. Further, many of the booths at the SBE convention were unoccupied; some exhibitors dismantled their displays well before the end of the second day.

Clearly, the SBE's belief that moving the national convention around the country would attract otherwise unserved members has not been supported by attendance figures. In fact, the only successful national show staged by the SBE was the one held in St. Louis, which is where it all began as a regional gathering. Further, it's thought by many that the society's agreement with the RTNDA to host a trade show jointly in Miami next year will not turn things around since these two organizations are so divergent.

The SBE's limited resources may be better spent supporting regional trade shows like those in St. Louis and Seattle, and by putting more emphasis on training and certification programs. SBE board and chapter chair business can just as easily be conducted at other trade events during the year, or in modestly budgeted meetings in centrally located metropolitan areas.

The society and its membership would be better served if the SBE board frankly analyzes its track record and reconsiders the value of staging its own, independent national trade show.

—**RW**

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GUEST EDITORIAL

The Inevitability of Change

by Dain Schult

ATLANTA Love change, hate change, fear change. Change, like taxes and death, is inevitable. While change can be mesmerizing and enticing, most people, when an actual element of change starts to take place in their own lives, recoil in fear.

Radio as an industry is fraught with change on a daily basis and yet no other industry resists change as much as this one does. It's like wanting to put tailfins on a new Corvette.

The sweeping changes by the swing of the pendulum to deregulation in the 1980s have led to the pendulum's reverse swing to what is the massive hangover of the 1990s.

The landscape of the radio industry has forever changed, first with Docket 80/90 and now the relaxation of the duopoly rules.

The jobs created by the addition of all those new FM stations will now give way to the downsizing of staffs via the new efficiencies of duopolies as well as satellite automation.

Baseball is the only other "business" that comes close to radio for tradition constantly butting heads with change. Someone pointed out to me that radio people, like most baseball players, are the only people in the world that are quick to tell you how many years of experience they have.

Does your doctor remind you every time you see him about how many years of experience he has? Not likely. He's too busy plotting his tee shot on the fifth hole later that afternoon.

Does the plumber who stops by to fix that leak under your kitchen sink remind you that his 17 years in the business means that his work is superior to the plumber with only five or 17 years tenure with the pipes? Not hardly. In fact he too is probably plotting his chip shot on that same hole where he and your doctor team up with your lawyer and yardkeeper for their weekly foursome.

And yet we keep right on bragging about how our particular number of years in this business somehow qualifies us for special dispensation from everyone else.

Whether someone's experience level totals 23 years or 23 minutes is of no consequence if the resistance factor to change remains.

Have you ever wondered what happened to all those people who crafted buggy whips in the 1890s? What happened to these craftsmen when Henry Ford cranked it up in the early 1900s?

Some of them may have snorted that those horseless carriages would never make it and went right back to work crafting their buggy whips. Their descendants now work (while there's still work available) in the defense industry in Southern California...

But the others may have swallowed hard and decided to get their resumes into Dearborn and move forward.

That's what we, as an industry, have to decide about now too.

If programming jobs are being lost left and right to duopolies and satellite services, should displaced jocks continue to wait for that big call to the majors or consider the benefits of cutting one's hair, slipping into a suit and moving into sales to make some real money?

Don't everyone roll their eyes or laugh. As a consultant I can vouch that the number one request of clients seeking employees is for salespeople. A good salesperson can write his or her own ticket these days.

Like it or not, there has been no change in the philosophy of many managers and owners that jocks are "a dime a dozen," nor is there any parity in the foreseeable future of program directors ascending to the general manager's chair in relationship to sales managers making it to that slot. Having started out in programming myself, there's no joy in admitting all of this, but that's the point. It needs to be admitted.

The same is true of engineering. I can count the number of good engineers on just two hands right now and one of those is retiring soon, so there's a table for one waiting on my right pinkie.

We can all hold wakes for all the lost jobs due to the changes of this decade or we can climb up off the canvas and use the changes for good. Having survived the convening of the "liars club" that passed for a radio convention recently in New Orleans, we can continue to resist change, but at what price? That resistance to change only led to fewer exhibit booths, hospitality suites and attendants.

We need more salespeople. We need more engineers. We need more creativity. We need more open acceptance of change. Can we afford to keep on making more buggy whips?

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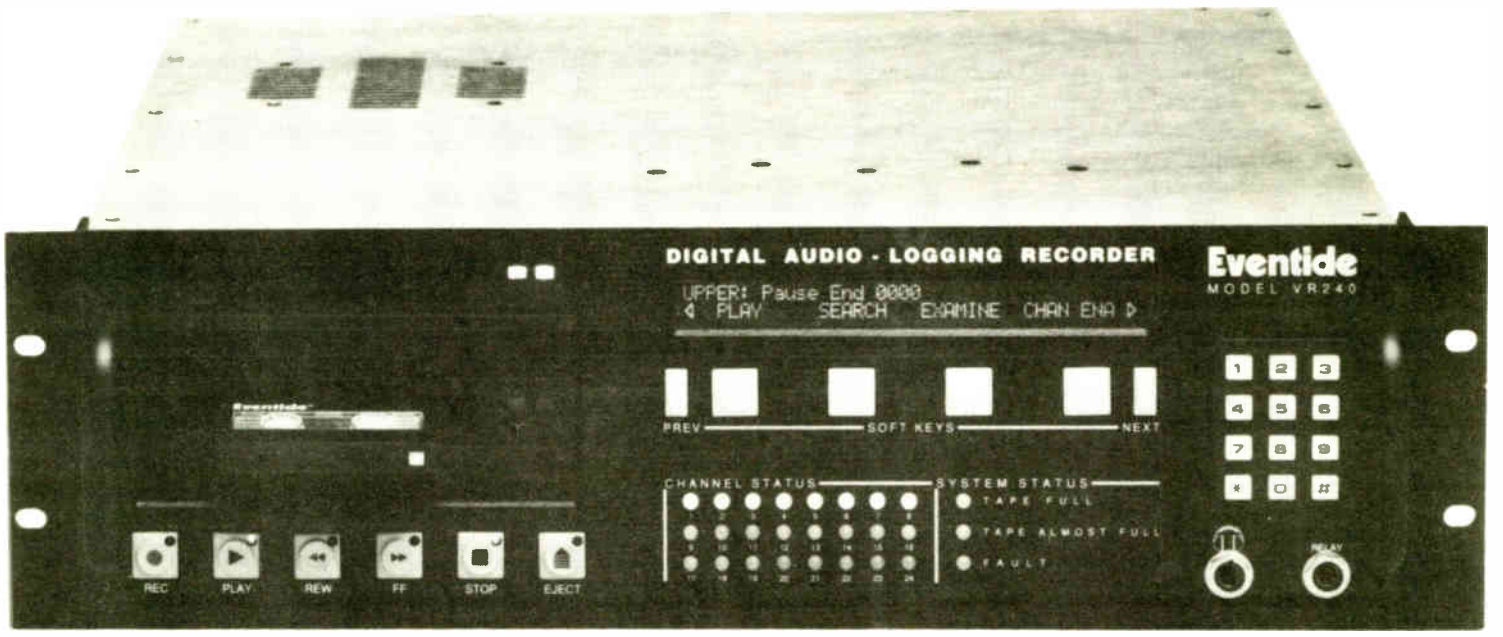
Dain Schult is a radio consultant based in Atlanta. Now principal of Radioactivity Inc., he has more than 20 years of experience in all facets of the radio business. He can be reached at 404-767-1840.

Correction

The November 4 *Digital Domain* article, "DISQ Unveils 'Supercomputer' at AES," incorrectly listed Gotham Audio's fax number as its phone number. The correct phone number is 212-765-3417.



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The two-deck version of the VR240 allows you to record on one deck while simultaneously playing back on the other. So you can search and play back previous recordings while continuing to record current programming non-stop. Or have the decks record sequentially for up to 21 days unattended recording.

Every station operation can appreciate the value of having a complete audio record of everything that goes out on the air. Full-time logging gives you absolute verification of which spots ran when, and for live copy, exactly what was said. The Program Director and the Sales Manager can monitor your competition, too— full-time or just the morning show, for example.

And couldn't the news department use an "instant replay" of fire and police messages to stay on top of local events? With Eventide's digital format, no tape is ever wasted on recording dead air.

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Standard Unlikely to Produce Boom

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AM stations have to purchase an AM stereo generator, Bealor added, they would also spend money to convert the rest of the audio chain to stereo, including consoles and STLs.

In a prepared response to the impending FCC AM stereo standard action, Motorola said lack of an AM stereo standard has hindered its acceptance. "Motorola recognizes the importance of adopting a single AM stereo standard since the lack of a standard has slowed the conversion to AM stereo. We will participate in the rulemaking process once the FCC begins that process."

Privately, however, Motorola officials said the standard probably will not create a massive conversion to AM stereo.

Selecting a standard might have had more impact on U.S. stations in the 1970s and '80s when the technology was new and AM stations were financially more healthy, according to the NAB.

During that time, several systems were proposed as possible standard bearers, including C-QUAM, ISB system, the Belar system, the Magnavox system and the Harris system.

However, critics have said that the FCC's reluctance to choose a standard left stereo technology without direction, with each system trying to prove itself. Sony even marketed a radio that could decode all five stereo systems.

C-QUAM on top

Eventually, Motorola's C-QUAM and Kahn's ISB systems emerged as the top contenders in the marketplace, with Motorola enjoying the advantage. Soon, however, Motorola and General Motors became entangled in a complicated patent infringement suit with Kahn—a dispute that is still in the courts.

The NAB's Marino said "there was a lot of momentum" for AM stereo in the late 1970s and early 1980s. The AM stereo momentum, he conceded, has long since waned as AM radio lost market share and revenue.

Depending on how quickly digital broadcasting evolves, some industry analysts predict that more AM stations may be swayed to go stereo in the interim if there are dramatic increases in AM stereo receivers and consumer demand.

C-QUAM AM stereo radios have been produced for several years, but not in great quantity or with much fanfare.

Herb Squire, chief engineer for WQXR-AM-FM in New York City, agreed with the equipment manufacturers that a standard is not going to influence a lot of stations to convert to stereo, but more receivers might. "I would think they (stations contemplating broadcasting in stereo) would wait until more receivers come out," he said.

More receivers needed

Industry groups agree. "The receivers are really going to help out," said John Quinn, chairman of the NAB's AMAX Committee, formerly the AM Receiver Manufacturer Liaison Committee.

AMAX is the voluntary, high quality AM product standard developed through the NRSC. AM stereo has been part of the AMAX promotion effort in the U.S. for more than a year. The AMAX requirements include enhanced frequency response, external antenna connection, and noise blanking.

While endorsing the law mandating an AM stereo standard in the U.S., the Electronic Industries Association (EIA), which represents receiver manufacturers, said an increase in AM stereo broadcasters will encourage manufacturers to produce stereo radios.

"You could (get more companies producing AM stereo radios) if some more of the broadcasters broadcast with the standard," said Gary Shapiro, vice president of the EIA's Consumer Electronics Group.

Some industry sources said an AM stereo standard will give the receiver industry at least a small boost because of the legitimacy a standard can bring to a product.

For example, a recent broadcast standard that resulted in consumer demand for a product is the MTS TV stereo standard, approved in the mid-1980s. Today, there are numerous VCRs and TVs with the MTS badge, and customers look for the designation on these products. Some consumers bought MTS TVs and VCRs before stations began broadcasting in stereo.

MTS stereo is not entirely analogous to AM stereo. Unlike AM stereo, TV stereo benefitted because the standard was enacted when there was initial interest and enthusiasm for it, analysts remarked.

One manufacturer said such enthusiasm is helpful to fledgling technologies. As an example, he cited the enactment of C-QUAM as the AM stereo in Japan earlier this year.

The manufacturer concluded that more AM stereo interest was generated because of heavy promotion by the Japanese government, receiver manufacturers and broadcasters.

FCC Looks at AMAX Mark Requirement

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stereo radios would drive up the cost of receivers and reduce demand.

"If you mandate AMAX, you would deprive a huge portion of the public from being able to buy AM (stereo) radios," Shapiro said.

In weighing the benefits of AMAX enhancements and AM stereo to the radio industry, Shapiro said the AM stereo standard action by the FCC is "much more significant" than AMAX for broadcasters and manufacturers.

Although opposed to mandated receiver standards, Denon Engineering Consultant Almon Clegg said adding AMAX to home receivers/tuners that are already stereo would not increase the price that much. He said stereo is the most expensive part of the conversion.

Clegg emphasized that on a $200 receiver, adding stereo adds about $20 while installing AMAX features would add perhaps another $5 to $10.

Requiring AMAX on portables, however, could double the price, he added.

Radio "Toys" Discussed at RTNDA

by Gordon Govier

SAN ANTONIO, Tex. There were, unfortunately, few products to attract radio people on the exhibit floor of the recent Radio-Television News Directors Association (RTNDA) conference here. The exhibits were heavily weighted toward television.

Radio reporters looking for a chance to scope out the new Sony NT-1 "Scoopman" micro cassette recorder were greatly disappointed. "I asked for one but they wouldn't give it to me," Sony salesman Scott Baker lamented. "They said it's a consumer product, not a professional product."

But exhibition hall dismay was eased immeasurably by a superb seminar called "The Latest Radio Toys," assembled by KIKK (Houston) News Director Chuck Wolf and local WOAI reporter Jan Thomas.

The latest gadgets

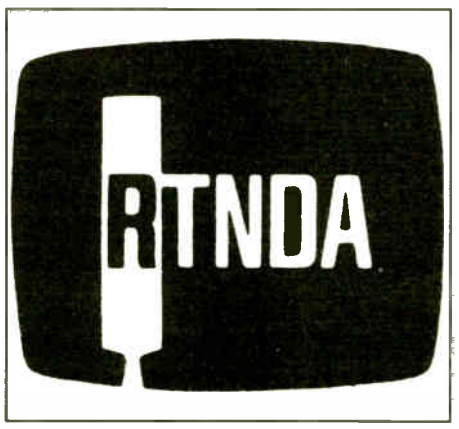
The session offered everything from a look into WOAI police reporter David Cuellar's gadget bag to the latest digital interface to connect your tape recorder to a laptop computer for editing and filing stories.

Cuellar covers the nightly police beat. Consequently, he said he carries a 750,000 candle power spotlight, among other things. (A night-reporting tip: Some typewriter correcting fluid around the mic input of the tape recorder can prevent embarrassing mistakes.)

The two WOAI reporters said they go for the less expensive and simple tape recorders. "If it breaks, you just throw it out and buy another," was the explanation.

Thomas reported WOAI had better quality audio from a recent visit by First Lady Barbara Bush than did competitors with better quality tape recorders. The difference was a shotgun microphone. Thomas and Cueller both carry relatively inexpensive ($49.95) video camera directional mics, modified with longer cables.

Thomas also recommends a lavalier



mic for interviews. A relatively inexpensive Radio Shack mic provides good quality audio and helps prevent interviewee mic fright, he said.

Using Gentner's Microtel

Most currently available tape recorders are not ideally configured for feeding stories over the phone. A little black box called the Gentner Microtel does offer the capability for wrap-around feeds from the field for only $226.

It's possible to feed audio via cellular with a little better quality than just holding the phone over the tape recorder speaker.

Those who have used the Gentner device say it's reliable, although it's not for use with pay phones; it needs to be plugged into a modular jack. A modular plug interface is now available for cellular phones, for about $250. That means it's possible to feed audio via cellular with a little better quality than just holding the phone over the tape recorder speaker.

One of the audience members said it is possible to feed audio over a cellular phone by tapping into a hands-free microphone set-up.

Doug Berg, a Southwestern Bell Mobile Systems spokesman, discussed cellular technology. He also exhibited an NEC UltraLite Cellular Workstation, which combines a notebook computer, a modem and a cellular phone in one case.

The computer age

Most local radio reporters probably are not ready for that kind of technology just yet. But the technology is ready for radio, through a little audio cassette-sized device called the MicroKey AudioPort. It's made by Video Associates Labs of Austin, Texas.

"It's only been on the market for about eight weeks," Wolf said, pulling out a laptop computer with a microphone and tape recorder connected to it through the AudioPort.

The AudioPort plugs into the computer's parallel port. It can input line and mic level audio. Then the audio is edited on the screen with the software that comes with it. Finally, the edited file of digital audio can be fed to the newsroom through the computer modem.

Of course, that assumes the newsroom is already configured for digital audio.

Basys brought its D-Cart multi-user editing system to the San Antonio RTNDA show. Basys' Harn Soper said the D-Cart is a competitive digital alternative for setting up anything but the smallest news operation, at a price of $12,000 to $20,000 per workstation.

Marti Electronics also was represented at RTNDA. "Today's Marti units send broadcast quality audio, as always," company spokesman Dan Rau said. "But they also send data and fax material."

The most exotic form of communication is probably the satellite telephone, which also was demonstrated for the "Radio Toys" audience. Set-up takes about five minutes, calls run from $6.50 to $10.00 per minute and the basic unit sells for about $45,000.

Radio news directors who like technical talk hope to do better next year. The 1993 RTNDA convention will be in Miami, and held concurrently with the Society of Broadcast Engineers (SBE) convention.

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KEYBOARD CONNECTION

Keeping Track of FCC Rules with Your PC

by Barry Mishkind

TUCSON, Ariz. Is there really a reason for having the FCC Rules and Regulations on-line in the computer as opposed to its standard printed form? At first it was hard for me to decide. What advantage could be gained by being able to scroll screen after screen of the Rules on the monitor?

This question actually encompasses far more than the Rules. The computer is a marvelous box that lets us do many things more efficiently. On the other hand, while you could balance your checkbook on the computer, it's no faster and a lot more expensive than pulling out the pocket calculator.

So, the key to whether any application is useful must be whether it saves us significant time or does something we couldn't do on our own. Pike & Fischer's "Broadcast Rules On Disk" seems to meet the criteria for many stations.

True, every station should have a current set of Rules on hand. Yet, most engineers rarely look at them unless they need to deal with the FCC. And keeping up with changes? Sadly, the majority of copies of the Rules found in stations are neither up to date nor complete.

So, what is in the P&F package?

Pertinent information

"Broadcast Rules On Disk" contains the complete text of Parts 1 (Practice and Procedure), 17 (Antenna Construction, Marking and Lighting), 25 (Satellite Communications), 73 (Radio/TV Broadcast Services) and 74 (Experimental, Auxiliary and Special Broadcast Services). Additionally, all current NPRMs (Notices of Proposed Rule Making) and NOIs (Notices of Inquiry) are included.

Using the Folio™ information retrieval system, the user can access any section, paragraph, word, or phrase in the Rules or specific sections that might be needed. Footnotes or linked references in a selection can be accessed by a simple keystroke.

Locating a section you need is as simple as typing a word or phrase, and immediately the program shows you how many times it occurs in the Rules. By modifying the request you can narrow in on the exact section you need.

Unlike some information retrieval systems, Folio shows only the immediate context of your search request. However, once you've found an item, you can quickly expand the display to see the material before or after the target.

Naturally, a key feature is being able to export the text you've located to hard copy or your word processor. This is indeed supported in Folio; you can format the output as it goes to the printer, or save it in a "generic word processing" format.

In these days of ever-changing Rules, it's nice to be able to get the bi-monthly update, and let the computer do the update. For some, not having to spend all day changing and deleting pages is worth the price.

"Broadcast Rules On Disk" is supplied by subscription, and includes bi-monthly updates and a newsletter summarizing significant items for broadcasters. A 30-day guarantee lets you look at the service and decide if it's for you. You may order or get information at 301-654-6262.

Software update

The fall computer show, COMDEX, is rapidly approaching. Just as with the NAB's spring show, many new programs and updates will be released at COMDEX. If you're considering buying or upgrading the programs you use, you might want to hang in there another month.

I'll try to keep you informed about the major releases. However, they're coming fast and furious, so feel free to let me know the programs in which you're interested. I'll try to check them out for you.

Meanwhile, if you're involved in writing custom programs or utilities at your facility, a new book from Ethan Winer can be a big help. "BASIC Techniques and Utilities" (Ziff-Davis, 1992) focuses on BASIC compilers, including the interface for QBASIC included with your DOS 5.0. Winer's tips and tricks will assist you in exploiting the best from BASIC.

BBS update

Interest in computer broadcast oriented bulletin board services (BBSs) has grown greatly in the past year, as several networks have been formed and developed outlets all over the country. Naturally, **RW** wants to keep you up to date with the latest information.

Toward that end, here's another new network: the Broadcasters Professional Communications Network (BPCN). Based at the Broadcasters' BBS in Phoenix, BPCN is actively adding outlets as far away as Stockholm. The host, Mark Shander, has linked over a dozen interest groups including the Broadcast Want Ads area from National Supervisory Network.

If you'd like to check out the BPCN, call 602-872-9148. A complete listing of BBSs carrying the network can be found there, so you can look for the closest. Here are a couple more BBSs on the net: California, Mike's Video, 818-240-5769; Colorado, NSN, 303-949-3253; Florida, SPPE, 813-525-2326; Pennsylvania, W3NU, 412-981-3151; Michigan, Lighthouse, 517-321-0788; and Canada, 1040 BBS, 604-736-6330.

□□□

Barry Mishkind, aka **RW***'s "Eclectic Engineer," can be reached at 602-296-3797. Computer users can connect on FidoNet at 1:300/11.3 or "barry@coyote.datalog.com" on Internet or via links from CompuServe and America Online.*

'Tin Man' Was Heart of WLAD Storm Broadcast

FROM THE TRENCHES

by Alan Peterson

Dear Alex,

Boy, I wouldn't wish this day on my crosstown rival...

I'm writing this fairly late in the evening, after a helluva day helping keep our station on the air during some of the nastiest thunderstorms I've ever been through.

Lemme take it from the top. Thunderstorm warnings were up throughout Connecticut for the entire afternoon. By about 2 p.m. we began to hear lightning "shred" in our monitors (good ol' AM). Within minutes, the Greater Danbury area was being socked by the first wave of several storms.

It didn't take long for one leg of our building's three-phase power to go south on us. The consoles went dead on both stations, while most of the lights stayed on. CE Tom opened the service panel and swapped the console breakers over to the rail that was still lit. Bingo—light and 120V sauce for the studios.

Because the building we're in had no functional backup generator, Plan B consisted of a rather elegant—albeit goinky—solution: battery operated radio! WLAD whipped out a mono cassette machine and the "Tin Man," while WDAQ strapped a double-deck cassette boombox across the lines to the tower. OK folks, it's show time!

"Tin Man" is an unbelievably ugly portable homemade six-channel mixer lovingly constructed by a former engineer, and puts out enough sock to tickle the transmitter from several miles away. With three mic inputs and three line level faders, there was plenty of flexibility and sonic clarity to spare.

Emergency music cassettes (both of them) were to cover only a short outage. If it weren't for PM guy Kirk Michaels' wedding fill cassette from his DJ service, we'd have recycled the same music every 44 minutes. Meanwhile, over on WDAQ, the double-bay boombox was being loaded with cassettes of Hot AC stuff, jingles and generic storm announcements to be shuttled, segued and skillfully mixed with nothing more than "play" and "pause" buttons. You know you're good when you can make a doubledecker sound like a full studio.

Tom's concerns were not unwarranted. Moments after his swap at the power box, we lost juice—along with 8,000 other city residents and businesses. Within a few more moments, both WLAD and WDAQ were up and running in a building without any auxiliary power source!

Emergency lights cut through the darkness, a colossal wet cell kept our electronic phone system working, and Traffic prepared next-day logs by hand on legal paper. Flashlights and lanterns were plentiful, the number for Domino's Pizza was in the Rolodex, and our news team kept the still-active phones in business taking storm info from our meteorologist and fielding cancellation calls.

Alas, Alex, this crisis brought even more discovery. As I mentioned, power wasn't to return for close to four-plus hours. Our emergency lights lasted only 90 minutes! The flashlights were about to pull double-duty on fading batteries.

The only solution was a sprint to Radio Shack in the season's worst storm yet. Eighty bucks worth of batteries went on the boss's charge. We were back in business.

I held halogen lanterns over Lisa Romanellos so she could read the news over WLAD to a confused, concerned public. We actually had the capability to play voicers over Tin Man, by patching another cassette machine to an unused input.

So you'd think by this time things would be well in control, right? I mean, both stations were on the air, word on the storm was timely and accurately broadcast, we had fresh batteries...what more could go wrong?

When the first leg of our stations' power went down, I heard what I thought was arcing coming from an outlet box (perhaps water made it down the metal conduit from above). With everything else happening, it escaped my mind until we all had a chance to sit and collect our thoughts, to outline what to do for the next time we lose the juice. Our moment of unguardedness didn't last long. Flapping out of nowhere into the failing beam of an emergency wall light, a little brown bat decided it was time to scope out all the excitement.

continued on page 13 ▶

Which type of CD player is right for your station?

Denon.

With its hugely successful DN-970 and DN-950 CD Cart™ Players, Denon helped make CDs the broadcast media of choice. Given the success of these industry-standard players, there were only two things Denon could do: 1. Make a CD Cart player that is smaller, faster, smarter and better; 2. Make a pro CD player that is *not* a Cart player. Denon did both.

ACD-5B CARTRIDGE WITH ATS BAR CODE.

The new DN-961FA Drawer-Loading CD Player is Denon's answer to the many broadcasters who *formerly* had to choose between the drawer-type player they needed and the Denon performance they wanted. Its Eject-Lock during play adds another most-wanted feature to its list of attractions. Meanwhile, the new DN-951FA CD Cart™ Player dramatically improved functionality with its Auto Track Select (ATS) system, which reads bar-coded carts to *lock-in, lock-out* or *auto-cue* to a specific track.

That's not all; three-in-a-rack mounting, true instant start, and end-of-message signals with selectable time-to-end are just a few more key features of these cost-effective new players.

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COLE'S LAW

Station Contests Can Win You Trouble

by Harry Cole

WASHINGTON With the regulatory pendulum apparently swinging away from deregulation and back to the regulation end of things, we were reminded a few months back of the FCC's rules governing licensee-run contests.

In July, the Commission surprised a licensee with a $6,250 fine for a contest which had been run at least three years ago. In light of this, a simple refresher course in station-conducted contests may be useful.

The Commission's contest rules are short and to the point. Section 73.1216 of the rules states that "a licensee that broadcasts or advertises information about a contest it conducts shall fully and accurately disclose the material terms of the contest, and shall conduct the contest substantially as announced or advertised. No contest description shall be false, misleading or deceptive with respect to any material term." Simple, right?

Every last detail matters

Well, kind of. The rule itself is indeed simple; complying with it may not be. To run a contest the right way requires a good deal of planning, an equal amount of supervision, and a whole lot of record-keeping.

Let's talk about planning. As you can see from the text of the rule, by the time a contest actually gets on the air, the FCC expects that you know all of the "material terms" of the contest and that you are in a position both to disclose those terms and to conduct the contest according to them.

That means you have to get your ducks in order well in advance—gone are the days that you could just slap a contest on the air on the spur of the moment, without at least some concern about possible FCC ramifications.

Getting your ducks in order includes figuring out such things as: (1) exactly what prize(s) you will be giving away, and then making sure that those prizes will be available when necessary; (2) how and when winners will be determined; (3) how and when the contest will be promoted. The more valuable the prize or complex the contest mechanics, the more tied down each detail should be.

Usually it's a good idea to reduce these elements to writing once everything is planned but before it goes on the air, so that you have a clear idea of what all the contest's elements will be. That will also assist you in preparing promotional copy containing all of the contest's "material terms."

Put it in writing

On this last point, there is no FCC definition of "material terms." Rather, it depends on the nature of the contest. As a general rule you should assume that any contest promotion should disclose how winners are to be selected and what they will win.

If there are any "gotchas," such as limitations on the prize (*e.g.*, the station will pay airfare, but the winner is responsible for hotel or food costs on the trip), or limitations on eligibility (*e.g.*, nobody younger than 18, nobody who has won another station contest in the last 30 days, etc.) or the like, they should be disclosed, too.

Obviously, the more complicated the deal, the more wordy the promos will be—a strong argument for keeping things nice and simple. Still, notwithstanding the likely complaints from your programming department, it is best to err on the side of completeness in your promos.

While the FCC's rules do not require that *every* contest promo contain a listing of *all* material terms, you should make a point to have at least one promo which does cover all the terms, and it is good policy to make sure that one or more such promos airs at least a couple of times during each daypart. That way all listeners will be likely to hear it and know the rules.

To be sure that the promo is broadcast as written each time, you may wish to record it so that there is no risk of inadvertent (or ad lib) variations. Also, it is a good idea to have a written set of the complete rules available for distribution on request.

Stick to the script

Once you have everything planned out and arranged for, the conduct of the contest must be supervised carefully to make sure that the station's staff runs the contest as it has been designed and promoted. Announcers should be reminded of the need to run things exactly as planned, without ad libs or variations—remember, an ad lib could result in a violation even if the contest has been carefully planned.

If non-station personnel are involved (*e.g.*, contestants are invited to submit entry blanks at participating advertisers' stores), you should spot-check the non-station participants to make sure that they are complying with the rules you have set up. (Remember, non-broadcast businesses may not be as sensitive as you to the need to keep the FCC happy—so you should not assume that any non-station participants will be as diligent as you might like in jumping through all the hoops.)

Finally, as with everything else in life, the job isn't done until the paperwork has been completed. It is advisable to have written records of each time the contest is played, and the results thereof (*e.g.*: the winner's name, address and phone).

When prizes are awarded, some record (usually at least a receipt signed by the winner) should be retained. The idea is to be able, if necessary, to "reconstruct" how the contest went down if you happen to get an FCC inquiry about it somewhere down the line.

Once the contest is over and done with, you should keep a file with the initial written descriptions or design of the contest, the text of all promotional announcements aired concerning the contest, the records reflecting the actual conduct of the contest, the paperwork relating to the contest winner(s), and any other notes, memos or the like relating to the contest. Again, the idea is that, if an FCC inquiry arrives, you should be in a position to show the Commission exactly how everything happened.

Case study

To illustrate the usefulness of this careful approach, let's look at the fine handed out in July, 1992 for a contest violation which appears to have occurred in 1989, or even earlier. The station was running a "Last Number Lotto" contest with relatively low-end cash prizes.

Apparently, a non-station business (possibly a station advertiser) agreed to fund a $200,000 "bonus" prize to be paid out over 20 years. While the $200,000 bonus was promoted on air and specifically mentioned in the contest's written rules, no mention was made that the bonus prize was coming from a non-station source.

You can probably guess the rest. A contestant won the bonus but, after the first

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The Storm and The 'Tin Man'

▶ continued from page 11

The "arcing" I heard was just him scratching his way into our space through a very small hole in the newsroom.

Three grown radio professionals, who only moments ago had no problem sticking hands into an electric service panel during a thunderstorm, took off screaming bloody murder into whatever corners we could find. All to escape a fuzzy, five-ounce flying mouse.

To make a long story short, Alex, power came back to our building about three minutes to 7 p.m., just in time for our Red Sox coverage to begin. We were prepared to carry the game via dial-up on a regular dial phone, zip-corded from the now-dead electronic phone system's terminal block to Tin Man.

Well, with the console reactivated and the satellite receiver up and running, we hit the pre-game show without missing a beat. Smaller stations that read my notes to you may find comfort in the knowledge that power failures at the studio site needn't mean going off the air. By my own reckoning, a "tin man" rig can be set up anywhere with the Radio Shack disco mixer, a couple of cheapie cassette decks, extra cable to repatch studio mics and some arrangement to throw the whole thing on line (bypassing the console).

As for me, allow me to inform you that I'll write again next month.

—Al

□□□

Al Peterson writes from WLAD/WDAQ, Danbury, CT 06810, and now holds 80 Radio Shack "Battery of the Month" cards. The above account is true. The pizza was cold.

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CONSULTANT'S CORNER

Optimize Your AM Antenna Performance

by Steve Crowley

WASHINGTON An AM station operator faces many challenges in order to deliver good audio quality to the listener. For years, not much could be done about lightning, interference from other stations, or poor radios.

Now with the AMAX campaign, more manufacturers are selling radios with advanced signal processing circuitry that improves fidelity and cuts down on the noise. The FCC has adopted new AM interference criteria that have the potential to reduce inter-station interference over the long term. Some transmitter manufacturers have even started including AM stereo as standard equipment.

There is one factor solely under the station's control—the bandwidth characteristics of the antenna. A small amount of money spent here can result in audio improvements to many.

Antenna technology

After remaining essentially unchanged for several decades, AM antenna technology has benefitted in many ways from recent engineering developments. Modern computer modeling techniques make it possible to accurately analyze and optimize the bandwidth performance of AM antennas. This analysis can be done in ways that are impossible using classic computational techniques.

This discussion focuses on directional antennas because they are the antennas most subject to bandwidth problems. The same ideas, however, apply to nondirectional antennas.

Broadbanding can be subdivided into two areas: impedance broadbanding and pattern broadbanding. Impedance broadbanding helps the transmitter final amplifier see a uniform impedance characteristic at sideband frequencies which minimizes transmitter-generated distortion. Pattern broadbanding helps assure that the shape of the pattern stays essentially the same at carrier and sideband frequencies.

It is possible to have a very flat impedance characteristic as seen by the transmitter final amplifier and still have the pattern distort greatly, especially in the minima regions. Conversely, the pattern can remain stable at the sideband frequencies while impedance asymmetry at the transmitter results in audio distortion.

If both the pattern and common-point impedance are not broadband, the listener will experience increased distortion. If you look at broadbanding, be sure to make the distinction between the two types and make sure both are at least considered.

Design it in

The easiest way to provide for broadbanding is at the antenna design stage. After pattern design, it is necessary to determine the operating impedance of towers. This must be done to design power dividing and phasing circuitry for the towers.

Accurate prediction of operating impedances saves time and money when broadbanding. Operating impedances can be predicted several ways.

A traditional approach is through classical antenna theory. This uses the self and mutual impedances of the array elements based on the sinusoidal current distribution assumptions and appropriate impedance transformations to generate the operating impedances. This method has several flaws, starting with the need to assume current distribution shape that rarely occurs in practice.

A modern, accurate approach is to use moment-method modeling. This recent technique, which mathematically breaks the tower into electrically-short segments, eliminates the need to assume the current distribution characteristics for the towers. Operating impedances can be predicted with great accuracy using this approach, which makes results of broadbanding much more predictable.

After predicting operating impedances, a system of networks must be designed to feed the array elements. Reactance values for "PI" and "T" networks are calculated. Transmission line formulas calculate the phase shift of voltages and currents in the lines.

The whole picture

Nodal analysis software looks at the antenna system as a whole, enabling the designer to see total systems performance with varying frequency. The networks that divide power and feed it to the various towers can be optimized for both pattern and impedance bandwidth using the software.

By making appropriate adjustments to network parameters, broadbanding can often be done with no increase in component count or cost. One method used by antenna engineers is to combine the impedances from the individual towers so that sideband reactances are of equal magnitude and opposite sign. The reactances cancel, leaving a flat impedance characteristic.

By flat, I mean flat at the transmitter final amplifier and not the common point. That's where it counts. Because of impedance transformations that take place within the transmitter's output network, a flat common-point impedance usually results in asymmetrical, distortion-producing impedance characteristics at the final amplifier.

Perhaps you have an existing system and don't have the luxury of starting from scratch. It is still possible to get significant improvement in impedance and pattern bandwidth performance at little cost. The cheapest and easiest thing is to use phase shifting and sideband reactance cancellation at the common point circuit.

For better performance, the bases of individual towers can be treated as well. Each antenna system has to be looked at on a case-by-case basis.

What about DAB? If a viable system is developed for the AM band, antenna broadbanding will be even more important.

□□□

Steve Crowley is a consulting engineer based in Washington, D.C. He can be reached at 202-223-6700; fax 202-466-2042.

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LOWPOWER LOWDOWN

Fifty Facts About FM Translators

by Howard L. Enstrom

MOUNT DORA, Fla. During my career in low power broadcasting, I've amassed a list of facts about translators that I feel is useful to know and remember. With your indulgence, I present them here for you today, in the hope that you may find them equally useful.

1. Think of translators as "narrowcasting" for particular communities and areas.

2. As amazingly cost-effective as translators are, those who contribute money to a project should have realistic expectations.

3. Most systems differ in cost, ERP, distance from the primary station, antenna height, radiated pattern shape, coverage pattern shape and how its signal is affected by terrain.

4. FCC rules purposely limit a translator's coverage distance.

5. The metric standard of measurement is used in FCC applications.

6. If a translator's 1 millivolt-per-meter (60 dBu) coverage contour is 7 km (4.35 miles) out, the 50 microvolt-per-meter (34 dBu) fringe contour is about 32 km (20 miles) out.

7. If a translator's 1 millivolt-per-meter (60 dBu) coverage contour is 13 km (8.1 miles) out, the 50 microvolt-per-meter (34 dBu) fringe contour is about 52 km (32 miles) out.

8. The maximum of 250 W ERP is conditioned on antenna HAAT, geographic regions and non-caused interference.

9. Ten watts ERP may be used for any antenna HAAT, conditioned on geographic regions and non-caused interference.

10. One of the most important decisions you can make about a translator concerns the site location with respect to community or area of service.

11. In general, the best site is centrally-located and channel use permits the translator to radiate non-directionally from an antenna having an optical view of area of service.

12. Sites with co-located electronic services increase the possibility of intermod product, desens and cross-modulation interference.

13. Local interference is dealt with using techniques and equipment, but first the problem must be diagnosed with expertise.

14. Translators should be powered from a dedicated AC breaker or fused circuit.

15. Make sure equipment is installed for convection cooling by allowing free air to flow about it.

16. A translator mounted on a wire-type closet shelf using brackets is preferable to one shoved back on a solid wood shelf.

17. Since 1/2-inch or 7/8-inch transmission lines are quite stiff, a more workmanlike installation uses flexible "jumper" cables for connection with equipment.

18. The FCC does not require translator logs.

19. Good practice, however, suggests the keeping of a maintenance log showing dates, times, off-air periods, reference information, etc.

20. The FCC requires that a sign be posted at a translator site to show the call sign, name, and telephone number of person in control of operation.

21. Many properly installed translators operate for years without problems or regular maintenance. Nevertheless, every translator licensee should have some person with technical expertise available for assistance, if needed.

22. If a translator is off the air for 30 days or more without notification to the Commission, it may not legally return on the air.

23. Remember, one cannot vent or force air from an enclosure unless it also has an air intake opening.

24. Screen vent openings to preclude insects, rodents, etc.

25. Security measures should be taken to reduce tampering or thievery.

26. AC line surge protectors are just as important as RF line types.

27. Beware of old, moisture-laden transmission line that is lossy.

28. Be sure all outside RF line connectors are sealed against water intrusion.

29. Regardless of some notions, if all impedances are matched, transmission line length is not critical, except for the loss factor.

30. From a practical standpoint, PL-259 ("UHF" type) RF connectors are as useful as the more expensive "N" type.

31. The standard impedance for antennas and line is 50 ohms, though some systems use 75-ohm type FM receive antennas.

32. Incoming interference to a primary signal is dealt with by using the right type directional antenna, line filters, site location, or combination of all considerations.

33. To minimize lightning damage potential, let someone else's antenna be the higher one on a structure.

34. Before settling on a site, make sure it enables 'round-the-clock, reliable reception of the primary station.

35. If a primary station's signal is unstable in level, the reason is multipath, and excursions will change with the sun's position.

36. An antenna preamplifier is used to

continued on page 23 ▶

STATION SKETCHES

PC Software Inspires Better Station Documentation

by Tom Vernon

HARRISBURG, Pa. Often in contract engineering it's the trivial and repetitive jobs that get postponed or are never completed, no matter how important. One such task is documentation.

Frequent changes in studio wiring and equipment upgrades make timely and legible documentation a must. But all too often "documentation" translates into a few ragged pages from a legal pad. These usually contain a list of wire numbers and where they go, along with a few handwritten notes scrawled at 3 a.m. They usually are shoved in a file folder and forgotten until the next major project comes along. By then, your notes have lost all meaning, and several minor changes to the wiring have gone undocumented.

This month's *Station Sketches* looks at a computer-based solution to these problems using INSPIRATION, a graphics/outlining program from Ceres Software. Keeping all of your client documentation on disk makes upgrades and changes relatively painless.

Creating a diagram

Let's begin with a simple diagram. Figure 1 shows the wiring of a small carrier current installation. To create this drawing, symbols were laid out on the screen and connected with links. Both symbols and links may have text assigned. This makes it easy to designate wire numbers. These links may be either diagonal or set to make 90 degree angles. Locations of angles may be adjusted after completion to accommodate unusual or complicated diagrams. Titles can be added to diagrams with the text only symbol.

When viewed on the screen, each symbol has a button that reveals a hidden text field. For engineering work these fields lend themselves well to maintenance logs or equipment specifications.

A variety of shapes and symbols come with the program, and they may be combined to create useful troubleshooting diagrams for operators. Standard ANSI flow chart symbols are enhanced with blocks containing supplemental information for several steps. Very complex drawings are manageable by creating sublevel diagrams for symbols. These will remain hidden until selected by double clicking on the upper right handle.

The real fun

The real fun with INSPIRATION starts when you customize the program for unique applications. Graphics may be created in other programs and imported to INSPIRATION and used as symbols. Color or gray scale objects may be employed as well.

They have all the same features as INSPIRATION's built-in symbols—namely, they can have text attached, and can be connected to other symbols with link lines. Also, they can have notes text attached. Symbols that are used regularly may be saved in one of the two User Symbol Menus. Fifty symbols may be saved in each of these menus.

Figure 2 shows the layout of a computer network. The computer and punchblock symbols don't come with the program, but were created and saved for this specialized application. For radio work, symbols can just as easily be created for fixed and variable attenuators, isolation transformers, splitter pads, patchbays, etc.

INSPIRATION has other features that make it a compelling item for the contract engineer. If you have to do presentations or reports for clients, you'll appreciate the program's outlining capabilities. It will automatically assign prefix labels to your outline in one of several formats, including Roman numeral, alpha numerical, legal, numeric, or bullet. This makes it very easy to stay organized.

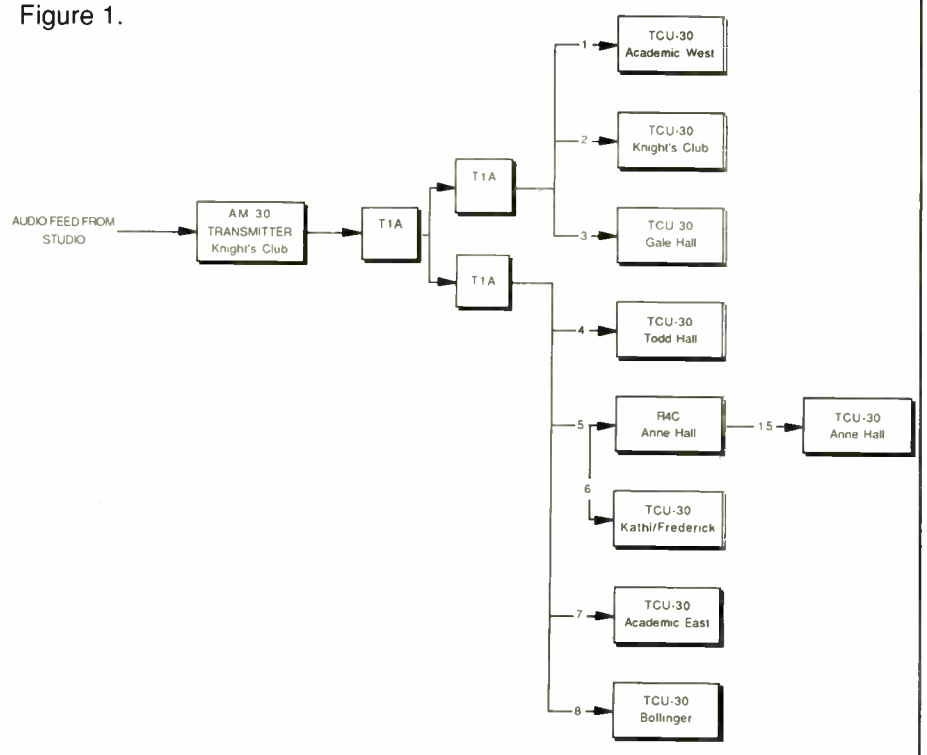
If you prefer to brainstorm your ideas in a visual mode before outlining, do so with INSPIRATION and it will automatically convert your mindmap into an outline! A single keystroke is all that is necessary to toggle between the visual and outline modes.

If you want to find out more about INSPIRATION, call Ceres software at 503-245-9011 between 8:30 and 5:00, Pacific Time.

□□□

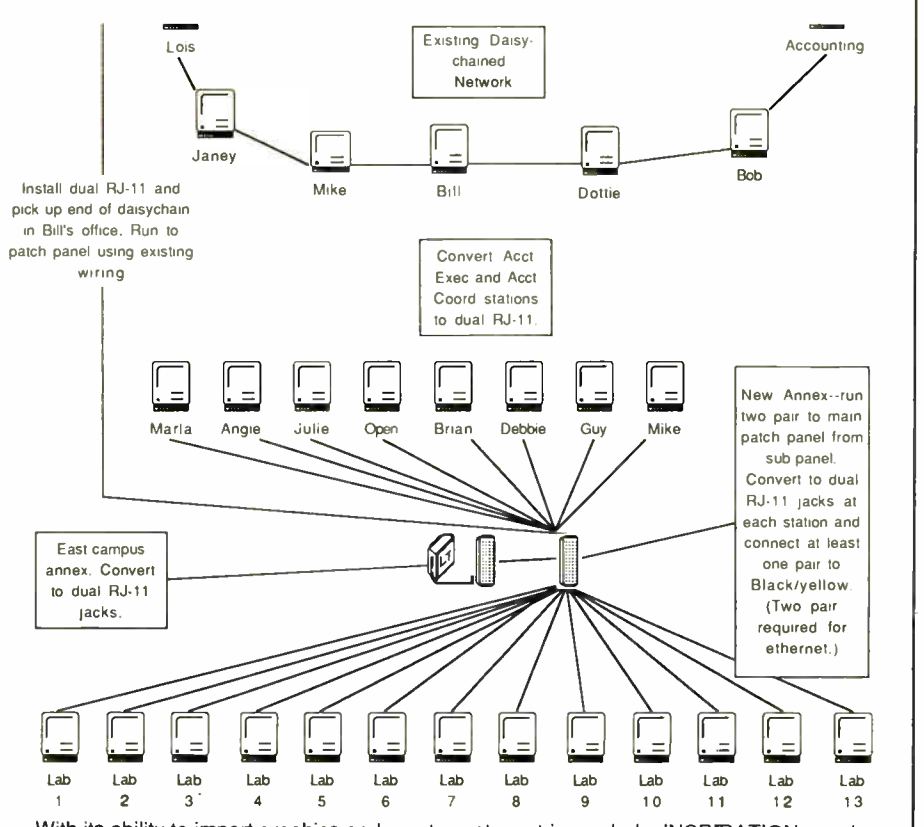
Tom Vernon divides his time between contract work and completion of a Ph.D. He can be reached at 717-367-5595.

Figure 1.



Simple diagram of a campus carrier current installation. Program includes features to ensure uniform size, spacing, and alignment of symbols.

Figure 2.



With its ability to import graphics and create custom strip symbols, INSPIRATION may be customized for unique applications. Up to 50 user symbols may be installed in each user symbol menu. Here the program is used to document a computer network.

PRODUCER'S FILE

Sound Effects Library Sets the Mood

by Ty Ford

BALTIMORE I love sound effects. As a production director at various radio stations, whenever I started to run dry in an attempt to come up with a creative idea for a spot, I'd peruse the sound effects catalog until something sparked.

Sometimes it happened quickly ("Aardvarks in well water—*that's it!*"). Sometimes it took longer.

A need for ambience

The main downside to sound effects libraries is that they often don't have enough different sustained ambiences. A good library should have different activity levels and different perspectives. For example: small town and big town street ambiences, vacant streets, busy streets, busier streets.

For spot work, it's important that the ambiences be at least 60 seconds long. It can be great fun to spend 30 minutes or so looping beds and stacking sound effects to custom-build your own environment.

I've created some great 60-second stereo ambiences by staggering the same 20-second mono background loop by a few seconds on different channels. After you make the loop, you lay down 60 seconds' worth on one channel. Then go back to the top of the production and lay down another track of the loop, making sure that it starts at a different place than the first track.

Provided there aren't any unusual sounds that make the tracks sound strange when combined, you'll get a very complex bed. Do a little panning, EQ and fader-move magic during the mix and you've got some nice stuff, but that takes time...and multitrack capability.

The Producer's Sound Effects Library, 12 CDs of which I've listened to, is the first library I've heard that has long-bed ambiences. On the average, each ambience bed is two to three minutes long. With beds that long, it's obvious that the collection is a prime candidate for feature film and long-form video projects.

Pick a mood

Overkill for simple spot work maybe, but damn nice to have. For example, CD BG2-01, "Backgrounds 2—Restaurants and Cafes," contains twenty-one ambiences with varying amounts of conversation and kitchen noise and dish clatter. There's even a restaurant patio ambience with bird noise.

On "Traffic/General" there are 23 tracks, each more than three minutes long. Ten of them are "City" ambiences including street level, second floor, fourth floor and eighth floor perspectives.

There are five freeway tracks. The first two are close-up and long-shot perspectives of highway sounds in the desert. The others get busier and noisier. Following that are a pair of "rural street" tracks for that 20-30 m.p.h. small-town feel. The last six tracks (Wet Traffic) are of cars and trucks on wet and puddled streets.

The "Rain and Thunder" CD is equally impressive: 25 variations of rain, each from two- to three-and-a-half minutes long; 15 variations of thunder claps; and the all-important two-minute "rain on umbrella" track.

The 76 different audience cheers and applause on "Applause-AP-01," while shorter in duration, are equally diverse and extensive. "Doors-DO-01" contains 99 different door sounds, knob rattles, lock/unlock sequences, squeaks, groans and slams. You never knew there were so many different doors.

The Producer's Sound Effect Library definitely gets high marks for attention to detail. One of the things I liked most about the library was that there were several versions of each of the shorter sound effects. The company is definitely not stingy with its sound.

Each of the three "Science Fiction" CDs, SY-01, 02 and 03, contain just under 100 electronic sounds. While many of them are analog synth zaps, chirps and monster groans that sound like they came from "Dr. Who" and "Star Wars," others are more evocative of "Star Trek—The Next Generation." If you've been looking for some laser effects and drone beds to spice up your station bumpers and promos, check these disks out.

On "101 Sound Effects" you get exactly that, a combination of real sound effects with a few sci-fi *weebs, warbles* and *waroongs*. The real sounds are just that, not weird approximations that sort of sound like what you'd expect.

No dupes

There is also almost no noticeable duplication. (well, OK, "Old Garage Door Opening" from "101 FX" and "Attic Stairs Pull Down" from the Doors volume are very similar, but that's about it.) All of the recordings were made on DAT or on a Nagra with Dolby SR noise

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WORKBENCH

Solving RF Interference

by John Bisset

FALLS CHURCH, Va. Solving RF interference problems is a challenge most of us could do without.

Morris Blum, owner of WANN in Annapolis, Md., and his engineering staff of Merrill Pittman and Les Jamison, have provided a compendium of RF suppressors currently available.

Industrial Communications Engineers of Indianapolis (1-800-ICE-COMM) offers a series of "terrestrial interference filters," and the company has a liberal exchange policy, should the filter you buy not solve the problem. The Model 465 offers 30 dB of attenuation, and eliminates most RFI. For really tough cases, the Model 467 attenuates the interference by 50 dB. ICE also offers Applications Bulletin 46 that contains some helpful tips in getting rid of RFI. For more information, circle **Reader Service 50.**

Telephone Extension Corp. in Pearl River, N.Y., manufactures the RF-1400 filter, available through RF Specialties offices. This filter accepts modular plugs, and is very consumer friendly. You simply unplug your phone from the wall jack, plug the filter in, and plug the cord into the filter—the RFI goes away! For more information, circle **Reader Service 160.**

TCE Laboratories offers both a single line filter and a dual-line version, for homes with two phone lines (and double the RFI). This company also sells RF-proof telephones. The TPXL is a single-line touchtone phone, and the TPXL-2 is a dual-line telephone. For more information, circle **Reader Service 88.**

The WANN crew also told me about a COIL RFI Suppression Network, manufactured by COIL Sales and Manufacturing Co., 708-806-6300. These are the filters the phone company uses. In fact, John Jones of Chesapeake and Potomac Telephone of Annapolis provided this information. The three versions C&P use are the Model 12-10A, which mounts inside the phone using spade lugs; the Model 12-13C, using a modular plug and jack; and the 12-14C which has a selector switch to isolate the specific RFI. For more information, circle **Reader Service 113.**

Another company that the phone company uses is Keptel Inc. The company manufactures a suppression filter that is used outside the home where the line enters the house. Keptel is located in New Jersey, and the toll-free number is 1-800-735-3783. For more information, circle **Reader Service 173.**

For engineers who would rather "roll their own," Palomar Engi-neers comes to mind. The company has printed up an RFI tipsheet with suggestions for using its ferrite beads and cores. Palomar also sells split beads and cores for ribbon cable. An experimenter's kit runs about $20. Palomar is located in California, and can be reached at 619-747-3343. For more information, circle **Reader Service 92.**

The engineering staff at WANN can be reached in Annapolis, Maryland by calling 301-269-0700.

★ ★ ★

On the subject of telephones, Dwight Weller of Weller Audio-Visual Engineering shares a neat idea using a Comrex. Dwight feeds a weekly automotive show from his Maryland studios to two stations at the same time each week. Rather than buy a second two-line Comrex 2XP, and two more phone lines, Dwight ordered three-way calling from the phone company. Since the RJ-11 output of the Comrex is shifted audio, there's no magic to making the dual feed work.

At the beginning of the broadcast, Dwight connects to the first station. Using the switchhook to "flash" and obtain the three-way dial tone, the second station is connected. The same procedure is performed for the second line of the Comrex. *Bingo*! Dwight Weller can be reached at 410-252-8351.

★ ★ ★

Looking for a snazzy way of placing liner cards so the jocks can read them, but without taping them to the copy board or to equipment? Consider investing in an X-ray clip. Your local Medical Supply store will usually sell replacement parts for the X-ray readers it sells. Mount the clip portion along the top of the copy board, slip in the liner cards, and save the tape for better uses than defacing your studio.

So you find the X-ray clips out of your budget range? Then take a trip to your office supply store instead. 3M, the makers of the Post-it Notes® sell a poster-board-sized panel that is covered with the same sticky glue used on the Post-it Notes. Not only does the panel make for a nice bulletin board which never needs tacks, but a one-inch strip cut from the panel and fastened to the top of the copy board makes for an inexpensive way of securing liner cards.

It seems that today's contract engineer is always expected to pull a rabbit from his toolcase. This is especially true when adapting RF cables. RF Industries makes this trick especially easy, by offering the new Unidapt Kit. This kit, which sells for $125, will match any male or female UHF, N, BNC, TNC, mini UHF, or SMA connector. Optional F and RCA connector adapters are also provided (See Figure 1). The kit comes in a padded zippered case. All the connectors are silver plated machined brass, with gold plated contacts and Teflon dielectrics. The 30-piece kit can be ordered by calling RF Industries toll-free: 1-800-233-1728. For more information, circle **Reader Service 144.**

This assorted RF connector/adapter kit will save the day for the busy contract engineer.

□ □ □

John Bisset is a principal with Multiphase Consulting, a contract engineering and projects company. He can be reached at 703-379-1665.

Effects Library Sets the Mood

▶ continued from page 19

reduction and are extremely clean.

The "FX Directory" contains a division for each of the library's 64 categories and comes in a three-ring binder so it can be easily updated. Directory updates are free whether or not you order the newest CDs. The directory is also available on Leonardo Software and Gefen Systems library softwares.

The most recent six, Science Fiction SY-01, SY-02, SY-03, Telephones, Applause and Doors are available as a set for $399. "101 FX" is available for $59.99. The earlier CDs are available at $89.99 each. Another set of six CDs should be available after the first of the year. If you're looking for a bargain, contact Leonardo and Gefen. Rumor has it they sell the line at below list price.

There are also plans to release a CD-ROM disk for the Roland 770 sampler, including sounds from autos, machines and some others.

For more information call The Producer's Sound Effects Library at 213-969-0339 or 800-826-3397.

□ □ □

Ty Ford is an audio producer/voice talent. Reach him by phone at 410-889-6201, via MCI mail (347-6635), or via America Online (Tford).

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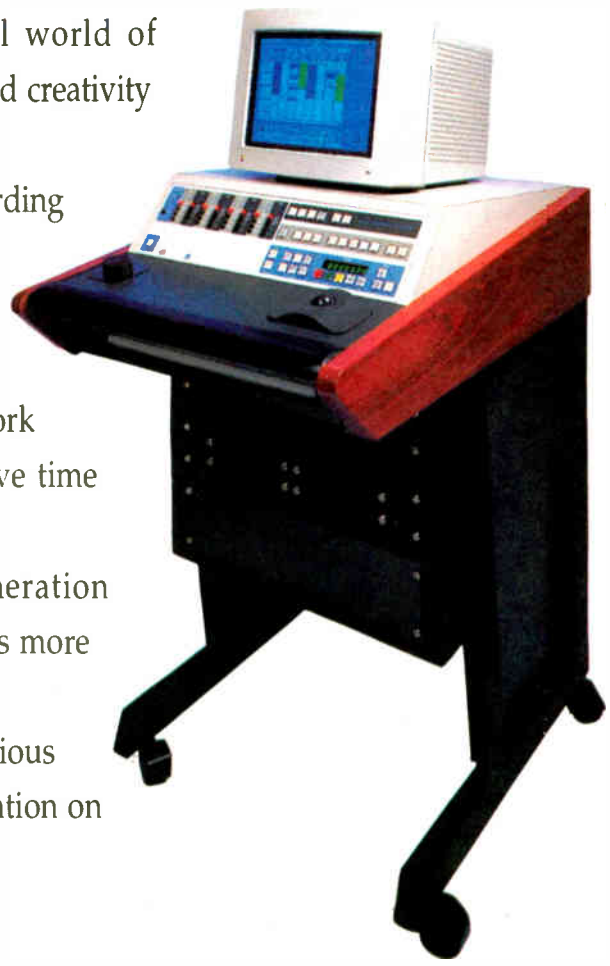

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Circle (41) On Reader Service Card

Quality Products, Few People at SBE

by Alex Zavistovich

SAN JOSE, Calif. Slow traffic through the SBE convention hall proved disappointing to many exhibitors that purchased space at the 1992 trade show. Still, the event boasted a variety of broadcast equipment to tantalize those engineers who did make the pilgrimage to the society's Silicon Valley venue.

Outgoing SBE Executive Director Steven Ingram said that as of Saturday, Oct. 17, attendance figures totaled 460, excluding exhibitors. Ingram broke those figures down to 250 registered attendees, with the balance being exhibitor guests, and 125 people registered for the Ennes Foundation sessions on Oct. 14.

Ingram estimated that the total represents a decrease of approximately 20 percent from last year's figures.

On the show floor, meanwhile, the story was not only what the manufacturers were exhibiting, but which of them chose to skip the event altogether.

Some long-time SBE stalwarts opted not to take part in this year's convention. Notably missing were companies such as Belar, Continental, Marti, QEI, Kintronic Labs, Potomac Instruments and Burk Technology. Some other companies, like Telex and CCA, had reserved booth space but did not set up exhibits. Several distributors also chose not to participate, including Bradley Broadcast Sales, Broadcast Supply West and Crouse-Kimsey.

Nonetheless, the show did generate some interesting news, such as a marketing partnership between Gentner Communications and TFT. Under the partnership, the two companies will "participate jointly in...ventures including sales training seminars, trade show displays, and special sales packages incorporating products from both companies." As proof of the agreement, Gentner's audio processing equipment was shown at the TFT booth.

Despite the sluggish traffic that marked this year's SBE convention, the show featured a cross-section of companies. Attendees could outfit a radio station entirely from products displayed in the exhibit hall.

This suit, according to Maxwell Safety Products, greatly reduces risk from exposure to RF radiation.

Wired for sound

Clark Wire and Cable showed its 800 series audio snakes, focusing on the 801,

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Translator Facts You Can Use

▶ continued from page 17

improve a signal-to-noise ratio, is located close to the receive antenna, and DC powered through the center conductor of the transmission line.

37. If a circularly polarized receive antenna is used, be sure electrical rotation direction is the same as the primary station's.

38. Be prepared to advise translator listeners about receiving conditions involving set quality, terrain and obstruction-shielding, antennas, signal reflection, etc.

39. If a primary station is non-commercial educational (NCE), its translators may operate on any of the 100 FM channels and receive the input signal by any means, including satellite.

40. If a primary station is commercial, its translators may operate only on one of the 80 commercial FM channels, and may not receive the input signal by satellite.

41. FM translators may not rebroadcast an AM station.

42. An FM station must provide written authority to have its signal rebroadcast.

43. A translator may serve as a relay station if it also serves a community of listeners.

44. Any entity may be a licensee of more than one translator for a community.

45. If a translator causes interference to reception of a full service FM station, even though its interference contour does not overlap that station's protected contour, it may have to relieve the problem, or cease operation.

46. If a satellite-fed translator loses its input signal so that conventional carrier muting does not take place, it uses an audio-presence detector to perform muting.

47. Since the FCC does not offer and assign a translator output frequency channel, the burden of discovery and proof of usefulness falls upon the applicant.

48. Due to the complexity of rules and regulations, most applicants have an engineer with data resources and knowledge to assist with technical and application matters.

49. At the present time, commercial translator applications, including major changes, must be accompanied with a filing fee in the amount of $425.

50. An applicant has a non-extendable 18 months from the issuance date of a construction permit to build the system.

□□□

Howard L. Enstrom is a broadcast consultant. He has owned and managed an AM station and is president of FM Technology Associates Inc., specializing in engineering design and sale of FM translator equipment. He can be reached at 904-383-3682 or by fax: 904-383-4077.

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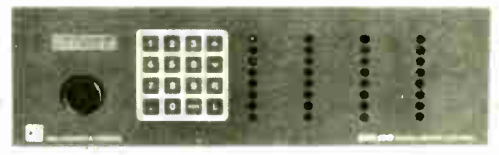

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READER SERVICE NO. 154

SBE Hosts Manufacturers

▶ continued from page 23

a 24-gauge cable, NEC CL-2 rated product. The company also showed its 24-gauge low capacitance digital audio cable.

Another introduction from Clark Wire is designed more for video and audio applications, rather than radio broadcast. CAMPLEX-1 is a flexible cable with stranded center conductor. CAMPLEX has a DC resistance of 14.7 ohms per 1,000 feet; it is recommended for runs up to 1,800 feet.

Other manufacturers of cable and related gear included Cooper Industries/Belden Division, which showed its digital audio cable. Lemo USA displayed its family of electronic connectors. ADC Telecommunications displayed its line of audio patching products, including a digital audio patchbay employing 110-ohm cable. Pacific Radio, a Los Angeles-based distributor, showed a variety of microphone cable assemblies.

Antenna manufacturers in attendance included Rohn, Scala, LDL, Shively, Dielectric, Jampro, ERI and Antenna Concepts. Radiation Systems Mark Antennas Division, Stainless, Inc. and Alan Dick & Co. also had product information available. ERI said it has gotten involved in the international market. The company has just completed an installation in Taiwan, according to ERI's Robert Rose.

To top off the tower products, so to speak, Hughey and Philips showed a variety of lighting beacons.

Measurement and monitoring

Several companies displayed products for protection from and measurement of RF radiation. Maxwell Safety Products introduced NAPTEX, a shielding textile. The firm showed a protective suit for tower climbers; it has a shielding effectiveness of up to 40 dB and weighs only two pounds.

Holaday Industries showed its induced body current meter and its line of broadband RF instruments; Loral Microwave-Narda showed the Nardalert personal RF monitor, essentially an RF and microwave dosimeter. Bird Electronic displayed its Model 6085 broadband high power RF calorimeter.

Power conditioning and lightning protection equipment also was on display. Northern Technologies showed its high-energy lightning suppression system and its transient control system. PolyPhaser Corp. showed its line of suppression equipment, including the bulkhead-mount coax impulse suppressor.

Control Concepts Corp. featured the Islatron for protection from spikes, transients and lightning-induced voltages. Current Technology showed the Power Siftor distribution panel protection system, and Bird Electronic displayed a variety of power measurement instruments. Test and measurement products also were available from Neutrik, Tektronix, Audio Precision and Rohde & Schwarz.

In the category of audio monitoring, Inovonics showed its Sentinel program audio monitor. Wohler showed its full line of rackmount audio monitoring equipment, including the AMP-1 and the VM-4 for cueing and confidence monitoring.

Transmission and STL gear

Broadcast Electronics was on hand with its AM1 1 kW AM transmitter with built-in C-QUAM AM stereo exciter.

AM stereo also was the theme at the Delta Electronics booth, where the Models ASE-1 and ASE-2 C-QUAM exciters were shown. Delta's display also featured the AM splatter monitor.

TTC was at the show with information on its line of transmission products. At the Harris-Allied booth, the Harris Gates 5 solid state AM transmitter was demonstrated, along with the company's extended line of RF equipment for AM and FM, including the Platinum series. Other RF manufacturers on hand included TTC, Larcan and BEXT, which also showed some STL products.

A number of companies provided STL devices which operate in the digital domain. Intraplex's 4800 DDAT link for fractional T1 applications, Dolby's DSTL, the TFT digital modem, and Moseley's DSP 6000 system were all on hand. Moseley's Dave Chancey confirmed that KSJO here uses the DSP 6000 in conjunction with the Orban 8200 Optimod, connected via an AES-EBU interface.

Comrex displayed its DXP and DXR digital audio codecs, in addition to providing information on the rest of its product line. The codec allows full duplex audio transmission with 7.5 kHz bandwidth.

In the studio

Broadcast Electronics' exhibit also showcased the AirTrak 90 audio console, AudioVAULT hard disk storage system, and the Disc Trak floppy disk-based cart machine.

The Wheatstone display featured the company's new line of AudioArts Engineering console products, including the R-10, a budget-priced user-friendly console. Wheatstone also exhibited its full line of on-air and production consoles, as well as the company's line of graphic and parametric equalizers, notch filters and distribution amps.

Manufacturers of processing gear were primarily shown through local distributor displays. Orban Associates featured its product line, including the Optimod in analog and digital versions, at the Advanced Marketing booth. CRL had its Audio Signature at the Broadcasters General Store exhibit, and the Cutting Edge Unity 2000 was shown by Harris-Allied.

Gentner's Prizm and Lazer were shown in the TFT booth. Inovonics had its David, a low-cost single rack unit analog processor, on display.

Radio Systems showed its RS-6700 DAT machine and a broadcast audio processor incorporating Dolby S noise reduction.

At the Fidelipac booth, showgoers were able to examine the Dynamax MX Series modular audio console, first shown at the company's suite during the NAB Radio Show in New Orleans. According to Fidelipac's Scott Martin, the console will be shipping in December. The DCR 1000 floppy disk-based cart machine also was displayed.

Another disk-based cart system on hand

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Remote Control, Then and Now

SAN JOSE The odds are that the FCC will take no further formal action regarding transmitter operation by remote control.

John Reiser, an engineer with the FCC's Mass Media Bureau addressing convention attendees at a technical session during the convention, said a new notice of proposed rulemaking (NPRM) on remote control operation will likely "never see the light of day." Reiser attributed that lack of action on a "freeze on NPRMs to reduce paperwork," and added that the issue is a "low priority for the FCC."

Offering an historical perspective on the matter, Reiser recounted that the Communications Act originally provided for transmitters to be operated in the presence of a licensed operator. After World War II, the FCC reorganized FM allocations, and established low power Class D 10 W non-commercial stations. The Commission changed its rules at that point, to allow for the operation of these station close to towers, he added.

In the early 1980s, the Commission issued an NPRM to amend its rules for transmitter operation, said Reiser. These new rules, however, were limited in scope. They proposed no technical ways of doing things, Reiser said, just the desired result.

With the advent of dial-up remote control, the FCC in 1988 issued a public notice to address the questions raised by the new technology. The public notice indicated that the duty operator must have the ability at all times to turn the transmitter off. Simple control by phone lines was not enough, Reiser said.

In recent times, the Commission has asked Congress to make broadcasters exempt from licensed operator requirements detailed in the Communications Act, or to eliminate that part of the Act entirely, Reiser said.

Still, Reiser said, "dial-up remote control is wonderful." He further reassured the audience that "transmitters that were well-maintained under old rules wll be maintained well no matter what the rules may be."

FCC on Wheels
The local field office of the FCC brought its mobile electronic measurement unit to the SBE show.

Contests Can Win Trouble

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two annual $10,000 payments, the money stopped and she complained to the FCC. The licensee responded that it was the other company, and not the station, which was responsible for the bonus prize.

The Commission, however, reviewed the contest's promotional material and rules and concluded that the contest was presented to potential participants as a purely station-conducted contest.

This placed the licensee in a no-win position: If the promotional materials were correct and the contest was purely station-conducted, then the station's failure to pay the bonus was a failure to conduct the contest as advertised; but if the promotional materials were incorrect, then the station had failed to fully and accurately disclose the contest's material terms. Either way the station had violated the contest rule, and the result was a $6,250 fine.

Additionally, the Commission's ruling cannot have helped the station if the contestant attempts to sue in civil court for the balance of the prize.

It appears that the station in question had been at least somewhat diligent with respect to the bonus prize: It had a written agreement with the prize's sponsor, and presumably it therefore enjoys at least some reasonable arguments in the event of a lawsuit. But the station apparently did not take the extra step of assuring that the promotional copy plainly reflected the source of the money. And the station also apparently had not insisted that all of the promised prize money be put aside (for instance, in an escrow account) to guarantee its availability.

In view of the fact that the Commission is nowadays clearly willing to issue fines for contest violations, you should probably review any contests you have on the air (or in the planning stages) and make sure that all your i's are dotted and t's are crossed. If you have any questions at all, you should probably consult your communications counsel right away, while there still may be time to correct any possible problems.

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SBE Sessions Target New Key Issues

by Alex Zavistovich

SAN JOSE Of the wide range of papers presented during the SBE convention here, several focused on issues currently under regulatory and legislative scrutiny: digital audio broadcasting (DAB), radiofrequency (RF) radiation exposure standards and improvement of the Emergency Broadcast System (EBS).

In a presentation titled "Planning the Future for Broadcast Engineers," Jerry Whitaker recapped broadcasting's competitive battle with consumer audio products for the home and car.

Whitaker added that plunging prices for radio station, coupled with the trend to LMAs and major mergers may lead to layoffs. These potential layoffs may exacerbate an already tight job situation in the industry, Whitaker said, noting that engineering staff at the average radio station has decreased from three in 1986 to two in 1989.

The NAB's Andy Butler, in a paper titled "Dodging Bullets and Seizing Opportunities," outlined some of the NAB's work on behalf of its members. This work includes improvement or enhancement of current broadcasting technical quality by pursuing digital audio broadcasting (DAB), radio broadcast data system (RBDS) and AMAX certification for AM receivers.

Butler gave evidence for the pursuit of digital technology for broadcasting by pointing out that "consumers have shown demand for high quality audio." In 1992, almost $10 billion dollars is expected to be spent on consumer audio equipment, he said, and digital cable audio services such as Digital Cable Radio and Digital Music Express have proved to be "attractive and seductive" to listeners.

Synopsizing the key players in the DAB race and the timetable imposed on them by the Electronic Industries Assocation (EIA) planned system tests, Butler stressed that all DAB plans require new receivers, transmitting equipment and digital programming. He said the average implementation cost for DAB conversion could range from $20,000 to $100,000, depending on how much of the station's operation is already digital.

Understanding RF compliance

In a panel titled "Environmental Standards: What You Need to Know," discussion primarily revolved around RF radiation issues. The FCC's Bob Greenberg noted that OST Bulletin 65 requires compliance with standards set by the American National Standards Institute (ANSI) for the specific absorption rate of non-ionizing radiation.

The FCC requires stations to power down or cut power when tower climbers are working on the tower; all stations on the tower must agree to and comply with the power reduction, he added. According to Greenberg, "many applications" are deficient regarding OST 65.

Robert Cleveland, also with the FCC, said rule 1.1307(b) 47 CFR looks at the services that must comply with ANSI guidelines, which are time-averaged over a six-minute period. Included are radio and TV, fixed and portable satellite uplinks, and workers climbing towers. He added that the ANSI standard may soon be replaced by another, IEEE C95.1.

New standards for exposure came under fire to some extent by consulting engineers James Hatfield, of Hatfield and Dawson, and Dane Ericksen of Hammett and Edison.

Hatfield said that the new standard for maximum permissible exposure—a two tiered standard for workers and the general public—maintains similar standards for occupational exposure, but decreases by one-fifth the public exposure limit in the human resonance range of 30-300 MHz.

One problem with the standard, according to Hatfield, is that for FM broadcasters, the body current limit changes in mid-band (100 MHz). This point also was raised by Dane Ericksen, who pointed out that "a 6 kW Class A at 99.5 has to do yet another survey" if it plans a facility construction or modification, while a station above that point is not required to do so.

If body current is really a problem, Ericksen said, the standard is deficient by being cut in half. A notice of proposed rulemaking planned by the FCC will give broadcasters a forum for their opinions, he acknowledged, but Ericksen expressed concern that the Commission may choose the "easy solution" and increase the cut-off to 108 MHz—"a pox on all FMs, not just half."

RF consultant Richard Tell stressed the need for federal certification and independent assessment of protective clothing for RF exposure. He noted that protective gloves seem effective in reducing contact current. Tell also underscored the need to show compliance with RF safety requirements, by knowing the field at minimal measurement distances and considering uncertainty in equipment calibration when making such measurements.

If body current is really a problem, engineer Dane Ericksen said, the standard is deficient by being cut in half.

Shively Labs' Robert Surette maintained that "most stations comply with the ANSI standard." He acknowledged, however, that "where you get in trouble is with low towers." In stations with a substantial amount of energy close to the tower, changing the number of bays on the antenna can "substantially reduce the downward lobe," he said.

In a session titled "EBS Summit Conference," proponents of systems designed to enhance or replace the existing emergency broadcast system shared a panel with FCC representatives to discuss the future of the EBS.

Something's got to give

Session chairman Richard Rudman of KFWB in Los Angeles noted that broadcasters have "gotten to a point where we know a change has to occur."

Dane Ericksen outlined the points raised by the SBE in its filing with the FCC on the EBS overhaul. The alerting system, he said, must be equally available to AM, FM and TV stations, as well as being flexible and simple to use. Additionally, the SBE was looking for the FCC to make statements regarding remote control and depth of modulation in the alerting system.

Rudman then brought up the "Emergency News Network" concept developed in Los Angeles. As detailed in another session during the show, the network would provide news and official information originated by police and other authorities in the form of press releases, drafted in simple English. The network would not undermine regular news reporting, Rudman stressed, and is intended to solve problems associated with a break in the "daisy chain" of current EBS notification.

Richard Smith, of the FCC's Field Operations Bureau, noted that comments on a notice of proposed rulemaking regarding EBS are due to the Commission by Jan. 15, 1993, with replies on Feb. 16. He also pointed out that a demonstration of the new systems will take place in Washington, D.C. on

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Products Displayed at SBE

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at the SBE was the dB-Cart, first shown in prototype form more than two years ago, and unveiled at the AES show in September. The unit, from Digital Broadcast Associates, utilizes a 21 megabyte 3.5-inch "floptical" diskette. The Audiometrics CD cart player was shown by Harris-Allied, while the Denon CD cart machine was available for inspection from the distributor CanComm.

RCS showed several products including the MDL-14, otherwise known as the RCS "Tracker," which can store a week's worth of radio programming on a single DAT cassette, with 100-2,500 Hz frequency response.

TM Century exhibited its "Ultimate Digital Studio," a programmable system for air playback of music and commercials. The system now interfaces with Computer Concepts' Digital Commercial System, a hard disk-based storage and editing system. The latter company also exhibited at the show.

Other hard disk-based digital automation and editing systems were scattered throughout the exhibit hall. At Broadcasters General Store, attendees could examine the Desk Jockey from Rodman Brown. Audio Images, a pro audio distributor, offered demonstrations of the Pro Tools system from Digidesign. Also, from ENCO Systems, was a display of the DAD486x, a 16-bit hard disk storage and editing system using a proprietary DSP circuit board and touch screen operation. The Arrakis Digilink hard disk system was on display at the Harris-Allied booth, as was the AKG DSE 7000 disk-based editor.

Service providers

Not all the exhibitors at the show were manufacturers, however. Service providers were also available. One unusual company is Chip Morgan Broadcast Engineering (CMBE), which provides a variety of contract engineering services. CMBE provides contract engineers with a centralized administrative service for collections and other paperwork. Another engineer, Doug Vernier, showed his broadcast technical software for contour mapping, FM search and other applications.

Sequoia Electronics also had a booth at the SBE show. The company provided information on its inventory of parts for various recorders, duplicators and tape loggers, as well as service for the equipment. Econco provided information on its tube rebuilding services, and NPR Satellite Services was on hand describing its various broadcast-related services.

Workstations Are Key Topic at AES

by Nancy Reist

SAN FRANCISCO A panel of digital audio workstation users and manufacturers presented a workshop on practical tips for audio producers converting to the digital domain. The panel convened at the 93rd convention of the Audio Engineering Society (AES) in San Francisco.

Panel members agreed that the process of choosing the correct workstation to meet specific needs is critical. They suggested several criteria that should be considered before making the investment. These include the specific features, the manufacturer's reputation, upgrade capability, ease of file backup and restoring, compatibility with other systems, and the kind of filing system the workstation uses.

Panelists agreed that prospective users should first carefully assess their particular needs. Then search for a workstation that meets those needs without getting distracted by superfluous features.

Know what you want

Scott Gershin, from Soundelux said that, though features vary, digital workstations that provide complex editing capabilities are different machines from those that provide several simultaneous tracks for multitracking. Ben Ing from Waveframe added, "The buying public has to realize that a facility has to specialize. They should look for a workstation that does what they want."

Roland House's Michael David said the buyer also should consider the manufacturers' reputation.

Upgrade capability is another significant criteria recommended by the panelists. The technology is constantly evolving, a fact which makes many people afraid to invest large sums of money in a piece of equipment that may rapidly become obsolete. But panelists asserted that a digital workstation does not have to be a technological dead end.

Otari's Matt Ward advised, "Look at the company's record for stability and ability to provide upgrades. You're dependent on it. Look at how the system is set up to accept new technology. Some systems are more modular in nature. If a system is more modular it's much easier to upgrade."

Prospective users should first carefully assess their particular needs, and then search for a workstation that meets those needs without getting distracted by superfluous features.

Ward also discussed different approaches to file management, which is a complex process in audio workstations, especially with space-consuming audio storage.

File design

He said that manufacturers usually take one of two approaches to file design. They may develop a dedicated system which can be sophisticated and efficient, but which also locks the user into specific hardware.

On the other hand, Ward noted, they may use an existing file system which is more flexible and open to outside peripherals, but which may be less efficient at accomplishing the particular tasks the user has in mind.

Panelists were divided about which approach was preferable. David emphasized that you should also consider the ease of backing up and restoring the data. "If a manufacturer tells you a box isn't going to crash, run like hell, because every box is going to crash once in a while."

Once a workstation is selected, you will need to change some of your production routines. According to David, "The key to all workstations is preparation and scheduling."

He said a digital audio workstation can save you time and enhance your creative opportunities, but you need to set some new preparation time aside.

Likewise, frequent project backups take some time, but it's time you can't afford to skip. Otherwise, your project is always vulnerable to disk failure.

Gary Hall of Sonic Solutions said that it's often difficult to determine whether or not a workstation will crash. "When a tape machine goes down, it's obvious. When a disk system fails, you can recover the data and ask if it's OK and all the manufacturer can say is 'I think it might be.' That adds a lot of stress." Scott Gershin from Soundelux said that the only way to prevent major disasters is to diligently back up your projects so you can recover most of your data if the system crashes.

Incompatible drives

One practice that may lead to unnecessary system failures is the use of incompatible disk drives. The drives sold by the workstation manufacturer may cost considerably more than drives purchased elsewhere, but several of the panelists claimed it may be difficult to determine how well the cheaper drives will work with the system.

James Moorer from Sonic Solutions warned that even a drive with the same model and make number as one recommended by the manufacturer may not work perfectly. He said that although everyone uses SCSII chips, drives may behave differently in a number of areas including handling of reject messages, powering up, disconnect during the data phase, sensitivity to bus noise and long cables, co-existence with other peripheral devices and thermal recalibrate behavior.

The panel was divided about the best way to avoid these problems. Some preferred to stick to the drives provided by the workstation manufacturer. Others suggested calling the manufacturer, telling them what drive you plan to buy, and asking whether it will work. Ing and Ward said that Waveframe and Otari will specify what drives they recommend and will support.

Gershin said that frequently a malfunction that seems to be a disk problem is actually due to bad cables. He recommends buying high quality SCSII cables and keeping backups on hand.

The way you connect different peripherals also can make a difference. Ing explained that as you add different SCSII devices you pull down the inductance in the system, which may impede operations. He also advised against mixing different kinds of cable and warned that Mac SCSII cable is not compatible with other kinds because Mac doesn't use some of the data lines.

The workshop ended with a debate about the likelihood of the emergence of a standard. Everyone seemed to agree that a standard would be valuable, but most said they think it's unlikely one will be developed in the near future.

SBE Targets Key Issues

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Dec. 11, 1992.

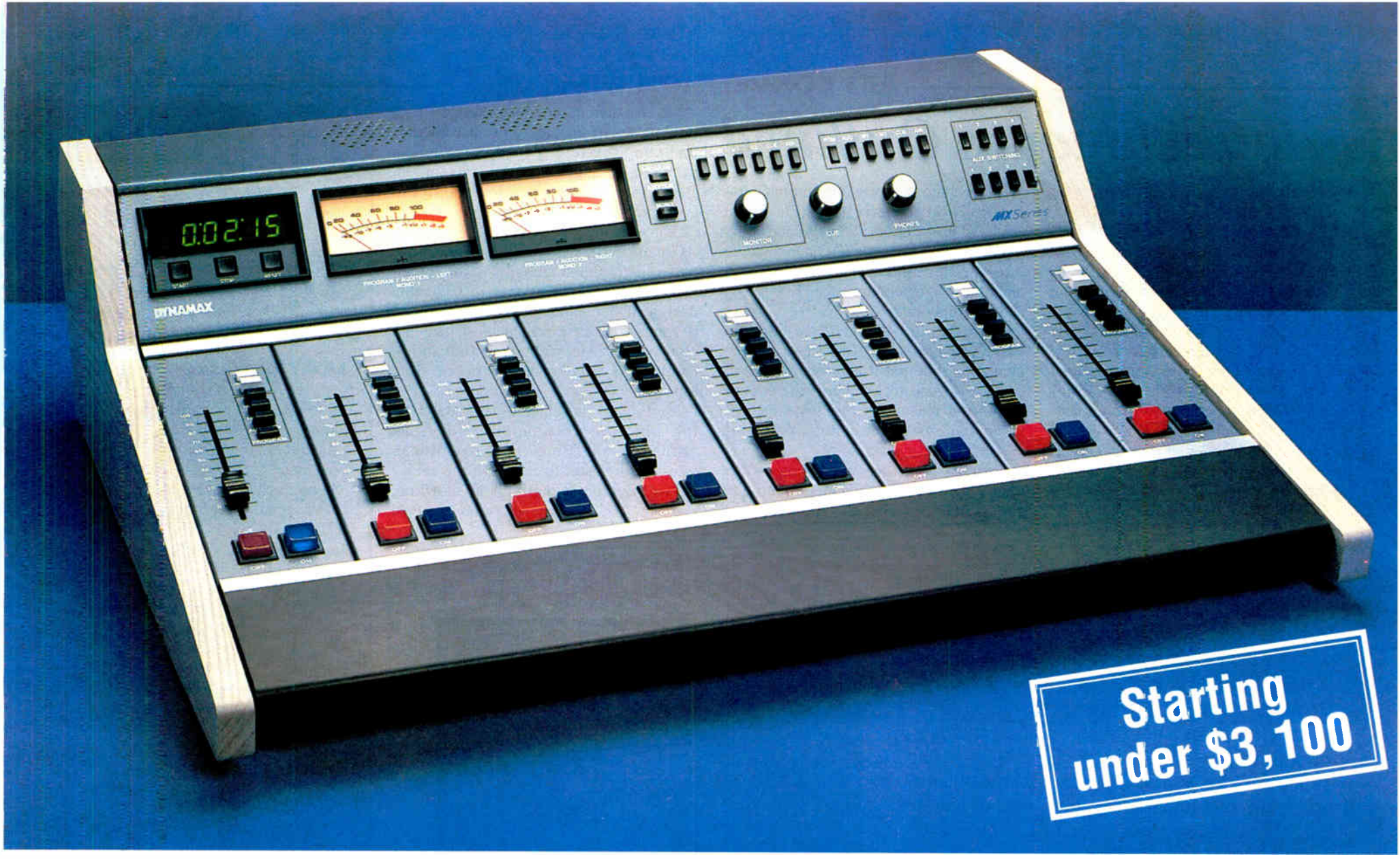
The rest of the session was devoted to explanations of the new systems. Jerry LeBow described the RDS-based SAFE I alerting system, which operates on a 57 kHz FM subcarrier. Le Bow pointed out that manufacturers will build the RDS feature in automobiles only as a value-added feature. Therefore, such RDS capabilities as datacasting and similar features are of interest to manufacturers.

LeBow said that implementation of EBS improvements may run to $50 or $60 million, which he hopes will come from FEMA or through other government funding, rather than being shouldered by broadcasters.

Art Botterell described California's Emergency Digital Information Service (EDIS), a government-access newswire for computerized dissemination of news releases coupled to a variety of distribution systems. Advantages of EDIS are low cost of implementation, a datastream compatible with newsroom automation and captioning systems, familiar technology and an operating philosophy that supports rather than supplants regular broadcast news.

The National Weather Service's WRSAME system was described by Larry Krudwig. Krudwig noted that WRSAME is operational in seven cities, with a total of 15 expected by the end of the year. In 1995, the Weather Service will replace its current system with a digital system, Krudwig said; some 415 stations will have the capability of transmitting the code.

Finally, Fred Baumgartner explained Colorado's Emergency Alerting System—ICEBS, as it's referred to in the FCC's NPRM. The system uses multiple networks to reduce interruptibility, and employs 7-digit DTMF coding to identify the emergency condition. Baumgartner described ICEBS as a web structure, as opposed to the current EBS daisy chain. The system will survive even if up to 80 percent of it is destroyed, he said.



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Mic Techniques Outlined

by Nancy Reist

SAN FRANCISCO Three-channel stereo miking was one of two papers presented on sophisticated microphone techniques at the 93rd Convention of the Audio Engineering Society.

In the first paper, technical consultant Michael Gerzon described possible microphone techniques for three-channel stereo. He said that three-channel stereo—which uses three speakers located at the left, center, and right positions in front of the listener—has been around for 50 years in the film industry. But it has been used almost exclusively in relatively large listening spaces.

The technique's possible implementation with high definition television (HDTV) and digital audio broadcasting (DAB) would bring three-channel stereo into smaller spaces. This means that recording engineers may need to develop new microphone techniques.

Gerzon claimed that three-channel stereo provides a lot of room for experimentation, but that it may be difficult to develop a good technique, if the experimentation is done without a thorough understanding of the unique problems inherent in the system.

Gerzon's paper described some of the theory behind three-channel stereo and discussed issues related to speaker placement. He then outlined the strengths and weaknesses of different mic placements, including discrete spaced mono mics, matrixed spaced mono mics, two spaced stereo mics, three spaced stereo mics, coincident techniques, near-coincident techniques, and the use of baffles.

Gerzon writes that "all but the most naive microphone techniques for three-loudspeaker stereo appear to need the design of dedicated matrix signal processing, often of a frequency-dependent character." He suggested that more research is needed on the processing aspects.

Gerzon also presented a paper describing the possible applications of "Blumlein shuffling" to conventional two-channel stereo microphone techniques. Gerzon said Blumlein shuffling

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Interface Affected By Jitter

by Nancy Reist

SAN FRANCISCO Problems with the AES/EBU/SPDIF digital audio interface were the topic of a paper presented at the Audio Engineering Society's San Francisco Convention on Oct. 1.

In research presented by Malcolm Hawksford, who had conducted tests with Chris Dunn at the University of Essex, the interface appears to work well.

"At first sight, it may seem that there are no problems and that the system is truly transparent," he said. "The fact is, if you transmit numbers over the interface, then the same numbers will be received at the end, assuming, of course, certain requirements like bandwidth and signal to noise ratio. On the face of it, it appears that the interface is perfect and allows exact communication of source data to the receiver."

Hawksford, however, said problems occur in the final digital-to-analog conversion process. It is not so much with the code itself, but rather with the timing of the code.

The instantaneous timing deviation of clock transitions from their correct positions is known as jitter. Hawksford and Dunn developed models to try to identify the source of the jitter. They said they discovered a relationship between the content and the jitter.

"The correlation between the time displacement and the data contained is quite strong," Hawksford explained. He played some sample spoken word tapes and tapes of the isolated jitter that accompanied those tapes. The relationship was clearly evident, although this changed with an out-of-phase stereo signal. "It's interesting to note that if the two channels are out of phase, the correlation is much, much less. That's because we're averaging over two clocks."

Hawksford said that problems associated with jitter also will be related to the cost of the system. "Of course, the bottom line is that if we engineer the D/A converter correctly, we can eliminate the problems of jitter. There's no question of that. The problem possibly exists in cheaper installations."

He suggested that one possible low-cost solution might be found in the decreased correlation between the signal and the jitter found when two signals are out of phase. "A simple thing would be to invert one channel of the interface itself. We heard that in truly out-of-phase signals the effect of jitter was very small. So in a stereo system if one channel were actually inverted, and provided the stereo content was small, the jitter would actually go down."

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CD, DAT Longevity Tests Released

by Nancy Reist

SAN FRANCISCO With the extensive use of CDs and DAT at radio stations, the long-term reliability of these products was the focus of a discussion at the 93rd Audio Engineering Society Convention.

DigiPress has developed a compact disc, the Century-Disc, made of etched tempered glass and gold. It is intended for long term archiving. Denis Oudard, General Manager of DigiPress' North American subsidiary, discussed some of the tests for CD longevity that DigiPress used in the design of the Century-Disc.

Many CD longevity tests expose CDs to extreme conditions, measure the impact of those conditions, and then extrapolate over time. He described three important components of longevity: chemical stability, mechanical stability and ruggedness. He criticized some tests of CD longevity as being overly simplistic and focused solely on chemical stability.

"Life expectancy is a complex issue. There is a medium aspect and an environmental aspect. In the medium aspect we cannot look at just one factor," Oudard said.

DigiPress has subjected polycarbonate CDs, Taiyo-Yuden WORM CDs, and various combinations CDs constructed of glass and metals to a series of tests, exposing them to different temperatures and humidities, salt, synthetic sweat and immersion.

According to Oudard, under most of the conditions imposed by DigiPress, the glass combinations held up best, followed by the WORM CDs. He said the polycarbonate CDs showed problems such as peeling and oxidation in many of the tests; he suggested, however, that some of the problems with the polycarbonate CDs may have been due to poor lacquer quality rather than to flaws in the substrate itself.

Moving from CDs to DATs, Slobodan Popovic from McGill University presented the results of his tests of DAT tape reliability. His three test groups each contained four tapes, one AGFA, one Ampex EX467, one Sony, and one 3M. The first group was subjected to 13 cycles of "mechanical stress," which added up to 90 minutes of still frame test, 2,600 mode switchings, 2,600 reproduction passes, and 55 overwrites. The second group was subjected to "environmental stress" created by putting the tapes in an environmental chamber with the temperature set at 40 degrees centigrade and 90 percent humidity for 30 days. The third group was subjected to 24-hour periods in the environmental chamber between cycles of mechanical stress.

Popovic recorded a sine wave and a segment of music on the middle of each tape after each stress cycle. Tapes were analyzed for dropout subjectively through A/B listening tests administered to 12 subjects. Popovic also analyzed the tapes objectively by scanning the waveform on the Studer Dyaxis digital workstation and monitoring the error indicators on a Sony PCM 2500 DAT recorder.

He said he found no dropouts in any of the 3M tapes, one dropout in an Ampex tape, two dropouts in the AGFA tapes, and four dropouts in the Sony tapes.

While the audience found this paper interesting, there was some criticism of the study design. One audience member pointed out that the number of tapes analyzed was far too low to reach any serious conclusions. Another commented that several companies get their tapes from the same manufacturers.

Mic Techniques Outlined at AES

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converts intermicrophone time delay differences into stereo amplitude differences.

He claimed that the technique, devised in 1931, can be used in a number of ways including: the improvement of stereo localization quality and accuracy from recordings made using a binaural head; obtaining stereo from a closely-spaced pair of boundary layer microphones; obtaining a wide stereo pickup with a high degree of rejection of unwanted sounds from the side and the rear; and the pick-up of true stereo at great distances from the sound stage.

Gerzon explained that the technique involves feeding the microphones' signals into a sophisticated signal processing system, the Blumlein Shuffler.

The lack of commercially available equipment that would allow the processing to be done by someone unfamiliar with the theory has kept the Blumlein Shuffler from popular use, according to Gerzon. Its main disadvantage is that it has poor mono compatibility, he said. The technique also is more vulnerable to wind and handling noise than many other techniques.

New Products Blanket AES Trade Show

by Alex Zavistovich

SAN FRANCISCO During the recent AES convention here, the exhibit hall of the Moscone Center was covered in a blanket of audio products for both the recording and broadcast industries. Trends on the floor revolved around the key areas of processing, recording formats and their media, and digital audio workstations.

Although the sheer volume of digitally-based products seemed to confirm the direction of professional audio gear in the future, a minor backlash against the technology also represented a trend on the AES show floor.

Some processor manufacturers in attendance showed lines of tube-based products. For example, Anthony Demaria Labs displayed the ADL 1000 tube compressor/limiter. The two rack space-high processor features frequency response of 15 Hz to 30 kHz, within 0.5 dB.

Lydcraft showed the newest Tube-Tech product, a two rack unit high vacuum tube compressor/limiter called the LCA 2A. This device contains a separate limiter and compressor on each channel. The channels can be used in mono mode or the two channels can be linked together for stereo applications and can also be connected to other LCA 2As.

Summit Audio showed a variety of tube-based products, including the EQF-100 vacuum tube equalizer, the EQP-200A dual program equalizer, the DCL-200 dual compressor/limiter, as well as the MMP-125 mic preamp and the TLA-100A tube leveling amplifier.

Also on hand at the AES show was a company well known to broadcasters, ATI. While not part of the tube-based processing trend, ATI displayed a wide variety of analog equipment, from the Emphasizer to the Vanguard console.

Solid state and digital

Despite this tube revival, processing products at AES by and large carried the "digital" label—or, at very least, "solid state."

Aphex Systems has revamped the Type C Aural Exciter. The new Type C^2 includes bass enhancement dubbed "Big Bottom," and provides simpler harmonic level adjustments. Also new from Aphex is the Dominator II Model 9721 multiband peak limiter module, a modular version of the Dominator II with onboard pre- and de-emphasis.

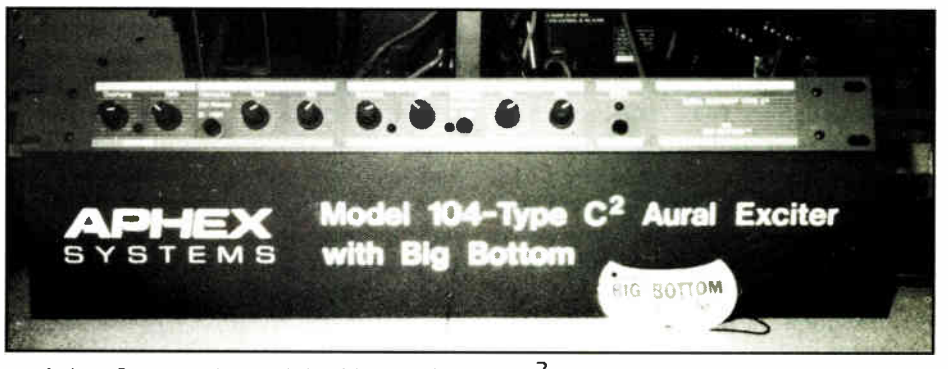
Sharing booth space with Klipsch, which was displaying its loudspeaker products, was Audio Animation, which exhibited its paragon audio processor. The paragon can digitally control various audio parameters including compression, limiting and equalization via a touch-screen display. Audio Animation also has a broadcast-specific version of this product, the paragon-transmission.

Audio Processing Technology (APT), developers of the apt-X digital audio compression algorithm, were showing ways that apt-X compression could be used on recorded audio tracks. These compressed tracks can then be transmitted via ISDN phone lines to recording studios.

BSS Audio previewed its Wireless Remote System Controller and introduced the new FCS-920 Slave Module for the FCS-926 parametric equalizer/analyzer system.

The dbx Model 172—or "SuperGate," as the compay calls it—is a two-channel gate/expander/ducker for recording studios, broadcast facilities, film and video post, and concert venues. Dolby Laboratories introduced the Spectral Processor, a one rack-unit, two-channel device that boosts signals below a user-adjustable threshold in three frequency bands, up to 20 dB.

Also from dbx was the Model 1024 buffer amplifier.



Aphex Systems showed the Model 104-Type C^2 aural exciter, with "Big Bottom."

Dynacord showed its DRP20X digital, 32-bit reverb and effects processor. The unit is a two-channel processor capable of producing reverb, echo, chorus, flanging, doubling, phasing and many other effects. New from DOD was the Series II rack-mountable line of audio processors, including the 231seriesII, which offers two separate 31-band EQs, and the 830 series II with two channels of 15-band 2/3 octave EQ.

Drawmer introduced the DL441 quad compressor/limiter, configurable as four independent channels, with either channels 1/2 or channels 3/4 stereo linkable.

New from Eventide is the DSP4000 Ultra-Harmonizer, which allows users to build their own effects by linking modular effects building blocks from a library of such blocks. Pitch shifters, delays, reverbs, EQ and other effects are included in this library.

Lexicon and Sonic Solutions signed an OEM agreement during the show. Additionally, Lexicon introduced the

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New Products at AES

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model 20/20 AD 20-bit analog to digital converter, with AES and SPDIF interconnection. The company also showed Version 3.0 software for the Model 300 digital effects system, allowing the unit to operate in single or dual machine modes.

Panasonic Ramsa showed the WZ-DM30 digital multi-processor, offering compression, limiting, graphic EQ, four-way crossover and four-band parametric equalization. A backlit LCD and jog/shuttle dial enables the user to see how the audio is being shaped by the processor.

Peavey showed a variety of processing gear, including the CDS 2000 dual channel compressor/limiter, the NGT 4000 four channel noise gate and the PME 4000 parametric equalizer. The company also showed the APB 8000 audio patch bay and 2400PB recording console.

On display from Sabine Musical Manufacturing was the FBX-900, a DSP-controlled digital notch filter that eliminates feedback in real time. Also on display was the company's FBX-1200, a DSP-controlled filter with an LCD display.

Symetrix showed the Model 601 digital voice processor. The 601 accepts mic or line level analog signals, converts to 18-bit digital and performs 24-bit digital signal processing, including parametric EQ, shelving EQ, notch filtering, noise reduction delay, gating and other functions.

Valley Audio Products showed a digital compressor/expander, in addition to its 460 Autogate and 310 Advantage audio noise and level meter.

Consoles, control room gear

DDA introduced the QMR for the home studio or commercial audio facility. The 12-bus QMR features 24-track monitoring and six auxiliary busses. It comes in two frame sizes, with 48 and 56 inputs.

Klark-Teknik used the show to announce the DN800 configurable crossover with four inputs and eight outputs. The DN800 can be configured as a stereo 4-way, stereo 3-way, or four input 2-way system.

Samson introduced the Model 2242, a 22-input rackmount mixer that is ideal for studio recording, live or audio post-production applications. Along with 22 inputs, 10 XLR microphone inputs and four-band equalization, the 2242 features a six aux configuration with 4x2 bussing.

Solid State Logic introduced several new products at the AES show. Among those products were the so-called "Dream Machine" G Series consoles for music production and the Ultimation moving fader automation system. Also new from SSL is the Scenaria digital audio/video production system combining a 38-channel mixing console, 24-track recorder, audio editor, multiple machine controller and automated routing system.

Not all console products at the show were for recording. Revox had the MB 16 broadcast console on display, featuring 16 inputs for line, mic and telecom use.

Genelec, a Finnish loudspeaker manufacturer, introduced its 1031A powered monitor system. The 1031A is a two-way monitoring system designed for the American market, featuring peak SPL levels of 121 dB at one meter and wide frequency bandwidth in a small enclosure. Other active monitors from Genelec were the 1032A, 1037A and 1038A.

Tannoy unveiled the PBM 5 playback monitor, a small monitor featuring a 3/4-inch soft-dome HF unit, rear porting and a gold-plated five-way binding post. It can handle power levels up to 100 W.

A number of new products were exhibited by Sennheiser, including the HMD250 broadcast monitor headphone, the MKE44-P stereo recording mic and the HD440 lightweight, full-sized dynamic headphone.

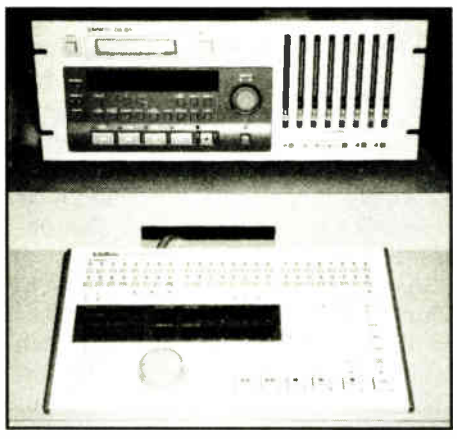
Shure showed its line of microphones and related products, including the Intellimixer, an intelligent microphone mixer that shuts down mic channels when they are not in use, thereby eliminating comb filtering and other undesirable audio effects.

Ashly Audio released the CFT-1800, a MOSFET-based power amplifier that delivers 300 W per channel into a four-ohm load. Mono-bridged, the unit can deliver 600 W into an eight-ohm load.

Crown International showed its line of microphones, including its PZM boundary-type mics. New this year from Crown is the 5000VZ amplifier, from the company's Macro-Tech line. The 5000VZ can deliver up to 5,000 W of power, in a chassis measuring three rack units high.

Whirlwind showed its Presspower active press feed box. The unit includes 12 mic outputs, 48 VDC phantom power supply, headphone jack with volume control, low-cut switches for channels 1 and 2, and other features. A back panel switch allows the primary of the power transformer to operate in either 110 VAC 60 Hz or 230 VAC 50 Hz. Also available from Whirlwind was the company's full line of cable gear.

A full line of cable gear was displayed by both Clark Wire and Cable and Gepco. Both companies now cut cable to length and terminate it as requested by the customer.



New from TASCAM was the DA-88 eight-track recorder, with remote control.

Sound diffusion products were available for inspection both from RPG Diffusor Systems and from SDG. The latter company showed its Art Diffusor line, in a variety of materials and sizes.

New formats, media

In evidence throughout the AES exhibit area were new recording devices and media to support them.

TASCAM debuted the DA-88 eight track digital multitrack recorder. Using an 8mm cassette transport that records on Hi-8 video tape, the DA-88 records at 44.1 kHz or 48 kHz. Up to 16 DAs can be locked together for a possible 128 tracks. The device has a suggested retail price of $4,499, and is available with the RC-848 remote control, for an additional $1,499. The CD-401MKII professional rack-mount CD player was also shown.

Akai showed the A-DAM, or Akai Digital Audio Multitrack format recording system. A-DAM is a 12-channel digital recorder using 8mm video tapes. Also shown were the DL1200 autolocator for the A-DAM and a variety of products for production, such as the S1100 digital sampler and the MPC60II integrated MIDI sequencer and drum sampler.

Alesis had its ADAT VHS-based eight-track multitrack recording system on hand. The company now endorses Ampex's 489 digital mastering S-VHS tape for the recorder.

In addition to its line of professional DAT recorders and other recording gear, Sony touted its new Mini-Disc (MD) optical disc technology. Attendees were provided with sample discs and a preview of the MD cart machine, slated to be available in prototype form by the spring NAB show. The company's PCM-2700 professional DAT recorder was also available, with features including absolute timing recording and AES/EBU digital I/O.

Digital Broadcast Associates also showed a broadcast cart replacement, the dB-Cart. This unit employs apt-X compression and "Floptical" disc technology; the medium is a 3.5-inch, 21 megabyte diskette.

Philips showed its digital compact cassette (DCC) format. The backwards-compatible format, which can play back standard analog cassettes, is supported by a variety of record labels, as is the Sony MD.

The DigiCart, from 360 Systems, has been augmented this year with a gigabyte disk drive, storing almost eight hours of stereo audio.

DIC Digital introduced the CD-R recordable CD in 63- and 74- minute recording times. The new CD-R product meets the Orange Book standard and is packaged in a recyclable storage case.

Fostex showed its PD-2 professional portable DAT recorder.

Among the introductions in recording media at the AES show, some were refinements of existing formats. DIC showed the MQ Series DIC///DAT master quality digital audio tape, with DIC's proprietary MicroFinity metal particle technology.

TDK unveiled its DA-R16, a 16-minute DAT cassette with Super Finavinx pure metal particle tape. The company also announced its support of both Sony MiniDisc (MD) and Philips Digital Compact Cassette (DCC) technology by providing recordable media for the two new formats.

3M showed its line of analog and digital tape, as well as the Tape Care Library Box for long-term storage. The company featured its 966 high-output, low print analog tape and two digital audio mastering tapes for Nagra "D" recorders.

Denon showed the DN-951FA CD cart player. Denon's Auto Track Select system reads bar-coded labels placed on the CD cart, to enable the player to lock-out play of a specific track, lock-in play of a specific track only, or auto-cue to a specific track. The DN-961FA, a drawer-loading CD player, was also shown by Denon.

Also new from Denon was the DN-M200X, a 200-disc CD changer for broadcast program automation applications. The changer uses two disc trays for storage.

Workstations proliferate

Without a doubt, the prevailing theme at this year's AES show was digital audio workstations. While space restrictions prevent a complete inventory of the

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New Products Shown at AES

▶ continued from page 34

products on hand, some products, both new and established, stood out.

Among the established products, AKG showed the DSE 7000 editing workstation, while Studer displayed the Dyaxis, Dyaxis II, and the Dyaxis Lite. (The company also provided information on its recordable CD system.)

Digidesign added a string of new products to its line, including the Sound Tools ProMaster 20 digital mastering system; Digidesign Intelligent Noise Reduction software, the Digidesign Expansion chassis, and Digidesign Pro Tools 2.0. Digidesign offers open system architecture, allowing cards from other manufacturers to be added to the company's CPU.

Digital Audio Labs showed the CardD system, a computer card that plugs into IBM AT-compatible PCs to allow digital quality editing at selectable sampling rates from 32 to 48 kHz. The EdDitor waveform editing program was also shown. The CardD is being used by another new company, Innovative Quality Software, as the hardware support for its Software Audio Console, a PC emulation of a recording console.

Digital F/X announced its acquisition of WaveFrame's assets, complementing an earlier acquisition of Hybrid Arts' assets in July. Digital F/X showed equipment from both companies, including the recently announced Digital Master E/X, a four channel, 16-track digital recorder and editor.

Korg announced the availability of version 2.0 software for its SoundLink random access digital audio production system. Highlights of version 2.0 include sample rate conversion from 44.1 kHz to 48 kHz or 48 to 44.1, permitting the use of sounds recorded at a different rate than the session in progress.

Otari announced plans to release the new 4.0 software upgrade for the ProDisk 464 digital recording/editing system. The revision includes the company's GUIDE (Graphical User Interface for Digital Editing) screen operating system and visual display system, facilitating access to ProDisk's editing functions. The company also has begun shipping the new DTR-90T four-head DAT recorder.

On display from Roland was the DM-80 digital audio workstation, reviewed in previous issues of **RW**. Also new from Roland is the DJ-70 sampling workstation, a 16-bit sampling keyboard targeted for live DJs, studios and broadcast facilities.

The AudioEngine was the newest entry into digital workstations from Spectral Synthesis. The AudioEngine is a modular system configurable from four to 16 tracks, with 256 virtual tracks and internal digital mixing.

Turtle Beach Systems reduced the price and added features to its 56K digital recording system, showing its Version 2.0 software upgrade. The upgrade allows for SMPTE chase/lock, time compression and other features.

Finally, an often overlooked area of audio products is test, measurement and monitoring gear. In addition to the System One from Audio Precision, monitoring products were available from Dorrough Electronics and Amber Electro Design.

Dorrough offers a line of loudness meters for studio and broadcast applications; Amber offers a wide range of test gear, including the Amber 7000 precision audio frequency generation and measurement system. The Amber 7000 combines a front panel user interface screen with both analog and digital hardware.

Products & Services Showcase

For more information on the products shown below, circle the appropriate Reader Service No.(s) on the enclosed Subscription/Reader Service card or contact the advertiser directly.

USER REPORT

Control Circuits Sell CCA FM4,000G

by Richard Haskey
Operations Manager
Western Wireless Works

PHOENIX, Ariz. I literally stumbled across an excellent—and affordable—FM transmitter while walking the floors at the NAB equipment exhibition last spring in Las Vegas.

The chief engineer of one of my client stations was with me as we prepared an equipment list for the client's new Class A FM station.

The station is licensed to a small mining town in south-central Arizona and was to be operated with the same staff as the AM outlet but with separate programming. Engineering would be handled by the station's contract engineer.

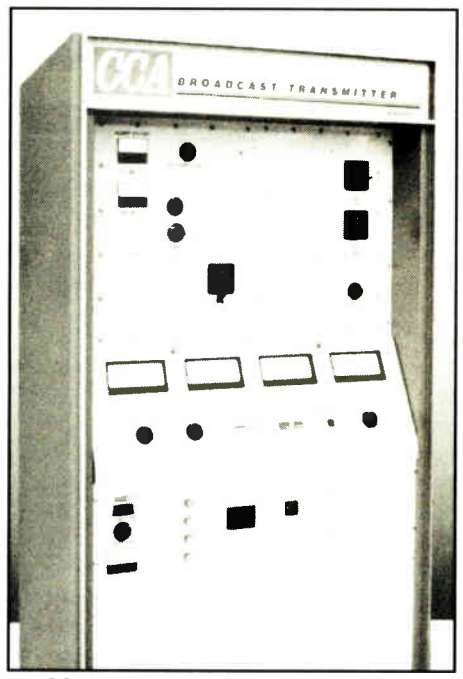
Simple needs

We spent several hours looking at impressive RF generators with all manner of hundred-IC on/off circuits, RF drivers with myriad—and expensive solid state devices waiting and screens that would blush and display cryptic fault diagnoses. We looked at new, all solid-state boxes that might make market in time to get the station on the air.

When we stopped by the CCA booth, however, we were impressed by the CCA FM4,000G. Here was just the box to satisfy the requirements the others didn't: no solid state drivers, just a single tube—a 3CX800A7; no tetrode final, just a medium-priced power triode (3CX3000A7) operating with grounded grid. This meant no neutralizing, no screen supplies, no screen blockers to go *"phanort"* in the night and trigger a frantic phone call to the engineer.

One of the two biggest selling points of the unit was the control circuits—simple relay logic using all plug-in control relays driving old-fashioned contactors. Secondly, the unit is housed in a spacious cabinet that makes everything accessible.

Steve McElroy, a very knowledgeable CCA sales engineer, guided us through the box step by step. What we saw made us instant believers in the transmitter. The station's owner/manager, in concert with dozens of other station owner/managers everywhere, couldn't have cared less about neutralization, screen blockers waving and high order *transmogrification*. His primary interest looked like this—$$$.



CCA's medium-power FM broadcast transmitters promise among the longest documented tube lives.

The low cost of the CCA FM4,000G was another point in its favor. Its economy simply fascinated him. Tried, tested and true technology commands a lower price than boxes filled with whistles and bells. The result is that we shaved several big ones off the budget for a new FM transmitter.

Installation made easy

CCA uses the same cabinet, a standard design and similar circuitry for each of its FM transmitters. The documentation supplied is very good and includes an overall schematic of sufficient size to preclude going blind trying to find C203A in an (often) under-lit transmitter hall.

McElroy who said (as he often does), "No problem!"

Installation was a breeze, partly because we had everything ready in advance to receive the box and partly because the transmitter came all in one piece, having been shipped by padded van. This meant there were only two "boxes" to deal with, the actual transmitter and the long box with the harmonic filter and directional coupler.

CCA uses a full-size harmonic filter manufactured from 3 1/8-inch copper transmission line. The ends are fitted with 1 5/8-inch EIA flanges and the package is supplied with a coaxial elbow to allow the unit to mount on top of the transmitter and rotate in almost any direction. I find this approach superior to the harmonic filter in a tiny box, used by several manufacturers. The directional coupler, too, is a quality device with

A spacious cabinet and simple relay logic control circuits were two of the biggest selling points.

McElroy has a user list a mile long and a story to go with each. The station's people called several users at random and got good reports from every one. The transmitter was ordered, an almost realistic delivery deadline was given to

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USER REPORT

WBCY Bases TTC Buy on Track Record

by Mike Peters
Vice President
Applied Communication Technologies

ARCHBOLD, Ohio In the past, it was easy to select a new FM transmitter. You simply called the three major manufacturers and let them fight it out. But we wanted something different—new technology with a proven track record. WBCY at Taylor University in Archbold, Ohio, selected the TTC FMS-8000, 8 kW solid-state FM transmitter.

The criteria used for determining what new transmitter we would purchase included audio specifications, a proven track record, immunity to lightning and minimum maintenance.

The FMS-8000 is "transparent" to the Model X FM exciter, so specs like FM noise of 92 dB and total harmonic distortion (THD) of 0.007 percent were measured right out of the box. Since there are no tuned circuits to deal with that would color the signal, synchronous AM noise is -60 dB.

Around the world

The FMS track record is excellent, with units operating all over the world. The downside is that almost 70 percent of these are overseas, so calling other users was difficult. But TTC was quick to get us in touch with their customers in the U.S. Almost every customer was happy, and those that had problems in the early years said TTC was prompt in coming to the rescue. They also said they would purchase another TTC transmitter when the need arose.

Some opponents of solid state FM transmitters are quick to point out that the technology is more susceptible to lightning than a tube transmitter. The FMS-8000 has a DC grounded output (like most modern tube transmitters) and MOVs on the AC input.

This protection is further enhanced by the ferro-resonant power supply, which can withstand voltage swings of ±15 percent. We also opted for the TTC surge protector, which extends the warranty to two years. Further, TTC has never lost a low-pass filter to lightning, so we were convinced.

Light maintenance

Maintenance on the FMS-8000 includes vacuuming the transmitter out once in a while, and cleaning the air filter. Since the transmitter site is over an hour's drive away, this was the kind of maintenance schedule we were looking for.

The FMS track record is excellent, with units operating all over the world.

There were only two things that really concerned us. First was the remote control interface to our new Potomac remote control. The hookup was easy once we figured it out, but since you can monitor practically everything in the transmitter, you can tie up a lot of channels quickly.

Second, the manual lacked installation and maintenance sections. TTC currently is updating the manual, but they reminded us the maintenance section will be fairly small compared to a tube transmitter. TTC will concentrate instead on trouble-shooting flow charts and the like.

In summary, we are very pleased with our decision to purchase the FMS-8000. TTC has proven to be a leader in solid state FM at higher powers, and we weren't about to settle for old tube-type technology.

□□□

For information, contact Russ Erickson, TTC sales manager, in Colorado: 303-665-8000; fax: 303-673-9900; or circle **Reader Service 16.**

Control Circuitry Sells the CCA FM4,000G Transmitter

▶ continued from page 37

sampling elements for forward and reflected power.

The FM4,000G operates from single phase power and can be supplied with transformers to match any voltage likely to be encountered. It uses a single fan to cool the tubes with the hot air exhausted out the top of the box. We opted to vent the exhaust air to the outside and provide make-up air via a filtered inlet arrangement. Others may do the job differently, possibly using a closed system to cool and recirculate the air.

All parts that might have wiggled loose on the trek from Atlanta to the central Arizona hill-country were taped or otherwise secured. The securing did its job—almost. We "hooked up" the box, shot the juice to it and *voila!* We ran into some trouble when trying to tune the final. We could not tune nor detune. We shut the unit down and tightened the linkage. Problem solved.

Help from Burk

Remote control hook-up ordinarily would have been easy, but did present a problem in our case. While each remote control function can be actuated with a normally open (or closed, in some cases) push-button, one rail of the control ladder is at chassis potential. Since this station had purchased a Burk Technology remote control, a unit that required both sides of the transmitter control circuit being above ground, it didn't work directly with the transmitter as supplied.

The CCA FM transmitter uses a 24 VDC system with one side hard-wired to the chassis. While mad scientists could have reworked all of the control PC cards to eliminate the chassis reference, we, instead, searched out another solution. Possibly not as elegant, but it was easy.

A quick call to Burk indicated they manufactured an interface panel that would make everything nice. Considering this was 1991, not 1961, the price was quite reasonable.

So, to sum up a long story with a happy ending, the CCA FM4,000G FM transmitter was bought, installed, remote-controlled and put into 24-hour service in early August 1991. As of this writing, except for utility power outages, the box has performed without fault since its debut.

□□□

Richard Haskey is a long-time broadcast engineer, consultant and contractor; he is also a principal at Western Wireless Works, a telecommunications engineering and contracting firm.

For information from CCA, contact Sales Engineer Steve McElroy in Georgia: 404-964-3530; fax: 404-964-2222; or circle **Reader Service 34.**

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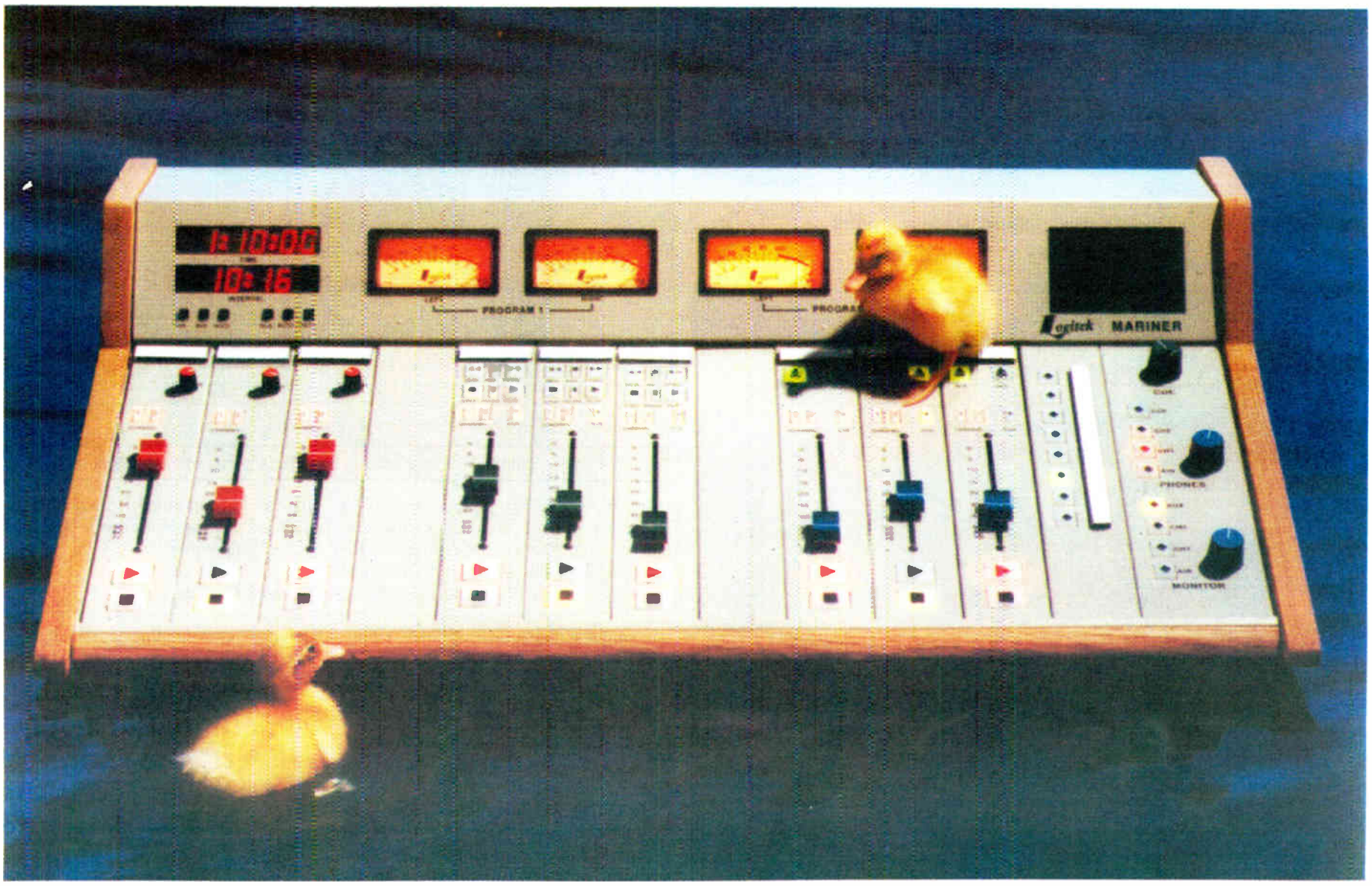

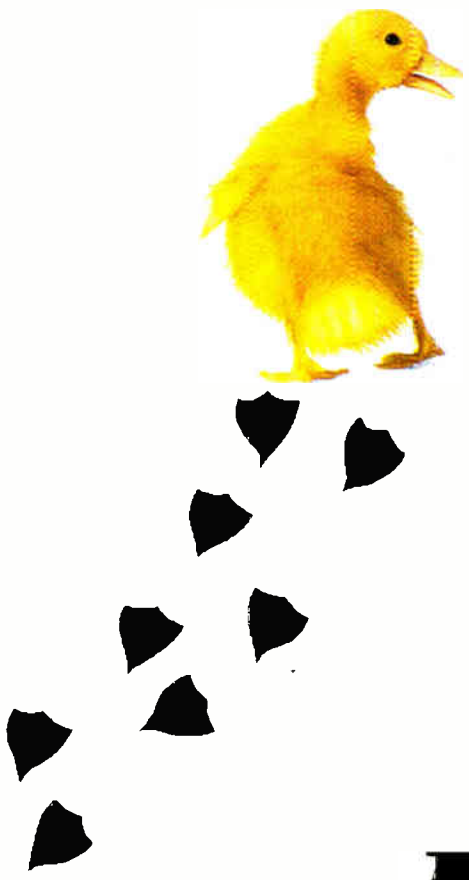

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TECHNOLOGY UPDATE

Platinum Series a Goldmine for Harris

by Ron Frillman
RF FM Product Line Manager
Harris-Allied Broadcast Division

QUINCY, Ill. The economic strain of today's business climate means that nearly 3,500 U.S. radio stations no longer have full- *or* part-time engineers for technical equipment maintenance and service.

Many transmitter engineers trained in the 1940s and 1950s have retired. Often, their jobs have been filled by studio engineers whose responsibilities have been expanded to include *all* equipment used by the station (studio and RF), or by contract engineers.

The large number of new stations that have gone on the air has intensified the competitive pressure at a frantic rate. In the U.S., for example, the typical listener now receives an average of 40 different radio stations and has ready access to affordable consumer audio products.

Solid state answers

Given these realities, FM transmitter manufacturers have looked to technology-based solutions to produce equipment that better responds to market requirements. Solid state has provided an important answer.

Drawing on the best of solid state FM (HT 250/500/1 FM), AM (Gates, SX-A and DX) and television transmitters, Harris developed the Platinum Series solid state 2 kW through 10 kW FM transmitters, which provide ruggedness, reliability, ease of use and low long-term cost of ownership.

The PT10 FM from Harris offers 10 kW power in a solid state package.

These transmitters, which require no tuning throughout the entire FM band, also are available for N+1 service required by some customers. In N+1 applications, changing transmitter frequency is as easy as selecting exciter frequency.

Exploiting the potential of solid state, the Harris Platinum Series uses a parallel design to increase reliability. The final vacuum tube—traditionally a single point of failure—is replaced by multiple, identical FET-powered RF amplifiers, which operate in parallel.

Each transmitter has only one "stage" between the exciter and the antenna. The basic stage in the Platinum transmitter is a PA module with 26 dB gain and capacity for more than 1.2 kW of output power.

The Platinum Series transmitter's output power rating is determined by the number of combined PA modules, with each module conservatively producing 1 kW of output power.

Power stages

Because output of individual modules is summed in a parallel combiner that has outstanding isolation, failure of a module (or even a number of modules, depending upon power level) will *not* take the transmitter off the air. Rather, output power will be reduced proportionally until repairs can be made.

Exploiting the potential of solid state, the Harris Platinum Series uses a parallel design to increase reliability.

Parallel design offers many direct benefits to a station's bottom line: Service on a failed module can be delayed until convenient, eliminating panic runs to the transmitter site at midnight. Fewer critical spare parts are required, and the need for a standby transmitter is questioned. Tube replacement and rotation requirements also are eliminated.

Additionally, Platinum Series FM transmitters are designed so that much routine maintenance takes place while the transmitter is on the air. "Hot-pluggable" modules can be removed and inserted while the transmitter continues to operate. The transmitters themselves have no interlocks. Transmitter safety takes on a whole new perspective when PA voltage is less than 50 VDC.

The added demands on today's station engineers underscore the importance of how user-friendly a transmitter is. It's no longer practical for RF equipment to be so complex that you have to be an RF specialist to operate, monitor and maintain it.

To this end, the controller on Platinum Series FM transmitters is simple and easy to use. There are no tuning adjustments, and straightforward front-panel controls include On, Off, (Power) Raise, (Power) Lower, and Local/Remote.

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TECHNOLOGY UPDATE

Transmitters Offer Value, Reliability

by David A. White
Sales Manager, RF Products
Broadcast Electronics

QUINCY, Ill. The FM-1C and FM-500C solid state FM transmitters offer reliability and CD quality at prices that give broadcasters great value for their dollar. Broadcast Electronics' FM-1C, the first of our next generation of solid state FM transmitters, is now joined by the FM-500C.

BE started with the FX-50 FM exciter, with audio specs of 93 dB signal to noise (S/N) ratio and 0.003 total harmonic distortion (THD), and followed it with an exceptionally transparent RF amplifier. The combination allows stations to transmit the total capability of their digital source equipment.

Reliable RF modules

Let's take a brief look at some features that make these transmitters reliable. The FM-1C contains two PA modules and the FM-500C has one. Each PA module is made up of two matched parts of Motorola MOSFETs operating at a conservative 250 W, combined to produce 500 W.

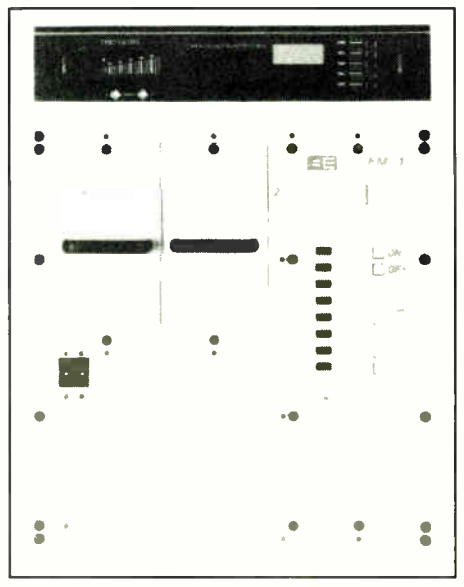
The RF module is protected from over-temperature, over-voltage, over-current and VSWR. The RF modules use a broadband design and are interchangeable with any of the other FM-1C or FM-500C the station might own (no tuning of optimization is necessary).

Dual cooling fans and a large efficient heat sink yield a low junction temperature (of less than 120 degrees centigrade). Some other competitive designs run a higher junction temperature of 160 degrees centigrade.

A front panel indicator on each RF module advises whether everything is OK (green), in a folded back condition (yellow), or a fault condition (red). This makes trouble-shooting very easy for the non-technical station employee.

We have made extensive use of LED and LCD readouts instead of analog meters or incandescent lamps. All of the operating parameters are measured by LCD metering with both the PA multimeter and the test meter inside the FX-50.

The main system controller is a highly reliable CMOS design for noise immunity and is generally easier for the average engineer to trouble-shoot than microprocessor designs. All the required parameters are buffered and available at the remote output connector. On the rear of the transmitter a 25-pin "D" connector and removable barrier strip is provided for remote control connections.



The FM-1C is the first in a new generation of solid state FM transmitters from BE.

Serviceability

The FM-1C offers flexible patching of its two RF amplifier 50-ohm inputs and outputs for half the power operation. The FX-50 exciter can also patch through the low pass filter for 50 W of emergency power in either model. BE's internal 1 kW-rated low pass filter is a strip line design offering excellent performance and transient protection.

All RF modules are removable from the front of the cabinet for ease of servicing. The control panel section also is removable and has a mounting hinge for placement during service. This feature also allows access to the switch mode power supply and the low pass filter.

The FM-1C amplifier cabinet weighs 103 pounds, and the FM-500C weighs 75 pounds. This compact transmitter can either sit on a table top or mount in any universal rack. Add 37 pounds for the FX-50 exciter and these units can easily be transported to any site.

One of the great benefits of this transmitter design is that you can change frequency readily and get it to any transmitter site as an emergency stand-by.

For safety, the FM-1C exceeds the strict international IEC-215 requirements. We also offer an optional power factor corrector for locations where unity power factor may be required.

The FM-1C and FM-500C transmitters are transparent to the signals from your studio.

□□□

For information, contact David A. White at Broadcast Electronics in Illinois: 217-224-9600; fax: 217-224-9607; or circle **Reader Service 156.**

USER REPORT

Continental Video Keeps Engineer by Your Side

by Gil Garcia
Chief Engineer, KPEZ-FM

AUSTIN, Texas I've installed several transmitters during the past 25 years. Usually a few years pass between installations. Remembering all the details from one project to the next is not always easy. My last installation was two years ago when I installed a Continental 816R-2B, 21.5 kW FM transmitter at KPEZ-FM.

The company I work for, Clear Channel Communications, is a group operator. Our group has a variety of transmitters but most of our radio broadcast transmitters are from Continental Electronics. Our technical director, Jim Smith, knew what he was doing when he selected the Continentals. I consider them to be great "workhorses" and they are extremely dependable. Therein lies my problem.

I spent a day with a Continental factory engineer when my new transmitter was tested and later attended the Continental transmitter school and seminar, but that was over two years ago. The transmitter rarely fails, so when it's necessary to work on it, I'm sometimes concerned that I may not remember all that I learned two years ago.

After more than 18,000 hours of operation, the transmitter tube began to lose efficiency and needed replacing. I vaguely remembered learning how to replace the tube but I couldn't remember every detail, nor how to tune the transmitter afterward.

I even considered the broadcast engineer's last resort—looking in the instruction book. I can take the book out and read the instructions step-by-step-by-step, but that takes a lot of time.

User-friendly instructions

I called my old friend Steve Schott at Continental and jokingly told him how great it would be to have an engineer at Continental standing by at the station 24-hours-a-day just in case the transmitter failed. It occured to me that if I couldn't have a factory engineer standing by, maybe I could have one standing by on video. That's how the idea of producing a video for Clear Channel Communications for transmitter installation, operation and maintenance was born.

Steve thought it was a good idea and believed that just one tape could cover the entire 816R Series of FM transmitters from 21.5 kW to 35 kW. He would try to arrange it with his company.

If a picture is worth a thousand words, what is a video worth? A tape like this required careful planning and the cooperation of several people from Continental. I would furnish the video equipment and editing. Continental would furnish the personnel and the broadcast equipment for the production.

The tape would be designed to cover all aspects of the transmitter, just as a printed instruction book would. Three major sections were planned:

•Installation—covering everything from how to get the transmitter unpacked to the electrical connections, remote control connections, grounding and air cooling;

•Component location—identifying how to access the transmitter cabinet and identifying the essential metering and internal components; and

•Adjustments and maintenance—from tube change to tuning, loading, and calibration adjustments.

Continental service

The video was taped in Continental's factory test area, thanks to the arrangements by Steve Claterbaugh, who is in charge of Continental's advertising and promotions, and Richard Garrett, who is in charge of Continental's test facilities. Dave Chenoweth, Continental's field service manager, was in front of the camera for five hours. The final version of the tape is two hours and 20 minutes of comprehensive and "user friendly" information complete with titles and credits.

As many of you know, Dave Chenoweth has conducted many free transmitter seminars and literally helped hundreds of customers on the telephone. Dave is an expert when explaining the 816R transmitter to Continental customers. After watching the video, even my little nine year old son claims he can now change the tube and tune the transmitter.

The tube in the transmitter went "soft" and had to be replaced just four days after the tape was completed. I popped the tape in the VCR and watched Dave Chenoweth change a tube and tune up a transmitter while he explained it. That night I changed the tube quickly, safely and tuned the transmitter to factory specs.

I began telling my friends about the video. Several engineers were surprised that there was a video that covered everything from installation to maintenance of the transmitter and they have asked for copies. Several consultant and contract engineer friends have asked for copies.

I don't have extra copies of the tape—Continental does. The tapes are reproduced on a standard VHS format and are available through Continental Electronics at a nominal charge to cover the costs of reproducing and shipping of tapes. Inquiries should be directed to Continental.

Words of warning: This tape is intended for use by qualified technical personnel *only*. The video is not a substitute for formal technical training and persons not qualified as engineers or technicians are warned not to access the transmitter cabinet or attempt repairs on broadcast transmitters where high voltages may be present.

If you are a qualified engineer or technician you will find this video instruction book an invaluable source of information and instruction for the Continental 21.5 kW, 25 kW, 27.5 kW, and 35 kW FM transmitters. Maybe we can persuade Continental to make videos for their other transmitters.

□□□

For information from Continental, contact Steve Claterbaugh in Texas: 214-381-7161; fax: 214-381-4949; or circle **Reader Service 91.**

USER REPORT

QEI Passes WAIJ (FM)'s Torture Test

by Jeff Detweiler
Sales Manager
QEI Corp.

WILLIAMSTOWN, N.J. Many broadcasters have endured the rigors of starting a radio station from the ground up, but few have ever faced the test of strength and spirit that befell Reverend Dewayne Johnson of WAIJ(FM).

WAIJ is a non-commercial Christian station, that began its broadcast legacy in October of 1984. The station evolved from Reverend Johnson's inspiration to create a non-commercial, listener supported, full service Christian station for the Grantsville, Maryland community.

After a tireless search to find the right equipment at the right price, WAIJ selected the QEI 3.5 kW FM transmitter for its operation. Through Reverend Johnson's hard work and constant attention, the fruits of his labor were rewarded with a growing listenership. The station seemed destined for success.

Calm before a storm

But just as everything seemed to be going so right, WAIJ was struck a crippling blow on a calm June night. That station had concluded its broadcast day, the sign-off cart played and the transmitter was turned off for the night.

The entire 320 feet of tower had been felled by a hacksaw-wielding vandal, and lay in a perfectly straight line on the ground.

It all seemed so normal until the station operator showed up the next morning. As the transmitter start-up was initiated, the operator was greeted with a high VSWR alarm and the transmitter dutifully went to its protective low power mode. After attempts to restore the transmitter to its normal operation failed, the operator decided a visit to the transmitter was in order.

As many of you can attest, the drive to a silent transmitting facility in the early hours of the morning is quite invigorating. The entire schematic of the transmitter and facility plan flash before your eyes.

You have envisioned every conceivable problem and planned your course of action. But few have had the experience that was about to unfold. As the station operator neared the transmitter site, the static on the radio gave way to the silence of the transmitted carrier...it's still on the air, maybe it won't be so bad after all.

But as he drove over the last rise in the road before the site, something was missing from this rural scene—*the tower lights!* As he pulled in the road, his heart fell to his stomach.

Down but not out

The entire 320 feet of tower had been felled by a hacksaw-wielding vandal, and lay in a perfectly straight line on the ground. With the antenna mangled and unable to effectively radiate, it was no wonder the coverage had diminished.

What was discovered inside was even more amazing. The transmission line, pulled taut by the falling structure, lifted the QEI transmitter by the output connector and yanked it to the ceiling—quite a stunt for a half-ton piece of equipment.

The truly amazing part, though, was that it was still on the air, operating in its protective lowered power mode. This was one test that even QEI's design engineers had not imagined.

The automatic arc suppression and protective power mode feature of the QEI FMQ series transmitter provided a momentary interruption of carrier to extinguish the arc and then ramped up to a safe power level, trying to protect the antenna, line and transmitter.

This feature saves costly arc damage repairs, but unfortunately it can't straighten a twisted pile of steel.

It took four men to get the transmitter down. A borrowed antenna was installed on a telephone pole nearby, a few feet of new line was connected, and a little dust was blown out of the QEI transmitter, and WAIJ was back covering the community of Grantsville.

Not since John Cameron Swayze tested watches has a manufactured product been so tortured and survived.

WAIJ has long since replaced the tower, and the community station has grown to a network of four stations with a fifth under construction.

The group is now known as "He's Alive" Radio Network and continues to grow. With the most recent purchase of the QEI FMQ-200008 for the group's Clarksburg, Penn., construction permit, QEI remains Reverend Johnson's transmitter of choice.

□ □ □

For information on QEI transmitters, contact Jeff Detweiler in New Jersey at 800-334-9154; fax: 609-629-1751; or circle **Reader Service 47.**

USER REPORT

WGAR Acts as Beta Site for RE's RDS

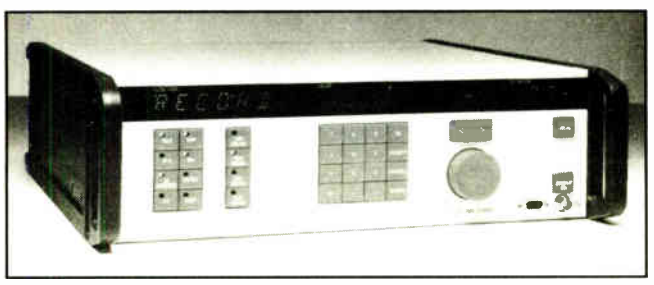
by Mark Krieger
CE, WGAR-FM

CLEVELAND It isn't often that I read a test review without feeling a least a pinch of cynicism. When **RW** asked me to provide a synopsis of WGAR-FM's experience with RE America's RE531 and 533 RDS encoders and Delco's RDS compatible receiver, I was determined not to write another public relations piece. The only problem was the system worked too well to avoid it.

Staying abreast of new trends in broadcast technology isn't easy. But with competition for radio revenues coming at us from every angle, it's my department's mission to evaluate new concepts and systems whenever possible.

WGAR-FM test site

We were approached by RE America with the suggestion that WGAR-FM become the first Cleveland beta test site for the Radio Data System (RDS). WGAR-FM took its first step into the world of RDS with the assistance of RE America's John Casey. With his help, the ensuing collaboration gave us the opportunity to evaluate RDS in real-world conditions while providing RE America feedback on its soon to be unveiled 533 encoder.



RE 531 RDS Coder

For those of you unfamiliar with RDS, it consists of a 1200 baud data stream transmitted on a 57 kHz subcarrier which is phase locked to the 19 kHz stereo pilot. The subcarrier is transmitted with 2 to 3 percent injection and subsequently demodulated in compatible receivers.

The demodulated data is used to provide the receiver with visually displayed information regarding station call letters, format, weather and traffic alerts (with possible EBS applications), as well as Radiotext, a 64-character user-definable message format. There is also a user-accessible transparent data channel that offers all kinds of possibilities to the creative broadcaster.

RDS can even be used to toggle receivers to other frequencies where a station may have translators in use! This is an improved, Americanized version of a system that has been in European service for a number of years.

Expertise gathered during that time by both encoder and receiver manufacturers, coupled with the guidance of the NRSC (National Radio Systems Committee), has produced a system that should prove to be of real benefit to both broadcasters and consumers.

Early specs

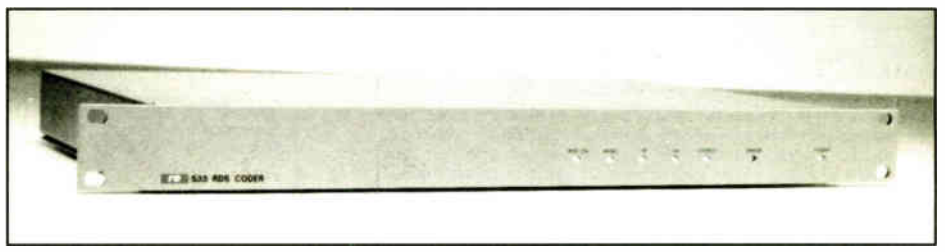
Initial testing began using RE America's Model 531 encoder. This is a large, feature-packed, European-built box with a scrolling digital display. Later, we switched over to a beta model 533 encoder, a streamlined, more affordable, American-built version targeted specifically at American broadcasters.

Unlike the 531, which has paging and on-board display capabilities, the 533 is specifically designed to be used in tandem with a customer-provided PC for the loading and review of data records. The receiver provided was a Delco RDS prototype, identical to that company's most recent production models, except for the addition of a 16-character alphanumeric display and multifunction user keys.

Installation of the 531 encoder was simple. A sample of the station's composite baseband signal was provided to the 530's "Sync" input using a BNC "tee" adapter between our Optimod 8100A and Moseley PCL 606C STL transmitter. Some readjustment of composite level was required due to loading presented by the somewhat low impedance of the 531's sync port.

This characteristic was found to be improved in the new 533, though a touch-up was still required. The RDS output from the 531 was then routed through a BNC cable to one of the aux inputs of the 606C STL.

The injection level was adjusted via level control on the 531 encoder for approximately three percent and *voila*: WGAR FM was transmitting RDS! It should be noted that the new 533 encoder can also be used in a composite loop through configuration for installation at a transmitter site where discrete audio STL is employed.



RE 533 Slim Profile RDS Coder

Qualitative testing

Once the system was operational, we began qualitative testing in two phases. The first consisted of checking both main channel audio and 67 kHz SCA for any detectable degradation while switching RDS in and out of the system. The second phase was an evaluation of worst case performance in known poor signal area.

Phase one testing was done during an overnight maintenance period with the system on-air. Switching the RDS encoder in and out of the air chain demonstrated that it was transparent to main channel audio performance. Some noise in the 67 kHz SCA region was present on our QEI 691 modulation monitor but almost undetectable on one of our 67 kHz SCA receivers. This is probably due to an overly broad 67 kHz passband in the QEI monitor and should pose no problem in most applications.

Phase two testing took place in a notoriously weak signal/high interference area with the Delco RDS receiver mounted in a 1990 Ford Aerostar van, using the factory-installed rod antenna. The results were most impressive, with the station call sign and format code cutting through even in areas where main channel audio

continued on page 47 ▶

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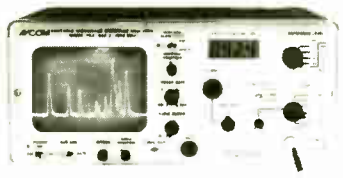

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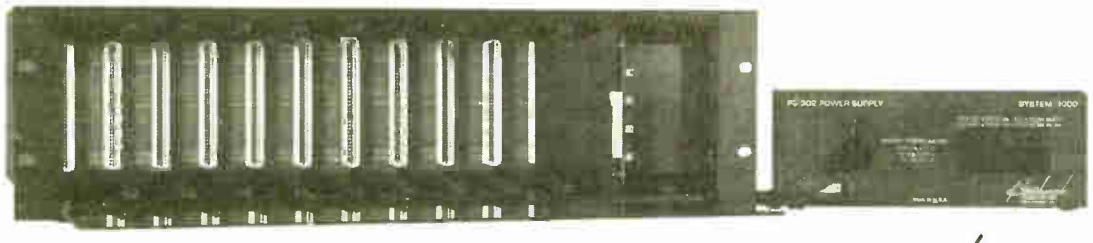

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READER SERVICE NO. 68

USER REPORT

Nautel Survives Island Climate of KZMI

by Edward H. Poppe, Jr.
Owner/Engineer
KCNM(AM)-KZMI(FM)

AGANA, Guam My version of an ideal transmitter entails one built with enough reliability so an engineer doesn't have to be on-site full time and you don't need a room full of spare parts. The transmitter would have to be small enough to be installed in a closet and sturdy enough to withstand severe power fluctuations.

The unit would require low voltage operation so there wouldn't be high voltage arcing and the resultant damage in a tropical, high humidity climate. It would have enough built-in redundancy so that a minor failure wouldn't shut you down.

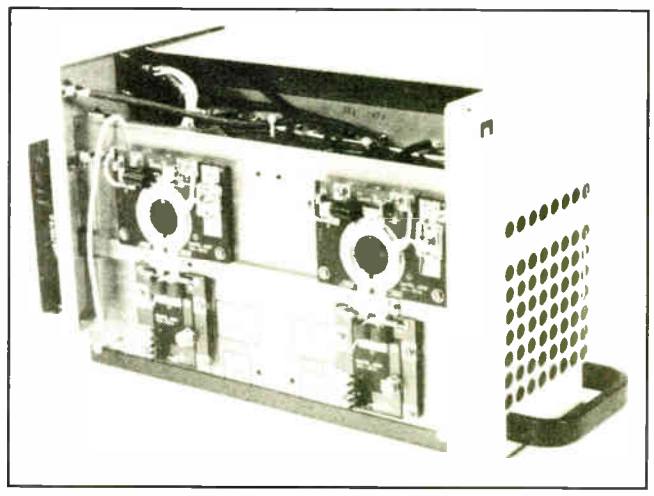
Ease of maintenance and room enough inside the cabinet to perform it also would be part of the design of an ideal transmitter. Most importantly, the unit would come with factory level support for trouble-shooting and spares.

We completely assembled the transmitter in less than two hours.

After having had several other transmitters in this same location and being plagued by high voltage failures, I was looking for relief.

Relying on experience

As the station's owner and engineer, I decided on the Nautel AMPFET FM4 transmitter because I was completely satisfied with the quality and reliability of our Nautel 5 kW AM transmitter at sister station KCNM(AM) (no failures in three years).



The Nautel FM4 contains four power modules, each with four 250W power amplifiers.

The hardest part of the installation was the delivery and unpacking—a process that took about three hours. It was crated for overseas shipment and the transmitter arrived in perfect condition in four crates. The modules were all individually packed as was the power transformer.

We mounted the transmitter on a steel dolly with casters so that it could be easily moved in a confined area. We completely assembled the transmitter in less than two hours, including the installation of the power transformer and another hour to double-check the assembly and wiring before we applied power.

The assembly process was a breeze: Nautel's instructions and the equipment manuals were easy to read and all the cables and connectors were clearly marked. It took just a few minutes to install our exciter and as there was some leftover room in the transmitter cabinet we installed our STL and remote control right inside the transmitter.

On the air

After running the manufacturer's recommended preliminary checks, we

continued on page 50 ▶

WGAR Checks Out RE

▶ continued from page 45

was nearly unintelligible.

Toggling through various Radiotext messages under these conditions did cause some textual garble, but due to the redundant nature of the system, the message would "fill in" over a period of a few moments. In short, RDS is a very robust system.

In the later stages of testing, RE America exchanged the model 531 encoder with the model 533. Though electrical performance is identical, this unit differs from the 531 in size (one rack space as opposed to three), but more importantly in the respect that the 533 is largely software driven.

RDS can even be used to toggle receivers to other frequencies where a station may have translators in use.

Connection between an IBM compatible PC and the encoder may be achieved by a simple null modem cable for local operation or through dial-up lines using an inexpensive 1200/2400 baud modem. The latter arrangement is typical for those who will be using the encoder at a remote transmitter site. The PC is then used to create, modify or review records to be stored in the encoder, which can be toggled via the PC or external switches.

Mark Kreiger stands by the RE 531 and 533 RDS coders.

Low cost design

The software-intensive approach is also an advantage in that it allows the cost of the encoder to be kept low, making it more attractive to medium- and small-market broadcasters while allowing for continuous and competitive software upgrades.

Alas, the software provided to us from RE America with the 533 was only partially developed, making any meaningful evaluation impossible. RE America has promised us a look at the completed production version in the very near future, and we're sure that many refinements will be provided in subsequent releases.

Since the system protocol is part of the industry standard, outside vendors will also be able to compete in software development. User friendliness and real-time control capability will be key items to look for in such "futureware."

The engineering department of WGAR-FM takes great pride in its attention to detail in the delivery of the station's audio product to the listener. We refuse to compromise with any system that degrades or fails to measure up to the highest standards. Even so, RE America's encoders and the RDS system have made honest supporters out of us.

The large variety of features and the fact that many receiver manufacturers are already tooled up for production makes RDS a system that can help broadcasters here and now. With NRSC/EIA standards now a reality, we feel that RDS will deliver the goods for broadcasters and the listening public.

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Editor's note: The RE533 is being produced in Westlake, Ohio and will be available in December. This model includes the following RBDS services with PC control program software: PI, PS, PTY, PTYN, AF, CT and RT. Any changes to the RBDS standard may be accommodated in future software versions.

For information, contact John Casey at RE America in Ohio: 216-871-7617; fax: 216-871-4303; or circle **Reader Service 195.**

TECHNOLOGY UPDATE

BEXT HPT Employs Demodulation

by Dennis Pieri
VP Marketing, BEXT Inc.

SAN DIEGO BEXT's new HPT (High Performance Translator) line utilizes frequency demodulation rather than the older conversion process. The advantages of demodulation are not universally understood; this article explains some of these differences between frequency demodulation and conversion.

For many years, the conversion method of operating FM translators was the scheme of choice for equipment manufacturers. Several disadvantages of conversion have been overcome with the acceptance of demodulation systems.

With the conversion method, the errors or frequency offsets are additive and require high precision quartz references to maintain exact frequency. The high quality crystals needed for each desired output frequency are expensive and carry long lead time, and corrections performed on a conversion system require precise calibration using complex and expensive instruments at RF frequencies.

Many conversions in cascade can lead to a phenomenon known as "flicker," a trembling of the carrier within the 88-108 MHz band, which can push the system out of specification. With the demodulation method this effect does not occur because an intrinsic high-pass filter eliminates carrier noise found a few Hertz from the carrier.

All conversion processes use two or more signals of differing frequencies to give rise to an infinite series of resultant frequencies, from which the desired frequency is selected. It is understood that in order to select the desired output frequency, one must employ highly selective amplifiers.

In any case, the spectral purity of the output signal always depends on the attenuation of spurious and unwanted signals, and certain spurious frequencies may be impossible to eliminate because they fall within the band. The output signal then contains the desired signal plus the undesired signal at a lower amplitude modulated at 10 times the bandwidth, way out of specification. It is extremely difficult to analyze such a system's possible frequency combinations or to predict a level of spurious harmonics lower than -60 dB.

Because the conversion system contains tuned amplifiers, degradation may occur over time due to temperature changes, aging of components and vibration. Given the high Q of the tuned circuits, conversion systems can be prone to spurious emissions and must be periodically readjusted with expensive test gear.

In demodulation systems, most of these problems do not exist. All circuits are broadband and do not require calibration (other than possibly the receiver's input filter). Factors such as humidity, temperature and age do not easily affect signal quality, and spurious emissions are not found on the demodulated signal.

While demodulation can produce changes in the degree of deviation not found in conversion systems, receivers of the demodulation type with digital pulse counters exhibit no problems with such variations at the modulation level.

The advantages of demodulation are not universally understood.

Phase and amplitude distortion associated with the intermediate frequency filters in conversion devices are corrected in the base band (40 Hz to 200 kHz) in the demodulation method.

Even though conversion system manufacturers try to use very low intermediate frequencies of 203 MHz, to make signal correction easier than it would be at high intermediate frequencies, the precision of correction with demodulation systems is around 10 to 20 times greater.

To reach this level of performance using conversion, the pass-band of the receiver must be widened to reduce the amount of correction required; this compromises selectivity, however, and therefore degrades immunity to interference.

These are some of the reasons BEXT has chosen the demodulation method for its new line of translators, under the model name HPT. The HPT also takes advantage of frequency synthesis to provide front-panel frequency programmability.

The HPT STL receives on the 950 MHz band, and transmits in the 88 to 108 MHz band. The HPT FMR both receives and transmits on the 88 to 108 MHz broadcast band. The transmitters will accept either balanced or unbalanced composite inputs with 2.2 V peak to peak producing 100 percent modulation. The SCA inputs will produce 10 percent modulation with 2.2 V peak to peak. Frequency response of the composite inputs is ±1 dB from 30 Hz to 100 kHz.

Power output is selectable in 1 W steps and is automatically regulated at the selected power. Foldback protection is also provided to protect against VSWR. Spurious signals are 100 dB below the carrier (another advantage of demodulation), while harmonic radiation is more than 65 dB below the carrier.

The receivers employ six-section helicoil front ends with built-in preamps. The 900 MHz receiver's front end is 10 MHz wide and the 88 to 108 MHz receiver is 1 MHz wide. Sensitivity is typically 10 ±V for 60 dB quieting in the mono mode and 100 ±V for 60 dB quieting in the composite mode. Total harmonic distortion is typically 0.05 percent in the composite mode and 0.02 percent in the mono mode, demodulated, decoded and de-emphasized.

Dynamic selectivity (or ratio of interfering signal to desired signal) is 12 dB or better at ±300 kHz and 50 dB or better at ±600 kHz. Internal jumpers select IF bandwidth and pre-emphasis. Loss of receive signal automatically mutes outputs and disables the carrier detect relay.

The frequencies of both the transmitter and receiver are selected with front-panel digi-switches.

The HPT represents an attempt to offer frequency demodulation-based technology in a bulletproof and full featured package, complete with the front-panel programmability for which BEXT products are known.

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For information, contact Dennis Pieri at BEXT in California: 619-239-8462; fax: 619-239-8474; or circle **Reader Service 58.**

TECHNOLOGY UPDATE

Users Attest to the Benefits Of Energy-Onix MK Series

by Ernie Belanger
VP Marketing
Energy-Onix

HUDSON, N.Y. Since its introduction in 1987, the Energy-Onix "MK Series" of FM grounded grid triode transmitters has proven itself capable of operating in the global marketplace. The transmitter offers many features and performance that ranks with the best of any tube-type transmitter manufactured.

The satisfaction level felt by users of our transmitters is evident in the letters we receive from them.

Wine country radio

Mike Martindale, Director of Engineering at KVON(AM)-KVYN (FM) in Napa, Calif., recently wrote about his experiences with the MK 3.5.

> **"I made hundreds of decisions in building WAVX. Choosing the MK-15 was one of the best ones."**
>
> –Jonathan L. Le Veen

Mike purchased the 3.5 kW, single-tube transmitter about two-and-a-half years ago.

Mike writes in part about the reliability of the automatic power output control:

"In reviewing our transmitter logs over the past two-and-a-half years, the machine has not drifted more than plus or minus two percent from the original set parameters. Nor have I ever had to touch the tuning for any reason. So far the machine has been hands off, literally."

The original 3CX3000A7 tube is still is in the unit and operating without problems, according to Mike.

The letter goes on to relate an incident that makes every engineer's heart drop—a lightning hit. "About a year and some weeks ago, I observed a direct hit on our tower," writes Mike. "The transmitter dropped, recycled and came back to life within five seconds. No damage, no problems. The lightning did make it past ground and left scorch marks on top of the transmitter."

To say the least, Mike is "very pleased" with his Energy-Onix transmitter. "The MK 3.5 improved the station's audio overall, increased stereo separation, lowered the power bill and is very reliable."

East coast experience

Jonathan L. Le Veen, owner of WAVX(FM), a 50 kW classical station, went against the advice of the self-proclaimed experts and purchased the MK 15, our 15 kW transmitter.

I just received Jonathan's letter, which tells the story of the one bright star in his station's race to sign on. "...Luckily, the MK 15 worked right out of the box, or we never would have made our tight deadline."

The decision to purchase the Energy-Onix transmitter was made after careful financial consideration. "Starting a new station during a recession is risky, and made it imperative that I keep costs to a minimum. One option would have been a reconditioned transmitter, which would have met my budget restrictions, but might have meant future unforeseen costs and reliability problems. The only other option was Energy-Onix.

"Although my MK-15 was somewhat more expensive (than a used transmitter), I'm sure I've made the better long-term decision. I'm glad I didn't follow the

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Harris Series A Goldmine

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Push-buttons select PA Voltage, PA Current, RF Power and SWR (Standing Wave Ratio), and these parameters are read on a large backlit numeric display.

LED annunciators on the control panel indicate transmitter status and fault conditions. These functions are available via remote control interface.

Long-term use

Automatic Power Control (APC) maintains the transmitter output to within one percent of the setpoint power by adjusting the PA power supply voltage. SWR foldback is accomplished through this same control loop, which results in the PA transistors operating at less stress under conditions of antenna icing of feed line troubles. Platinum transmitters will fold back gracefully even if SWR reaches 10:1 or more, then return when the condition is rectified.

With the rapid evolution of digital technology, some broadcasters are concerned that today's solid state transmitters will become prematurely obsolete. There's no need to worry.

Platinum Series FM transmitters are designed with bandwidth sufficient for operation with virtually any FM exciter—now and in the future. Since the APC operates independently of the exciter, the only requirement is exciter power.

Platinum Series FM transmitters also require up to 90 percent less routine maintenance than tube transmitters and provide extensive on-air maintenance capability. They also are engineered for easy operation and monitoring by any user. Stations faced with a shortage of technical staff and soaring competitive pressures may want to take a closer look.

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For information, contact RF FM Product Line Manager Ron Frillman at Harris Allied Broadcast Division in Illinois: 217-222-8200; fax: 217-222-7041; or circle **Reader Service 104.**

USER REPORT

Altronic Dummy Load a Smart Choice at CIEZ (FM)

by Greg Miller
Chief Engineer
CIEZ(FM)

HALIFAX, Nova Scotia One of the many pieces of equipment that must be considered by any new station is a dummy load, both for initial setup and for ongoing maintenance.

When the time came to build CIEZ(FM) (Sun FM), the task of determining what equipment should be purchased fell to Ottawa-based consultants Stacey Lawson and Associates. Sun FM was to operate on 96.5 MHz and serve an audience of 250,000 in a three-TV, six-FM and three-AM station market in Canada.

Altronic was selected for many reasons, one of which was its track record of problem-free operation.

CIEZ went on the air more than two years ago, during which time it has obtained a top rating in the BBM surveys and continues to serve the market with an easy listening format.

The Altronic Research Model 6725 dummy load was selected for many reasons, one of which was its track record of problem-free operation. According to the manufacturer, there have been very few—and by that they mean less than five—types of repairs, warranty or otherwise since the introduction of the air-cooled line.

Taking this into consideration along with the load's known quiet operation, the superb RF characteristics and the quick delivery service Altronic promised, the choice became easy.

Since installation, the Altronic Research load has continued to operate quietly and maintenance-free in the corner of the transmitter room.

The 6725 is a 50-ohm load for the FM band able to operate at 25 kW continuous duty cycle. The unit has proven itself to be a reliable piece of equipment. It is air cooled and easy to access should any repairs become necessary.

Routine maintenance and equipment checks show that the 6725 has maintained a stable VSWR reading of less than 1.10 during application of power.

Located at Giezers Hill, Halifax, Nova Scotia—one of the largest multi-antenna sites in Canada—the dummy load services our Harris Model HT 25FM transmitter, which feeds 3 1/2-inch air dielectric and 4 1/16-inch hard line into a patching facility located in another building. From there it supplies a SIRA 12-bay antenna, through 136 meters of 5-inch line, providing 100 kW of radiated power in an omni-directional pattern.

I feel confident that Altronic Research, with its reputation for fast shipment on replacement parts, will continue to serve Sun Radio in its broadcasting needs.

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For information from Altronic Research, contact Doug Starkey in Arizona at 501-449-4093; fax: 501-449-6000; or circle **Reader Service 98.**

Energy-Onix Is Praised for MK

▶ continued from page 49

advice of the 'experts' who advised me to stick with the 'big name' manufacturers."

Jonathan writes that he initially planned to use a different exciter, but decided to give the stock Energy-Onix exciter a try. He is pleased with the exciter performance in meeting the demands of a classical music station.

He concludes, "I made hundreds of decisions in building WAVX. Choosing the MK-15 was one of the best ones. Thanks for the nice box!"

Jonathan's decision to try the Energy-Onix stock exciter and to buy it rather than buying a "super exciter" saved him about $4,000.

Jonathan and Mike are but two of several hundred very happy Energy-Onix users across the country.

International use

The international marketplace also has welcomed the Energy-Onix "MK Series." Export sales of the MK series have earned Energy-Onix the 1992 New York Governor's Export Achievement Award. The award was recently presented by Governor Mario Cuomo to Energy-Onix's founder, Bernard Wise, president of the company.

The MK Series is currently in use at power levels from 1.5 kW to 30 kW in Mexico, Central and South America, Korea, Turkey, Greece, by all major radio networks in the Philippines and in other countries as well.

Energy-Onix was honored in 1991 when it was selected by Radio 7 to provide the transmitters for the first commercial radio station in Moscow, Russia.

Quality, reliability, and an excellent value for the dollar have all added up to worldwide acceptance and success of Energy-Onix and the "MK Series" of transmitters.

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For information on Energy-Onix products, contact Ernie Belanger in New York: 518-828-1690; fax: 518-828-8476; or circle **Reader Service 185.**

Nautel Survives Island Climate

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powered up the transmitter and went on the air. There was one small problem at turn-on: the output power meter was inoperative. A quick check showed that the problem was the meter movement; it was probably damaged during shipment. (A new meter, from the factory, was on site in four days by courier service).

After several hours on the air, a BNC connector shorted out and the transmitter's protection circuitry shut down one of the output modules. The transmitter remained on the air at slightly reduced power. After several minutes of trouble-shooting, the problem was discovered and the DC power removed by pulling the fuse to one portion of the RF module. Total power reduction was about 200 watts. Replacement parts arrived with the power output meter.

The only change I would recommend to the manufacturer is to install 19-inch rackmounts and standard power outlets in the open area in the transmitter cabinet.

Nautel's AMPFET FM4, 4kW transmitter

As of this writing, the AMPFET 4 kW transmitter seems to have been the solution to my transmitter problems. It has operated flawlessly on-air for the past three months. I must say here that this is one of the few pieces of broadcast equipment that I have been totally satisfied with from day one. I have been so impressed with the operation of the AMPFET 4 kW transmitter that I will be replacing our KSTO(FM) transmitter with the new AMPFET 10 kW when it becomes available.

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For information on Nautel transmitters, contact Mark Sexton in Novia Scotia: 902-823-2233; fax: 902-823-3183; or circle **Reader Service 165.**

BROADCAST ELECTRONICS

New Disc Trak™ Digital Cart Machine.

Using inexpensive 3-1/2" floppy disks as the removable media, Broadcast Electronics' Disc Trak Digital Cart Machine incorporates 16-bit linear digital technology to deliver superior audio quality matching that of CD, DAT and other digital sources.

- Up to 112 seconds of stereo audio at full band width can be stored on a single disk.
- Cueing is instantaneous, and up to five start/finish cues can be entered and executed in sequence with 0.01 second accuracy.
- LCD display provides spot name and timing information.
- 3-1/2" floppy disk features hard case and sliding gate for excellent protection of recorded material.
- Available in both record/playback and playback only configurations.
- Rugged design and construction for years of dependable service.
- Disks can be labeled on the sides and/or the end for quick, easy identification in the machine or in storage.
- Space required for storage represents only one tenth that of magnetic tape cartridges.
- CD audio quality on 50¢ media.

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BROADCAST ELECTRONICS INC.

4100 N. 24TH ST., P.O. BOX 3606, QUINCY, IL 62305-3606 U.S.A., PHONE (217) 224-9600, TELEX 250142, FAX (217) 224-9607

Circle (169) On Reader Service Card

BUYERS BRIEFS

NEPTUNE, N.J. Electro Impulse Lab., Inc. developed a new series of dry RF calorimeters used for precise measurement of RF power.

Calorimeters are especially useful for broadcasters to accurately measure transmitter output without radiating—high power RF attenuators can make even low power calorimeters useful.

These calorimeters are unique in that they are dry. They use no fluids, pumps or thermometers and are lightweight and portable. Calorimeters read true RF power regardless of waveform and have a wide frequency range (typically DC-1 GHz) with a VSWR of 1.1:1.

RF power is displayed directly on the meter's digital readout. The units employ solid state circuitry. A calorimeter requires 115 volts AC, 60 Hz for a cooling fan (export version available).

Operation of a unit is simple: Connect the RF power to be measured and line voltage—readout is quick and accurate.

A bridge version is also available that can be used to compare two RF sources or one RF source against a known source, either AC or RF.

For information contact Thomas McNichols in New Jersey: 908-776-5800; fax 908-776-6793; or circle **Reader Service 64.**

JERSEY CITY, N.J. In view of the continuing slowdown of the Italian domestic market, Siel, a Milan-based manufacturer of FM transmitting equipment, is increasing its export activity.

The latest boost to Siel's exports came as a result of its presence at the NAB show in Las Vegas last spring. Equipment was displayed with Eurotech, its new U.S. distributor.

"The aftermath of NAB has been extremely positive for us, resulting in numerous and substantial new orders," said Antonio Orizzonte, one of Siel's two partners.

With the addition of the U.S. market, the company now exports to 14 countries: Greece, Norway, Belgium and France, newly independent countries including Lithuania, as well as Asian and African countries such as as Hong Kong, Singapore and the Ivory Coast.

Among significant recent orders was the sale of a dual 5 kW system, purchased by Crow, Siel's distributor in Singapore, and the complete transmitting system of Radio Man, a 10 kW FM Catholic station broadcasting over a large portion of the Ivory Coast territory, including the capital, Abidjan.

For information from Siel, contact Yabrizo Plochino at U.S. distributor Eurotech in New Jersey: 201-434-5729; fax: 201-332-0751; or circle **Reader Service 131.**

OCALA, Fla. The JT Communications PLFM-100 replacement exciter PC board is a universal upgrade for FM broadcast exciters. The PLFM-100 is a 3x5-inch PC board, both assembled and tested in the U.S.

Operating at 12 VDC, the output level is 0.1 W, sufficient to drive most 8 W to 12 W amplifier stages. There are both composite and 75 µSec pre-emphasis unbalanced audio inputs. DIP switches select any 100 kHz step from 88 MHz to 108 MHz (optional 75 MHz to 90 MHz operation is possible). Upon installation, the PLFM-100 will make that old exciter operate as good as new, and add years to its old age, at a fraction of the cost of a new exciter.

For information, contact Jim Trapani at JT Communications in Florida: 904-236-0744; fax: 904-236-0744; or circle **Reader Service 147.**

WOODLAND, Calif. Econco Broadcast Service has the capability to rebuild power tubes used in the latest FM transmitter designs. Rebuilding services are available for the 4CX3500A, 4CX7500A and 4CX20000A family of tubes. The rebuilt tubes offer output and life equal to new tubes at considerable cost savings.

These tubes have been developed to provide maximum gain to allow solid state drivers and single stage vacuum tube final amplification. The products required the development of new processes and techniques to provide rebuilding services that produce tubes equal in every respect to new tubes.

Due to the close spacing, internal elements are subjected to higher temperatures, resulting in extremely high requirements for grid and filament structures. Econco, as a result of its 23-year-long study of tube failures, has developed an extensive understanding of tube failure mechanisms.

In addition to its rebuilding service, the company offers free applications assistance for any tube user. Write or call for its free publication, "Tube Topics, a Guide for Vacuum Tube Users in a Transistorized World."

For information, contact Debbie Storz at Econco Broadcast Service in California: 800-532-6626; fax 916-666-7760; or circle **Reader Service 117.**

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I certify that the statements made by me above are correct and complete

PS Form 3526

MARKETPLACE

Radio World's Marketplace, a compendium of new and recently introduced radio broadcast products, appears monthly in Buyers Guide.

AT&T Accunet

AT&T Accunet switched digital services allow high-quality remote dial-up digital broadcasting. AT&T's Switched Digital Services (SDS) and Switched Digital International (SDI) can carry a two-way digital audio signal on a single digital telephone line.

Once installed, AT&T's Accunet switched digital services are as easy to use as making a normal phone call. Simply dial and talk. Switched digital services always are available when needed, however, users pay only when they are actually in use. Prices are based on distance, time of day and length of call. In the Continental U.S., the price for a standard day rate, Switched 56 Kbps call will not exceed 20.6 cents for the initial 30 seconds or 25.2 cents for each minute thereafter. International prices range from 22.5 cents to $2.70 for the initial 30 seconds and 23 cents to $2.50 for each additional minute. There are additional charges for access the AT&T's Accunet Switched Digital Services.

Equipment required includes a digital audio codec at each location, which provides the digitization and compression of an analog audio signal into an outgoing digital signal; and a network interface at each location, placed between the codec and the phone line. This provides the necessary interface required for digital transmission, as well as the dialing capabilities.

The service can be purchased directly from AT&T in more than 450 U.S. locations.

For information on Accunet Switched Digital Services, contact AT&T's service line at 800-222-SW56; or circle **Reader Service 126.**

Solution to Nov. 4 puzzle

A	L	B	U	M	■	D	I	G	I	C	A	R	T	
N	E	■	P	A	■	U	F	O	■	■	U	■	O	
S	■	M	■	R	E	C	■	O	■	E	D	I	T	
W	H	E	A	T	S	T	O	N	E	■	I	■	■	
E	■	D	R	I	P	■	Z	■	T	O	O	■	B	
R	■	I	T	■	■	A	■	C	■	■	A	D	E	
■	M	A	S	T	E	R	C	O	N	T	R	O	L	
W	E	T	■	E	■	R	O	M	■	■	T	E	A	
A	■	O	■	A	■	A	I	R	Y	■	S	■	R	
■	B	U	R	K	■	K	N	E	A	D	■	F	■	
C	■	C	K	■	■	I	■	X	■	O	B	E	Y	
C	A	H	O	O	T	S	■	■	A	G	R	E	E	

Safety Fabric

Maxwell Safety Products offers Naptex fabric, which provides protection in potentially hazardous envirnoments—up to 40 dB attenuation, effective to more than 50 GHz.

Manufactured by a double patented process, Naptex is a versatile shielding textile consisting of a cotton/polyester base. It can be fashioned into a variety of forms, including coats, coveralls, portable EMI shielding curtains and covers.

Naptex is available in two grades of shielding effectiveness, each in standard and flame retardant versions. It may be machine washed and dried or dry cleaned and worn for extended periods in total comfort.

For information, contact Joe Amato, VP marketing, in New York at 516-366-2411; fax: 516-361-6135; or circle **Reader Service 48.**

CD's

Want to Sell

Denon DN-950FA plyr, 2 yrs old, $750. D Matyis, KITR, 10333 Richmond #6937, Houston TX 77042. 713-780-0937.

Denon DN-950FA plyr, used 6 mos, $730+s/h. B Lord, Lord Bdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Want to Buy

Technics SLP-770/777/999/similar, will pay near-new price, gd cond, maybe 2. M Friend, WTJU, Box 711 Newcomb Hall, Charlottesville VA 22904. 804-924-0885.

COMPUTERS

Want to Sell

DEC VAX 11/780 supercomputer system w/tape/disc drives, Ethernet comms, software & manuals, sell/trade. M Schramm, 205-826-0390.

Xerox Diablo daisywheel printer w/cheap software. P Wells, KJQY, 625 Broadway #1200, San Diego CA 92101. 619-238-1037.

NEC P6 24-pin dot matrix printer w/8 int fonts, $150. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Micro Pro Wordstar, never used, $40/BO. Steve, Dynes Comms, 957 Natl Rd, Wheeling WV 26003. 304-243-0744.

CONSOLES

Want to Sell

Howe Tech 9000 clean, works great, spare pwr sply, parts, 2 yrs old, $4500. P Wolf, WDCQ, 12381 S Cleveland Ave, Ft Myers FL 33907. 813-574-5548.

BE 4S-50 4-chnl stereo, gd cond. L Salge, KCMR, POB 979, Mason City IA 50401. 515-424-9300.

Gates Gatesway II. K Kenzie, KIXY, 13 E 11th St, Washington MO 63090. 314-239-0493.

Auditronics 200 series, blue face mods, (1) mic input (MIS), gd cond, $125; (1) mono line ouput, gd shape, $125; (3) stereo line output, $150 ea, $650 all. M Guthrie, 813-855-5642.

SMC 6-chnl, solid state, very gd cond, 600 ohm, $200+s/h. F Smith, 615-624-7126.

Ward Beck R2200 stereo, 18 input mods, (2) pwr splys, (10) patch bays, prod, $4200+s/h/BO; Ward Beck R2200, stereo, 17 input mods, pwr sply, (10) patch bays, air, $4000+s/h/BO. J Shadle, KPSN, 3719 N 32nd Ave, Phoenix AZ 85017. 602-279-5577.

McMartin B-501 mono, gd cond w/spare parts & extra board, 5 pots, aux inputs, $300. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Quad 8 8-input mono, nds pwr sply. J Gaffney, Ross-Gaffney, 21 W 46th St, NY NY 10036. 212-719-2744.

SMC 8-chnl, solid state, great cond, $200+s/h. F Smith, 615-624-7126.

JBL 4311 pr spkrs, $750/BO; JBL Decade 36 spkrs, $500/BO. J Diamond, Joe Diamond Co, Box 102C, Chubbic Rd RD#1, Canonsburg PA 15317. 412-746-3455.

Audiolabs Quantum QS-22 12-chnl, very gd cond, XLR conns, slide pots, rem starts $2000+s/h. P Robillard, WYLD, 2228 Gravier St, New Orleans LA 70119. 504-834-7745.

Gately 16x8 w/EQ on every chnl, 4 effects buss, quad mon, Canon conns for line & mic inputs & Canon conns for outputs in custom cons, $1500. A Baker, Bdct Prods, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers write Radio World, PO Box 1214, Falls Church, VA 22041. Attn:_____

POSITIONS WANTED

Experienced radio engineer with varied background desires to relocate..any stable position welcome..Computer Literate..Resume on request. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box #11-04-01RW.

20 yr pro has relocated to Ft Myers FL, AC/oldies/CHR, reliable, great numbers, sks on-air shift. D Palmer, DHP Enter, 4370 Harbour Terr, N Ft Myers FL 33903. 813-997-3796.

Former CATV chf tech w/16+ yrs exper in RF, A/V, equip maint, syst design & ops seeks challenging tech pos. J Powers, 607-272-7717.

Serious about radio air personality looking for station that values 15 yrs exper & natural ability to comm & entertain adults. Mike, 609-729-3520.

Mgmt, small-to-med mkt, 10 yrs bdct exper, elects degree & exper, working on bus degree. D Koehn, 609 S 15th, Quincy IL 62301. 217-228-2115.

CE w/big prod voice & over 15 yrs hands-on engrg exper seeks CE pos w/prod/air shift in competitive top 100 mkt. G Morgan, 704-563-8676.

10 yr male radio vet exper in most formats seeks PD/air pos, pref midwest, can relocate immed, familiar w/Dig DJ. 219-271-8457.

Freelance engr w/heavy duty exper for any job, anywhere w/great refs, audio, RF, automation, xmtrs, ants/construction, domestic/intl. 813-849-3477.

5 yrs on air exper w/prod & sales, looking for long term FT pos, any format, oldies spec. Mike, 314-869-3284.

Engrg pro w/extensive radio field svc exper seeks hi-tech field svc pos, RF, audio, dig, construction & sales spt bckgrnd. 517-379-4803.

DJ/Trainee/volunteer sks pos, any format, 5 yrs exper as DJ, some prod work, willing to learn, ham operator for 3 yrs, pref CA/CO/PA/AZ/AL, will work anywhere. J Benjamin, 602-788-1882.

PD/OM avail w/20+ yrs, perfer cont Christian format. Jo, 304-762-2527.

Quick fix prog, sales, mktg & engrg expert, freelance for struggling stations anywhere. 813-849-3477.

Freelance engr w/heavy duty exper for any job, anywhere w/great refs, audio, RF, automation, xmtrs, ants/construction, domestic/intl. 813-849-3477.

DJ/intern, any format, seeks pos, will give 110% to PD/boss, any shift/location. Marc, 718-998-0676.

Station oper, announcing & perf student, age 63, desires Fresno CA area, perf talk, news, C&W, easy, let's talk. A Bulick, POB 416. Yuma AZ 85366. 602-342-0306.

Quick fix prog, sales, mktg & engrg expert, freelance for struggling stations anywhere. 813-849-3477.

Laurie Kendrick gives great headlines, Houston bdct vet will do talk or be news/sidekick at any major mkt station. 713-460-1307.

HELP WANTED

International Sales Manager: West Coast manufacturer seeks Refional Sales Manager. Heavy engineering knowledge of broadcast. Degree preferred. Spanish a must. Write to: Radio World, POB 1214, Falls Church VA

STAFF ENGINEER: KLVE/KTNQ needs 2 yr electronics school graduate w/ 2 yrs work exper at AM or FM bdct station. Responsibilities include supplying tech support for any of the stations diverse activities in the Los Angeles/Orange county areas. Resume w/employment references to: Bob Moore, CE, KLVE/KTNQ, 1645 N Vine St, Hollywood CA 90028. EOE.

RADIO STATION OPERATIONS MANAGER
($30,930-$37,585, Excellent Employee Benefits)

School District seeks qualified candidates to maintain broadcast equipment and manage a public FM radio station. Must have thorough knowledge of FCC rules and regulations and extensive experience in radio station broadcast operations. Must possess a Society of Broadcast Engineer, FCC General Radiotelephone or equivalent certification.

The Eugene School District is located in Oregon's mid-Williamette valley within short distances to ocean beaches and snow-capped mountains. The District is nationally recognized for its educational excellence. Its public radio station includes an educational component for its students.

CLOSING DATE is December 15, 1992. To apply before the closing date, submit a letter of interest, application form, resume, a copy of your certification, and a list of four professional references to: Eugene School District, Human Resources Department, 200 N. Monroe, Eugene, OR 97402 (503-687-3247; FAX #686-1426) AA/EOE/ADA

ABOUT OUR EMPLOYMENT SECTION

HELP WANTED: Any company or station can run "Help Wanted" ads for $1.50/word or buy a display box for $55/column inch. Payment must accompany insert, use your MasterCard or VISA; **there will be no invoicing.** Blind box numbers will be provided at an extra charge of $10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

POSITIONS WANTED: Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 2 issues of Radio World. Contact information will be provided, but if a blind box number is required, there is a $10 fee which must be paid with the listing **(there will be no invoicing).** Responses will be forwarded to the listee, unopened.

Mail to: BROADCAST EQUIPMENT EXCHANGE
PO Box 1214, Falls Church, VA 22041
Attn: Simone Mullins

CONSULTANTS

SERVICES

CONSOLES . . . WTS

British Helios classic 24/16/24, circa 1970s, updates/mods w/doc discrete mic preamps, 9 sep PS w/wood rack cab, mahogany desk, $9500/BO/trade; Snake 16 phantom-powered inputs w/ext PS, 250' Belden 19-pr cable/mil conns/ss strain reliefs, 10' Neumann XLR snake mates w/box or Belden snake, top qual, exc cond, $750/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 813-377-5264.

Harrison MR-4, 28x24, great condition, $26,500. Tom 816-931-3338.

Want to Buy

Gates Mdl 6-10 chnl, pref tube mdl. M Bitner, WGWD, POB 919, Quincy FL 32353.

Gates stereo Yard complete & repairable. B Elliott, WFRX, 915 E 4th St, Charlotte NC 28204. 704-338-9970.

Cetec Series 10 info, will pay copy costs. L Smith, Smith Studios, 15 Ravenill Rd, Winnipeg Manitoba Canada R2K 3K4.

DISCO & SOUND EQUIPMENT

Want to Sell

Altec 1750 1/3 octave, mono, active EQ, green fold-down faceplate, exc, $25. J Addison, Stowe Media, 171 Hartford Rd A-7, New Britian CT 06053. 203-827-0329.

Gibson SG (3) elec guitars, cherry finish, (1) 1974 std ltd edition, (1) 1968 SG Jr, (1) 1972 SG-100, all w/cases, $1000 + s/h-will separate. J Tanis, Civitas, 925 N Northlake Dr, Hollywood FL 33019. 305-920-4218.

Altec 88B/908-8A (2) horn & driver, exc cond, $150 both/BO; (2) EV DL15X 15" hi-pwr woofers, never recond, $125 ea/BO. G Becker, 813-960-8153.

Peavey MK4 24-chnl, $1400; CS-8CO, $375. 502-465-3342.

dbx 208 8-chnl noise reduc, new, $2000/BO; 154 & 155 4-chnl noise reduc units in same rack, mint cond, $600/both/BO; 150 2-chnl noise reduc, new, $300/BO. J Diamond, Blue Diamond, Box 102C Chubbic Rd RD 1, Canonsburg PA 15317. 412-746-3455.

EMT 140-T plate reverb, $450; RCA 220 V heavy duty bulk erase, $1500; Telex 6120 master reel cons, stereo, new cond, $1750. 617-630-0007.

EV T-350, (2) 1040A & N-3 horn spkrs & 3-way xover ntwk in walnut cab, w/o woofers, new cond, $250 all. S Lawson, KAK Prods, 920 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Symetrix SE-400 para EQ, new, $450/BO; (2) phase shifters, new, $250 ea/BO; (2) SG-200 stereo noise gates, new, $300 ea/BO; A-200 stereo headphone amp, 20 W per chnl, new, $200/BO. J Diamond, Blue Diamond, Box 102C Chubbic Rd RD 1, Canonsburg PA 15317. 412-746-3455.

Ivie 10A freq analyzer, BO; 20A pink noise gener, BO; 6 1/2' custom equip rack; goose necks; mic cables; Soundworkshop 262 stereo reverb, $500/BO: ART DR1 dig reverb, new, $750/BO; ART 01A dig reverb, new, $750/BO; (2) ADA 2.56i dig delays, new, $500 ea/BO; Loft 450 delay line flangers, new, $500 ea/BO; (2) Nexus 96 point patch bays, 1/4" in front, RCA in back, new, $300 ea/BO; Switchcraft 48-pt patch bay, balanced, used, $100/BO; (2) AB Syst 205A stereo pwr amps, 200 W, new, $500/BO; AB Syst 301 spkr switcher, new, $250/BO. J Diamond, Blue Diamond, Box 102C Chubbic Rd RD 1, Canonsburg PA 15317. 412-746-3455.

Dolby 301 A-type stereo, discrete, $500. W Gunn. 619-320-0728.

Klipsch Lascalas horns in road cases, will handle 300 W per chnl, excel cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

EDUCATION

FINANCIAL SERVICES

LIMITERS

Want to Sell

WE 189D xformers, $35 pair; UTC LS-141 hybrid xformer, new, $50; UTC LS-33 20 W line to line xformers, $120 pair; Cinema Engrg #64266 xformers, $30 pair. R Robinson, 203-269-4465.

Optimod 8000A, $1450. L Salge, KCMR, POB 979, Mason City IA 50401. 515-424-9300.

DAP 310. K Kenzie, KIXY, 13 E 11th St, Washington MO 63090. 314-239-0493.

BE AM 400 lim/comp. D Nadon, WLYT, POB 9250, Haverhill MA 01831. 508-374-4733.

Gates SA39B comp. D Nadon, WLYT, POB 9250, Haverhill MA 01831. 508-374-4733.

CBS Audimax 4450A; Volumax 4111; Volumax 400; Audimax III; Audimax IIIS; FM Volumax IIIS, $50 ea. F Konwinski, WSOY, 1100 E Pershing, Decatur IL 62524. 217-877-5371.

CRL SPF-300 like new, NRSC filter, $175. B Buchanan, KSHN, 517 Travis, Liberty TX 77575. 409-336-5793.

Orban Optimod 8100A clean, exc cond, $3200; Mod Sci Stereo-Maxx, little use, excep clean, perf cond, $2200; Texar Prism near new cond, flawless oper, $1400. E Sutton, WOKI, 1900 Winston Rd, Knoxville TN 37919. 615-531-2000.

UREI BL-40 excel cond w/manual, $300; BBE 224 proc, excel cond, $200. R Laine, POB 10665, Golden CO 80401. 303-233-9393.

Optimod 8000A. Unit just serviced by Orban, $1500. Arthur Patrick, 405-536-2242.

Pac Rec AM Multilimiter, gd cond, $300; Inovonics 250 5-band proc, gd cond w/FM limiter cards, $1800. R Dietterich, WORD, 7 Pkwy Ctr #625, Pittsburgh PA 15220. 412-937-1500.

Gentner/Texar Audio Prisms, very gd cond. 3 yrs old, $1000 ea. J Salov, WHGR, POB 546, Jackson MI 49204. 517-740-1165.

Orban 8100 Optimod, exc cond, $3500. J Salov, WHGR, POB 546, Jackson MI 49204. 517-740-1165.

Orban 8000A, gd cond, in svc. A Stevenson, WHZT, 313 N Mattis Ave #205, Champaign IL 61821. 217-355-1059.

Dorrough DAP 310, $400. E Horton, KWOG, 255 N Russell, Douglas WY 82633. 307-358-3656.

MICROPHONES

Want to Sell

Telex WHM-500 wireless, 171.825 MHz, $50. P Russell, Bowdoin Coll, Sills Hall, Brunswick ME 04011. 207-725-3066.

Sony ECM-MS5 stereo w/DC-MS5 pwr sply & GP-5 shock mount hand grip, $850; AKG C522 stereo electret condensor pckg, $500, both new. G Odell, 203-296-2972.

Shure SM-5B studio, very gd cond w/holders, $150 ea. J Salov, WHGR, POB 546, Jackson MI 49204. 517-740-1165.

Peerless MB 520 (2) w/pwr sply, $500/BO; (3) AKG D2000E, $125 ea; (4) Sony ECM-33FP, $200 ea; (6) Sony ECM-22, $150 ea/BO; (2) Sony C-22, $150 ea/BO; (6) Sony ECM-21, $100 ea/BO; Fostex M55RP, $250 ea/BO. J Diamond, Joe Diamond Co, Box 102C, Chubbic Rd RD#1, Canonsburg PA 15317. 412-746-3455.

RCA 44 jr ball mount, BO. J Phillips, WZOM, 408 Clinton, Defiance OH 43512.

Neumann M56, exc cond, $750; EV-642 shotgun, exc cond, $295; (2) Sony C-35P w/pwr splys, $595 both. F Virtue, Virtue Studios, 8809-11 Rising Sun Ave, Philadelphia PA 19115. 215-763-2825.

Telefunken/Schoeps CM61 tube mic, very rare, uses std 6AU6 plug-in tube, orig PS, new cable, mint cond, $2475; CR-176 large diaphram tube mic, new, $1250. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 813-377-5264.

Senn 4032 (2), used 6 mos, $254 ea+s/h. B Lord, Lord Bdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Telefunken U-47, Neumann U-67, KM-54 mint; RCA ribbon mics (2) KU3A's 10,0001, (3) 77-DX, (1) 44-BX, (2) BK-5; Altec tube mics M-11, M-20, M-30; 639 film version mic ect. Trade or sale. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

Telefunken M921 dual (2-way, not front/back) nickel capsules, cardoid only, classic tube mic; **Neumann KM84** pair, mint, $1100. W Gunn. 619-320-0728.

EV 676 supercardioid mics 3/$200; EV RE10 mic, $125. W Gunn, 619-320-0728.

Desk mics (hiZ), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books #8 & #6; RCA tube manual; Sony head demagnetizer (new); jack femal connectors; EV 502 transformer primary/secondary. Mr. Oliver, 212-874-7660/0274. Call afternoons till 10PM.

Want to Buy

EV RE20/PL20. C Wright, Screaming Bunny Prod, 5288 Indian Garden, Petoskey MI 49770. 616-348-2740.

Sennheiser 421s/441s, Neumann KM84s, EV RE20/PL20. Wayne, 619-320-0728.

RCA 770X working, gd cond, maybe more. B Berry, Karavan Bdctg, 13 Montgomery Pl, Conroe TX 77384. 409-321-2920.

AKG C24. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 813-377-5264.

RCA 77DXs/44BXs ribbon, chrome/TV grey, gd cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

MISCELLANEOUS

Want to Sell

Rec sleeves, 45 rpm, various; Radio Shack Pwr n Plug w/plug in adap & manual, $25; Radio Shack cable converter, $20; (8) different old mic tech manuals, $40/BO; album mailers, $1 ea/BO; (31) 25-pin conns, $1 ea; (7) 13-pin conns, $1 ea; (6) hot mix radio shows on CD, BO; Ronnie Spector on Apple lable 45s, mint cond, $3 ea; patch bay, $65/BO; (34) American Top 40 w/Casey Kasem shows, 1984-1985, $5 ea; (8) Rick Dees shows, $20 ea. Steve, Dynes Comms, 957 Natl Rd, Wheeling WV 26003. 304-243-0744.

Uptimers (3), new 2" readouts, counts to 9:59 & resets, momentary closure resets unit to 0:00, $57.50 ppd; Audio Dig TC-2 dig delay unit, new w/o manual, $950 ppd UPS; audio & RF tech manuals for Sparta Elec Corp equip; (3) Sparta TPA 7-1 25 W audio mods, $45 ea/3 for $100; (8) Nortronics CH3-R sensor tape hds, $10 ea/8 for $50. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Audio input xformers Ampex 15095 (4), plug in octal 8-pin, 150/600 ohm input, 15K out, $18 ea; (9) 4580116-20, plug in octal 8-pin, 600 ohm input, 15K out, $18 ea; (2) Triad A-10-J, 600 ohm input/60K output, $36 pair; (2) UTC A-20 pri 50/125/200/333/600 ohm in, sec 50/125/200/333/600 ohm out, $40 pair. S Lawson, KAK Prods, 920 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Executone K18027 phone syst w/2 CPU's, 20 phones, nds work w/intercom, conf, music on hold, spare parts & prints, BO. L Smith, WKYG, 1715 ST marys Ave, Parkersburg WV 26102. 304-485-4565 x117.

WE 189D xformers, $35/pair; UTC LS-141 hybrid xformer, new, $50; UTC LS-33 20 W line to line xformers, $100/pair; Cinema Engrg 64266 xformers, $30/pair. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

Grinan Fixture, 240-slot Lazy Susan rack, table-top, wood w/yellow formica covering, exc cond, $200. S Southern, WCIR, Box 1037, Beaver WV 25813. 304-252-6452.

Want to Buy

On-Air light, old, 1955-1965. R Orr, WSEV, POB 486, Branson MO 65616. 417-334-6012.

Chicken Delight jingle & other memorabilia. T Wilds, T Wilds Enter, 3564 E 2nd #47, The Dalles OR 97058. 503-298-2592.

UTC LS-10X, 12X, LS-18 xformers; Western Electroacoustic Labs mic PS#120A schematic. R Robinson, 203-269-4465.

RCA on-air light; WE clock; DAT of '60s Bucannan & Cellas Pal-O-Mine 45 rpm single; NAB SupeRadio. Klay, 801-272-1814.

UTC LS-10X, 12X, LS-18 xformers; WE 120A schematic; Hycor 4201 passive EQ. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

Radio transformers by Chicago, UTC, Triad, Peerless, Freed, Sola, send list. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

Billboard magazines 1955-1965, any/all issues. B Berry, Karavan Bdctg, 13 Montgomery Ave, Conroe TX 77384. 409-321-2920.

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.

MONITORS

Want to Sell

Gates GTM 885 FM mod monitor; Gates freq monitor. D Nadon, WLYT, POB 9250, Haverhill MA 01831. 508-374-4733.

TFT 742A FM stereo mod; TFT 763 mod main-chnl, new parts, $2500 both + s/h. 614-775-2600.

Potomac AM-19 (204) 2-twr direc ant, $1500/BO. B Buchanan, KSHN, 517 Travis, Liberty TX 77575. 409-336-5793.

Belar SCA-1 SCA on 67 kHz, $400. R Dietterich, WORD, 7 Pkwy Ctr #625, Pittsburgh PA 15220. 412-937-1500.

Want to Buy

Belar AMM-1/AMM-2 mono, AM, gd cond, working, BO. R Miller, KUAU, Box 575, Lahaina HI 96767. 808-572-5534.

Belar AMM-1/AMM-2, working, mono OK, BO. R Miller, KUAU, 490 Ulumalu Rd, Haiku HI 96708. 808-572-5534.

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

MOVIE PROD EQUIP

Want to Sell

RCA H1001 (2) 16mm optical trk rec, 1 w/WE elects, 1 camera & 1200' magazines; Westrex RA1519 35mm port mag rec w/R&P, gd cond, manuals; RCA PR41 35mm stage rec, port w/mixer amp & mic, preamp, 220 V, mint cond. J Gaffney, Ross-Gaffney, 21 W 46th St, NY NY 10036. 212-719-2744.

Moviola 16 & 35mm upright w/any combination of hds, exc cond; Eastman Kodak Mdl 2 TV rec camera, 16mm, working, 1200' mags, 115 V, manual. J Gaffney, Ross-Gaffney, 21 W 46th St, NY NY 10036. 212-719-2744.

Maganasync Moviola 3000 16mm edge trk rec w/inching knobs, 3 PB units, 16mm edge trk w/inching knobs, AB&H proj & counter w/large display & small unit w/display that run from master sync motor; (2) control panels, main & mini, $19K all. A Baker, Bdct Prods America, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

RECEIVERS & TRANSCEIVERS

Want to Sell

Onkyo T4130 AM/FM stereo tuner, dig w/20 presets, $150. L Salge, KCMR, POB 979, Mason City IA 50401. 515-424-9300.

Regency Microcom H44B 35 W, VHF, 4-chnl, $20. P Russell, Bowdoin Coll, Sills Hall, Brunswick ME 04011. 207-725-3066.

RECEIVERS . . . WTS

SCA decoder, high quality micro-miniature 67/92 kHz, prewired & ready to install, $15. D Jackway, Background Music Eng, 5742 Fairoak, Springfield MO 65810. 417-881-8401.

Lafayette LT-725 AM/FM/SCA, 67 kHz stereo tuner, just tweaked, $125/BO. D Pulwers, 703-751-9346.

Sony SRF-A1 AM, port, new, $89, w/AC adapter, $99. C Fox, WOLF, 4853 Manor Hill, Syracuse NY 13215. 315-468-0908.

Want to Buy

Marantz 18 FM stereo, solid state w/mon, 1" scope, working. J Addison, Stowe Media, 171 Hartford Rd A-7, New Britian CT 06053. 203-827-0329.

REMOTE & MICROWAVE EQUIP

Want to Sell

Moseley 303 3 trans/3 rcv. K Kenzie, KIXY, 13 E 11th St, Washington MO 63090. 314-239-0493.

Moseley TRC-15 (2), 1 w/Hallikainen interface for radio send/wire return, $1000; 1 is orig, radio send/audio out for SCA return, $500, both work well w/manuals. M Martindale, KVON, 1124 Foster Rd, Napa CA 94558. 707-252-1440.

Marti STL-8 (2) xmtrs & (2) R-200/950 rcvrs on 946.875 & 947.125 MHz, $2500/both. B Herzog, WPKR, POB 3450, Oshkosh WI 54903. 414-236-4242.

Marti RPT 30 UHF 25 W xmtr/rcvr w/auto identifier & yagi ants, $1500; Regency 15 W UHF xcvr, gd cond, $150. P Wolf, WDCQ, 12381 S Cleveland Ave, Ft Myers FL 33907. 813-574-5548.

Gentner VRC-1000 perf cond, (16) telemetry/metering chnls w/manual, $1600. B Buchanan, KSHN, 517 Travis, Liberty TX 77575. 409-336-5793.

Vintage pckg w/Collins console & 2 turntables; vintage RCA rc/studio end. D Nadon, WLYT, POB 9250, Haverhill MA 01831. 508-374-4733.

Moseley PCL 303 composite STL on 949 MHz, working, $1900; Micro Controls RCR9/RCT9, 9 chnls, cleaned & checked, 110 kHz control, audio telemetry, $900; Moseley tube-type SCA gener on 67 kHz, $125. E Horton, KWOG, 255 N Russell, Douglas WY 82633. 307-358-3656.

Studer dual line telephone hybrid, $500; variable coils removed from 5 kW operation. R Dietterich, WORD, 7 Pkwy Ctr #625, Pittsburgh PA 15220. 412-937-1500.

TFT 7610-R & C (2) dig telemetry ctrl w/manuals, $1200. R Driver, WAIM, 2203 Old Williams Tom Rd, Anderson SC 29621. 803-226-1511.

TFT 7610, nds repair, $400; Moseley TRL-1 telemetry return on 450 MHz, $600; RCA/Moseley TRC-1 rem xmtr, side only nds minor repair, $100. R Dietterich, WORD, 7 Pkwy Ctr #625, Pittsburgh PA 15220. 412-937-1500.

Marti STL 10 (2) exc cond w/combiners, 951.375/625, $3500. J Salov, WHGR, POB 546, Jackson MI 49204. 517-740-1165.

Moseley TRC 15-AW w/Hallikainen dig readout option, gd cond w/manuals, $750. K Stokes, 504-383-8695.

Marti RMC-15 16-chnl, 3 pieces w/manual, exc cond, $500. D Igou, Bdct Engrg, 8435 Twisted Oaks, Garden Ridge TX 78266. 210-651-9049.

Want to Buy

McMartin RPV-1430 (4) 30 W, 450-456 MHz, 13.5 VDC, (4) bdct xmtr, $400 ea; (3) WR Comms WR-1455, 8-chnl, 30 W, 450-512 MHz, mobile xcvr, $250 ea; (2) Celwave PD 526-4, 120 dB UHF duplexers, $700 ea. F Grayney, CKBW, 215 Dominion St, Bridgewater NS B4V 2G8, Canada.

Marti 15 W & up UHF xmtr. C Phillips, WXVC, POB 987, Clinton TN 31717. 615-457-2697.

Marti CR-10 UHF 450-460 MHz. H Thompson, WWIC, 815 W Willow St, Scottsboro AL 35768. 205-259-1050.

Gentner VRC 2000. M Hopper, WHBQ, 483 S Highland St, Memphis TN 38111. 901-458-3255.

STL-type xmtrs & rcvrs, pref solid state, mono/stereo. M Heller, WTRW, 1414 16th St, Two Rivers WI 54241. 414-794-1800.

SATELLITE EQUIP

Want to Sell

Wegener 1601 mainframe w/1601 pwr sply, 1630-01 card for CNN news, 6 mos use, BO. M Daigle, WSJR, 6 10th Ave, Madawaska ME 04756. 207-728-4000.

SCPC ntwk needs for expansion: Harris, Adcom, Avcom & others. M Sagnelli, Great Lakes Media, 2929 Covington Ct, Lansing MI 48912. 517-371-2142.

Scientific Atlanta 7300/7325 w/ or w/o McCurdy decoder syst for Unistar format & T2F-100, $5500. P Posen, KEZN, POB 291, Palm Desert CA 92261. 619-340-9383.

Fairchild Dart 384 dig rcvr w/cards for Unistar news & Indiana U sports, BO. C Cage, WERK, 8510 S State Rd 3, Muncie IN 47302. 317-289-9375.

Zephyrus 300 w/304 mainframe, 391 rcvr, 321 demod, card tuned to .33 MHz, new, excel cond, $850. M Vanhooser, 214-827-5759.

Adcom 7550 rcvr for SMN/Unistar formats; Satcue 400 switcher, $3500. J Salov, WHGR, POB 546, Jackson MI 49204. 517-740-1165.

Wegener 1816, $1000. B Coleman, KPNC, Box 2509, Ponca City OK 74601. 405-765-2485.

Want to Buy

Wegener 1681. P Posen, KEZN, POB 291, Palm Desert CA 92261. 619-340-9383.

Fairchild Dart 384 dig sat rcvr & downconverter. M Heller, WTRW, 1414 16th St, Two Rivers WI 54241. 414-794-1800.

SOFTWARE & DATABASES

STATIONS

Want to Sell

Corp CCB equip & 2 LPTV CPs, CPs within 100 miles of DC, 10 kW ERP stations, UHF 25 & 47. 703-894-5944.

Class C FM/10 kW AM, KMCM/KMTA, Miles City MT, reg signals, mint equip, $595K. Paul, 612-222-5555.

1000 W AM w/2 guyed twrs, phasing equip, 1000 W xmtr, consoles, turntables, records, cabinets, all old, all/part, BO. J Childress, 704-586-2221.

Want to Buy

STEREO GENERATORS

Want to Sell

CRL SCA 300B gener on 92 kHz, 1 1/2 yrs old, $1200. S Reynolds, WTUG, 142 Skyland Blvd, Tuscaloosa AL 35405. 205-345-7200.

Harris STX-1B AM C-Quam stereo exciter, limiter, manual, gd cond, $1950. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210.

RCA BTS 101 (2), $100 ea. R Dietterich, WORD, 7 Pkwy Ctr #625, Pittsburgh PA 15220. 412-937-1500.

Rood/Marcom 203 stereo gen/test set, $300/BO; Moseley CSG-2 185 kHz subcarrier gener, $100. P Wells, KJQY, 625 Broadway #1200, San Diego CA 92101. 619-238-1037.

Moseley, $450. E Horton, KWOG, 255 N Russell, Douglas WY 82633. 307-358-3656.

TAPES/CARTS & REELS

Want to Sell

Capitol 16" xcription library; vintage 78s, BO. D Brennan, Brennan Custom Video, 3596 Loma Ridge Dr, Brancham AL 35216. 205-823-0088.

Ampex 456 Grand Master carton w/10 hubs, new, $100; (3) Scotch 10 1/2" metal, new, $10 ea; (2) Fidelipac 300 type-C, new, 10 1/2", $10 ea; (2) VIF NAB adapters, unused, $30 pair. M Saady, 1st City Rec, 14160 84 Rd #3E, Briarwood NY 11435. 718-846-2062.

7" on 1/4' (15) reels of classic DJs, AOR, $75/BO. D Pulwers, 703-751-9346.

Scotchcart II's (650), various lengths w/C&W & AC, $2.50 ea+s/h. B Lord, Lord Bdctg, 13313 SE 208th St, Kent WA 98042. 206-31-2374.

ACTION-GRAM

Equipment Listings

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

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*Closing for listings is the first and third Fridays for the next month's issue.
All listings are run for 2 issues unless pressed for space or otherwise notified by listee.

Broadcast Equipment Exchange

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TAPES . . .WTS

Audiopak AA-2 new, (20) 70 sec; (15) 40 sec, used once, $100 all. Kent, WASI, 347 W Berry St #600, Ft Wayne IN 46802. 219-423-3676.

Carts, (200), various lengths & brand names, great shape, $1 ea; UMC cart replacement motor, $100. Steve, Dynes Comms, 957 Natl Rd, Wheeling WV 26003. 304-243-0744.

Want to Buy

Cash for Orr radio, Irish band A/V tapes & boxes, 3, 5, 7 & 10" reels; Orrtronic Car Mate; Aeromate tape plyrs. H Norman, 205-825-0390.

Disc recs, needles, blanks, rec xcriptions. B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

40s-70s hits all, history of R&R, C&W, big bands, blues. S Stevenson, Stevenson Crp, POB 1288, Blaine WA 98230. 604-531-4576.

Std carts, short length, 10/15/20/30 sec, gd cond. T Heathwood, Heritage Radio. POB 16, Boston MA 02167. 617-969-9966.

50¢-$100 per rec for 45 rpm recs & LPs from 50s & 60s, nice cond. B Berry, Karavan Bdctg, 13 Montgomery Pl, Conroe TX 77384. 409-321-2920.

Beautiful music tapes for collector, pref unannounced w/25 Hz tones. 800-248-9879.

TAX DEDUCT EQUIP

Want to Sell

Help! small coll radio station has lost our board, will pay s/h. W Richter, Lenior Coll, Box 7410, Hickory NC 28603. 704-328-7164.

Low pwr FM educ radio station nds working/not equip such as exciters, stereo geners, any bdct equip. J Benjamin, 602-788-1882.

TX southern Baptist church would apprec donations of any TV/radio equip, working/not, will pay s/h. T Hergenrader, 903-785-6431.

Educ audio prod studio seeks working equip donations, will pay s/h, rcpt given. M Tupper, Univ S Fla, 4202 E Fowler Ave CIS 1040, Tampa FL 33620. 813-974-2591.

Any bdct equip will be appreciated for new AM school going on air soon, esp need 500 W xmtr, air mon & STL. E Smith, 601-845-2265.

Monte Vista Christian School, would appreciate any donations of used radio equipment along with used TV broadcast equipment. T Quinn, 408-475-0423.

Eng student desiring donation of old bdct equip (anything)in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

TEST EQUIPMENT

Want to Sell

HP 206A audio osc, rack mount, works, w/manual, $100. F Konwinski, WSOY, 1100 E Pershing, Decatur IL 62524. 217-877-5371.

Tek FG507/TM515 function gen w/roadcase, $800; Tek DC508a/TM503 1.8 GHz freq counter, $375; Sounder phase check set, BO; HP 400FL AC voltmeter, BO; Pulse Dynamics pulse gener, $50. P Wells, KJQY, 625 Broadway #1200, San Diego CA 92101. 619-238-1037.

General Radio 1606-A RF bridge, BO; 1211B 0.5-50 MHz oscillator w/pwr sply, BO. D Kanago, Kayway Radio, 918 E 10th, Spencer IA 51301. 712-262-6499.

Philips PM6507 curve tracer, $1475/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 813-377-5264.

Patch bays (4) ADC single inputs (24) rack mount; Dynakit pre-amp PAS 2; manuals for Ampex recorders 601, 351, 350 also for Gotham PBF 150 W amp & Neuman lathe 131 disc cutter. Mr. Oliver, 212-874-7660/0274. Call afternoons till 10PM.

Want to Buy

Crown RTA2 real time analyzer; Tek 570 tube curve-tracer; Lambda & HP pwr splys. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 813-377-5264.

Bird RF wattmeter, thru-line & line section for 1 5/8 line & 4000-5000 W pwr. 618-423-2082.

TRANSMITTERS

Want to Sell

CSI FM 3000E (1) single phase plate xformer, (2) high volt chokes, (2) high volt caps, (1) high volt contactor, $1000. J Leutzinger, KOCD, 3001 W 13th St, Joplin MO 64801. 417-624-1230.

Bext T-800 exc cond, on air 1 1/2 yrs, $4000. J Paoli, 818-774-5378.

RCA BTF-1E2 clean, 1 kW w/BTE 15A, stereo, solid state exciter, 1970s unit, $5000; Harris/Gates FM 5-C, 5 kW, clean, 3-phase, 200 V w/manual, harmonic filter & low pass filter & TE-3 exciter, $6000. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Collins 20V3 1000 W, some parts changed to operate up to 500 W, reliable w/manual, $2000. B Buchanan, KSHN, 517 Travis, Liberty TX 77575. 409-336-5793.

Precision 100 mW AM, tunable & solid state, very gd cond, $260; TDD-5 25 W AM tuned to 530 kHz, perf cond, $500. F Smith, 615-624-7126.

Collins 820-D-2 1 kW/250 W, nds some repair w/many spare parts, $3900. F Hughey, WACQ, Rte 4 Box 12, Tallassee AL 36078. 205-283-6888.

Collins 20 V3 1 kW AM, $1000. P Wolf, WDCQ, 12381 S Cleveland Ave, Ft Myers FL 33907. 813-574-5548.

NEC FBN-9200 E FM 25 kW, 1984, uses single 4CX15000A in finals, on 101.1, w/new final & 25 kW air cooled dummy load, BO. R Miller, KUAU, Box 575, Lahaina HI 96767. 808-572-5534.

Gates FM 250C mint cond w/6095 exciter, mono. K Kenzie, KIXY, 13 E 11th St, Washington MO 63090. 314-239-0493.

Collins 830-D 1 kW FM w/exciter & manuals, $2900. Bob, 603-448-0500.

Gates HFL-3000 single-phase plate/screen xformer for HFL-3000 linear amp, 208/240 AC primary, 5400V at 1.2A/1200V at 0.25A, $250. G Mendenhall, 217-228-0822.

Harris TE-3 FM exciter, overhauled, exc cond, composite & SCA inputs on 99.3 MHz, $650; Gates BC-250GY AM 250 W xmtr, $1500, add $150 for chnls below 1300 kHz; ITC 1 kW FM w/o exciter, BO. E Horton, KWOG, 255 N Russell, Douglas WY 82633. 307-358-3656.

TTC AM-10000 10 kW AM tuned to 1140 kHz, 6 yrs old, in use, solid state audio driver & exciter, $25K; CCA 1 kW AM, tuned to 1190 kHz, $3000; Sparta 701 1 kW AM, tuned to 1190 kHz, $3000. G Arroyo, WONQ, 1033 Semoran Blvd, Orlando FL 32707. 407-830-0800.

Gates FM 10-G tuned to 99.1 MHz, new final & driver tubes, gd cond, $13K/BO. L Martino, KGGI, 2001 Iowa Ave #200, Riverside CA 92507. 714-684-1991.

LPB AM-60P 60 W on 1430, exc cond w/manual, $1100. R Driver, WAIM, 2203 Old Williams Tom Rd, Anderson SC 29621. 803-226-1511.

Collins 830-D 1 kW, FM w/exciter & manuals, $2900. R Vinikoor, WNTK, RR1 Box 249, New London NH 03257. 603-526-9464.

Harris MW1A 1 kW solid state, 1360 kHz, spare parts, $8700/BO; CCA AM 2500D 2.5 kW AM w/pwr cutback, 1590 kHz, $7000/BO. A Soroka, WJRO, 159 8th Ave NW, Glen Burnie MD 21061. 410-761-1590.

Gates FM-5G 5 kW, working, poor cond; AEL FM-5KB 5 kW, working, poor cond; Bird Elects 8922 5 kW dummy load, air cooled, gd cond; (4) Scala HDCA-5eb, 92.3 MHz, gd cond; Moseley TRC-15, half for locating at xmtr site w/Hallikainen retrofit. S Cichorsky, Paso Bdcters, POB 2031, Paso Robles CA 93447. 605-239-3916.

NEC FBN 9200E 25 kW FM, 1984, uses single 4CX15000A w/new tube & 25 kW air-cooled Electro Imp DPTC-25KFM dummy, BO. R Miller, KUAU, 490 Ulumalu Rd, Haiku HI 96708. 808-572-5534.

Used & New Transmission Line, many sizes & lengths, many like new. 412-733-1994.

Want to Buy

10 W FM xlator, working. J Stromquist, WNCB, 2828 Piedmont Ave, Duluth MN 55811. 218-722-3017.

Versa Count V322 exciter part of manual. P Lotsof, KAVV, Box 18899, Tucson AZ 85731. 602-290-9797.

10 kW FM, gd cond, pref CCA. D Hogendorn, KNEI, POB 492, Waukon IA 52172. 319-568-3476.

Low pwr AM/FM exciter, 25 W/less. T Heathwood, Heritage Radio, POB 16, Boston MA 02167. 617-969-9966.

Harris FM-20-H2/similar. W Wilson, WJHY, 1005 SW 10th St, Topeka KS 66604. 913-757-8888.

2 kW FM, gd cond, pref East coast, $3000+ depending on make & mdl. B Vinikoor, 603-448-0500.

FM 2 or 2 1/2 kW, pref Collins/Harris. R Vinikoor, WNTK, RR1 Box 249, New London NH 03257. 603-526-9464.

Harris/Cont FM 10 kW w/ w/o exciter. C Scott, EME Comms, Rt 3 Box 485-C, Moultrie GA 31768. 912-890-2506.

5 kW AM on 1410 kHz, pref 1970s/newer, no PCBs, $12-$15K. R Egan, WIZM, 432 Cass St, La Crosse WI 54601. 608-785-7914.

3 kW FM, gd cond w/o exciter for backup., 105.9 MHz, single phase. K Sleeman, KQPM, 110 W Standley, Ukiah CA 95982. 707-763-0191.

Harris 20 kW. W Wilson, WKTY, 1005 SW 10th Ave, Topeka KS 66604. 913-357-8888.

FM 2/2.5 kW, pref Collins/Harris. Bob, 603-448-0500.

10 kW FM, single phase, pref Harris/one been replaced by upgrade, no problems, freq on 92.3. R Muselman, 816-359-2261.

1-5 kW, newer w/remote, loadable to 500 W, 950 kHz. K Riggs, KTBR, 829 SE Cass, Roseburg OR 97470. 503-672-4427.

McMartin AM/FM xmtr, any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

TUBES

Want to Sell

Penta prem output tubes, KT88, $35; KT99B, $55; EL34HD, $15; 12AX7B, 6072M/PR. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 813-377-5264.

4-1000A, 8877, 4CX250B, 4CX1500B, 4CX3000A & more. We carry large inventory all major brands, Eimac, Amperex, RCA, etc. Call Stew 1-800-842-1489.

Audio generator, TE22 (Lafayette), Sencore translator tester (portable); Cannon plugs, male & female 3 prong (new); new & used cable w/Cannons or without. Mr. Oliver, 212-874-7660/0274. Call afternoons till 10PM.

4CX3000A, used, OK; (3) 3CX2500F3, BO. T Devine, WVLK, 300 W Vine St, Lexington KY 40507. 606-253-5900.

Want to Buy

4CX250B (5) used. K Gutzke, 612-866-6183.

6072, 5651, 5691,, 5692, 6005, 6084, 6386, 7308, 6AQ5, 6BL7, 6DN7, 6EJ8, 6EM7, 6GK5, 6HU8, 6JK6, 6XK8, ECC808, ELL80, 300B, 2A3, 13CW4, VF14, AC701. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 813-377-5264.

TURNTABLES

Want to Sell

Gates (4). D Nadon, WLYT, POB 9250, Haverhill MA 01831. 508-374-4733.

Technics SP-15 (2) gd cond w/ATP-12T tonearms, $250 ea. P Wolf, WDCQ, 12381 S Cleveland Ave, Ft Myers FL 33907. 813-574-5548.

Carrera 33/45 rpms, new w/new Stanton cart, $90; tone arm w/hd shell, $25; Harris EQ preamp, $45; (3) Audio Technica ATP-N2, new, $45; RCA tone arm, $40/BO. Steve, Dynes Comms, 957 Natl Rd, Wheeling WV 26003. 304-243-0744.

Technics SP10MKII-1 (2) w/stand & tone arm, $775 ea+s/h; (2) RTS stereo phono preamps, $220 ea+s/h. B Lord, Lord Bdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Want to Buy

Fairchild, Westrex, Neumann, Grampian & Presto studio disc lathes; hi-fi tube gear; 45/78 recs. K Gutzke, 612-866-6183.

1955-1965 tone arm. R Orr, WSEV, POB 486, Branson MO 65616. 417-334-6012.

VIDEO PROD EQUIP

Want to Sell

Sony LDP-1000 (2) CAV & CLV, int/ext drive, genlockable, RS 232C port, rem, manual, $400 ea/$950 all. J Krepol, JVK Studios, 7 Dustin Dr, Claymont DE 19703. 302-798-4076.

Convergence 103 editor, A/B roll, $1500; AVS 6000 dig stds conv, $6000; For-A 410 TBC, $1200. C Denke, Amer Prev Svcs, 2247 15th W, Seattle WA 98119. 206-282-1776.

Pana S-VHS edit suite w/camcorder, switcher, editing VCRs, monitors, dig effects + more, $6500. B Kidd, Airwaves One, 510 W 2nd, Rayville LA 71269. 318-728-4574.

Radio Shack video proc, $175. Steve, Dynes Comms, 957 Natl Rd, Wheeling

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