

AES Draws Record Crowd to N.Y. Show

by John Gatski

NEW YORK Judging by the attendance and the products exhibited at 1993 Audio Engineering Society (AES) Convention, the radio industry was well represented.

Pulling out of its usual New York, hotel-show format and replacing it with an NAB-style show at the Jacob Javits Center, the show drew a record 17,855 in attendance and 352 exhibitors. The attendance bettered the 1992 numbers in San Francisco by more than 3,000 and there were 50 more exhibitors.

In recent years, companies have shown and even introduced new radio-oriented products beyond the normal production gear that overlaps the professional audio and radio genres.

Otari, for example, showed the B-10 broadcast console expected to be ready by early 1994 (spring). The unit will be available in 14- and 24-module mainframes. Otari also showed its Pro-MD (MiniDisc) storage/playback system that is compatible with the Sony MD machines, also available in early 1994.

Denon came to AES with its own MD Cart recorder and player, again

announcing an early 1994 availability timetable.

With the apparent manufacturer interest in professional MD products, rival Philips seems to have new plans for the consumer-based Digital Compact Cassette (DCC). It showed a mockup of a professional DCC player. A Philips spokesman said an actual product may be ready in time for NAB 1994. Curiously, Philips did not reveal whether it will also make a recorder—although that would seem necessary to keep up with the MD competitors.

For radio, Sony demonstrated the first pro MD players to be introduced, the MDS-B2P and the MDS-B1 player/recorder. Also, in Sony's huge AES display was the new DMX-B4000 digital radio broadcast console, pro line of DAT decks: the under \$1,000 DTC-A7, and the more feature-laden PCM-2300 and PCM 2700A, and the much anticipated dual-deck DAT editor.

Several companies, including Sony, also demonstrated CD library systems that can be programmed for broadcast use. Denon showed the DN-1200FP changer controller system, and Revox (of

continued on page 3 ►



Studer showed its Dyaxis II Multidesk option at the 1993 AES. Complete AES coverage begins on page 28.

Real-World Test for Digit™

by Rob Norton
Program Director
KRNA(FM)

IOWA CITY, Iowa On Aug. 18, 1993, Harris Corp. of Quincy, Ill., and KRNA(FM) began beta field tests of the Harris Digit™ digital exciter, the next generation of FM broadcast exciters. KRNA applied for and received special temporary authority from the FCC to conduct the equipment tests.

For Harris, KRNA represented a test site already using its latest model HT-35 FM transmitter, and a station on the cutting edge of digital broadcasting with the Moseley 6020 (6010/6020)/DSP 6000 Digital Encoder/Decoder STL system and an Optimod 8200 digital audio processing already on line. For KRNA, the beta test was a way of squeezing more performance from an already great sounding station. Our motto is "can the compression, crank up the fidelity."

Prior to installing the Harris Digit digital exciter, KRNA used the Harris THE-1 analog exciter with superb results.

System measurements

The measurements contained in this article are system measurements (standard proof). They include the exciters, the transmitter and audio chain, with the 8200 processing switched off. These tests are close to real-world usage and do not reflect what the exciters would show if tested alone.

The demodulator used was a Belar FMS-2 and the test equipment employed was an Audio Precision System 1. We

tested both exciters and comparisons were noted.

If you are interested in heavy processing with low-grade source equipment, there is no reason to bother with a digital exciter. The old "garbage in—garbage out" theory is in full effect here.

Let's deal with the subjective first. Yes, there is a notable difference to be heard between the THE-1 analog exciter and the Harris Digit digital exciter. The Digit



Harris Digit™ digital exciter

sounds more open and seems to allow more stereo separation to come through.

Dramatic improvement

When comparing the Digit exciter and the HT-35 transmitter at our main site to the MS-15 Exciter and the FM-20K transmitter at our backup site, there is a dramatic improvement.

Technically, the Harris Digit exciter seems to improve the system noise specs by 5 dB with the Digit's FM noise figures at 88 dB down in comparison to the THE-1's figure of 83 dB (Figure 1). The distortion measurements of both units were impressive with the THE-1's performance well ahead of its published specs, hovering between 0.05 and 0.04 percent (Figures 2 and 3).

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NEWSWATCH

FCC Makes It Official: C-QUAM Is the Standard

WASHINGTON The FCC officially named Motorola's C-QUAM as the U.S. AM stereo transmission standard. As expected, the order was quietly approved by circulation, rather than in the regular monthly meeting (RW, Oct. 13). The commission published the order on Oct. 27 to meet the one-year deadline mandated by a 1992 act of Congress.

The order gives stations operating with alternative stereo transmission systems one year to cease broadcasting with them. However, stations may indefinitely continue using AM stereo exciters from Kahn Communications Inc. that include the "POWER-side" feature as long as identical program material is fed to both channels.

"The growth of AM stereo depends now on both the expansion of stereo transmission by AM broadcasters and quick action by manufacturers to offer the public a

wide choice of AM stereo receivers," the National Association of Broadcasters said in a statement released the day after the order.

Dolby AC-3 Chosen For HDTV Sound

WASHINGTON The "grand alliance" of high definition television (HDTV) transmission system proponents has selected Dolby's AC-3 audio system as the technology for the video system's audio.

Dolby AC-3 is the main ingredient in Dolby's latest generation of theater products.

In being considered for HDTV, the Dolby AC-3 technology beat out other systems including MUSICAM, which had hardware problems during its scheduled test phase last summer. Those problems were later fixed, but the testing lab did not allow the system to be retested.

FCC Denies AFCCE Petition

WASHINGTON The FCC has denied a petition by the Association of Federal

Communications Consulting Engineers (AFCCE), which wanted the FCC to reconsider FM application processing requirements.

When the FCC modified its "hard look" application policy in 1992, it said that applications that are sufficiently complete would be accepted. That policy also allowed "applicants the opportunity to correct what were previously considered uncorrectable defects (that were) fatal to their applications."

AFCCE said that certain engineering information, such as antenna radiation center elevation above mean sea level, total structure elevation, and ERP is too important to be missing

continued on page 8 ▶

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Leaner Arbitron Plans its Future

by Randy Sukow

NEW YORK Arbitron Ratings Co. is dropping its television and cable ratings services as of Jan. 1, but says it will improve its radio service. Current projects to significantly increase radio market sample sizes and establishment of a new qualitative research service remain in place, company executives said.

"We are going to be redirecting a lot of our resources now into areas where we think we will be better aligned with what our radio customers are asking for," Arbitron President Steve Morris said.

The decision to cut the TV audience surveys, which Arbitron has conducted in competition with A.C. Nielsen since the 1940s, will result in the loss of over 700 jobs, more than 50 percent of the company's work force.

First-quarter 1994 implementation of sample size increases could be delayed.

"We are keeping on board those particular skill sets that are necessary to launch the qualitative product. We're going to organize them into teams and as it expands and we need more people, certainly we will add them," Morris said. The company's payroll will total about 550 employees after the cuts.

Sample plans

Morris assured that the cuts will have no negative effect on the radio ratings service. "(Television) certainly took a lot of management time and attention, and we put very good people on that, but I would not say it was at the expense of radio. Radio is a separate business with a separate set of needs."

Arbitron is going forward with plans

to increase radio ratings sample sizes, although the originally planned first-quarter 1994 implementation could be delayed.

The plan calls for gradual sample increases over the next two years, eventually amounting to samples 70 percent larger than the current counts in continuously-measured radio markets. The increase will be 40 percent in markets that are not continuously measured.

A two-percent 1994 rate increase to pay for the sample increase is planned for all markets. Subscribers in continuously-measured markets will face an additional two-percent increase in 1995. Arbitron said, however, that it will bear most of the additional expense for the service upgrade.

Two months after the sample increase plan was announced last August, 52 percent of subscribers had agreed to it, a far cry from the near consensus Arbitron hoped to have before implementing the plan. Twelve subscribers wrote letters rejecting the plan. The rest have not yet responded.

"We wouldn't call it off. Whether we delay it is a decision, we'll have to look at," Morris said.

Specialized

The new initiative to do qualitative audience profiles is still in the planning stages. The company expects to do surveys for both radio and TV, but does not know where most of its qualitative client base will emerge.

"I don't want to oversell something in its early stages, but I can tell you that the response has been very, very positive," Morris said. "Radio customers have been saying that what they really

need is a way to develop a targeted capability to sell their product."



A failed qualitative project Arbitron attempted in the early 1980s "was probably ahead of its time," said Jay Guyther, vice

president, sales and marketing, radio

station sales. Advertisers are increasingly demanding more complete audience information.

"Our sense is that the people providing qualitative service do not have the product the broadcasters are asking for and that we have a unique capability, primarily because we have the diary base for accurate measurement of what people watch and listen to," Morris said.

Arbitron already has a business alliance with Scarborough Research, a qualitative firm. Morris said the new qualitative service will "dovetail" and not conflict with that relationship.

Audio/Radio Gear at AES

► continued from page 1

Studer Revox) with its combined system of the CC 100 controller, CDC 100 changer unit and an 486 PC using Revox DigiMedia.

maintain the maximum signal level possible, to ensure minimal degradation as it routes through the digital conversion processes and compression. Besides the Dominator II, Apex builds the Model



Apex Systems' Dominator™ II Model 720

Of course, with all the digital technology and now "compression," there are companies that make products to ensure clean signal paths. Apex President Marvin Caesar said his line of boxes, such as the Dominator II Model 720, can

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Pondering the Consequences of Change

WASHINGTON New York's AES Convention was a resounding success in terms of both attendance and content (see our coverage in *Studio Sessions*). Instead of its usual New York, hotel-show format, AES went with an NAB-style show which drew a record crowd: 17,855 attendees and 352 exhibitors. The attendance bettered the 1992 numbers in San Francisco by more than 3,000 and there were 50 more exhibitors.

According to News/Studio Sessions Editor John Gatski, the Jacob Javits Center worked out well for the vendors. There was plenty of room under one roof for all the exhibits, demonstration rooms and sessions. Even with the record crowd, there were no major bottlenecks—that is, inside there weren't any.



Unlike in Las Vegas where the broadcast shows are the centers of attention and cab drivers swarm (as orderly as possible) to the convention center and the adjacent Hilton like killer bees, the Javits Center is kind of out of the way of normal cab traffic (after dark, the west side of the city below midtown is a dicey proposition at best).

What became a simple chore in front of the convention center eventually became a major undertaking as people would move further down the street—trying to snag a cab before it got to Javits.

On one evening, John tried unsuccessfully for 20 minutes to flag down a taxi. He eventually hailed a newly on-duty limo driver who negotiated a sort-of reasonable \$10 fee for the trip back to the

hotel. However, the driver didn't have any change and stopped in the middle of the street (in a questionable neighborhood) to get some money from the neighborhood liquor store.

Future shows at Javits should include a

Digital issues, data transmission, and communications in general are still being treated as pure polemics by broadcasters, and as real life, up-and-running situations by other industries.

little better cab planning, including someone to direct their entrance and exit. An AES spokesman said the organization did ask the cab authority to alert taxi companies to send more cabs, but they didn't seem to listen. Maybe next time, they will. (As a former New York City resident and veteran "cab hailer," I can only say: Don't hold your breath, John." In the Big Apple, cabbies do it their way. If they want to go to Javits, they will—when and if they're good and ready).

But then, New York cabbies are not the only ones to resist change. When I was growing up, due to my father's job as an electronics engineer with NASA, I spent many of my formative years overseas, both in Europe and in South America. Back when I was a kid, television was a scarce commodity (we're only talking late '60s, early '70s). The privatization of broadcasting had not yet occurred abroad.

I grew up listening to the radio. Spanish soap operas and mystery serials. To this day, I don't subscribe to cable and am perfectly happy with my selection of over-the-air TV... except for those times when I get the niggling feeling I'm missing out on some good stuff while I'm blanket-stereotyping the whole concept of cable as bad. Hmm.

The other day, through a series of related incidents, I had the misfortune to drive into the "secured" parking area in

my condo building and come face-to-face with a burglar. Yes, a real, flesh and bone man who was breaking into cars with a hammer and stealing stuff. Any stuff. Even a hand gun and ammo one of the building residents had left in his car.

I managed to get away and call the police and etc...the story ended in: They got away, but I was unhurt.

I'm telling you this because I promptly changed my mind about the value of car phones and within a week had a nice little Motorola installed in the car.

Why am I really telling you this? Because as some of you may know, having a car phone opens up a whole new world of information to a driver. I was both dismayed and pleased to discover in my handy little owner's manual that I now can dial the local traffic reporting facility directly (with a four-digit number) and get traffic reports for specific areas at will. *At will.*

And this was only Chapter 1. I understand the amount of stuff I have access to now will keep increasing. Check out the October 23 issue of the British news-magazine, "The Economist," if you really want to know just how fast this is increasing.

In the last issue of *RW* we tackled the issue of data transmission services. And at the risk of sounding like a broken record, I feel the need to urge you to look into what you want your industry's role in the future to be. Many of the issues of digital reduction and compression, data transmission, communications in general, are still being treated as pure polemics by broadcasters, and as real-life, already-up-

and-running situations by other industries (see Judith Gross' piece on the Hit Factory on page 25).

Obviously, not all change is good. But change will happen whether we like it or not. Look at AM stereo. Finally, a standard. But, is this decision going to have the kind of impact it might have, had the industry pushed for a decision earlier? I'll say it again, control your future.

And who knows, maybe next year I'll even subscribe to cable.



Dick Rosenbaum, general manager, news programming ABC Radio, was named ABC News Radio Bureau chief. Concurrently, Jim Farley, news director, ABC Radio Direction and Entertainment networks, succeeds Rosenbaum as general manager, news programming in New York.

Lewis Klein, immediate past president of Gateway Communications Inc., and a founder of the National Association of Television Program Executives (NATPE) was named the 1993 recipient of the Pennsylvania Association of Broadcasters' Gold Medal. The Gold Medal is given annually in recognition of Pennsylvanians who distinguish themselves through significant contributions in the fields of communications, business, arts, science, governments, sports, education and civic enterprise.

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Hi-Fi AM lives

Dear RW,

I enjoyed your "FCC to Close Book on AM Stereo Standard" (RW, Oct. 13).

I grew up listening to AM radio in the era when WABC New York, WLS Chicago, WBZ Boston and CKLW Windsor, Ont., were great rock 'n roll powerhouse stations. These AM stations fascinated me with how they delivered a signal.

I collect old radios as a hobby, and have several Scott AM high-fidelity radios. They are of 1936 vintage and have a frequency response of 50 Hz to 16 kHz. Yes, AM does sound great through these Scotts. At night WQEW(AM) New York shows off its sonic savvy.

I strongly feel that I am fortunate to have this unique medium—AM—as a friend.

Vernon Oehlke
Ghent, N.Y.

Satisfied customer

Dear RW,

This is in response to David Norlin's letter (RW, Oct. 27) in which he details his dealings with Mr. Al Williams and the repairs of his Versa-Count. Mr. Norlin states: "If anyone is contemplating having Mr. Williams work on their unit or have dealings with American Communications, I would urge them to think more than twice about it."

I do not know Al Williams; I have never met him. However, we also have had some dealing with him over the years. We have had a Versa-Count exciter since 1985. Over the years, whenever we had any questions about the operation of the equipment, he or a member of his staff have always been most helpful and gracious.

Our most recent encounter with Mr. Williams was this summer when our exciter failed and we were not able to repair it, either in the field or on the bench.

We called Mr. Williams on a Saturday and made arrangements to air freight the exciter to him. He personally picked it up at the airport when it arrived on Sunday morning, worked on it all Sunday, had it ready to air freight back Sunday night, but requested an extra day of operation on the bench to assure its repair. The unit arrived back at 10 a.m. Tuesday.

I felt RW readers needed to hear from at least one very satisfied customer of Al Williams' equipment and his services.

Gil W. Patschke
president and
general manager
Christian Broadcasting Corp.
KIJN-AM-FM Farwell, Texas

Dramatic radio

Dear RW,

I enjoyed reading Frank Beacham's article about radio drama in the Oct. 27 issue of RW. You may be interested to know that the longest running radio drama, which is still on the air, is "Unshackled." It is produced by the Pacific Garden Mission in Chicago and has been on the air on hundreds of stations around the world since 1950.

Bruce W. Clark
chief engineer
WTHE(AM) Mineola, N.Y.

Small-market promotion

Dear RW,

It's high school/college football season, a time of year when many small-market radio stations might see positive cash flow. High school/college football is programming with audience potential and stations are able to sell it.

What about the other 90 percent of your broadcast week? It's hard to sell something very few people listen to. An audience is the product you sell and local programming is the product you offer the audience.

Here are just a few recommendations to those seeking to achieve an ample spot load at higher unit rates:

- Your technical facility must be functional and provide solid RF and clean audio, so get it in good shape. Quality programming is useless if people can't hear you.

- Program to attract a large percentage of your coverage area. Get irritants off the air. It is too easy for listeners to turn you off or switch stations.

- Pay attention to simple details. Be sure to know the pronunciation of the cars in the auto dealer's ad. Use clear, informative copy and make sure each spot is perfect before it airs. (Recording straight to cart won't achieve this.)

- Stop making excuses for poor performance. You have to earn the respect of your audience and advertisers to get and keep them.

- Spend money carefully. For example, having no jingles is better than cheap (or worn out) jingles. Be certain you cover the basics. If you're a music format, invest in the right music. In an area where the "big boys" penetrate your market, the audience can hear the difference.

It really doesn't have to cost a lot of money to program professionally and market what you do. It takes intelligence and effort. Paying attention to details costs vir-

AES: Promising Ground for Radio

Mention radio to some audio equipment company executives and it invokes mental images of a small, moribund industry.

All they see is a box-shaped building and a stick standing beside some deserted country road. Inside the building, or perhaps in another building a few miles away, a wan, skinny fellow in blue jeans sits in a closet-sized room spinning LPs and talking into a 50-year-old mic.

In short, it is the picture of a bad sales prospect.

For those audio companies who still view radio in this way, they should get rid of the notion without delay. Radio is a lucrative market.

The signs are that more and more audio companies understand this. It was visible at the recent Audio Engineering Society (AES) annual convention in New York, which drew record attendance and 352 exhibitors (50 more than 1992).

Some of the most prominent exhibitors—Sony, Philips and Otari among them—used AES as the stage to introduce products designed for radio-industry customers, less than a month after a radio-only convention was held in Dallas.

It only makes sense to seek out radio buyers. An improving economy and consolidation in the radio industry have combined to give many station managers and engineers decent capital budgets to work with for the first time in several years.

Many stations are willing to buy because there is demand for high-end audio gear. Radio broadcasting is going digital and anything less than the cleanest, high-fidelity audio sources will sound substandard to already sophisticated consumer ears.

Compact disc players and digital audio tape recorders are already well established at most stations and all indications are that a run on digital workstations is coming. Manufacturers also should not underestimate the amount of audio production work done at stations these days and the likely increase of in-house production work as digital equipment continues to proliferate.

Broadcasters and manufacturers need to continue to debate the inner workings of digital audio systems since this is a common concern. But there is no doubt that radio is accepting these new products to the benefit of everyone concerned, buyer and seller alike.

—RW

tually nothing yet yields great benefits.

If you are considering cutting expenses to turn that bottom line around, remember that this could result in reducing the quality of the very product you have to offer. Another option may be change, seeking advice from someone else to develop a profitable product.

James Graham
Sandy Springs, S.C.

Sack the shack

Dear RW,

I haven't paid \$3 for a Radio Shack catalog ("Page Four," Oct. 13). I won't pay it.

My last three trips to radio shack have been for out-of-stock items. Will paying \$3 cure this?

My opinion is that if our local manager was working for Heinz 57, there would be seven varieties in stock and 50 varieties out of stock.

I know the above is vicious. It was meant to be. No other supplier tries to charge for catalogs.

There is an easy solution for the people who pick up catalogs but never buy. Radio Shack sends sale flyers to customers who have bought merchandise. Why not give these buying customers a coupon for a free catalog?

Greed and a \$3 profit are why not.

Larry Albert
Murray State University
Murray, Ky.

Down times

Dear RW,

Unemployment in the radio industry is the worst it has been in my 20 years around this business. It's sad so many excellent personalities have become victims to technology.

Working with many broadcasters in the West Texas area, I find the lack of available advertising dollars is contributing to the demise of local radio. I'm seeing four and

five radio stations operating under one roof, repeating satellite programming. Station operators are forced to use novice personnel.

If any readers need an experienced air talent/production/promotions person, call me. My bags are packed and I'm ready to relocate at my expense.

Steve Rogers
Lubbock, Texas

Corrections

In the Oct. 27 coverage of the NAB Radio Show in Dallas, RW mistakenly omitted mention of DCS Live!, introduced by Computer Concepts. DCS Live! is Windows™-based touchscreen software, designed for cart-machine-like user friendliness with PC control. It interfaces with the Computer Concepts DSC (Digital Commercial System) workstation.

RW also failed to mention Gentner Communications Corp.'s Dallas product introductions: the G2500 and G3200 digital telephone "super-hybrid" systems, and the DS100, DS1000, DS2000 and DS2002 digital audio storage packages (prices ranging between \$7,995 and \$19,995). Details of the superhybrids, however, are given under "Technology Updates" in the Oct. 27 issue, page 56.

Also in the Oct. 27 RW, the RBDS Roll-Call page contained incorrect information. Tectan's address is Box 27157, Concord, Calif. 94527. The contact is Judi Pendleton and the phone number is 800-TECTAN-1. Denon's phone number also was listed incorrectly; the correct number is 201-575-7810. Coupon Radio's phone number is now 212-595-1313.

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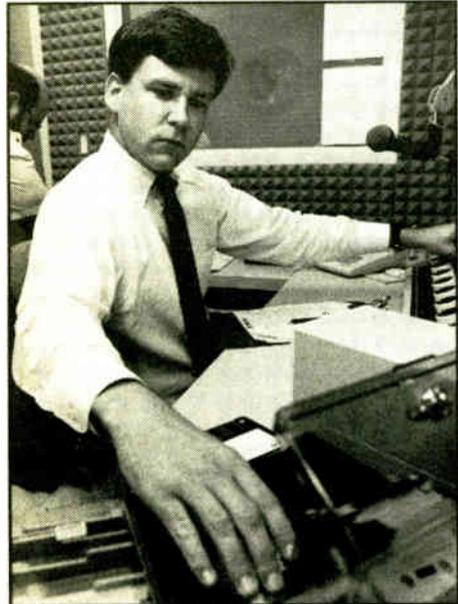
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WNQM, WWCR Rise from the Ashes

by Bob Kirby

NASHVILLE George McClintock still is troubled by memories of the fire that devastated his AM/shortwave facilities the night of April 3. But he also is proud of the newly rebuilt facility that he and his staff recently occupied.

"At the local SBE meeting, I (recently) gave a talk about our experience rebuilding, and looking at those photographs was very, very difficult," said McClintock, general manager of WNQM(AM) and WWCR, the shortwave station, both owned by F.W. Robbert Broadcasting Co. of New Orleans, a for-profit religious broadcaster.



At WWCR/WNQM's new studios, David Allison and Program Director Dennis Schoeck prepare material for broadcast.

Those photos, according to McClintock, included images of three shortwave and two AM broadcast transmitters "that literally melted in the heat," of the fire that destroyed the studio and transmitter facility on the northern outskirts of Nashville. The fire damage to the building and its

contents was estimated at almost a million dollars.

A transmitter malfunction was the probable cause of the fire. "We suspect that when we turned on our third shortwave transmitter, somehow, somewhere the building caught fire as a result," McClintock said. "The transmitter wasn't functioning correctly, and we turned it off. By the time I got home, the building was ablaze." McClintock said arson was also considered but not proved.

Engineers were able to get WNQM (1300 kHz) on the air by April 6 "out of a trailer and with one kilowatt," McClintock said. The shortwave broadcasts resumed 38 days after the fire, but the new (and improved, the staff said) facility was not ready for occupancy until October 8.

"It is the Taj Mahal," McClintock said, referring to the 4,000 square feet of space in the new building. "It's not an unlimited budget, but quite frankly it's much more than what we absolutely had to have."

The concrete block and steel beam structure houses three air and three production studios. One air studio is dedicated to WNQM, another to one of the shortwave transmitters. A third studio feeds separate programming to two other shortwave transmitters, which are located in an adjacent building.

The new studios feature made-to-order Broadcast Electronics mono consoles and BE's Disc Trac 3.5-inch floppy disk cart players. "The Disc Trac works great for us," McClintock said, "but then our local programming rarely amounts to more than program opens and closes. We get about two minutes on the small floppy and about five minutes on the large one. A conventional station might have problems with that five-minute limitation."

Each station broadcasts a mix of religious programming. "We do virtually no local program origination," McClintock said. "It comes in by satellite or standard audio cassette tape," he said. One of the shortwave transmitters broadcasts Los Angeles-based evangelist Gene Scott 24 hours-a-day,

according to Adam Lock, the shortwave program director.

With the significant RFI potential of the 5 kW AM transmitter and three 100 kW shortwave transmitters, engineers designed several layers of protection.

Unlike their domestic counterparts, shortwave broadcasters intent on reaching

near the 41 or 49-meter bands, continues coverage after dark.

The frequency agility designed into high-frequency, high-power shortwave transmitters means additional challenges for the maintenance engineer. "All the plungers and tuning coils change to the correct presets," consulting engineer Watt Hairston said. "The vacuum variable capacitors, the coils, all those components basically are intended to work on one frequency for a lifetime. So when a bellows goes all the



The new studios of WWCR and WNQM

the world rarely remain on the same frequency longer than a couple of hours. Instead, as the earth revolves continents under the cover of night, shortwave broadcasters change frequencies to enhance propagation. WWCR returned to the air with three Continental 418E 100 kW transmitters.

"They are frequency agile and synthesized," McClintock said, "and can move from one frequency to another and tune-up in about seven seconds." Each transmitter radiates on two frequencies: A "day path" frequency, adjacent to the 19-meter shortwave broadcast band, provides coverage in Europe, Africa and the Middle East during daylight, and a "night path" frequency,

way in and all the way out two times, a day, that does make for the occasional failure."

Each shortwave transmitter feeds its own "rhombic" antenna over open transmission line. The antennas consist of 475-foot legs suspended 60 feet overhead by telephone poles.

Shortwave program audio is prepped by a Orban Optimod 9105, a model customized to the needs of the shortwave broadcaster who typically operates in international shortwave bands where spacing is 5 kHz rather than the 10 kHz and 9 kHz domestic band spacing standards in the U.S. and Europe.

"This box is very much tailored for voice," said Philip Moore, Orban's product manager, "and can be made very loud. You can cut bass under 200 Hz so you don't use up transmitter power on bass, and there's a brick wall filter the user can specify on the top end."

While happy with the audio processor and transmitter design and performance, McClintock claims that in the shortwave realm, performance is all in the antenna. Specifically, he strives for the lowest feasible takeoff angle, the angle at which the signal strikes and bounces off the ionosphere.

"In shortwave, you want low takeoff angle so you go as far down range as possible before hitting the ionosphere. If you hit the ionosphere too high, you have no consistent long range (propagation)," he said.

As a commercial shortwave religious broadcaster, McClintock thinks his organization is unique. "We are a commercial radio station with implications of a for-profit corporation," he said. "When a transmitter is off the air, money is lost, and we behave frantically. We're extremely aggressive in sales, in programming and in engineering. Some of the others who do this have a more leisurely pace."

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Bob Kirby is a former radio general manager and news director, and is a free-lance technical writer in Kansas City. He can be reached at 816-941-4356.

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Classical Radio Stations Making a Buck with Bach

by Dee McVicker

PORTLAND, Ore. "We figured out the format problem at 106.7 FM: The oldies weren't old enough." That campaign statement, which unseated KKBK-FM's (K-Bach) oldies format and kicked off its new classical format in the Portland market, aptly describes the growing success of the classical format.

According to a 1993 directory by the Classical Music Broadcasters Association,

1994 Olympic Groundwork

by Alan Carter

LILLEHAMMER, Norway When the XVII Olympic Winter Games officially begin here on Feb. 12 with the opening ceremonies, some of the most creative minds in sports radio and television will use the latest technology developments and most enterprising techniques to broadcast the story worldwide over the next 16 days.

Digital and stereo. Those words are spoken almost simultaneously by those responsible for the operations of the Norwegian Broadcasting Corp. Olympic Radio and Television Organization 1994 (NRK ORTO 94), the host broadcaster producing the international audio and video feeds.

CBS, with the lucrative U.S. rights, has the radio division in a separate operation alongside its TV counterpart. The radio crew will work eight of the 11 sports venues while also taking audio feeds from CBS TV and ORTO, according to Andy Vallon, manager of radio technical operations.

All CBS Radio sports shows will be live from Lillehammer, and communication with New York for transmission will be via Switched 56 from AT&T using CDQ1000 codecs from Corporate Computer Systems.

CBS Radio will have five studios to use for production and on-air, and a transmission area.

For the first time, a host broadcaster will provide a stereo audio feed; individual networks used stereo at previous games. CBS Radio, however, is not using stereo audio and will combine the international feed.

Radio broadcasters, who will be at many of the venues with commentators, are benefiting from the stereo signal. ORTO will deliver an international radio signal that is produced as an analog stereo signal in a separate mixer at the venues.

All incoming ORTO routing is digital from the 11 sports venues with the stereo audio embedded in a serial video digital signal at 270 Mbps.

At CBS, radio and TV engineers point to the design and philosophy behind their facility—the network's third-largest operation behind New York and Los Angeles. But there is a significant difference.

It's all temporary. Installation started Sept. 13 and everything must be packed in crates and out by March 15.

there are roughly 50 commercial classical stations in the U.S., most of which are prospering.

As printed in the association's spring 1993 newsletter, 16 classical stations in an Arbitron sweep increased market share an average of 7.5 percent between the fall of 1991 and the fall of 1992. Based on more than 20,000 national interviews conducted by MRI (Mediamark Research Inc.) in 1993, the audience for classical stations is up 16.7 percent since 1990.

According to KKBK-FM General Manager Bill Failing, who has a less than traditional approach to the classical format, listeners are not at all the age that many perceive them to be.

Not old snoots

"The median age of our listener is about 45, which means there are as many under 45 as there are over 45," Failing said.

John Major, owner of KCMA-FM, a classical station near Tulsa, Oklahoma, concurred. The average KCMA-FM listener is in his 40s, he said. "This is not an old people's format."

Whatever age, classical listeners are profiled as affluent, educated and with a high percentage of disposable income. In real radio terms, the classical format is one of the most richly efficient advertising sells.

This is especially true in markets serviced by a large number of stations playing the same hits. "I think specialization is the name of the game," Major said. "There is going to be more fragmentation, fractionalizing, and so forth. Here in Tulsa, we have 30 or 40 stations, and eight or nine of them are playing country."

Most station owners running the format will agree with Major. Warren Bodow, president and general manager of the New York Times Co.'s WQXR-FM New York, known as the first station to go on the air with the classics in 1936, said: "What makes classical music work is that in a highly segmented radio market, classical music radio can provide a very

targeted audience of up-scale, affluent adults. No other format can do that as efficiently," he said.

Steady income

Moreover, he said, compared to stations with more mainstream formats, in which advertising is usually booked four weeks at a time, the classical station typically enjoys a steady stream of income year round.

"Forty-five percent of our revenue base is from advertisers who are with us for 26 or 52 weeks at a time, who want a constant presence on the station because they feel the value of this rare audience of ours," he said.

Upscale restaurants, travel agencies, and New York's burgeoning financial institutions are the predominant advertisers on WQXR-FM, which has a potential audience of roughly 5 percent of the population—a whopping three-quarters of a million people, according to Bodow. This large classical listening audience explains why there are two commercial classical stations in the Big Apple.

The classics take on many forms, from the renaissance of the genre to the top 40 hits of modern-day movies and even the somewhat avant garde. "So much of it you don't realize is familiar," Failing said, whose station's classical format leans more towards top-40. "Brahms' lullaby, for instance, you wouldn't know as Brahms' lullaby but it's what every baby was raised on."

Switching the dial

KKBK-FM's top 40 classical format attracts a broad spectrum of listeners, including the younger crowd. Failing said: "Younger people, instead of being exclusive listeners, tend to be part time. At least it is one of the buttons. When they're in the mood for it, they turn to it. We tend to trade off with the all-news station, then the public stations and then AOR, because a lot of people that are into music are also into classical."

This positioning in the marketplace enables his station to go after mainstream advertisers in addition to those advertisers targeting the upscale, more affluent listeners. The approach is apparently paying off. By August, less than three months into its new classical format, KKBK-FM had booked over 40 percent of its effective yearly advertising dollar and was well on its way to achieving its goal of getting a six-share in the Portland

market.

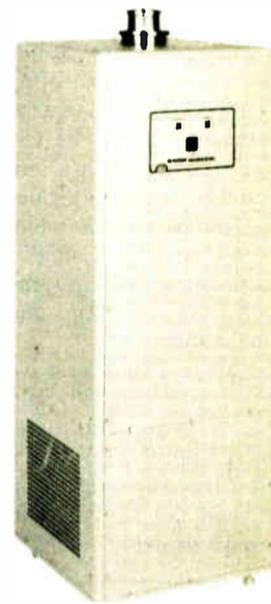
"Too many classical stations think it's just a boutique format, and it's not," Failing said, who became convinced classical would do well in the mainstream almost ten years ago when he approached a large general merchandising store to advertise on his first classical station, a Portland AM.

"The marketing director (of the store)...said, 'Bill, let me tell you, this will surprise you but we sell more records and tapes than anybody in the Pacific Northwest and the single largest selling record in the history of our record sales was a classical music survey record.'"

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Dee McVicker is a freelance writer and regular contributor to RW. She can be reached at 602-545-7363.

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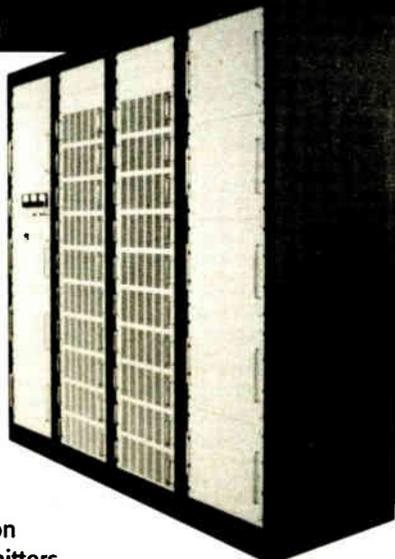
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STATION SKETCHES

Proper Cables Key to Ideal Studio

by Tom Vernon

HARRISBURG, Pa. Cable is one of the most neglected pieces of hardware in the radio studio. Ideally, studio wiring is a transparent link between different pieces of equipment. But problems often arise in the real world.

Some stations use two-conductor, 22 AWG wire as a universal medium for connecting everything in the station. This type of cable has its place, but several types of wire are needed to interconnect the typical studio.

Right cable for the job

Most low- and medium-level wiring is best accomplished with 22-gauge, two-conductor shielded cable. The foil shielded type with a separate drain wire (also 22 gauge) is preferred. Stranded wire is preferable to solid, as breakage can occur over time with solid core cables.

Smaller diameter, larger gauge wire is more fragile and difficult to work with. It is easily nicked during stripping and may break with rough handling and flexing.

A larger diameter, smaller gauge wire can also cause problems. The larger bundles you end up with may not fit through console access holes, and it may be difficult to make connections to terminal strips or solder lugs designed for 22-gauge wire.

Stereo installations may be facilitated with two-pair cable, with a shield for each pair, and a common ground wire. This cable should only be used to run stereo pairs to a machine. Using it to connect different pieces of equipment can easily introduce ground loops due to the common shield wire.

Plan for the future. Pull at least 10 percent more wires than you need between the rack and console, between studios or other major terminal points. Pulling wires is tedious, and it takes no longer to pull one wire than a bundle of 12. Future upgrades become a simple matter of connecting each

end of the installed pairs.

Even though crosstalk is very low with foil shielded cable, it's good to follow the time-honored practice of separating mic level cables from medium level cables. Avoid bundling these wires together in the same path. Give them about four inches separation in long parallel runs.

Control room speakers will have poor sound if they are installed with small wire. Speakers are low-resistance devices, so the added resistance of smaller wires becomes significant. Also, speakers depend on a low amplifier impedance to dampen out unwanted resonances.

Now it should be easy to see why speakers connected with a long length of telephone cable sound bad. The best way to wire speakers is via two-conductor unshielded 12-gauge wire. Plan for as short a run as possible. Again, keep these high-level wire runs separated from low and medium level cables.

Some folks adopt the more-is-more philosophy and install speakers with monster cable. No independent lab study has ever documented audible improvements with these expensive cables. Unless you have golden ears and unlimited resources, the money could be better spent elsewhere.

Mic cables

Occasional sightings of two-conductor shielded cable running from a microphone through the arm and under the counter are frightful. Not even stranded cable is designed to hold up to the continuous flexing that microphone arms are subjected to. From Murphy's Law we know that failures will occur when you're interviewing a celebrity or during morning drive in a ratings sweep.

You can avoid problems by wiring microphone arms with flexible cable designed for this purpose. Terminate the cable with male and female three-pin XLR connectors. The console end can be wired to a

junction box with Switchcraft wall plates to make quick cable changes routine and trouble free.

During quiet passages, the signal from a microphone may be as low as -70 dB to -120 dB. The mic cables are very sensitive to hum and noise pickup. The better grade cables have a braided shield or aluminum tape shield for maximum noise immunity. The double-balanced cables have four conductors and offer improved noise reduction. They take a little longer to wire to XLR connectors, but give outstanding performance.

Remote control wiring is facilitated by multiconductor cables selected for your requirements. Shielded cable is preferable, especially for older 24-volt control circuits laden with electronic 'clunks' as equipment starts and stops.

As you plan this wiring, be sure to check schematics and think through how remote commons and grounds are connected within the equipment so that you don't create ground loops between audio and control grounds.

Documentation of your work is important. Use adhesive wire markers as you go, and keep a written record as well. Database programs and PCs make this once-burdensome chore a breeze.

If you are starting an installation from scratch, it's a good idea to set up the console and check frequency response, noise and distortion before any wiring is installed. This way you know the console meets specs.

Wait until the installation is complete before checking and about 150 wires will be connected and you won't know for sure whether any problems are in the wiring or the console. If time permits, power up the console and periodically check for hum or RFI problems. The thought of waiting until you're done and then disconnecting each of those wires, one by one, to find the problem, should give you the incentive to check as you go.

Stereo phasing must also be verified when

the installation is done. Clipped sine waves and an oscilloscope make quick work of this task. My experience has been that the sleep-deprived engineer makes at least one phase reversal around 3 a.m.

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

NEWSWATCH

► continued from page 2

from the application. The group claimed that applicants would end up filing incomplete and/or speculative applications that could lead to processing delays.

In denying AFCCE's petition, the FCC said that "although the engineering data is essential, a few errors or omissions in this information can be tolerated at the early stages of processing to allow for greater flexibility of the system as a whole."

According to a commission press release, the modified "hard look" system is working well.

Bonneville Sells Music Service

SALT LAKE CITY Bonneville International Corporation (BIC) has sold the assets of Bonneville Broadcasting System to Broadcast Programming, a Seattle-based music syndication company. At press time, the terms of the sale had not been announced.

Bonneville Broadcasting System was organized in 1971 under another name, and initially concentrated efforts on developing and distributing "beautiful music" and "easy listening" formats.

"Bonneville International entered the music service business in the 1970s because the operation fit well with the needs of the organization at that time," said Dr. Rodney H. Brady, BIC President and CEO. "Over the years, the needs of our radio properties have changed to the point where BBS is no longer synergistic with our operation. We (now) intend to focus on our radio and television stations."

Uncertainty at KARW Spurs Possible Fine

LONGVIEW, Texas Radio station KARW(AM), owned by Pine Tree Media, may be fined up to \$250,000 by the FCC for "willful and repeated violations" of commission rules including misrepresentation of ownership on the renewal application.

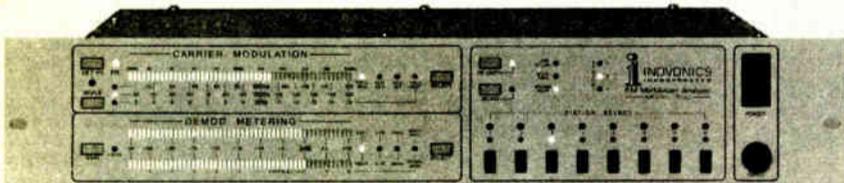
According to the FCC, the application was filed on behalf of Ken Tuck, who had died three months before the application was filed. The person who signed the application, Robert Murray, had no legal authority to do so.

The commission also said that persons operating KARW have "refused to identify who controls station and have refused to describe how such control was obtained."

New Station Totals

WASHINGTON As of Nov. 1, there were 11,528 radio stations in the U.S. The count included 4,949 AM, 4,938 FM and 1,641 educational stations. There are an additional 2,044 FM translators and boosters.

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10	1 Main Theme		3.1	11	BFBS Sting		34
20	2 Main Theme		3.2	12	BBBBFBS		32
30	3 Main Theme		3.3	13	Non Stop Hits	BFBS	47
40	4 Main Theme (Light)		1.6	14	BFBS		32
50	5 Main Theme (Rock)		3.3	15	Most Music Power/		42
60	6 Short Main Theme		4.3	16	The Most Music/		48
70	7 Short Main Theme		4.5	17	.Bed-BFBS		42
80	8 BFBS Sting		2.8	18	.BFBS Sting		2.7
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KEYBOARD CONNECTION

PCs Simplify Coverage Calculations

by Barry Mishkind

TUCSON, Ariz. As any engineer who's been involved in moving or upgrading a facility knows, even after planning for most every contingency, RF power often seems to have a mind of its own. Sure, you can put up the antenna and point it toward your market, but can you really be sure the signal will cover the whole area?

AM coverage is usually easier to predict than FM, because the wavelength is long enough to overcome most natural effects. True, nighttime skywave and reradiation problems are concerns for most directional

stations, but, by and large, it's not hard to predict how far the signal will be strong.

With FM's shorter wavelength, it only takes some metal close to three feet long to create multipath problems. Even the tower members can become parasitic radiators and cause a "non-directional" antenna to have a very non-circular pattern.

The biggest problems come from multipath generated off the ground. That's where your PC comes into play.

With the program

What's nice about the computer is that right at your desk, you can now do a lot of

what-if-ing just by punching a few buttons. There are a number of programs and services available at moderate expense (sometimes free). The savings on one installation can easily pay for the whole setup.

Several program vendors have long provided programs and terrain data that you load into your own computer and plot your current coverage as well as that from any other location in the market. CDS and Dataworld will also provide data and maps by mail or modem if you give them your location.

COVPRED, available for the PC, is a lit-

tle utility that takes your HAAT (height above average terrain) and power, and allows you to determine the mathematically predicted distance to the field strength contour of your choice.

Changes can be entered on the fly, allowing you to see what would happen if you raised the antenna 150 feet or moved it to a higher location. COVPRED can quickly gauge whether a particular site deserves further attention. Then, you can turn to your consulting engineer, or one of the more sophisticated programs.

To give you an idea of what is possible, programs for \$300-\$450 will give you a picture of the terrain heights in any direction, which is quicker than dragging out all those topo maps. You can determine if there's a hill in the path between your transmitter and the listeners, sometimes saving hours of trying to figure out why the general manager can't hear the station at home.

The vendors mentioned above all provide a variety of DOS-based programs, usually on an *a la carte* basis, so you can pick and choose what you need, whether it's just contour prediction, FM channel searches or the ability to design a custom coverage map.

Cutting edge

The more expensive packages, running up to as much as \$3,000, incorporate propagation analysis models, like the Longley-Rice model, which make FM, TV and other VHF/UHF analyses more accurate. A three-dimensional picture of a station's propagation can be produced with products like SURFER™ from Golden Software.

Many programmers are beginning to take advantage of the Windows™ graphics and printing interfaces. Some programs for broadcasters are being written to support these interfaces. You tell the Windows program what kind of printer or plotter you have, and your analysis program will concentrate on the calculations and display.

Rich Biby of CDS began the trend at the spring National Association of Broadcasters convention, showing off the new Windows-based TProfile (terrain profile), RFPATH (propagation analysis) and RFCAD (full capability coverage maps and propagation analysis generation) programs. They are easy to set up and are even capable of handling information from the main CDS computer. You can dial in for information and manipulate it at your leisure.

Rich is willing to work with engineers to develop the products and services needed. For example, as a public service, Rich has arranged for any ham operator or frequency coordinating body to access his database free of charge to get distance, azimuth and path terrain profile information.

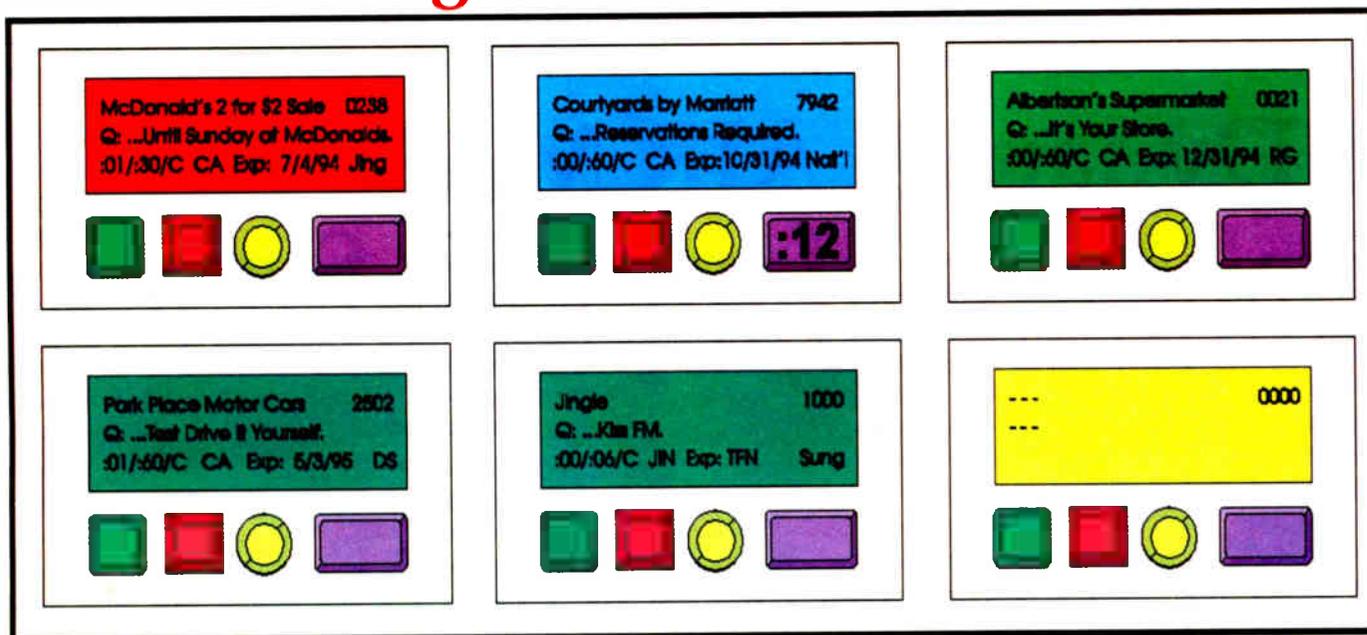
Just send e-mail to rich@comm-data.com, or send a letter to CDS, 6105 Arlington Blvd., Falls Church, VA 22044. Tell Rich your call sign or coordinating body, and he'll give you free access as noted. For further information on the CDS programs, call 800-441-0034.

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Barry Mishkind can be reached at 602-296-3797, or on FidoNet at 1:300/11.3 or "barry@coyote.datalog.com" on Internet. His address is: 2033 S. Augusta Place, Tucson, AZ 85710.

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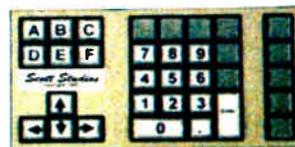


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The DYNAMAX CTR10 Series needs no introduction. Over 10,000 units are installed in all four corners of the globe. Over the years, the unit has been refined and now includes a brushless DC servomotor. The CTR10 Series combines good value, reliability and high quality audio.

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DYNAMAX COBALT Cartridges provide excellent high frequency response, high sensitivity and increased head room, and are ideal for top quality reproduction from a digital audio source.

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The MASTER CART yields maximum performance at standard operating levels and is well suited for general purpose stereo recording.

The MODEL 300, workhorse of the broadcast industry for thirty years, this cartridge is intended for monophonic use at standard recording levels.

DYN-400X Professional Back Lubricated Recording Tape is a low noise mastering tape for use at standard recording levels and is available on NAB hubs or 7 inch reels.

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The DYNAMAX ESD10 uses dual full-track erase heads to ensure deep cart erasure of 75 dB or more. The patented splice detector which requires no sensitivity adjustments rapidly locates the splice and positions it perfectly before recording.

The BLANK-IT hand held eraser is molded of rugged plastic for light weight, easy to handle, quick and accurate tape erasing in any setting.

The MODEL 400 table-top eraser features a hardwood case, scuff resistant laminate top and removable aluminum pivot pin permitting erasure of audio, video or computer tape reels up to 11 inches in diameter x 1 inch wide.

Other Accessories

Fidelipac offers CARTRIDGE STORAGE SYSTEMS in numerous configurations including a 25 slot vertical wall rack, a 200 slot mobile carousel rack mounted on heavy duty casters, and table-top units which hold 96 cartridges or up to 48 cartridges (as shown above).

Fidelipac's world standard WARNING LIGHTS are available in eight different languages plus custom versions on request. Back illuminated brilliant red letters on an opaque black foreground command attention and visibility.

In addition, other useful accessories (not shown) include alignment cartridges and precision gauges for head insertion and right angle zenith calibration.

For a complete menu or information about our digital audio products, call Fidelipac.



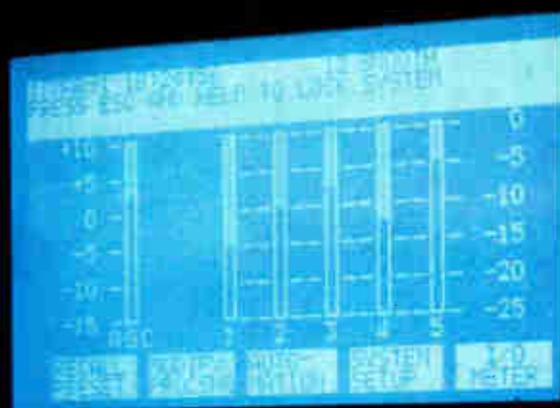
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World Radio History

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World Radio History

COLE'S LAW

The Devil Is in the Duopoly Details

by Harry Cole

WASHINGTON With the relaxation of the FCC's duopoly rules, more and more licensees are taking the plunge and buying other stations in their existing markets. What, if any, are the new application requirements for such a sale?

Assuming you are buying the assets of the other station (as opposed to the stock of its corporate licensee), you will need to prepare and file FCC Form 314. (A stock deal would require FCC Form 315.) The current editions of the form are dated August 1992. Don't use any earlier versions of the form—they will be returned to you with instructions to refile on the current form.

Mind the details

Be sure to include a copy of the sales agreement or detailed letter of intent as an exhibit to the application. The commission won't accept your application for filing without it.

That's not quite as bad as having your application returned, since it means that you will presumably be given a file number and a place in the processing line as of the date you actually file. However, your application will not be processed, no notice of acceptance of your application will be issued and, consequently, the deadline for the filing of petitions to deny will not kick in until you do file the missing agreement.

(If the staff should send you a letter noting the absence of the agreement and requesting that you submit it pronto, you will generally have 15 days to do so. After that, your application is subject to dismissal.)

Over and above the information traditionally required in an assignment or transfer application, a new requirement has been added for situations when the proposed deal results in control of two same-service stations in a single market. You must include exhibits demonstrating compliance with the radio ownership rules (Section 73.3555 of the FCC's rules).

That section permits common ownership of up to two commercial AM and two commercial FM stations in radio markets with 15 or more commercial radio stations, provided that the combined audience share of the commonly owned stations does not exceed 25 percent.

In markets with 14 or fewer commercial stations, a single licensee can own up to three commercial stations, no more than two of which are in the same service, and provided also that the resulting combination of stations constitutes less than 50 percent of the stations in the market.

The number of stations in a radio market is "the number of commercial stations whose principal community contours overlap, in whole or in part, with the principal community contours of the stations in question."

While there are no established rules governing the format of this kind of multiple ownership exhibit, you should generally be sure to include the following:

- An engineering statement, containing a map with appropriate contour lines plotted, together with a narrative explanation and listing all of the stations in the relevant market. In light of the commis-

sion's definition of "market," it is usually best to have an engineering consultant handle the preparation of this item.

- A separate statement reflecting compliance with the other elements of the rule. For example, if the engineering statement shows that there are 14 or fewer stations in the market, the separate statement should include a reference to the fact that the proposed assignment will not result in common ownership of more than 50 percent of the market's stations.

- If there are 15 or more stations, your separate statement must contain specific reference to the appropriate audience rat-

That pesky little audience share requirement is an important thing to worry about.

ings information necessary to demonstrate compliance. That should include the source and date of the data and a specific enumeration of at least the relevant audience ratings (Monday-Sunday, 6 a.m.-12 midnight, average quarter hour, 12+).

If possible, it is also helpful to include a copy of the actual audience ratings report, so that the commission staff can verify the accuracy of your statement.

By the numbers

Some of you, when you see that pesky little audience share requirement (you know, no more than 25 percent of the market's audience, based on the latest available ratings), will probably think it is an important thing to worry about. Well, yes and no.

On the one hand, the commission has made clear that it will review applications carefully to make sure the 25 percent level is not exceeded. Be sure to keep on the underside of 25 percent, if possible.

But the commission also seems to be taking the position that you are OK as long as the 25 percent level is met as of the date you file your application. If the most recent ratings as of the date of filing show you're all right, the mere fact

that earlier ratings books (issued, say, over the last few ratings periods before you file) or later ratings books (issued while your application is pending) tell a different story, is probably irrelevant.

This, of course, opens considerable vistas. For example, if a proposed combination exceeds the audience cap, but one or more of the stations happens to have a sub-par book that happens to bring the combination in under the cap, the deal should fly at the FCC.

Similarly, even if the available ratings show that the cap is exceeded, even after the application is filed, it seems to make no difference to the commission. In one

case, subsequent books (issued while the application was pending) showed that the total share for the proposed combination had risen to 27.5 percent. Even though this was brought to the FCC's

attention by a concerned petitioner to deny, the FCC was not impressed, and granted the application.

In another case, a petitioner claimed that, while a proposed deal would be under the 25 percent cap according to the current ratings, an average of several past ratings periods would show the aggregate ratings were over that cap. The FCC again chose not to let that claim get in the way of a grant.

Needless to say, no improper calculations should be made to skew ratings and bring them in under the cap. Indeed, in either of the two cases mentioned here, if the petitioner had been able to convince the commission that the ratings numbers had somehow been cooked, the results would likely have been very different.

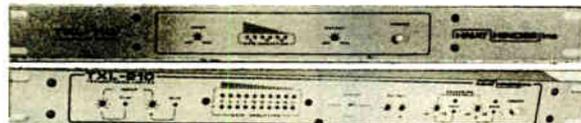
In any event, the fact that ratings are a significant element of the duopoly showing makes it important for you to understand how the FCC treats them, so that you can take advantage of them or avoid any potential pitfalls.

□□□

Harry Cole is a partner in the Washington-based law firm of Bechtel & Cole, Chartered. He can be reached at 202-833-4190.

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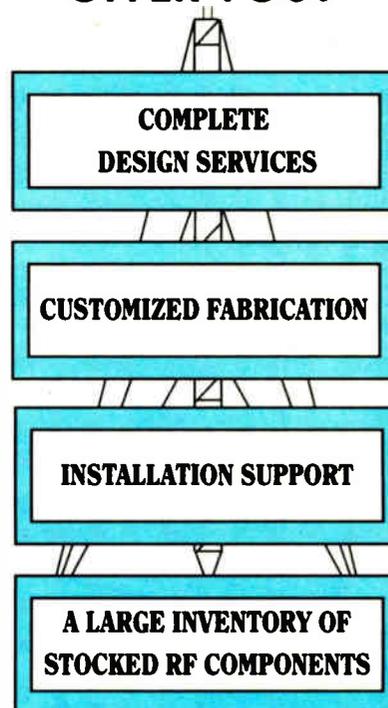
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WORKBENCH

Improve Your Shop with Color Codes

by John Bisset

FALLS CHURCH, Va. Any fastener with a recessed socket is usually referred to as an Allen screw, but this is not always correct. "Allen" is a registered trademark for one specific type of recessed hexagonal socket and the wrenches to fit it.

Most shops carry more than one set of Allen wrenches. They come in the U.S. and metric sizes, the common bent type and those used with handles. Many shops display them in a box, tray or "miscellaneous" drawer, while others diligently keep the different types separated.

The distinctions are more important than they seem. The U.S. and metric sizes are almost the same size. It is frustrating to find a U.S. wrench in the metric wrench drawer, and then have to search for the proper metric wrench.

Larry Albert of Murray State University uses auto touch up paint to color code his wrenches. He uses a couple of bands on either end, so even if the tool is stored in a plastic case, it's easy to identify by the color.

Larry's code is: BLUE, U.S. Allen;

ORANGE, metric Allen; YELLOW, metric Allen with ball tip, and WHITE, U.S. Spline (Bristol). The colors make it easier to sort the tools after a project.

Larry used a similar identifying procedure for his alignment tapes. Because he often uses U-Matic and VHS alignment tapes, he devised a labeling procedure that consists of taping a piece of cart label over the window of the tape cassette. A pen is then used to mark each section of the alignment tape. By referring to the label, specific alignment sections can be located.

★ ★ ★

Most stations use a satellite for something. An engineer's knowledge of satellites often comes from piecing together the information from each manufacturer's instruction manual. The folks at Allied's satellite division are helpful, but what's really been needed is a good reference to satellite radio.

Universal Electronics has prepared such a reference, "Tune to Satellite Radio," aimed at the consumer TVRO owners. It is inexpensive and uses a layman's approach to explain satellite reception so that it can be used by engineers and managers alike.

The 100-plus-page book consists of eight chapters on such audio services as SCPC, standard audio subcarrier, FM squared audio, as well as news and weather fax services. Equipment requirements and hookups for each service are shown and explained.

If you are an experienced satellite engineer, you'll appreciate the last chapter, a quarterly updated radio guide listing all satellite audio program services by satellite and transponder for both C- and Ku-band satellites.

The basic book costs \$16.95; updates are \$25 a year. Order a copy by contacting Universal Electronics, Columbus, Ohio, 614-866-4605; fax 614-866-1201. Mention that you heard about the book in **RW**.

For more information, circle **Reader Service 191**.

★ ★ ★

While we're on the subject of satellites, I was given some information from an engineer in Southern Virginia about substituting other power supplies for the expensive Lambda supplies that Scientific Atlanta (SA) uses. This engineer spoke with Kathy Maxwell of Newark Electronics in Richmond, Va. (804-282-3109), who recommended the following replacement supplies:

- For the +/- 15-volt supply, replace the LMD-Y-152-9965 supply with an Astec Model 12DL1.7. This supply provides either +/- 12 volts at 1.7 amps or +/- 15 volts at 1.5 amps. A knob on the supply switches between the two.

- The 5-volt supply, a Lambda LMS-Z-5-0V-9965, may be replaced with a Sola Model SL5-05-030-1, which is 5 volts at 3 amps.

Lambda will rebuild their supplies if they are seven years old or less, but cannot guarantee the availability of older replacement parts.

Perhaps your newsroom is using one of the "newsdesk" software packages that combines the newswire with word processing features. If your news department subscribes to more than one news service, this type of software can easily integrate several different data sources. Most of the software packages require installation of a multi-port communications board to accept the additional data feeds.

When I recently routed an AP wire to port No. 1 (as instructed) and routed ABC to port No. 2, I couldn't get the ABC line to output data. I called both AP and ABC and finally pieced together a scenario that would work.

There was a pin wiring error in the connector that went from the satellite data port to the com port on the computer. The data comes in on the following pins: No. 3, receive data; No. 7, ground, and No. 20, data terminal ready. Both ABC and AP instructed me to use only pins Nos. 3 and 7. Pin No. 20, it turns out, takes the high from the PC and enables the satellite modem to send data. No handshake on pin No. 20, no data.

Next, the AP News-Desk software must be configured for each additional data line used. Contrary to what both companies initially told me, the following configuration data should be used: WIRE-2, ABC; WIRE IRQ, 5; WIRE SPEED, 9600; PARITY, NONE; DATA BITS, 8; and STOP BITS, 1.

I know 9600 baud is impossible on a 1200 baud modem, but the system wouldn't work unless this baud rate was selected. ABC admitted they didn't know why this occurred, but that on the AP NewsDesk systems, 9600 had to be selected.

□ □ □

John Bisset is a principal with the contract engineering group Multiphase Consulting. Sub-missions to "Workbench" can be sent to his attention, in care of **RW**, or faxed to 703-998-2966. Published sub-missions qualify for recertification credit for all SBE certification levels.

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We All Get the Mords Wixed Sooner or Later

Dear Luci,
 Before I get rolling, a big thank you to everybody who called, wrote and E-mailed me regarding "THE BIG ONE" (RW, Sept. 22). At this writing, everyone who touched base with me supported my decision and the eventual outcome.
 I should mention I had the complete backing of the program director and our vice president/general manager in my decision, and that finally there was little question the spot would need a serious rewrite. To my

readers, I thank you.
 A call I got from Mark Burg of WLAX(TV) La Crosse, Wis., sets the mood for this month's excursion. Somehow we got on the subject of getting the tang all tangled up, and we had a great laugh over some butchered pronunciations we've heard and even committed. (Good thing he paid for the call).
 Ever since day one behind a mic, I've always had great difficulty saying "conveniently located" and "regularly," so I never

FROM THE TRENCHES

by Alan Peterson



say either anymore. (Even WFAN(AM) New York's Don Imus boots "regularly" quite regularly.)
 Of course, nothing could rescue me from "Riverview Produce on West Sixth St."—I still have the tape of my seven live on-air attempts to say the crummy thing.
 Mark topped me with a tale of a guy at his

station who tried to talk up a local performance by former "Tonight Show" drummer Ed Shaughnessy. Revved up on caffeine, he told his listeners to watch for Ed Shag-A-Nassey (ample justification for phonetic spellings on promo cards).

Some fellow personalities I hang out with yielded several gems, such as my former teammate at WHMP-FM Northampton, Mass., Hugh Massey, who reported on a drug bust and confiscation of several dozen "Hypodeemic Nurdles"; the weekend at WARM-FM York, Pa., who talked up "Mr. & Mrs. Jones" (that's "Me & Mrs. Jones"); and the nostalgia jock backselling "Zero Johnny Zero" (O[h] Johnny O[h]).

Weekenders have it the roughest. They're only in touch one or two days a week, and sometimes they encounter names and words not normally seen in their regular jobs. So it was with a very young Connecticut jock I heard, giving the weekend weather for "Groton, Clinton and vick-enitty."

Most of us learned about spoonerisms either the hard way or from Kermit Shafer's legendary books and records. Among the best I've heard or heard about are "Tonight's High Fool Scutball Fours," "Shattered Scowers," or the delightful combination of "snow falling" and "snow starting" when you're not sure which word you want and wind up using a mix of both.

Back to Wisconsin for a moment, for Mark Burg's favorite agricultural show, "Orgasmic Gardening." Mark says the host booted this one several times before he realized what he was saying. That word is routinely dropped accidentally for organic or organism. Still it's fun to hear, as are sports figures like Monica Seals, political figures like Yassir A Raft and the sometimes deliberate Hillary Rotten Clinton.

The first time I heard a perfectly uproarious political bobble, it was when a night jock in Oswego, N.Y., mangled a Carter Administration official's name. A super-quick rip and read newscast transformed "Juanita Krebs" into "Uganda Krapps." Of course, this is the same guy who mispronounced "ABBA," so he's forgiven.

Remember a gazillion years ago when you could lose your job just for playing a double-red dot record after a blue dot record or got cited for not being tight enough?

No more. In the modern day, anything-can-happen world of our industry, the pillars of the temple continue to crumble. Just when you think you've heard it all and become jaded, along will come someone whose lips suddenly do the "Curly Shuffle." Even when it happens to me, I find it hysterical. Some things will never change, and shouldn't.

To anybody who's ever pulled a Bill Buckner on the air, thank you. You've made my day, Mark's day, and who knows how many others?

-Al

□□□

Al Peterson writes from WTCY(AM)-WNNK-FM Harrisburg, Pa. Reach him at 717-238-1041 or on CompuServe (73122,312).

(Whoa, did he mean "CompuServe"?)

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See pp. 38-39

Equipment and Applications for Radio Production and Recording

PRODUCT EVALUATION

Fostex D-10: Studio DAT on a Budget

by Rich Rarey

WASHINGTON With the introduction of the modestly priced D-10 DAT recorder, Fostex Corporation has demonstrated it can produce a versatile recording/editing tool for the professional or consumer DAT market. (See page 20 for a field test of the Fostex PD-2.)

Features

At a \$2,500 list price, the standard D-10 offers some high-end features: instant start using RAM memory, optical I/O, digital I/O, balanced/unbalanced analog I/O, memory to store 100 tape locations, two channel wireless remote control and a basic general purpose interface control.

Perhaps the most surprising feature is the quiet transition from STOP to PLAY. The audio transition is seamless, of course, but

the subcode area.

DATs with SMPTE timecode capability internally convert the timecode to DAT frame time when they record IEC format timecode onto the DAT tape. DAT frame time rules specify one frame to be 30 milliseconds in length, and therefore 33.33 frames are recorded every second. To recreate the SMPTE timecode, these DAT recorders use the DAT frame time—the Pro R-Time—and another data component called Pro Binary to properly count and display the frames in SMPTE format. The SMPTE DAT recorders display the frames count from 0 to 29, or 0 to 30, depending on the selected timecode output.

The D-10 can read Pro R-Time but, alas, not the Pro Binary data. Because there are 33.33 frames per second, the D-10 will add one frame to the count every three seconds. The result is the user would see the frames count from 0 to 32 twice, then count from 0 to 33. The D-10 cannot record Pro R-Time—only A-Time.

A-Time frame display counts the same way as the Pro R-Time display, but the A-Time is initialized to 00:00:00 time and 00 frames at the beginning of the recording. For the location

point searches to work properly, Fostex strongly recommends that continuous A-Time be recorded on the tape.

Instant start

The instant start feature, where the first few seconds of audio is played back from RAM until the mechanical transport has stabilized, has become a popular feature in modern DAT recorders, and Fostex has taken this convenience a step further: Start-IDs do not necessarily have to exactly mark the beginning of audio for instant start to be effective. The AUTO CUE UP button will cause the D-10 to "listen" to the tape just prior to a Start-ID for any audio above a user-determined threshold.

If audio exceeding this threshold is found, the D-10 will make that location the RAM starting point. The four threshold levels, -20, -30, -40, and -55 dB, are selectable from the setup mode and should be adequate for most applications. The threshold settings also affect the AUTO ID record mode, where the D-10 will write a start-ID automatically if at least one second of silence precedes audio level above the threshold.

The user can easily rewrite a Start-ID by erasing it and shuttling slowly along the tape—marking the desired point and listening to the D-10 rehearse the indexing process. But this method will overwrite any Pro R-Time information that was at that spot, effectively erasing any pre-existing timecode data.

Speaking of Start-ID locate functions, the

depth, punch-in and punch-out assembly recording is possible by loading desired locations into memory, but Fostex will not guarantee A-Time continuity at the punch-out point.

An editing system

Preliminary information in the owner's manual offers several hookups that pair
continued on page 23 ▶



Fostex D-10

the transport mechanism makes none of the usual "ker-chunking" heard in other DAT recorders. When we used the D-10 on the air, the lack of mechanical sounds caused us momentary surprise, thinking that it hadn't started at all.

Features found on some modern DATs are absent from the D-10: a "confidence" head for monitoring tape playback during recording, and variable speed. Such additions would add complexity and cost to the unit, but probably are not required for typical D-10 applications. While the front-panel buttons and shuttle/jog wheel are logically arranged, they have a less-expensive feel to them.

Setup mode

Pressing keypad buttons "0" and "1" together activates the D-10 Setup mode, and as the name implies, its usefulness depends upon the installation of the D-10. This is fortunate, as the Setup mode displays each alphanumeric character in a seven-segment readout that never was intended to express English characters. The manual provides a table to help translate the displayed squiggles into English.

Users will appreciate having an absolute time ("A-Time") display with frame-units resolution for cueing and timing purposes, but applications requiring SMPTE time code writing or frame-accurate reading will be constrained by the D-10's interpretation of Professional R-Time. As explained in the owner's manual, the Pro R-Time information consists of pack data recorded in

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PRODUCT EVALUATION

'Accurate' Monitors From Digital Designs

by Bruce Bartlett
with Jenny Bartlett

ELKHART, Ind. Although not a well known monitor company (at least not yet), Digital Designs builds its studio nearfield monitors to accommodate a variety of listening tastes and prices.

For example, when I unpacked the flagship DD161b and the bargain priced M6, I noticed a foam plug in the bass ports. This clever plug lets you choose between two bass alignments from one speaker. With the plug in (for acoustic suspension), transients are faster, bass is tighter, and the

lowers roll off gradually. With the plug out (for bass reflex), you get deeper bass extension, faster roll-off and more kick.

Features

The DD161b lets you customize the sound even more. On the back are rotary switches for the midrange and treble. The midband switch has three positions: (1) reduced 3 kHz region, (2) flat and (3) boost from 200 Hz to 4 kHz. The three tweeter settings are flat, +3 dB and +6 dB.

Many extra features adorn the DD161b: magnetic shielding, oxygen-free copper wiring, lead-free silver solder on all

connections, solid-state/self-resetting tweeter fuse, mirror-image matched pairs and rounded cabinet edges that reduce diffraction. The DD161b is priced at \$742 per pair.

Costing just \$218 per pair, the M6 is a member of the company's Magma line of consumer loudspeakers, but it also works well as a low-cost, professional nearfield monitor. To reduce costs, it omits level controls and rounded cabinet edges. It also handles less power than the DD161b, and has a bit rougher response.

The DD161b comes with a beautiful hand-rubbed finish of genuine oak veneer. In contrast, the M6 cabinet has a painted finish over oak. On the back of the DD161b are easy-access, gold-plated, five-way binding posts. These inputs can be bi-wired; you run separate wires from your amp to the woofer and tweeter. The M6 has spring-loaded push-type connectors.

Both models use a 6.5-inch polypropylene woofer with a 1.25-inch diameter voice coil, and a liquid-cooled polymer dome tweeter. Tweeter diameter is 25mm

in the DD-161b, 20mm in the M6. The drivers were chosen for their good transient response, which comes from light weight, stiffness and internal damping, according to the company. Both drivers are mounted off-center, which is said to smooth frequency response.

Since the woofer rolls off sharply at the high end of its response, all that's needed in the crossover is a high pass filter on the tweeter (a polypropylene capacitor). This is claimed to provide a clearer signal path with minimal group delay.

Listening Tests

I auditioned the Digital Designs DD161b and M6 separately prior to making my lab measurements. Each pair was placed on stands just beyond a small mixer in my studio. The speakers were four feet away and four feet apart. The tweeters were at ear height and aimed straight ahead—not toed in. Why? The speakers sounded too bright when they were aimed at me. Measurements show that they are flatter at 10 to 15 degrees off axis. You can tune the

continued on page 24 ▶

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PRODUCT EVALUATION

Durability, Preamp Excellence Embody Power-Hungry Portable

by Rich Rarey

WASHINGTON It was a hot and humid Sunday back in July. Standing 2,000 feet from the threshold of National Airport runway 18, audio engineer John Widoff and I waited for the next flight to arrive. Within minutes, a Boeing 757 roared past us at three hundred feet above the ground. We recorded the track onto the Fostex PD-2—a portable timecode DAT that is well known in "audio-for-video" circles.

After about 25 minutes of recording various airport sounds (with impressive sonic results) for an upcoming NPR Weekend Edition, I heard an urgent beeping in the headphones. The Fostex battery was getting low and the unit would shut off shortly. Wait a minute! We were supposed to get at least 70 minutes, so what was going on? Then the PD-2 simply quit, dead. Out of power. No juice.

This was my first field recording with the \$10,000 PD-2, and because Fostex marketing has positioned it as a direct replacement for "1/4-inch analog recorders"—primarily for Video, Film and Television—we thought it would benefit National Public Radio, where we frequently use NAGRA analog recorders for sound gathering and interview events.

One of several concerns is the quality of mic preamplifiers in our field recording gear. The Sony D-10 DAT preamplifiers, for instance, have a subjectively harsh sound and lack the "warmth" of the NAGRA preamps. The D-10 also lacks internal phantom power and the extensive monitoring capability that the NAGRA and Fostex PD-2 provide.

Fostex has correctly designed the PD-2 to surpass the NAGRA preamp section by including selectable input/reproduce

metering, recessed "pop-up" controls for speaker and headphone levels, M-S and A/B monitoring with selectable mono sum and individual channel monitoring, and perhaps its biggest difference from NAGRA recording: SMPTE Timecode.

The realm of DAT recording requires a measure of faith: is a signal actually being put on tape? With the PD-2 confidence head, monitoring the playback is easy and allows more concentration to other tasks. The unit has a just-large-enough LCD display window, backlit if you need it, to simultaneously provide level and limiter indication, timecode, format and ABS time read-out and error annunciation. The comprehensive user-settings, controlled by software, allow adjustments to the PAUSE time.

The PD-2 and NAGRA weigh about the same, with the PD-2 making a smaller footprint. Although we didn't get much recording done on the PD-2, we listened to it and the NAGRA analog recordings we also had made. Soundwise, the PD-2 preamps compared favorably to the NAGRA preamps, and its features made it an attractive NAGRA alternative. But what about the low battery life?

Rick Cannata at Fostex told me that the PD-2 is a power hungry machine. Several microprocessors are at work controlling and processing data while the machine is ON, and even with several design refinements, the PD-2 will only run, at best, 70 minutes on a full battery. Cannata also pointed out that NiCad batteries require a complete discharge to prevent "battery memory" from ruining it.

With this in mind, PD-2 users would be wise to invest in a suitable battery charge/discharge system, as well as a quantity of NP-13Plus batteries.

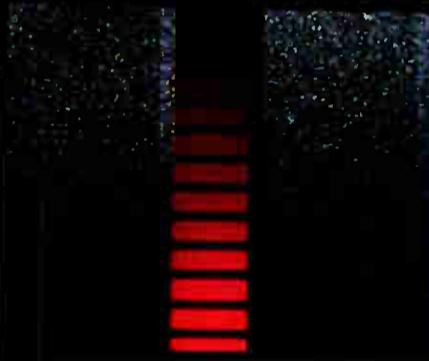


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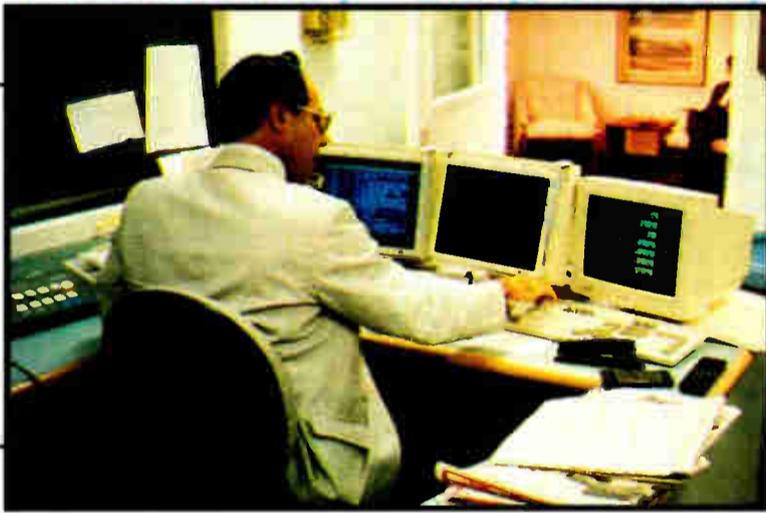
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DIGITAL DOMAIN

Making Workstations Work for Radio

by Mel Lambert

LOS ANGELES Digital editing, mixing and signal processing has progressed by leaps and bounds in recent years. Yet today's radio production environments still requires designs that take full advantage of the flexibility, creativity and operational freedoms offered, but not yet fully implemented, by digital workstation technologies.

I'm still surprised that so few of the systems being offered to the radio industry live up to the promise of fully integrated functionality and powerful user interfaces.

Indeed, affordable digital audio workstations are changing the way in which we approach the types of tasks that can be handled within the digital domain.

No so long ago, discrete units handled various delay, ambiance and reverb functions—in addition to equalization and compression/limiting. Now add discrete digital mixers and hard disk recorders to the equation, and you end up with a collection of boxes (hopefully with industry-standard digital I/Os) that need to be interconnected and controlled from a central mix location.

Blurring distinction

Gradually, the distinction between different components, the mixing console, recorders and discrete DSP functions; has become rather blurred. But almost without exception, we can only achieve some of the various mixing, recording, editing and processing tasks, timecode sync and transport control from a workstation's hardware control surface.

During the past several years, I have used the following "wish list" of basic features as a basis by which to judge the usefulness of a workstation intended for use in a radio-production facility:

- *Real-time multichannel recording and playback.* A number of workstation manufacturers proudly advertise that their designs will handle stereo/2-channel inputs, and/or possibly play back as many as four tracks at a time.

To me, a practical workstation design that matches the user flexibility of existing analog multitrack should offer at least eight tracks of simultaneous input and output. In this way, the system can provide either real-time mixing of hard-disk digital audio "tracks," or enable real-time digital compression, EQ, noise elimination and other useful functions.

- *Non-destructive waveform editing and sample-accurate assembly.* Hard-disk editing provides us with the ability to accurately edit and manipulate different versions of an original sound file and to assemble together discrete segments into a continuous program.

Without the ability to edit original digital audio files, and to link elements together into a continuous program, a workstation is little more than a digital recorder.

- *Real-time audio mixing and signal processing.* Having recorded the various audio elements to fixed/removable hard disk or erasable magneto-optical drives, and non-destructively edited the material to the required length, it is absolutely essential that the digital workstation allow individual components of a radio program, such as jingles or PSAs, to be edited.

On-board DSP

Recent designs offer on-board DSP power that can provide real-time dynamics control

(compression, limiting, expansion/gating) and multiband parametric EQ, plus reverb, delay and ambiance generation.

- *Dedicated work surface with familiar user controls and dedicated functions.* I remain convinced that to be truly user-friendly, a digital audio workstation must incorporate a user control surface with familiar linear/rotary faders, push buttons and switches. So-called "glass" or "virtual consoles," those in which virtually all system functions are controlled from a large monochrome, gray-scale or color monitor, are simply too cumbersome and non-intuitive to use. It is very tiring to use a single mouse/trackball to drive a complex, multi-channel system, not to mention the large amount of eye-to-hand coordination involved.

I am convinced that the vast majority of radio production engineers are far more comfortable with a combination of a high-resolution color/gray-scale video display and dedicated control panel.

- *High-speed program backup and archiving.* Having recorded or in-loaded a variety of sound elements for editing, processing and mixing, we obviously need to purge the workstation before the next project can begin. The various sound files, edit lists and associated data should be capable of being off-loaded in faster than real time to Exabyte or Data DAT.

Speedy reloads

Newer generation designs feature MO drives that also speed the reloading of material if the material needs to be re-edited. Newer designs should also offer Open Media Framework (OMF) compatibility, to allow a project completed on one design of workstation to be moved to another.

- *Flexible machine control of audio and video recorders.* A variety of audio and video machines, plus timecode synchronizers and related devices often need to be controlled from a workstation, via industry-standard serial/parallel protocols.

- *Synchronization to SMPTE/EBU timecode.* Timecode might seem more appropriate to video production than radio, but the ability to accurately lock various sound elements recorded on, for example, timecode-capable DAT, to a central timeline

can also simplify inload and offload of sound files.

□□□

Mel Lambert has been intimately involved with the production and broadcast industries on both sides of the Atlantic for more than 15 years. Now principal of Media&Marketing, a Los Angeles-based consulting service for the professional audio industry. He can be reached at 818-753-9510.

Fostex D-10 Studio DAT

► continued from page 19

two D-10s into a simple assembly editor where the recording D-10 uses the punch-in/punch-out features to instant-start the playback D-10 via the GPI control. The user can operate two D-10s via the two-channel wireless remote control by switching between the "A" and "B" channels. The setup mode selects which wireless channel the D-10 will recognize.

An inexpensive digital editing system could consist of a couple external digital sync signals—such as 44.056 kHz—into the D-10's AES/EBU input, or combine an event controller and house sync plus a VTR, plus a mixer plus several D-10's into a multitrack, "multitrack" device.

Sound quality

In an informal subjective listening impression of an early production sample, I played a theme music tape on a D-10 and on a Sony 7010. Audio was patched through a Ward Beck Console and monitored on Genelec speakers. To my ears, the D-10 playback sounded just a tiny bit harsh at higher frequencies and on complex musical waveforms, but

overall quality was very good.

I then compared RAM scrub playback by loading a point into instant-start and slowly turning the jog/shuttle wheel. The D-10 RAM scrub is somewhat jittery and the sound at low jog speeds has annoying PCM sampling hash. The user may have to listen carefully and scrub several times to ensure that the desired audio point is properly marked.

Looking to the future, it appears that Fostex will manufacture a SMPTE timecode module to fit into one of the two empty option panels at the back of the D-10. It is my hope

that Fostex will introduce modules with varied features to allow users to match more applications to the machine.

Overall, the D-10 is a reasonably priced recorder intended for applications that require more than the basic DAT functions. It would be a decent addition to small digital workstations and home audio production shops and a useful lowcost tool for the audio professional, including broadcasters.

□□□

Rich Rarey is a contributing writer to RW and technical director for National Public Radio's Weekend Edition.

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Digital Designs' Nearfield Monitors

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high end to your taste by adjusting the angle of the cabinets. (By the way, this point needs more emphasis in the user manual, because it can change your whole impression of the speakers.)

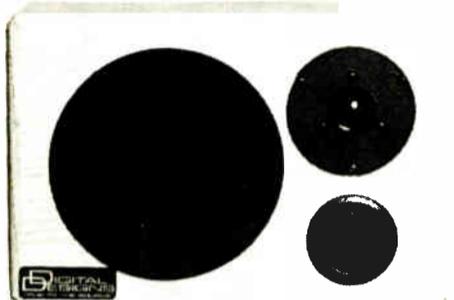
When listening to the DD161b, I adjusted the speakers' tone controls to my preference: 0 for the midrange and +3 for the tweeter. Here are my impressions with a variety of CDs and my master tapes. These opinions reflect my own taste and bias, and are not an endorsement or critique by RW:

CD No. 1—"Time On My Hands," John Scofield, Blue Note CDP 792894 (jazz quartet)

DD161b: Clean, crisp cymbals! Sweet and delicate. In this respect, the DD161 reminds me of the Tannoy System 6. Imaging is quite sharp, even with the speakers not toed in. Bass is full and warm, but tight. The snare sounds slightly too mid-bassy or "tubby." The sax has just a little breath or edge.

M6: The low end is the same, but there's more hard edge to the sax. Cymbals are not as sweet; they sound like cheaper metal!

CD No. 2—"Secret Story," Pat Metheny, Geffen GEFD-2446 (world music)



Digital Designs' DD161b

DD161b: A warm, smooth sound. The percussion and acoustic guitar are clear. The highs go way out! It's a good tonal balance, not harsh, easy to live with.

M6: This mellow recording sounds great on the M6. Quite lively.

CD No. 3—"Unplugged," Paul McCartney, Capitol CDP 796413

(acoustic pop)

DD161b: The guitars are almost too bright. Guitar plucks are clearly delineated. It's easy to hear the floor monitor speakers in the vocal mics.

M6: Sibilants are harsh and fatiguing. Not as pretty sound.

CDs No. 4 and 5—"Second Stage," Delos D/CD 3504; "The Firebird," Stravinsky, Telarc CD-80039 (classical)

DD161b: In the beginning of "The Firebird," you can hear some of the very deep bass-drum roll. Instrument timbres are full and gentle. You can hear key presses on the woodwinds, but the sound is not artificially etched. It's transparent and open.

M6: Not as smooth as real instruments. Timbres are given a harder character.



Digital Designs' M6

CD No. 6—"Kamakiriad," Donald Fagen, Reprise Records 945230-2. (pop)

DD161b: Incredibly tight bass, kick and snare—absolutely no boom. There's

great transient impact and plenty of dynamics. The vocal is "sizzly" and just a little "tubby."

M6: The sound is more forward and slightly harsh.

I also tried the monitors using master tapes mixes of various recorded materials. The listening impressions were as follows:

DD161b: The tonal balance is a little puffy; there's some midbass boost and upper mid loss.

M6: The mix holds up well on these speakers. Bass notes are clearly defined, but the snare and piano are slightly "tubby." Deep bass notes are thin, but there's good presence on all the instruments.

Measurements

I measured the anechoic frequency response of the DD161b and M6, respectively, at 1 meter. I measured the response from 333 Hz up to exclude room reflections. The response below 333 Hz is approximate. It's non-anechoic and smoothed to reduce the effect of standing waves. I left in the foam plug, measured 15 degrees off axis and set the DD161b midrange control to 0 and the tweeter control to +3. These settings gave the flattest response.

Neglecting the narrow dip at 11 kHz, the DD161b response is 55 Hz to 18 kHz (-3 dB). This uniform response explains the good tonal balance of the DD161b. The M6 measure 50 Hz to 20 kHz (-5 dB), with a narrow 6 dB peak at 4 kHz. This peak gives the M6 its forward, sometimes harsh character, and it emphasizes percussive attacks and sibilance.

The group delay of both speakers is extremely low: under 0.3 milliseconds from 300 Hz to 20 kHz. This is excellent time performance, and it accounts for the first-rate transient response.

Summary

The Digital Designs DD161b delighted me with its excellent tonal balance. The highs (cymbals, guitar strums), are transparent, sweet and smooth. Bass is full and warm for such a small speaker and is very tight. There's not a trace of boominess, although the 200 Hz area has a slight peak.

The deep bass is thin, as you'd expect with a speaker this small. But you don't miss it. Another plus is that the stereo imaging is sharply focused. Transient response is excellent in all frequency ranges. The DD161b is superb in its clarity and detail and in its reproduction of dynamics.

At \$218 per pair, the Digital Designs' M6 offers a lot of bang for the buck. It features the same full and tight bass, sharp transients and clear imaging as the DD161b. But its upper midrange around 4 kHz is enhanced, giving a forward, sometimes harsher sound with sharper attacks. For its bargain price (remember it is from Digital Design's consumer line), however, it's a good, sturdy performer which can handle the needs of many studios.

Digital Design's address is 100 N. Quapah, Suite K, Oklahoma City, OK 73107. For more information, contact the company at 405-946-4500, or circle Reader Service 101.

□ □ □

Bruce Bartlett is a recording engineer, technical writer and freelance contributor to RW. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.

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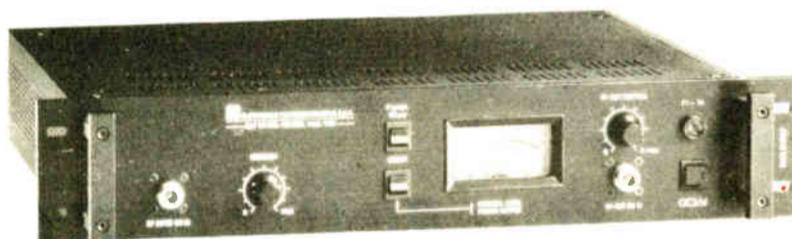
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TECH TALK

Laying Down Audio Tracks by Phone

by Judith Gross

NEW YORK From the controversy raging over digital data compression, you would think it was a technique only to be embraced in cases of dire necessity.

Based on the debate on the subject at the recent Radio Show (see **RW** Oct. 27, *Tech Talk*), I was sure the battle lines were neatly drawn. In one corner stood the expedient realists, with their view that data compression is an unavoidable economic reality in a world where audio (and video) are rapidly becoming digitized.

In the other corner were the audio purists: the recording artists, producers and other defenders of the integrity of analog sound quality for the sake of its artistic purity.

Broadcasters may be forced to rely on digital compression (reduction) schemes to transmit audio from one corner of the world to the other. But the producers of recorded audio, it is logical to assume, have sufficient time and budgets to insure that their pristine waves of audio never come close to the bit-snipping techniques of digital STLs, disk storage systems and, eventually, digital audio broadcasting.

This assumption came tumbling down during the recent Audio Engineering Society (AES) Show held here in early October.

Think again

The place was the Hit Factory. The producer was Phil Ramone, who has been the critical ears behind many a big-name recording. The occasion was a demo of technology already finding its way into major audio recording, video and film houses—the transmission of audio in real time through phone lines via a digitally compressed network.

In this case, the connection folks, were E.D. Net—Entertainment Digital Network, a small business which grew out of LucasArts' Skywalker Sound. E.D. Net started as a way of sending audio being recorded for films between Skywalker's two facilities in Northern and Southern California. Now it's a separate company operating in 60 locations worldwide (27 U.S. cities), moving audio point-to-point for music, film and video recording.

E.D. Net's product is its network and connection time. Its DMS (digital multi-channel system) provides from two to six channels of bi-directional audio, with or without synchronization, over T1 (fiber optic) phone lines using Dolby AC² digital data compression. Its DPS (digital patch system) supplies links via Switched 56 and ISDN phone services using Corporate Computer System's MUSICAM digital data compression.

Clients buy or lease the necessary equipment to hook into the network, for network connection and for connection time when they use the network.

Three places at once

The studio in the Hit Factory demo was already hooked into E.D. Net's network, as are other big-name studios such as Capitol Studios in Hollywood, Howard Schwartz Recording in New York and Crescent Moon Studios in Miami, where Gloria Estefan records.

Ramone was putting the finishing touches on Estefan's Christmas album. He

already had a master track with music, Estefan's vocals and a children's chorus as back-up vocals. Now he needed a back-up track from a vocalist at Crescent Moon and a solo from a featured saxophonist in Los Angeles.

Each of these two was sent a guide track of what was already recorded over two of E.D. Net's T1 channels using Dolby AC² at 256 kilobits per second (kbps) for dual mono. This was synched via timecode between the studios using a third channel. A fourth channel was for talkback between Ramone and the artist.

Using the guide track she had been sent, the vocalist from Miami sang her part over the network, which was laid down to digital multitrack at the Hit Factory. The same procedure was then repeated from Los Angeles with the saxophonist. Although it was compressed audio, the sound quality was phenomenal in both cases—at least, it was good enough for Ramone's critical ears.

"From a musical viewpoint, the quality is there," Ramone said following the demo. In fact, the quality and the interactive nature of the process, with Ramone

talking back and forth, encouraging the artists and asking for additional takes with slightly different nuances, gave the group gathered for the demo the eerie feeling the artists actually were in the next room and not 2,000 and 3,000 miles away. I found myself glancing at the mics on the other side of the glass booth just to make sure no one was there.

Ramone recorded the two artists in a roomful of reporters and other interested audio pros because he believes strongly in the technology. He had used it before, to record vocalists such as Barbra Streisand, Aretha Franklin, Tony Bennett and others in duets with Frank Sinatra, for a newly released CD called "Duets." None of the artists had actually recorded in the same room with Old Blue Eyes and most, not

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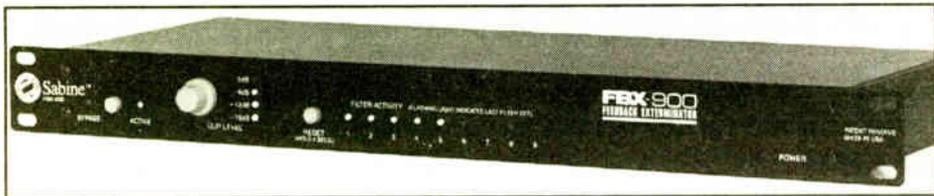
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PRODUCT GUIDE

Companies with new product announcements for Studio Sessions Product Guide should send them to Radio World, c/o Studio Sessions Editor, 5827 Columbia Pike, Suite 310, Falls Church, Va. 22041



Sabine FBX-900 Feedback Eliminator

Using the digital signal processing, the Sabine FBX-900 can automatically detect and eliminate feedback. The unit quickly (and inaudibly, the company claims) eliminates the feedback by assigning one of nine very narrow one-tenth octave adaptive digital notch filters.

Intended use is radio production, TV production and live music settings. For information, contact Sabine at 904-371-3829; or circle **Reader Service 196**.

Apogee Wyde Eye Digital Audio Cable

Apogee Electronics has introduced a high quality digital audio cable said to reduce the audible effects of "jitter."

The Wyde Eye cable is designed within strict parameters with high quality raw material to ensure optimum performance, according to the company. The A-11 (AES/EBU version) has color-coded pins to ensure correct wiring.

For information, contact Angie Orduno at Apogee, 310-314-1700; or circle **Reader Service 148**.

Studer Dyaxis II With MultiDesk

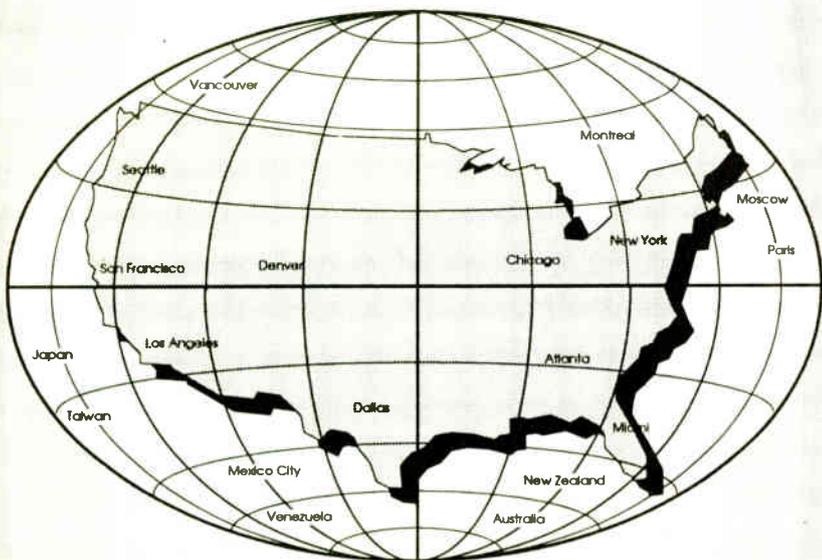
Studer Editech Corp. has added the advanced control MultiDesk option to the Dyaxis II digital audio work station.

According to Studer, the MultiDesk feature improves speed, accuracy and ease of use of the Dyaxis II. Automation control includes level, pan, mutes, and DSP functions. Also included are 100mm moving faders from Uptown Automation, a jog wheel and the ability to automate up to six Dyaxis II processors.

For information, contact Studer at 415-326-7030; or circle **Reader Service 51**.

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Audio Tracks by Phone

► continued from page 25
even in the same city.

E.D. Net's service has been used to dub vocals for movies, where an actor has left the set to begin a shoot somewhere else. This happened with "Searching For Bobby Fisher," "Toys" and other films. Stephen Bochco has used the service to complete the audio work on "NYPD Blue" with its hectic production schedule. Agencies have used it to get client approval of spots.

Time and cost benefits

Let's you think this is all technology for technology's sake, there are some real-world considerations driving this new technique. The first, of course, is cost. The recording industry, in recent years, has seen the same belt-tightening evident in other entertainment industries. Linking up a network can save dollars.

Four channels of E.D. Net's DMS bi-directional audio with synchronization between locations runs about \$175 an hour. The connection runs anywhere from \$350 to \$900 (depending on location) and the equipment costs \$9,500 to \$16,000 outright or available on a 36 month leasing program.

Compare this with hundreds of thousands of dollars to fly several big-name artists from city to city and put them up in expensive hotels each time a recording has to be made. Even the producer's time to go to a particular studio can be expensive. Ramone has an E.D. Net link up to his home.

But time is an even greater factor. How do you finish tracks on an album with a vocalist on tour? Get approval from a director or ad agency on the other coast? Re-record the speaking part of a film actor

halfway around the globe?

In addition to cost and time, factor in the physical toll extensive travel takes on recording artists and performers (like 77-year old Sinatra, or Estefan, who had to undergo extensive physical therapy after her accident a few years ago), and the idea of "virtual ubiquity"—E.D. Net's slogan, begins to sound mighty attractive.

Arguments put to rest?

What the Hit Factory/Phil Ramone demo proved to me, however, is that the use of data compressed audio is becoming acceptable even to quality-conscious audio producers. This may be a scary notion to some audiophiles. It's important to note that in most cases, there is never a need to go beyond one pass-through of compression.

I understand there has been one case recently, where the compressed track was sent through a different algorithm for some additional mixes. Now the whole recording is being mastered to DCC tape, and the producers are all ears to insure there is no degradation to the quality.

And yes, some of the compressed audio may eventually become a DCC or MiniDisc and go through another generation of compression. But at 256 kbps for dual mono, even the golden ears seem to be satisfied—at least some of them.

It may be time to face the notion that in the world of audio, it seems a fair bet that digital data compression is here to stay.

□ □ □

Judith Gross is VP/Head Copywriter for Media/Scan, an advertising and marketing agency specializing in broadcast and pro audio technology. She can be reached at 212-929-6108.

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Denon Professional Test CDs

Denon has introduced what it calls the industry's most comprehensive audio test CDs.

Disc 1 tests include frequency response, phase, level, log sweep, de-emphasis accuracy, audibility of distortion, linearity, and signal-to-noise of D/A converters. Others tests include wow/flutter,

level, head azimuth, bias and equalization for open reel and cassettes.

Disc 2 and 3 cover microphone and room acoustics tests as well as reference recordings that can be used to compare room acoustics and equipment. The Denon Test CDs are priced at \$150.

For information, contact Mike Stelts at Denon, 201-882-7460; or circle **Reader Service 84**.



MicroSound Digital Audio Workstation System

The MicroSound Digital Audio Work Stations, from Micro Technology, have offered an affordable, easy-to-use hardware/software system for several years.

The new Windows-based MicroEditor 2.3 software upgrade now features the ability to overlap, mix and play up to 50 stereo segments at any point without bouncing. The new upgrade also allows up to 2,900 stereo segments to be imported into a mix.

MicroSound systems can be configured from your own computer or Micro Technology can provide an entire workstation.

For information, contact David Cox at 919-870-0344; or circle **Reader Service 33**.

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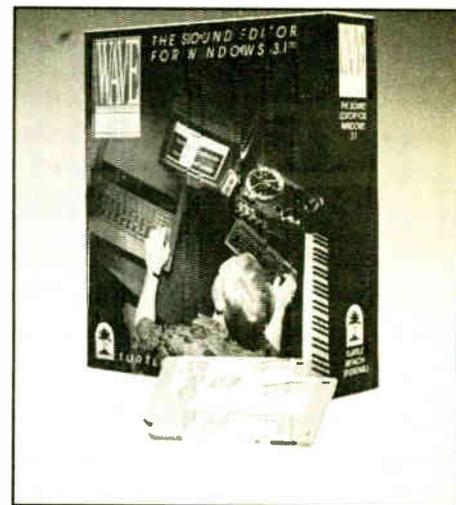
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Turtle Beach Systems' Wave 2.0 professional sound editing software works with any Windows 3.1 compatible computer and soundcard.

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For information, contact Jeff Klinedinst at Turtle Beach Systems, 717-843-6916; or circle **Reader Service 182**.



**Shure FP22 Portable
Stereo Headphone Amp**



Shure's new FP22 Stereo+1 headphone amplifier is an improved version of the FP12 mono unit.

The FP22 provides quarter-inch or 3.5mm headphone feeds from any type of audio input. The FP22 also can mix a line or mic level mono signal via XLR input with a stereo signal via quarter-inch input. Features include 81 dB gain, stereo input pad, mono/stereo switch and balance. It can be powered by an internal 9-volt or external DC power.

For information, contact Shure at 800-25-SHURE; or circle **Reader Service 140**.

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AES CONVENTION

COVERAGE

Digital Advances Demonstrated at AES

by Ty Ford

NEW YORK Open Media Framework (OMF), MediaLink, MediaNet and Super Bit Mapping (SBM) were four of the "hot phrases" caroming off the walls of New York's Jacob K. Javitz Center during the 1993 Audio Engineer Society (AES) convention. If you haven't run into them yet,

here's what they mean.

Avid's Fady Lamaa explained that OMF is a file format for the interchange of digital audio, video, animation and graphics files among applications and platforms. Included in the format is the data as well as the composition information and what sources the media came from. It's a file format, not a transfer protocol.

Products such as Media Composer and AudioVision from Avid, and Alias, a high-end animation software maker, are already using the OMF format. According to Avid, other current OMF participants include Blue Ribbon Soundworks, Dawn/Doremi Labs, Digidesign, Merging Technologies, Sonic Solutions and Studer Editech.

Whether OMF will prove its value or become a casualty of competition remains to be seen, but it's a nice idea.

A digital network

According to Sonic Solutions' Tom Bennett, MediaNet is a network for the transfer of digital audio, digital video, pre-press publishing, animation and graphics. The data transport technology uses a NuBus card with its own 68030 processor, SCSI control and up to 16 MB of DRAM combined with its own file system. It bypasses, but is compatible with AppleTalk and Apple Share.

The file system handles larger files and

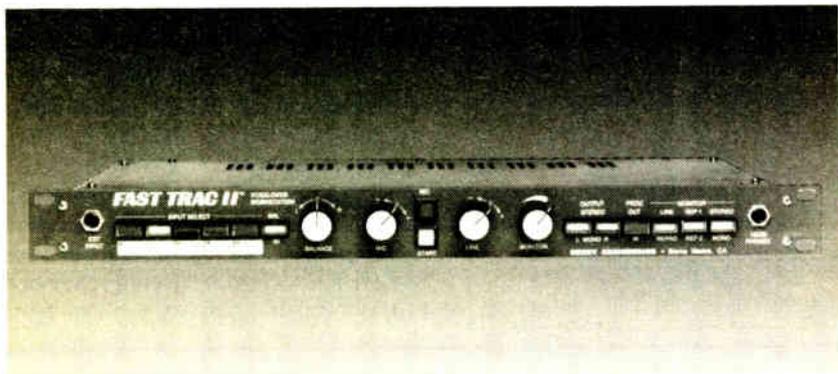
Solutions' Andy Moorer said.

One of the most interesting applications that combined the power of a computer with an audio system was Peavey's Mediamation Control system topology software. According to the presentation, Mediamation was developed with cooperation from the IBM PC group and was running on an IBM PC 486 DX2 with Windows 3.1 and a 12-inch high rack-mounted unit. This is a software-based system that replicates a sound system. It does away with racks of hardware and connecting cables.

First you select a mixer (1x1 to 24x24), EQ, limiters, compressors, gates, duckers, meters, DAs, test signals and a host of other modules from the pull-down menus and place them on the computer screen. Then you connect them by dragging connections from one module to the other with the mouse. You're not just configuring pictures on a screen here, you're actually making connections.

Peavey's Mediamation

The system is designed to take analog via 8x8 breakout boxes with A/D conver-



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Fast Trac II by Henry Engineering is an incredibly useful audio management system that has numerous applications in radio and television audio.

Fast Trac II functions as a stereo switcher, audio mixer, utility dubbing center, voice-over recording system, compact production facility, or as the "control head" of a multi-track digital editing workstation.

Fast Trac II incorporates all of the functions of a typical audio mixing console: input selection, level and balance control, mic-over-line mixing, and complete monitoring. Additional

features make Fast Trac II perfect for specialized broadcast production tasks. Automatic "ducking" permits efficient voice-over recording. The timed auto-start Machine Control System for source and recording equipment creates perfectly cued dubs reliably with one button ease.

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"Send me literature." Circle (73)



Record crowds saw the latest production equipment at the 1993 AES Convention.

continuous data streams and graphics. Bennett also confirmed that MediaNet was compatible with OMF.

MediaLink, from Lone Wolf, is a networking protocol for the transport of control, status monitoring and MIDI data at a rate of 125 kbps. To date, twenty-seven manufacturer licensees include: Altec Lansing, Asymetrix, Atlantis Electro-Optical, Audio Digital, Audio Logic, Carver, Crown, DDA, Dynacord, Electro-Voice, Fender, Harman Industries, JBL, Klark-Teknik, Light Shadow Dancer, Mark IV Pro Audio, Midas, QSC Audio, Rane, SeaLan Systems, Soundcraft, StarWave, TOA, University Sound, UREI, Vega and Z Systems.

Super Bit Mapping (SBM) is an algorithm that uses a filtering technique to change the shape of the spectrum to move noise to a region where our ears are not as sensitive to it, between 15 kHz and 22.050 kHz. For 20-bit recorders, like the Sony 3402, the Sonic Solutions system or the 18-bit Nagra D, SBM is seen as a way to improve the sound of 20-bit digital audio when it is reshaped to fit onto a standard 16-bit CD.

At present, Sony sells the only SBM hardware. Sonic Solutions offers SBM as a software option for its system, Sonic

sion or digital audio from any input source to the point of input to power amplifiers. You are limited only by the number of card slots in a PC chassis.

Breakout boxes convert analog to digital using 18-bit delta sigma A/D converters. Digital I/Os and internal through-put are to be 24 bit. Devices can be linked for stereo or group operation. User placeable "audio present" lights on the inputs and outputs of each block allow for quick identification of setting problems within a module.

Hardware/software

Peavey's ultimate goal is to turn hardware into software. To provide user interface that's quick and easy. They expect to provide four different kinds of operator controls: a dedicated control panel using VCA devices; a smaller fader bank and some buttons; keyboard and mouse and touch screen.

Peavey also is planing to incorporate MIDI Show Control capabilities. Digital through-put was quoted as less than 10 milliseconds with continuous monitoring of the signal path to maintain time alignment.

According to Peavey, the U.S. Senate continued on page 31 ►

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Most importantly, both the DN-961FA Drawer Loading model and the DN-951FA are from Denon, who for 83 years has been serving the needs of audio professionals and for 21 years has been advancing the art of digital audio.



DN-951FA CD CART PLAYER



DN-961FA DRAWER LOADING CD PLAYER



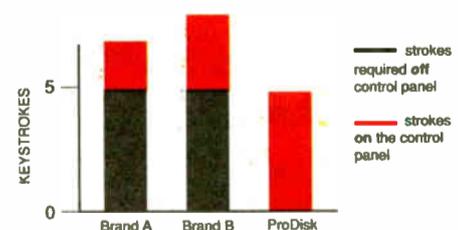
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Otari's ProDisk 464 is fast and easy to use. Here's proof: To record a file and trim head and tail, it requires fewer total keystrokes. Even more significantly, ProDisk lets you work totally on the control panel while its two competitors force you to supplement with either keyboard or mouse.

*Comparison of many other functions show similar keystroke savings.

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Companies Show New, Improved Products

by Ty Ford

NEW YORK There were lots of new products and lots of people to see them at this year's AES show.

Although I was temporarily distracted by bumping into recording artists Lou Reed and Laurie Anderson, I quickly found the Eventide booth and downed one of their larger-than-life chocolate bars. As I waited for the sugar rush, I got the run-down on the Ultra-Harmonizer DSP 4000 (\$5,000).

The A/D-D/A converters are 18-bit, AES/EBU I/Os are 24-bit and the internal processing is 56-bit. Sample rates are 32 kHz, 44.056 kHz, 44.1 kHz and 48 kHz. A major step forward in effects processing, Eventide's use of a simplified graphic algorithm construction kit allows you to choose up to forty of the ninety-some effects modules to create

your own monster or masterpiece. There are eighteen banks of factory programs to get you started.

A must-have

Reverbs, delays, EQ, crossfades between programs, you can even take your creations with you to another DSP 4000 via front-panel removable memory cards. If I were stranded on a desert island with a keyboard, a mic and a digital multi-track machine, I'd have to have a DSP 4000.

Panasonic's new SV-3800 DAT recorder was another interesting product. Although no price has been set, look for it to be priced at \$2,800, depending on the Yen. Audio-wise, the SV 3800 resembles the 3700 and 3900 with several important distinctions: instant start, synchronization to external video and word clock, programmable digital output level from 0 to -6 dB of attenuation and absolute time search.

Night Technologies International showed a fixed-frequency, fixed-Q, six band analog equalizer called the EQ-3 (\$4,300), that claims a worst possible case phase shift of only 20 degrees. Because the patents are still pending, no one at the booth was willing to divulge the technology used in the equalizer's design—except to say that the circuit contained a chip used by Novell, and that principles of psychoacoustics are used.

No EQ phase shift

In a quick listening test, the EQ-3 exhibited little if any phase shift even when adjacent bands were adjusted to alternately boost and cut the fullest possible amount. If you've become tired of the "phasey" sound of your present EQ, the EQ-3 is worth a listen.

G Prime showed the EMT 248 digital audio processor, tagged "The Professional Audio Toolbox." It offers high-quality 44.1 kHz or 48 kHz two-channel processing at a premium price; \$7,000 for the basic unit with reverb, delay and stereo effects.

The unit has analog and digital I/Os and digital clock I/Os. The analog inputs are 16-bit 64x oversampling, the outputs 4x oversampling. The digital input is AES or SPDIF with AES outputs only. Internal processing is listed as 32 bits floating point at 50 MHz. Optional plug-in modules include: adaptive real-time noise filters; parametric, adaptive and fixed notch EQs; compressor, expander, limiter, de-esser and noise gate. Other options include a production interface with time code, MIDI In/Out/Thru and serial port.

Award winners

t.c. electronics of Denmark, which impressed me years ago with the award-winning TC2290 delay/effects/sampler, brought its M5000 digital audio mainframe. The M5000 has four module slots into which you can place a mixture of analog or digital modules. At present, you can configure the unit with up to eight channels of digital processing with four independent AES/EBU, SPDIF and optical I/Os.

Settings and programs can be stored on 1.44 MB removable disks or on PCM-CIA memory cards. The standard disk drive allows you to backup your data on your PC or Mac as well as receive free updates by mail or modem and burn them into the unit's memory without

removing the unit from its rack.

The main rack features continuous MIDI control of all parameters via In/Out/Thru ports, SMPTE input for cue list management, a DIN plug for remote operation, a programmable pedal switch socket and options for a 2.5 Mbps ARCNET type port for data exchange between a PC and one or more M5000.

There is also an optional SCSI port for data exchange between the M5000 and

C414B/TLII (\$1,499). The C3000 offers both cardioid and hypercardioid patterns, -10 dB pad and a -10 dB/octave bass roll off at 100 Hz. The C414B/TLII, is a four-pattern model based on a recreated version of the 1-inch dual diaphragm C12 capsule from the 1950s.

Incorporated are -10 and -20 dB pads and 12 dB/octave roll offs at 75 Hz and 150 Hz.

DATEQ Audio Technologies of Al-

mere-Haven, Holland, debuted the BCS 50 broadcast console (\$8,000 for 10 channels with hybrid), a smaller version of the BCS 100 and 200. The BCS 50 is a modular VCA mixer that houses a maximum of 16-input channels. There are five types of input channels: mono, with or without EQ;

stereo with or without EQ; and a phone hybrid channel.

Also high on the list of recommendables from AES were the following: Soundcraft DC 2000 digital console, the Lexicon 20/20 AD converter, Digidesign's DINR Intelligent Noise Reduction Software, Sony's C-800/C-800G tube microphones, Genelec's 1038A studio monitors, the Kurzweil K2000RS sampler and Digidesign's Session-8 XL workstation.



DATEQ BCS 50 Console

Macintosh, optical and hard drives. A/D-D/A conversion is 18-bit delta sigma, 64x oversampling while output is 20-bit 8x oversampling. Stereo/two channel analog versions start at \$4,491, quad stereo digital versions list at \$7,566.

Eyeging microphones

Two AKG condenser mics caught my ear; the new C3000 (\$699) dual pattern large and micro diaphragm and the

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Digital Advances

► continued from page 28

will be the recipient of the first installation, scheduled for completion in March 1994. The work will be done by David Carroll Electronics of Berkeley, Calif., and is expected to be completed by early next year. Although the Peavey folks had to reboot the system once during the demo, they were able to pass audio from a DAT, change its gain and apply EQ. The price of any or all of the system was not revealed.

Fostex showed its Foundation 2000, a \$25,000 multitasking, dedicated digital recorder/editor/mixer workstation now in the "beta" test phase. The fully proprietary system offers signal processing, subframe accuracy, sample transfer and digital audio routing. The product is expected to ship by the end of the year.

Projects are recorded onto removable project environment (RPE) cartridges that store both data and audio. As such, an RPE can be removed from one system and plugged into another system in a different location with all audio and data intact. A 540 MB RPE holds 90 minutes of mono, 45 minutes of stereo or up to 12.5 minutes of eight-track recording and costs \$1,100. A 1.3 GB will soon be available, no price on that yet.

The unit has a capacity of 18 analog inputs and 20 outputs, and a digital capacity of two inputs and two outputs. Each unit is capable of recording, playing and mixing 16 simultaneous real-time audio channels. Multiple units can be cascaded for up to 96 channels. The edit controller provides transport controls via 9-pin RS 422, with hard keys, a touch screen display, mix screen, metering screen and reels screen for project management. Each project can have up to six reels.

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SIGNAL-TO-NOISE

Browsing the Bargain Bin at '93 AES

by Frank Beacham

NEW YORK I am always on the prowl for the cheap, affordable audio gear (or relatively cheap, anyway), and at this year's AES, I felt like a kid in a great big toy store.

For you portable DAT recordists, it's a banner year. Big news on two portables, one approaching affordable and one approaching perfection.

HHB, the London-based independent supplier of digital recording technology, broke new ground in the professional portable DAT price and performance race by announcing a four-head, four-motor portable that allows off-tape monitoring for well under five grand. This dream machine is called the PortaDat PDR-1000.

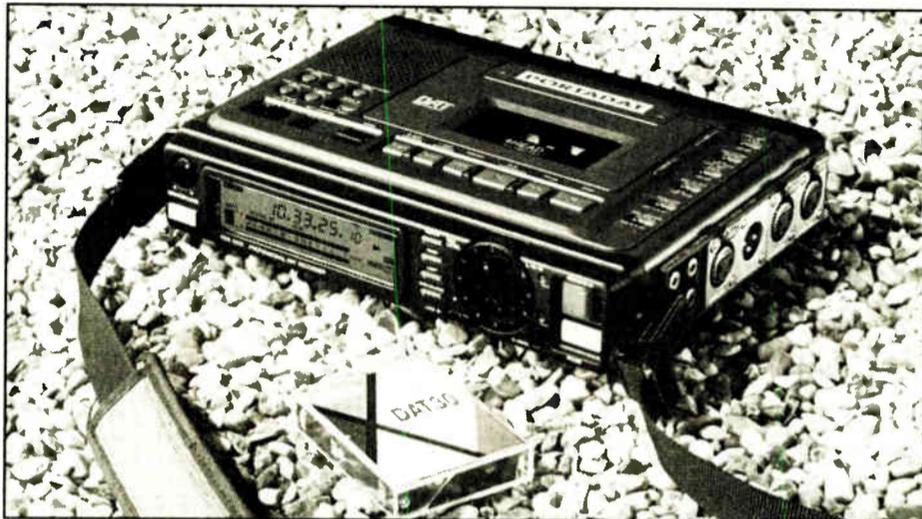
Jammed packed with features in a case that bears a striking resemblance to the Sony D-10 series, the PortaDat also has selectable sampling rates, balanced XLR mic/line inputs with 48 V phantom power and AES/EBU/SPDIF digital I/Os.

Better batteries

There's also relief from those unreliable nicads that have plagued DAT recordists for years. The PortaDat uses nickel metal hydride rechargeable battery technology. HHB claims a consistent two-hour bat-

tery life and vastly easier and improved charging.

The PortaDat is based on a Sony-manufactured DAT transport used for professional data recording, but otherwise it is a new design from the ground up, said HHB's Steve Angel. Although our



PortaDat PDR1000 Professional DAT Recorder

sources say the PortaDat is being built by Aiwa for HHB, Angel declined to reveal the name of the manufacturer that is making the PortaDat for his company.

Exact list price on the PortaDat is \$4,375. Also coming is a time code ver-

sion of the PortaDat, priced at \$6,995 list. Both machines will be available in January.

In other big DAT news, the elegant but troubled Stelladat appears to be poised for re-entry into the marketplace after an ill-fated debut earlier this year. After

Sonosax promises major improvements in the new Stelladat and took the unusual step of publishing a report outlining all the flaws in the original machine and how they will be dealt with.

Power consumption, a major problem with the initial version, has been reduced by 50 percent to 17 watts through re-design of the power supplies, according to the company. The analog audio path and mixer module is also being completely redesigned to higher standards.

Stelladat resurrected

By the time you read this, Sonosax promises beta test machines will be in the field and initial deliveries are scheduled for the first quarter of the new year. Price will range, depending on options, from \$12,000 to \$15,000.

Here's another "Scoopman" scoop. Word is that Sony is about to release a successor to the micro-sized NT-1 digital recorder. Rumors are that the new NT-2 will have digital I/O, solenoid controls, and two modes of recording (most enticing): one at standard speed and another double speed that allows it to record at 44.1 kHz, the sampling rate of compact discs. If the two-speed capability proves true and with no data reduction, this may re-position the Scoopman as the thinking man's digital Walkman. Watch out MD!

And speaking of MD (MiniDisc), Sony is taking a lot of heat these days about

continued on page 34 ►

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PRODUCT GUIDE

Tektronix AM 700 Audio Measurement Systems

Long known as a video test and measurement instrument company, Tektronix will soon introduce a new line of audio measurement products, including the comprehensive AM700.

The AM700 is a portable, self contained test and measurement instrument comprising analog/digital generators, acquisition unity, internal CPU, DSP and VGA display. The AM700 will be available in early 1994.

For information, contact Tektronix at 503-627-1555; or circle Reader Service 65.

Sonic Solutions Quattro

Sonic Solutions Quattro offers radio production engineers four track and larger audio editing capability using the Macintosh Quadra. Features include: real time playback, up to 24 track capability by adding extra modules, 16-bit to 24-bit editing and mixing, background loading/unloading, and multistation link via SonicNet. The Expanded Quattro system adds machine control, TimeTwist, and optional A/D and D/A converters.

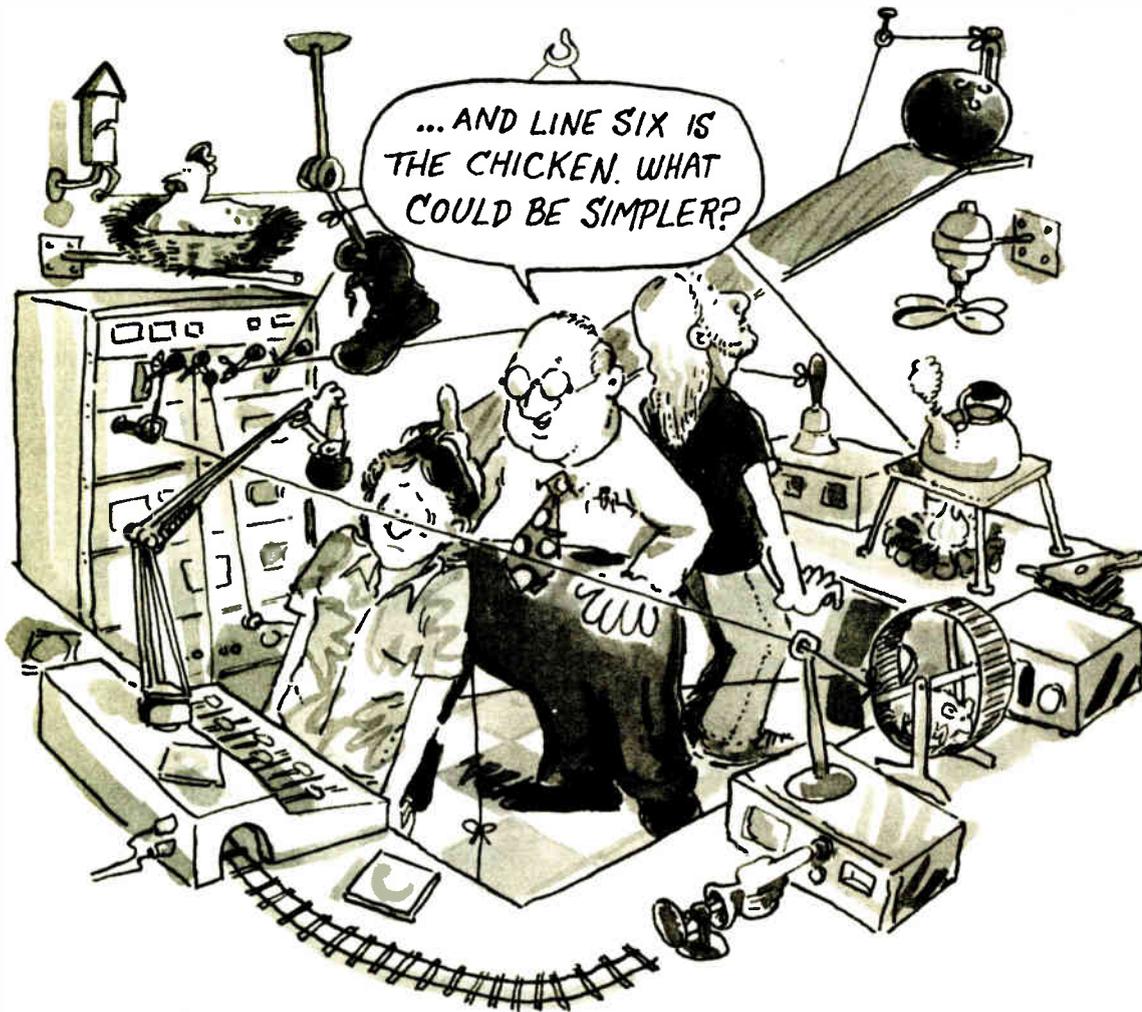
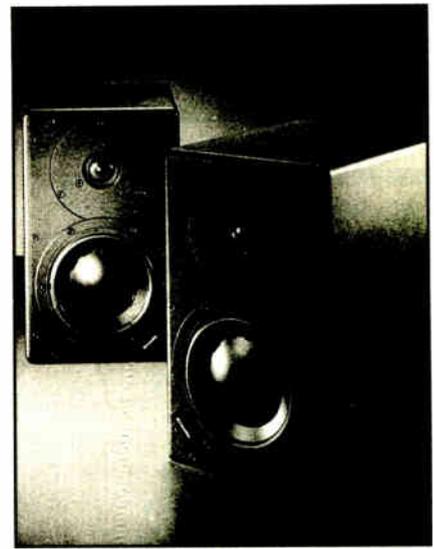
For information, contact Sonic Solutions at 415-485-4800; or circle Reader Service 157.

Dynaudio PPM1 Nearfield Monitor

Designed for radio broadcast and production room use, the Dynaudio PPM1 miniature monitors offer the performance of speakers twice their size, according to the company.

The 4ohm speaker measures 10.8 inches high, 6.7 inches wide and 9.1 inches deep and features rear port for extended bass. Frequency response is rated at 50hz to 20kHz, plus or minus 2dB. Power handling is listed at 120 watts continuous, up to 1kW peaks.

For information, contact Dynaudio Acoustics in London, England, +44-71-379-7600; or circle Reader Service 208.



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World Radio History

Bargain Bin Shopping at The 1993 AES

► continued from page 33

using data reduction on the professional MD cart machine being marketed to radio stations.

Compression dilemma?

Not just from customers, but from other manufacturers adopting the format into their own professional products. Though Sony is still officially "studying the matter," we are told it is not so simple to turn off the data reduction circuitry on these pro MD machines. First, there's the political issue of changing the MD format, which has been formally standardized; and second, there are the economic issues of redesigning the basic MD chip set that includes the data reduction circuitry.

Our sources say the economy of using the consumer chip set in the pro cart machine is what makes it affordable to manufacture in the first place. Creating a new set of integrated circuits especially for the pro machine might send the cost of MD cart through the sky.

We haven't heard the last word on MD compression for radio stations yet. Stay tuned for more from Sony on the subject in the near future.

Finally, one more new audio tool to check out. The Fostex 380S Multitracker. It uses Dolby S noise reduction to produce four channels of super clean audio on standard analog cassettes running at double speed. It also has XLR mic inputs, sweep EQ in the midrange and a lot of advanced features packed into the 12 input mixer. List price is \$995.

These self-contained cassette-based post production systems (also from Tascam, Marantz and others) get better every year and offer incredible bang for the buck. If you're on a tight budget, you don't have to go digital. With a little patience and care, you can produce about anything of professional quality on one of these post systems in a box.

□ □ □

Frank Beacham is a writer, director, producer and consultant. His address is 163 Amsterdam Ave. #361, New York, NY 10023.



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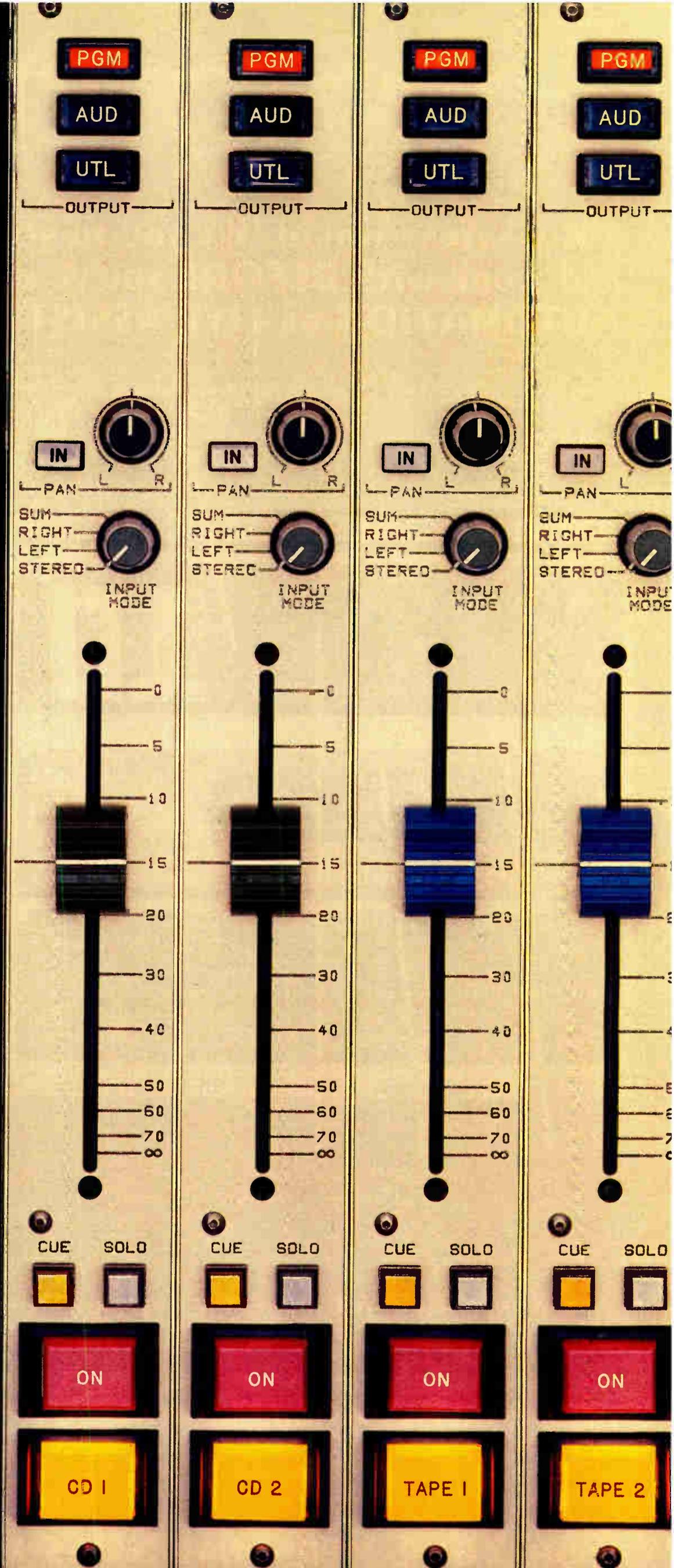
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ON THE AIR 0:05 PEG STEELY DAN Time: 3:28 Intro:15 End:F	10	System AUTO-SEGUE LOADING:3 LOGGING:ON TIME UPDATE
> NEXT TO AIR ONE MOMENT IN TIME HOUSTON WHITNEY Time: 4:11 Intro:14 End:C	CD JUKEBOX #3 Slot:36 Cut:14 CD ID:160 Sked at:09:55A Sked on:07/28	
NEXT TO FOLLOW LEGAL AD DIGITAL AUDIO Time: 5:10 Intro:00 End:C	DIGITAL AUDIO Spot:5013 Sked at:10:00A Sked on:07/28	

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- F2** Manual
- F3** View Events
- F4** Edit Events

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The screenshot shows the following interface elements:

- Top Bar:** T M C I 9:22 AM ULTIMATE DIGITAL STUDIO Wednesday 07/28/93
- ON THE AIR 1:59:**
 - SURFER GIRL (CD JUKEBOX #3, Slot:28 Cut:01)
 - BEACH BOYS (CD ID:307, Sked at:09:21A, Sked on:07/28)
 - Time: 0:22 Intro:14 End:F
- READY TO AIR:**
 - HORMEL_3 (DIGITAL AUDIO, Mode:STEREO)
 - COMMERCIAL_1 (HDSK, Spot:7012, Sked at:09:23A)
 - Time: 0:30
- NEXT T:**
 - KXAS_TV5_2
 - COMMERCIAL_1
 - Time: 0:30
- VIEW EVENTS ESC to Exit:**

9:14 AM	3	YOUR WILDEST DREAMS	MOODY BLUES
9:18 AM	3	JUST A SONG BEFORE I GO	CROSBY, STILLS & NAS
ON AIR		SURFER GIRL	BEACH BOYS
09:23 AM	:30	HORMEL_3	COMMERCIAL_1
09:24 AM	:30	KXAS_TV5_2	COMMERCIAL_1
09:24 AM	:10	MIX_105_12	JINGLES
- System AUTO/SEGUE**
- LOGGING:ON**
- TIME UPDATE**
- F1 Help**
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World Radio History

Microphone Selection, Placement Critical to

Part II of V

by Steve Rowland

NEW YORK In this installment of "Producing a Radio Documentary," I will examine the various kinds of microphones that can be used for making high quality, ready-for-air recordings.

If you could have only one microphone it should be a good omni-directional one that can be hand-held. The news department standby, the EV RE-35 is a good mic. I like the EV-RE50 and the Beyer M-58 a

little better (about \$160 each). They sound good, are rugged (can be shared by various producers or engineers at a station), can be used inside or outdoors, and are very good for recording interviews. Another good choice is the new Shure VP64. I haven't used it, but have heard good things about it, and at about \$90 is probably a good buy.

To really take advantage of the full fidelity of digital recording, you might consider going up a notch or two in quality. For the past couple of years, I have been using the Neumann KM series condenser microphones. It is a capsule system, composed of a pre-amp body with very small replaceable caps which provide various patterns. I always travel with two pre-amps, two omni-directional caps, and two cardioid (semi-directional) caps.

This arrangement gives me great flexibility; I use them for interviews (usually omni), indoor location work (cardioid) and for stereo recordings (two cardioids mounted on a stereo bar in an X-Y set up. Schoeps, AKG and Sennheiser are some of the other makers of superb capsule systems that can be used this way.

There are, however, some important drawbacks to this system. These condensers are really studio mics, and have no internal shock mounting or built-in wind screens like the RE50 or the M-58. They are not designed for hand-held use at all (some people have told me that I am crazy for even attempting it). In addition, they are phantom powered, and require a portable power supply—not a big deal really, but just one more thing to consider each time you leave the studio.

In addition, they are all quite expensive, especially the Neumann and the Schoeps. But in my opinion the biggest consideration, especially for radio stations, is that all of these mics are relatively fragile, and would not hold up well to being passed around.

There are other types of microphones which I would like to consider here:

There are a number of good stereo mics

on the market. Crown, Sony and Neumann each have a good entry in this category. There are a number of systems used to get the stereo image. Most are either XY patterns or MS (mid-side) patterns. The X-Y configuration points 2 cardioid mics

toward the center. The MS mics combine a bi-directional mic with a cardioid pointed center. The Crown mic is actually a pair of great PZM (pressure zone mics) mounted in an unusual housing.

I am most familiar with the Sony ECM-

Using Headphones On-Site

by Steve Rowland

NEW YORK It is absurd to think one can get good location sound without headphones, but many reporters and many producers just don't wear them. They prefer to have an engineer along, and to let the "techy" wear them.

For radio documentaries, it is often better for the producer to be there alone. I suppose some audio pros feel strange wearing headphones, or think it will distance them from their subjects. The more you wear them though, the more natural they feel, and the more natural you become in your role as recorder and producer.

My first choice for location headphones is the Sony MDR-V6. It is sold in many consumer electronics stores for around \$75. Sony recently put out a "pro" version—but guess what?—they are actually identical to the consumer version, with just a different label. Either way, the phones are very efficient, very durable, the fold up, have good isolation, and best of all, they have a very flat, clean and detailed sound.

One of my more important pieces of location equipment is my gadget bag. I strongly recommend the use of a high quality, weather resistant camera-bag. Tenba and Tamrac are two of the best manufacturers. The big advantages of these kind of bags are portability, ability to use them over the shoulder while recording, great strength and durability, and the myriad of pockets for organizing your gear. I am not known to be a compulsively neat person at home or in the studio, but my bag is always organized.



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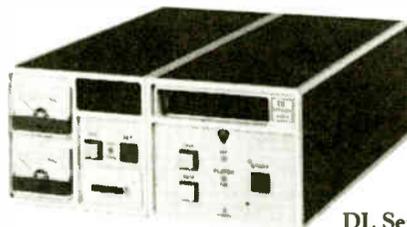
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Radio Documentaries

MS-5 (about \$1300). This is a true mid-side stereo arrangement achieved by using three cardioid capsules inside the housing. The advantage of using three cardioid caps instead of the usual cardioid plus figure eight cap is that the wind effect is less on the cardioid than a bi-directional mic.

The ECM-MS-5 is a great outdoor location mic. It has an adjustable pick-up pattern with which you can choose the width of the stereo field. This mic also comes with a very nice blimp-type windscreen and adjustable handle for use outdoors.

Any of these good stereo mics would be a great choice for using on location to give your listeners a real sense of place, of being there. After all, the more exciting and engaging your soundscapes are, the more success you will have in drawing listeners in, and letting them use their imaginations in ways which are impossible with TV and film.

Wireless mics, sometimes called radio mics, are used extensively in the film industry. More than ever, wireless mics are used as the primary sound source for location film recording. They also turn out to be an invaluable tool for audio documentary producers. If you are following one particular person for your program, putting a wireless on them allows you to keep a mic in perfect recording position as he/she moves around, and more importantly, to get that recording without interfering with the proceedings.

I used wireless mics with Miles Davis and Carlos Santana to record them working on projects. In both cases I was able to record the proceedings with minimal interference, and was able to bring listeners into very private musical rehearsals.

The wireless mic is actually a three-part system, which consists of, on one end, a lavalier mic plugged into a small, battery operated transmitter which can be attached to a belt. On the other end is a receiver and antenna; the signal is received and routed through an ordinary mic cable into the recorder or mixer.

Some receivers are designed to be rack-mounted (for use in stage performances) and others are battery operated—and smaller. Of course the latter, which are what is needed for location work, are more expensive.

There are several good wireless mics and a lot to learn about them. There is also a very wide price range, but as usual, you pretty much get what you pay for. Some operate on VHF frequencies, most of the better ones on UHF. The better mics provide a longer range and better reception in tough situations. One has to worry about interference from CB radios, from other wireless systems being used nearby, strong electrical signals, taxi cab radios and even metal beams inside buildings. Some of the best are made by Tram, Vega and Sony.

I have used the Sony WR-27A transmitter/WRR-27 receiver systems in a wide variety of situations, usually with superb results. Any problem that did arise was solved by moving the receiver to a slightly different location, within the room. You need a little extra time to get set up, but the results can be extraordinary.

Borrowing again from film and video sound, I have found that a good hypercardioid mic on a fishpole is a great asset. This arrangement is good when you are covering a group of people, and where you need to change the mic position frequently, or if you are covering an outdoor event which is changing locations.

One of the most important characteristics of a good hypercardioid mic is quality of the off-axis sounds. Because you will be moving with the mic, and will often be just a bit late, getting your mic into position, the sound recorded as the mic is getting there is important. The less coloration in the sound, the better.

This is just one of the aspects that separates the great microphones in this category from those that are merely good. The Schoeps has been the nearly unanimous choice of the film sound folks for a long time, and there is

good reason. It is a perfect choice for this kind of work. They are quite expensive to buy, but very reasonable to rent from a film supply house for a day or two (Many firms will gladly ship anywhere in the country.)

One of the tricks to getting good verité material, is to keep a low profile. You have to have a small crew (one person is ideal) and keep out of the way. Pressure Zone Mics (PZM) also can be very useful in the field. Strategically placed ahead of time, PZMs can be very good for capturing sound from different parts of a room, without having a boom man interfering with the proceedings.

PZMs are sometimes called boundary mics and consist of a small condenser mic, attached to a flat metal plate. The sound is

reflected off the plate into the mic. It is often recommended that the mic be attached to an even larger flat area, like a piece of plexi-glass, for greater pick-up.

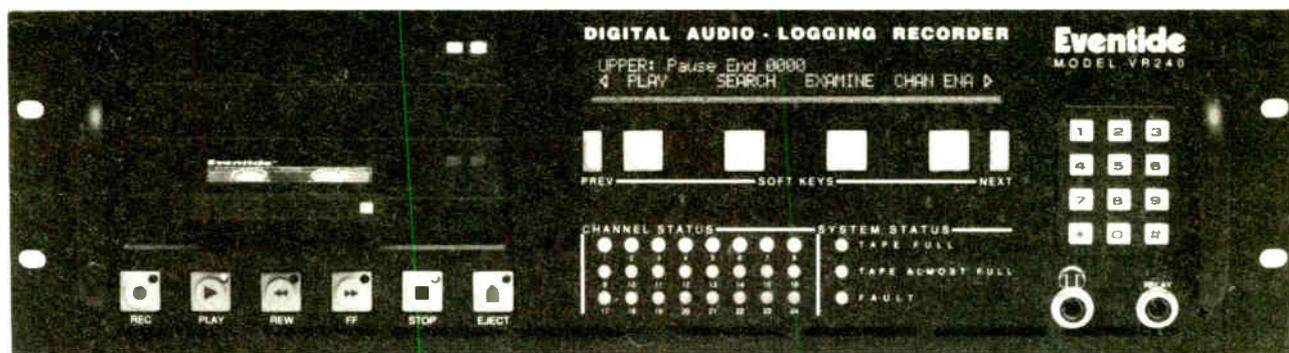
I've used them on desks, tables, walls and windows, and gotten surprisingly good results.

A set I use often consists of a wireless on the main subject, and a PZM on the other channel. The best PZMs are made by Crown and Neumann. Radio Shack sells an adequate PZM, remarkably priced, for about \$45.

□ □ □

Steve Rowland is a principal in the production company, *The Music Makers in Philadelphia*. He can be reached at 215-843-4388.

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USER REPORT

Blasting the Ether with Continental

by Mark Krieger
Chief Engineer
WGAR-FM

CLEVELAND In my 17 years as a broadcast engineer, I cannot think of any piece of equipment that requires more research and reflection before purchase than a transmitter. The transmitter is the final pipeline for your product—no matter how good or bad that product is.

The transmitter is the one item in your inventory most likely to roll you out of bed or to confound you in the wee hours of the morning. A transmitter is more than just the sum of its parts; it has, well ... personality. Thus when we received our company's blessing for the purchase of a new box early in the year, the purchase of our Continental 816R-2C 21.5 kW FM transmitter was neither a quick nor easy decision. Happily, it ultimately proved to be the right one.

Arranging for the installation of our

816R-2C was a bit like producing a theatrical event. The plan was to remove our existing auxiliary transmitter (a venerable RCA BTF 20E), and slip the 816R into its space in our tiny transmitter building. All this would be done while continuing to broadcast country hits through our old main transmitter a scant 24 inches away.

Smooth installation

Electricians, sheet metal workers and movers all had to be choreographed within the one day schedule. The transmitter was shipped from Continental in Dallas and held locally at the shipping agent's warehouse. On the morning of our target date, a well equipped moving team delivered the goods on schedule and in perfect condition.

The entire process rolled smoothly. After arriving on site at roughly 9 a.m., the 816R-2C was blasting the ether just 12 hours later.

To what do we owe such good fortune? Well, partially to the help of our top notch corporate and station engineers as well as prudent preparation. But, a great home-style video tape from Continental and Field Service Manager Dave Chenoweth made

the transmitter. All the information is there and easy to understand. This kind of thing is long overdue in our industry.

The 816R-2C is terrific. With our old main transmitter, we spent many frustrating hours trying to massage decent RF bandwidth using the tried and true RF/Composite sample XY oscilloscope display method. These efforts produced little more than poor efficiency and severe headaches.

With the 816R-2C, however, the display looked textbook perfect the first time. This transmitter is broad. And it tunes the way an FM transmitter is supposed to tune—with smoothness and predictability.

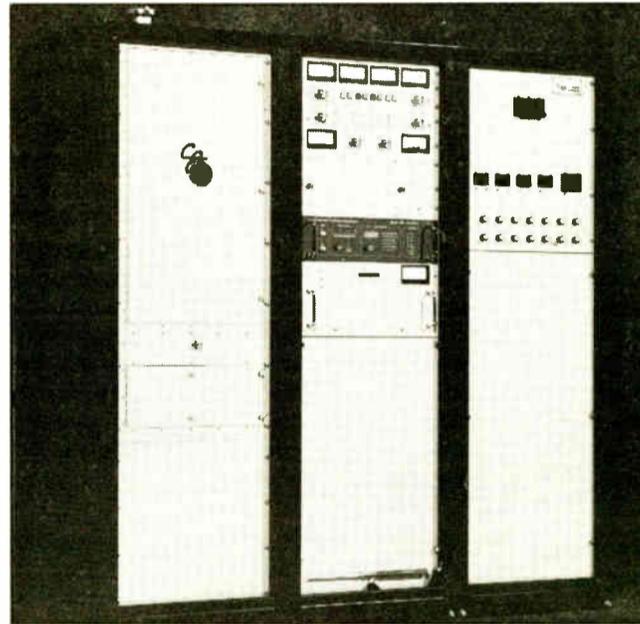
The sound

That brings me to the bottom line: how does it sound? The answer is that it doesn't. When WGAR-FM built its new studio facility three years ago, we installed a precision de-emphasis network at our engineering shop audio monitoring facility. This allows a gain matched A/B comparison between processed audio just

ahead of the stereo generator and our actual off-air signal.

The comparison with the 816R-2C (using a Continental 802B exciter) on line pro-

continued on page 42 ▶



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USER REPORT

Nautel Transmitter: The Choice of Olympian Station

by Tom Trotzer
Chief Engineer
KGY-AM-FM

OLYMPIA, Wash. Although you'd never know it, our Nautel AMPFET 4 FM transmitter was one of the first of its series off the production line in early July 1992. It was installed by late summer that year, and it went on the air for good on Oct. 30, 1992. It has been on the air ever since, with nary an adjustment and not even the slightest malfunction.

Nautel's early claim to fame was manufacturing radio beacons for the Canadian government, but its greater claim to fame is its ability to manufacture outstandingly reliable commercial broadcast transmitters. I knew that Nautel's solid state AM transmitters had developed a tremendous track record for reliability, and I wondered if the new AMPFET line of FM transmitters could possibly do as well. The answer is yes.

From the ground up

Early in 1992, when KGY-FM was granted a license for McCleary, Wash., I approached John Schneider at R.F.

Specialists in Seattle. We were putting the station on the air from the ground up and I needed dependable equipment. I needed a transmitter with a 2.6 kW capability, and it had to be single-phase capable.

There was no three phase power available and, as it turned out, commercial power was not available either. The transmitter site is on a hilltop about five miles from the nearest paved road at a 1,600-foot elevation. Although that is just a small hill in these parts, it is definitely remote.

John has sold Nautel transmitters for some time and knows as well as anyone of their dependability. While I preferred the idea of a completely solid state transmitter, I was concerned about timing. Nautel's new AMPFET 4 would not be off the production line until at least June 1992; we had hopes of being on the air by the end of July.

John sent me the specifications of the AMPFET 7, which was already on the market. Among its features were solid state FET circuitry in its PA modules, single-phase power requirement, low

continued on page 42 ▶



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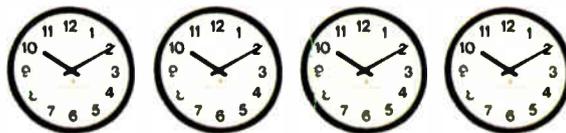
- Mix analog and digital displays
- Serial master clock or timer link
- 12/24 hour clocks
- External 10 or 1 Hz sync
- External 60/50 Hz (line) sync
- Time zone hour offset
- Daylight savings time catch-up
- All digital displays act as master or slave units
- Top of hour relay closure
- Top of hour clock reset
- 00:00:00 timer relay closure

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- Remote keypad
- Lead acid long life battery
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- Wall mount

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- Desktop Up/Down Timer (DTT-6)
- Desktop Clock (DTC-6)
- Desktop Clock and Up/Down Timer (DTCT-6)
- Analog Master Driver (AMD-1)
- 12" Analog Clock (AC-12)
- Desktop Up Timer only (TM-3)



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World Radio History

Nautel AMPFET 4 Handles the Heat

► continued from page 40

composite signal distortion, low synchronous and asynchronous AM noise levels over tube type transmitters, overall efficiency greater than 65 percent and the ability to run on fewer than the total complement of PA modules should one or more fail, which is important when you don't have a standby transmitter.

John also noted that the AMPFET 4 would include plenty of power headroom above the licensed 2.6 kW with which we would be running. I was sold.

Four wooden crates

Nautel stuck to the promised manufacturing schedule. In mid-July 1992, four

wooden crates were sent to us by air freight. One crate contained the main chassis, one the power supply transformer, one contained the four PA modules and the identical IPA module and the final crate contained ancillary parts and manuals.

It all arrived in perfect shape, with the exception of shipping damage to two of the three front panel meter movements—I believe the main chassis crate fell from a vertical to a horizontal position during transit. To this day, the manuals are still not complete, but the documentation I received enabled me to assemble the transmitter and get it on the air.

The AMPFET 4 comes with a full com-

plement of remote control capabilities, including forward and reflected power readings, power trim, on-off control, air

Nautel's greater claim to fame is its ability to manufacture outstandingly reliable commercial broadcast transmitters.

conditioning, power on, transmit on, fault protect and reset, signal sample, remote interlock, etc.

Because Nautel does not yet make an exciter, we are using a Continental 802A

exciter. Although the AMPFET 4 includes space for an exciter, and Nautel provides a power cable and coaxial feed cable for one, I decided to mount the exciter in an equipment rack next to the transmitter. I considered mounting the exciter in the transmitter, but decided it

would take a fair amount of prefabrication to make the Continental exciter fit well inside the transmitter cabinet.

Handles the heat

The transmitter is housed inside half of a 10-foot by 20-foot steel cargo container along with the exciter, remote control, audio processor, STL equipment and power transfer switch. The other half of the container houses two 20 kW Perkins diesel generators (one main and one standby) for our electrical power.

I have provided some heat and lots of ventilation, but no air conditioning. During this past summer's 100 degree weather, our building's interior temperature hit 116 degrees. The Nautel transmitter never flinched, and the specs showed that its internal shutdown temperature of 158 degrees was never reached.

There are three muffin fans cooling the power supplies in the bottom of the cabinet, and a similar fan on each PA module as well as the IPA module. I did, however, add additional fans to cool the equipment rack housing the STL equipment during the hot weather.

It is raining now in Washington, and before the winter is over, our transmitter site will certainly be snowed in, as it was for several weeks last year. But as it starts its second year, it looks as though the Nautel AMPFET 4 is ready to take care of us.

□ □ □

For information, contact Jorgen Jensen in Maine at 207-947-8200; fax: 207-947-3693; or circle Reader Service 122.

Continental Blasts Ether

► continued from page 40

duces an almost indiscernible difference between the two signals. This is an extremely transparent transmitter.

All this is not to say that perfection has been achieved finally. Some of the remote interfacing is a little clumsy. The blower is a bit on the loud side and the documentation lacks some detail. But these are really small items. The 816R-2C has a lot more going for it. It is built like a tank and internal access is very good. It was clearly designed with maintenance in mind.

One nice feature, one of many, is the soft-start circuitry which makes the "Plate On" command easy on the transmitter and the nerves. Another plus is the built-in harmonic filter, which makes RF plumbing simple.

In short, the folks at Continental built the 816R-2C well, and they built it right.

□ □ □

For information, contact Steve Claterbaugh in Texas at 214-381-7161; fax: 214-381-4949; or circle Reader Service 94.



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USER REPORT

CCA Is Atlanta Engineer's Best Experience

by **Bob Helbush**
Chief Engineer
WKLS(FM)

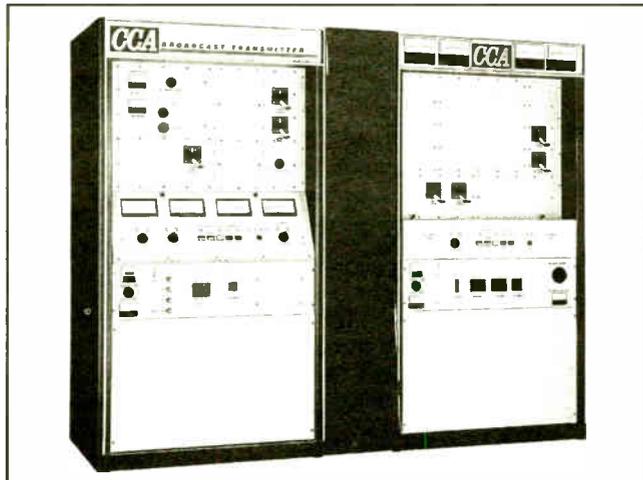
ATLANTA The best experience I have had with our new CCA FM transmitter is no experience. I haven't had to think about it at all because it is so reliable. That's the kind of experience I need from a transmitter.

WKLS(FM) 96-Rock is a 100 kW rock'n'roll FM station in Atlanta. We first looked into CCA transmitters after a nearly four-year nightmare with another manufacturer's transmitter. WKLS had one of those fancy, high-priced, complex models with all the whistles and bells. It was a nightmare. All that sophisticated technology was useless because it was attached to a completely unreliable transmitter. But now that's all gone!

Simple, rugged, reliable

Luckily for us, Jim Ary, director of engineering for our parent company Great American Broadcasting, ran across CCA Electronics at the NAB Convention in Las Vegas. CCA made just what we needed: a line of simple, rugged, and super-reliable FM transmitters. It had no solid-state drivers and no fancy whistles and bells. It also had just a single-ended PA tube: no tetrode

final, just a medium-priced power triode operating in a grounded-grid configuration.



The Super Power FM transmitter by CCA

CCA also uses simple relay logic control circuits in all its transmitters using all plug-in control relays driving higher rated contractors. CCA's spacious cabinets keep everything accessible. And there is no need for combiners, reject loads and all the associated plumbing.

When we first approached CCA, the highest rated FM transmitter in its line was 35 kW and we needed 45 kW. That didn't deter CCA in the least. "No prob-

lem," said Steve McElroy, CCA's vice president of sales. "We'll just add a single-ended PA tube 45 kW FM to our line." Thus, 96-Rock became the first owners of the CCA 45 kW Super Power FM transmitter.

When I heard the news that we were replacing our nightmare transmitter I was excited, to say the least. When I heard that it was going to be replaced by a CCA transmitter, I was elated! I have known the president of CCA, Ron Baker, since he was the chief engineer for one of our competitors in Atlanta. A fellow broad-

cast engineer who is now making transmitters for a living has to know how to make one that is reliable.

No problems

The new CCA FM45000G3 transmitter is housed in two cabinets that occupy only 21 square feet of floor space. It consists of a CCA 12 kW grounded grid triode transmitter driving a 45 kW amplifier with a single CCA 30,000 PA tube in the amplifier.

The amplifier cabinet is completely independent of the driver insofar as control circuitry and power supply are concerned. The only interconnection between the two cabinets is the RF line and control cables. Since the amplifier utilizes a CCA triode, in the absence of RF drive, the final stage will not over-dissipate. In this transmitter every stage is operating conservatively at 60 percent or less of capacity.

We received our new CCA transmitter and were up and running in January 1993. Except for a minor change to the automatic power controller and some minor component changes, few modifications were necessary. CCA was cooperative and the service and support provided were second-to-none. Since then, we have had no problems.

As I said before, when it comes to transmitters, the best experience is no experience. Our CCA transmitter has certainly given me better night's sleep and no more nightmares. When you need reliability, you need CCA. Frankly, I don't see how anyone could purchase any other transmitter and really think they were getting something better.

□ □ □

For information, contact Steve McElroy at 404-964-3530; fax: 404-964-2222; or circle Reader Service 59.

5 out of 5 cassettes prefer the TASCAM 122 for tension headaches.

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delivering the industry's finest cassette performance day after day. Choose the 122 MKIII. It not only cures tension headaches, but may eliminate your heartburn, as well.

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Harris Digit™ Exciter Beta-Tested

▶ continued from page 1

3 However, with the Harris Digit exciter in the system, the distortion drops to between 0.02 and 0.03 percent (Figures 4 and 5). The frequency response of both units seems to be identical.

What impresses me the most about the Harris Digit exciter is that while its specs appear to be incredible, due to the nature of a digital system, they will stay this incredible day-in and day-out for years to come.

Component aging has no effect. Exciter tweaking is not necessary. The slow degradation of the signal, usually indiscernible to the ear, is reduced. It either works or it doesn't.

Next logical step

For KRNA and listeners in the Cedar Rapids-Iowa City area, it works very

well. Our market may not be Silicon Valley, but our listeners are getting the direct benefit of KRNA's commitment to pushing the envelope in broadcast technology.

KRNA has made a continuing commitment to the best possible on-air quality. The Harris Digit exciter is the next logical step in fulfilling this commitment. KRNA wants to offer its listeners the best possible audio signal.

KRNA's management knows the station competes with CD listening, as well as with other radio stations, so KRNA is committed to coming as close as possible to

live concert hall sound quality.

In the studio, KRNA uses a digital commercial storage and retrieval system. One of KRNA's production studios is set up as an eight-track recording stu-

dio for maximum advertiser commercial impact. The quality of KRNA's commercials is a selling point to many of our

advertisers; they know KRNA's commercials sound good and are effective.

□ □ □

For information on the Harris Digit™ digital FM exciter, contact Martha Rapp in Illinois at 217-222-8200; fax 217-222-0581; or circle Reader Service 48.

Figure 1.

Signal to Noise

	DIGIT	THE-1
Left	87 dB	82 dB
Right	87 dB	82 dB
Composite	88 dB	83 dB

Stereo Crosstalk

	DIGIT	THE-1
Main to Sub	69 dB	64 dB
Sub to Main	68 dB	63 dB

38k Suppression

	DIGIT	THE-1
	68 dB	63 dB

(Note: these measurements reflect the audio chain into the Optimod 8200; into the respective exciter; into the HT-35; into a dummy load.)

Figure 2. THE-1

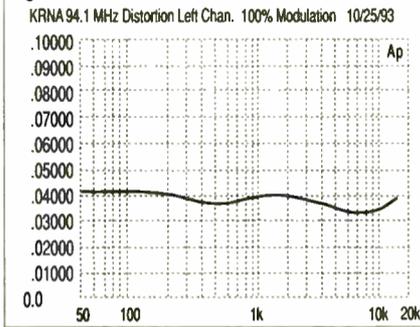


Figure 3. THE-1

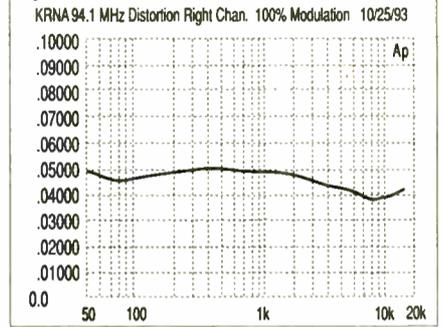


Figure 4. DIGIT

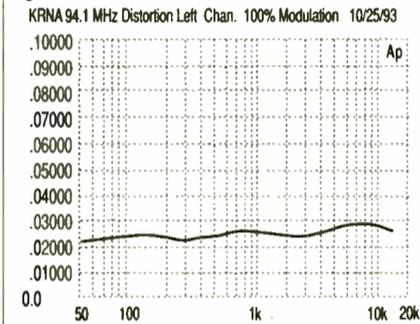
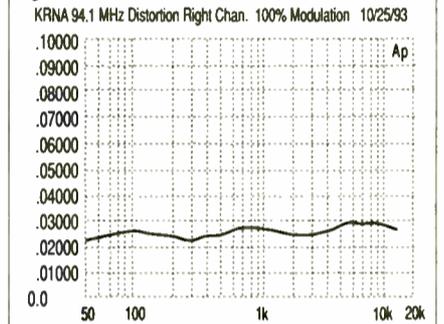


Figure 5. DIGIT



(Note: these measurements reflect the audio chain into the Optimod 8200; into the respective exciter; into the HT-35; into a dummy load.)

USER REPORT

Crown Heart of Network

by Al Stewart
Network Technical Director
Colorado Christian University

DENVER Satellite downlink capability opens up a number of exciting programming opportunities for smaller, independent broadcast organizations like the Colorado Christian University FM radio network.

As the network technical director, one of my primary duties is to ensure the highest

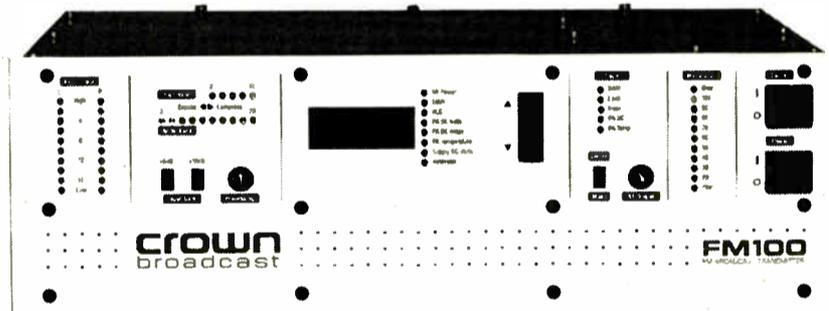
possible technical quality for the university's two FM stations and 21 translators scattered throughout Colorado, Utah and Wyoming. Limited human resources to cover this sizable geographic area makes this an even more daunting task for me and my small, but dedicated, staff.

Thorough look

When the university began considering satellite capability, we started a thorough evaluation process. A package including

audio processing, stereo generator and transmitter would be needed. Also, given

really needed remote capability. Purchased individually, these compo-



The Crown FM100 is the heart of a three state network.

our logistic and staffing situation, we

components could easily exceed \$12,000—not an insurmountable sum, but still a considerable expense, especially for a Christian educational institution.

During evaluation, we became interested in a product being developed by Crown International's new broadcast venture. This product, which later would be called the FM100, offered a user-adjustable 20 to 100 W FM transmitter, audio processing, stereo generation and RF generation in a highly compact unit with a projected cost of less than \$6,000. Obviously, we were intrigued.

Working with Crown Broadcast Product Manager Don Spragg, we were able to acquire one of the first beta FM100 units. Installation of the FM100 at the transmission site was simple. We just dialed in the frequency, set a few parameters, and were on the air.

Running at our current legal limit of 46 W with a simple Yagi antenna, the unit performs well. Its built-in metering and diagnostics of a variety of key functions (RF power; SWR; ALC; PA DC volts and amps; PA temperature; and supply DC voltage) is welcome, clear and concise. It is also frequency agile, with the synthesized oscillator circuit performing capably.

We have found the unit to be reliable—there were a few glitches with the beta unit, but Crown's quick response and dedicated service-oriented approach

continued on page 50 ▶

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HT 30/35FM Series:
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HT 3.5/5/7/10FM Transmitter
Course Sept. 26 - 30

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TECHNOLOGY UPDATE

DB ELETTRONICA

DVC Line of Frequency-Agile Translators From DB Elettronica Available in the U.S.

DALLAS The DCV line of FM translators from **DB Elettronica** of Italy are frequency agile, and both input and output frequencies are easily set. Frequency changes are made with internal DIP switches. Realignment of the input filter is easily done with the aid of the front panel meter.

Seven frequency ranges are available,

including: the DCV/FM (87.5 - 108 MHz); the DCV/4B (430 - 500 MHz); and the DCV/GHz (830 - 1020 MHz). For translators operating below 500 MHz, the synthesis step is 10 kHz; for those operating above 500 MHz, the synthesis step is 100 kHz.

The translator output power is adjustable from zero to the model maxi-

mum. DCV translators are available in five, eight, 15 and 20 W models.

The DCV line's crystal-oven thermostats allow more precise and stable reception and transmission, and a greater resilience in variable weather conditions, thus making the unit less vulnerable to hop distortion.

Other features include: demodulated AF output to monitor the received signal; external adjustable squelch; front panel instrumentation; and optional 12 V DC power supply.

For information on DB Elettronica equipment, contact Jimmie Joynt at Factory Direct Sales in Texas at 214-33-3425; fax: 214-377-4625; or circle Reader Service 67.

ECONCO

4CX3500A Vacuum Envelope Tube Modification by Econco Extends Tube Life and Performance

WOODLAND, Calif. Throughout its life, the 4CX3500A power tube has earned a reputation for short life and catastrophic failure. Many engineers have had a tube fail by tripping the overcurrent relays. And when they go to remove the tube from its socket, the tube is removed from the transmitter in two pieces.

Econco's examination of many of these tube failures has led its engineers to develop a modification to the 4CX3500A vacuum envelope which greatly reduces the possibility of this premature failure. 4CX3500A tubes which have failed in this manner can now be rebuilt with a replacement ceramic between the screen contact and the anode. This replacement ceramic is designed to greatly reduce the possibility of catastrophic tube failure.

Throughout its existence, Econco, working in conjunction with broadcast engineers, has developed improved parts

EEV

EEV Broadcast Tetrodes Increase Longevity and Audio Performance

ELMSFORD, N.Y. EEV's range of broadcast tetrodes are designed to enhance longevity and to increase audio performance in comparison to equivalent tube types currently available.

Every EEV 4CX broadcast tetrode is manufactured with an improved mesh filament design. This mesh design ensures long-lasting concentricity of the filament and consequently provides better linearity and less noise. The mesh design also eliminates warm-up variations, which—more importantly—offers longer life performance. The bottom line to the broadcaster is longer life and better performance than loop-style filament tubes.

EEV currently manufactures the following tetrodes for AM/FM radio: 4CX5000A, 4CX10000D, 4CX10000J, 4CX15000A, 4CX35000C, 4CW25000A and 4CV100000C.

EEV also offers direct technical assistance on a toll-free line, direct interface with the manufacturer, and a 10,000 hour warranty.

For information, contact Greg Morton in New York at 914-592-6050; fax: 914-682-8922; or circle Reader Service 119.

and process to allow broadcasters to improve the life and performance of their power tubes.

For information, contact Debbie Baker in California at 800-532-6626; fax: 916-666-7760; or circle Reader Service 161.

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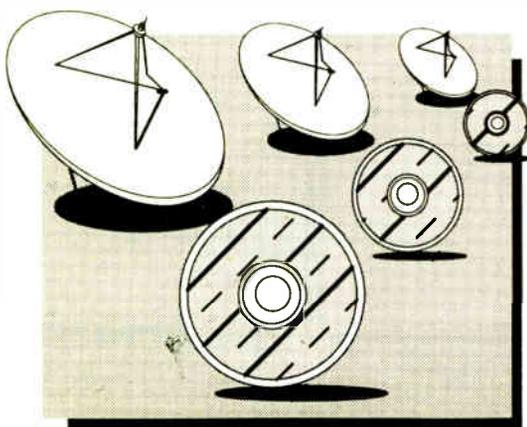
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- II. Job Function**
- | | |
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World Radio History

COMET

Comet Capacitor Cover Cools with Water For Improved Current Carrying Capacity

STAMFORD, Conn. Standard convection cooled vacuum capacitors are cooled by the natural flow of air around the capacitor. Limited convection cooling reduces the current carrying capacity of smaller broadcast capacitors well before the capacitor electrodes' design parameters are met. Some increase in current capacity is possible though conduction cooling; however, it is generally not a substantial increase.

More significant improvements in current range are now possible with specially designed water cooling covers

from Comet North America Inc. With auxiliary water cooling, an increase of 25 percent in current capacity is typical, while the overall dimensions of the capacitor remain unchanged.

The best results are experienced with smaller diameter capacitors, such as "minicons." With the minicons, auxiliary water cooling covers are both cost effective and easily mounted onto standard types.

Water cooling is also advantageous in clean room environments where forced air cooling of matchboxes, for example,

is not possible, and relatively small dimensions are essential.

The current versus frequency curve of the CV05W-1000EW demonstrates a typical gain in performance resulting from auxiliary water cooling.

For information, contact Lance Scott in Connecticut at 203-852-1231; fax: 203-838-3827; or circle Reader Service 15.



LUKE COMPANY

Linear Power Supply from Luke Company: Reliable, Efficient and Effective

LAKE CITY, Mich. RF electronics depend upon power supplies. Although switching power supplies perform well with many applications, a linear design power supply will meet the most demanding requirements.

An advantage of modern linear design is fewer components. Not only do components operate at lower voltages, less electronics are present, and thus less exposure to failure. Linear design is inherently hard regulated, provides ultra-fast current rise, very low output ripple and electronics are not required across the AC input lines. Well engineered designs have almost no voltage shoot at start-up and will regulate well at reduced input line voltage.

Luke Company has developed a commercial line of linear power supplies. Output voltages range from 12 through 50 VDC up to 2.75 kW output.

AC input range is forgiving as well. The model 555vh operates from 208 to 250 VAC input. Other features include current limiting, adjustable foldback, overtemperature protection and an integrated circuit managed overvoltage crowbar.

For information, contact Jim Benedict in Michigan at 616-229-4593; fax: 616-229-4593; or circle Reader Service 168.

There are real differences between the technologies proposed to replace the Emergency Broadcast System in the United States.

It is imperative that the FCC select the most reliable, comprehensive, secure and user friendly system that will work today and is adaptable into the digital world of the 21st century.

ONLY THE SAGE EMERGENCY WARNING SYSTEM (EWS):

Sends live text or live audio in addition to pre-stored weather related codes,

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Addresses receivers, pagers and smoke detectors down to a single home, school or hospital,

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Offers the additional valuable features of RDS including call letter display and format search.

The Sage Emergency Warning System advantages are clear. Choose one comprehensive system for today and tomorrow.

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SAGE ALERTING

RDS and MAC Merge for Sage Alerting's Alternative EBS Delivery System

STAMFORD, Conn. Sage Alerting Systems Inc. has developed a complete systems approach. Emergency Warning System, to replace the aging Emergency Broadcast System (EBS). The heart of the system is the multiple actuation controller (MAC), which allows radio, TV and cable operators to

monitor multiple alerting sources simultaneously (National Weather Service, police, civil defense). The MAC can automatically capture the audio and/or video of these facilities in emergencies.

The MAC was developed in response to both commercial demand and the "Black

Box" specification of the FCC Notice of Proposed Rule Making. The Sage response to the FCC specifications provides many unique features and capabilities with the MAC.

The Sage Emergency Warning System uses RDS to communicate emergency alerts directly to the public. These alerts can turn on radios in cars and homes, activate smoke detectors, page emergency workers, activate sirens and even send messages to electronic sign boards. The MAC is the central controller of the system and is installed at both activation sites, such as emergency operating centers, and at radio, television and cable facilities.

The MAC interfaces with any IBM compatible computer with an 80/286 or

higher microprocessor, meaning that almost all computers found at radio and television stations can be part of the new EBS System.

SAGE

ALERTING SYSTEMS, INC.

The Sage Emergency Warning System and the MAC can provide selective alerting down to an individual home, school or office and it can automatically turn on receivers selectively at any time of the day or night. Also, the Sage System can support long term battery operation of these alerting and warning components, which may be necessary under emergency conditions.

For information, contact Gerald LeBow in Connecticut at 203-357-1464; fax: 203-357-1531; or circle Reader Service 174.

ELECTRO IMPULSE

DPTC-25KFM Forced-Air Cooled Dummy Load From Electro Impulse Laboratory



NEPTUNE, N.J. Radio frequency dummy loads for FM radio stations, once considered an optional piece of test equipment, have become indispensable in the operation of a modern FM station.

Early dummy loads used water cooled resistors with heat exchangers: these were often unreliable and expensive to maintain.

Electro Impulse Laboratory Inc. developed a dry, forced air cooled dummy load with broadband capabilities, which has become the standard of the industry.

The DPTC-25KFM, the company's most popular product, is usually operated via an RF switch whenever it is necessary to test or tune up the transmitter.

The load is so rugged that even though it requires AC line voltage to power a cooling fan, application of full 25 kW RF power with the fan off for a few minutes may not damage the load.

An interlock system is included with a low air flow switch and an overtemperature thermostat with dry floating relay contacts which can be used to shut down the transmitter in the event the load is not operating.

One of the most important considerations when installing a high power dummy load of this type is that all of the power will be dissipated as heat in the room where the load is operating. If the space is air conditioned or poorly ventilated, the temperature could rise to unacceptable levels causing the dummy load overtemperature safety interlock to cut out. Well ventilated transmitter rooms are usually the best for installation.

For information, contact Mark Rubin in New Jersey at 908-776-5800; fax: 908-776-6793; or circle Reader Service 75.

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Are you thinking about replacing your old cart machines with 'Digital Carts' such as floppies, flopticals, Bernoullis, or Opticals??? Well, think about it a little more! Add up the list price for a digital cartridge recorder, just a single player, AND the floppy disks--- and you will find that you could have bought a Digilink workstation for \$7,995 that gave you 'Live' -AND- 'Automation' capabilities!!!

A Digilink workstation stores audio on an internal hard disk and comes out of the box with a capacity of 547 one minute, stereo carts for only \$7,995. Even better, the Digilink hard disk has an average 15 year life. Imagine how many floppies you will break, wear out, lose, and replace over 15 years. That doesn't count all of the floppy disk mechanisms that will jam, break, and simply fail...

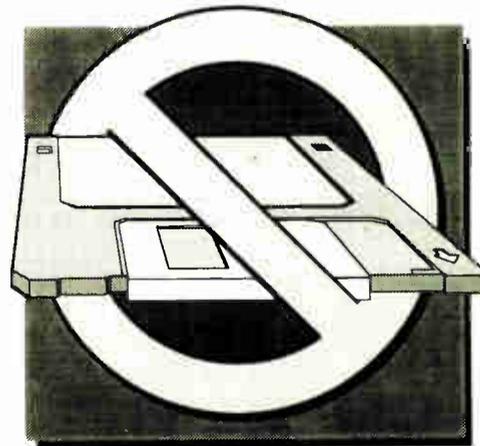
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With all of these features, it is easy to see why there are more than 500 Digilink workstations around the world from Paris to Moscow to Taiwan to Jamaica and in your own backyard. Don't suddenly come to the realization that you could have bought a Digilink!

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WHAT ELSE

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JT COMMUNICATIONS

'No Frills' Transmitter from JT Communications Suits the Needs of Small-Budget Stations

OCALA, Fla. JT Communications has two solutions for stations looking to replace old exciters for a minimal cost.

The JT Communications FMT-15 FM exciter uses modern technology, without the glorified "extras" that boost the cost. The FMT-15 is frequency-agile in 100 kHz

steps anywhere from 88 to 108 MHz. For foreign markets, it is also available from 75 to 90 MHz. The FMT-15 is adjustable from 0 to 15 W, and the output has foldback limiting for excessive mismatches.

The FMT-15 is a 3.5 inch high rack mount unit, and operates on 120/240

50/60 Hz. It contains a front-panel LCD display for metering and a front-panel RF switch, which can be optionally remote controlled. The FMT-15 retrofits in almost all upgrade situations, and is FCC type notified. A stereo generator option, model CSG-10 (with a composite clipper), is available, either factory installed or as a retrofit.

If the station engineer wants to cut expenses further, and has the time and know-how, JT Communications offers the PLFM-100, a self-contained PLL modulated oscillator, with 100 mW out-

put. The engineer must install the PLFM-100 in existing FCC type-accepted equipment, and the installer must take steps to insure the modified exciter remains compliant with applicable rules.

The PLFM-100 operates on a single 12 V power source, and it contains both composite and 75 uS pre-emphasis audio inputs, making it fully stereo compatible. Application notes on certain exciters are available from JT Communications.

For information, contact Jim Trapani in Florida at 904-236-0744; fax: 904-236-5130; or circle Reader Service 212.

SUPERIOR ELECTRIC

Superior Electric's Auto Voltage Regulator

BRISTOL, Conn. Incoming power above a transmitter's tolerance level will damage the unit. This may occur as a sudden high amplitude, high current, short duration transient or a long duration, continuous high line. Either condition may damage or shorten the life expectancy of an unprotected transmitter.

Extended low voltage increases component operating temperature, which creates unwanted component stress. Incoming voltage that is only 15 percent below nominal can reduce power tube life by as much as 67 percent. Low voltage also reduces transmitter output power resulting in diminished signal strength. Conversely, voltage that is 10 percent higher increases operating temperature accelerating the decarburizing process.

Installing Superior Electric Stabiline WHR series automatic voltage regulators ensures proper signal strength by providing stable power to the transmitter. They prolong component life, power tubes, filaments and control circuitry by minimizing stress from extended exposure to low or high line voltage. For additional protection, the Stabiline WHR regulators can be equipped with a variety of options, including transient voltage suppression, tropicalization, under/over voltage trip release and maintenance bypass.

The Stabiline WHR units are available in power rating from 2 to 1680 kVA, for 120 to 600 V, single and three phase AC service. Output accuracy is user selectable from 1 percent to 9 percent. They are highly effective, 99 percent typical, low impedance devices.

For information, contact Ted Gladis in Connecticut at 203-582-9561; fax: 203-582-3782; or circle Reader Service 30.

Crown FM100 Beta Test Connects Three States

► continued from page 44

ensured that we were able to quickly rectify these minor problems. The full production FM100 unit we are now using has shown that all of these glitches have been addressed and corrected.

Inherently versatile

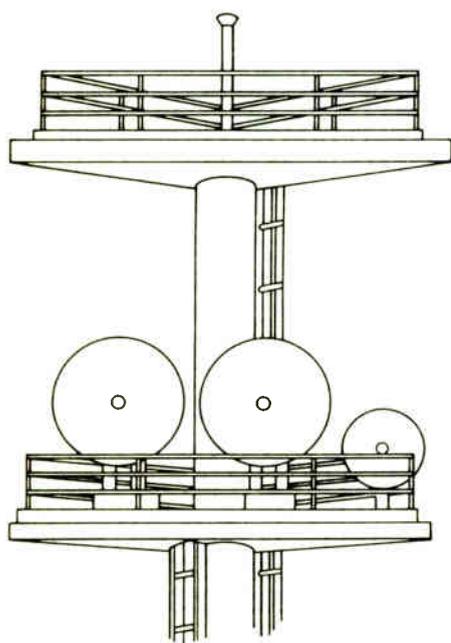
The unit's inherently versatile design allows it to suit a variety of tastes. For example, we prefer the spectral density and overall loudness offered by dedicated domestic processors. After some experimentation, we found that the FM100's loudness can be significantly boosted with the addition of a Barcus-Barry (now BBE) sonic optimizer. With a cost of about \$425, this proved to be a cost-effective

solution providing acceptable results. We intend to experiment with other processing devices when time and budget allow.

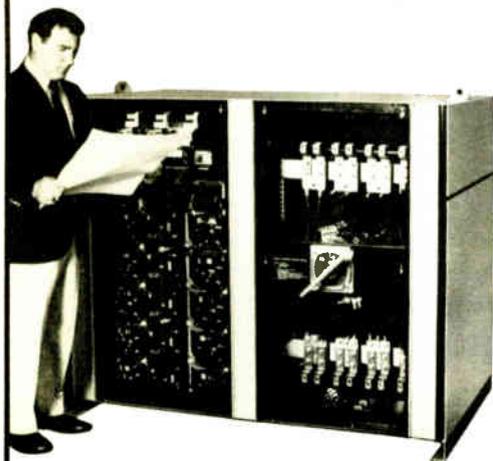
One of our favorite aspects of the FM100 is its remote monitoring and control capability, especially valuable given our logistic and manpower situation. This remote capability will be even more vital to us in the future, because we plan to add several more FM100's for both satellite and full transmission purposes by mid-next year. Due to the FM100's versatility and low cost, these goals will be achieved easily within our budget.

□ □ □

For information, contact Phill Sandahl in Indiana at 219-294-8000; fax: 219-294-8329; or circle Reader Service 192.



"I recommend STABILINE® Voltage Regulators for any brand of transmitter that is being placed in a harsh operating environment."
— Steve McElroy, CCA ELECTRONICS



3-phase, 500 kVA WHR Series Voltage Regulator

How to tame transmitter power problems.

WHR Series STABILINE® Voltage Regulators for AC power systems up to 660 volts.

Transmitters placed in remote, unattended locations such as mountain tops and wilderness areas depend on long utility power lines for service. Unfortunately, the lines often produce poor voltage regulation and other damaging power aberrations. Poor regulation can reduce power tube life by as much as 70% and the performance of associated equipment is similarly affected.

For example, a 15% undervoltage can decrease power tube life because cold operation promotes contaminant buildup in the tube. Conversely, a 10% overvoltage decreases life because increased temperature accelerates the decarburizing process.

The problems can be easily corrected.

Cost-effective WHR Series STABILINE® Voltage Regulators are the preferred choice of broadcasters worldwide for use with transmitters, receiving stations, studios and mobile production vehicles. These high power voltage regulators maintain constant voltage to your sensitive equipment even when the power line input voltage and system load vary widely.

Features include:

- Hold output voltage within $\pm 1\%$
- Power ratings from 2 to 1680 kVA

- Maintenance bypass plus other standard options
- 99% typical efficiency
- High overload capacity
- 19-inch rack mount versions
- Designed for UL and CSA approvals

A host of options allow you to customize your application.

Standard options include:

- Single or three phase models
- Analog or digital control
- Bypass switch
- Ammeters
- Frequency trip meter
- Tropicalization
- Manual raise-lower switches
- Zig-zag neutral generation
- Single or individual phase control
- High energy transient suppression
- Input voltage range alarm contacts



"Our production vehicles don't leave without one."
— Ron Crockett, SHOOK ELECTRONICS



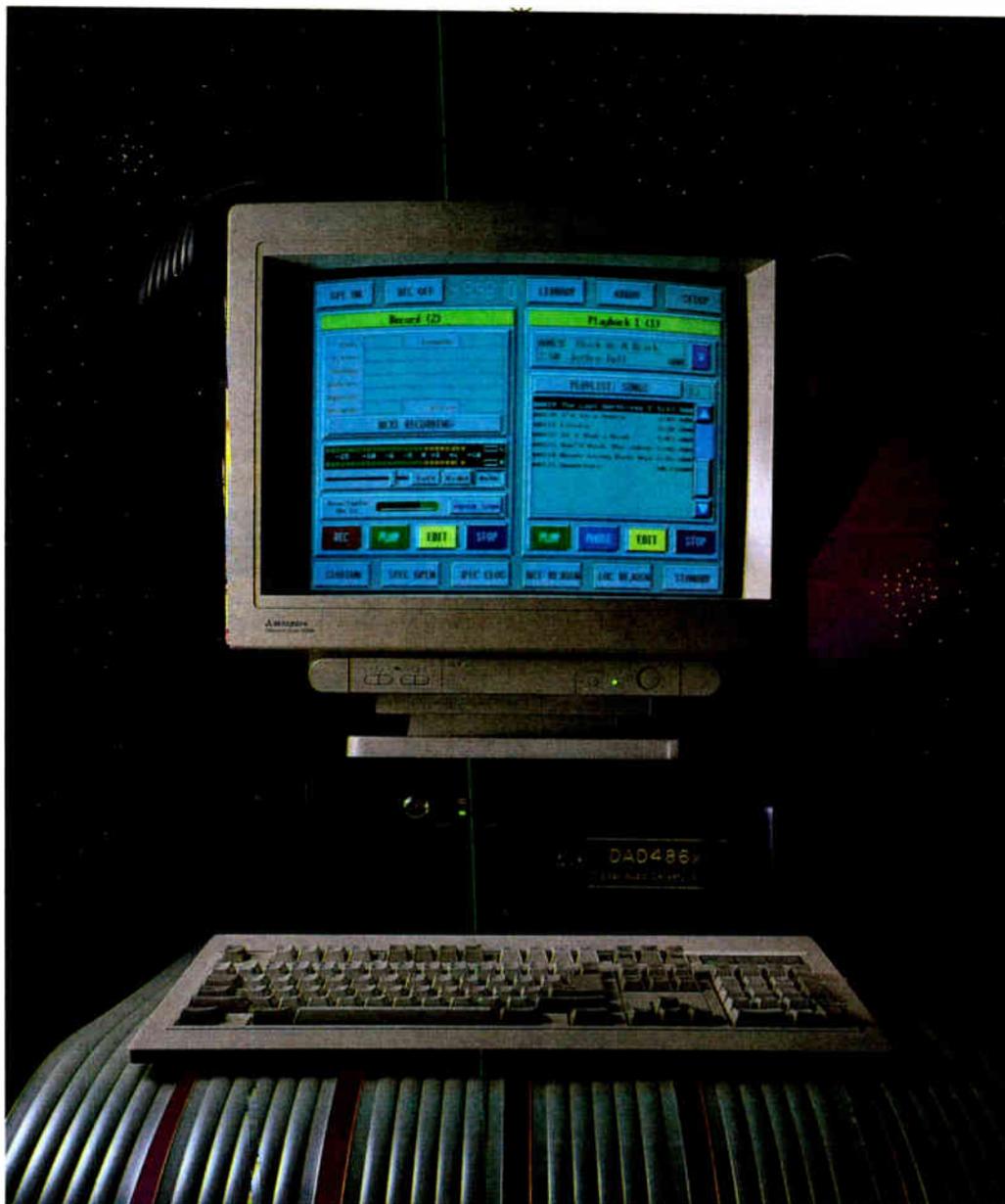
For Catalog WHR692 and to learn how WHR Series STABILINE® Voltage Regulators can be the solution to your power problems, write, fax or phone Ted Gladis at

1-800-446-6161

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Designed to streamline and simplify the tasks of producing, recording and distributing audio, the DAD486x is the most user-friendly system you'll ever love to operate.

The DAD will do more than just improve your audio. It will improve your bottom line. Eliminate the expense of operating and maintaining traditional, endless-loop cartridge machines while providing

power, versatility and flexibility. And, get high quality audio.

DAD's advanced production and operating features are so intuitive and easy to understand that your system investment will begin to pay for itself as soon as it is installed.

This system was planned for use in the real world. DAD's graphic user interface emulates a standard analog audio cartridge machine's controls. Push PLAY and DAD plays the cut shown in the Playback "slot." The number of playlists you can store in DAD's memory is unlimited.

And its powerful ARRAY feature puts 144 audio events at your fingertips for instant playback.

In order to meet your specific needs, a DAD486x system can be configured to precisely match your budget and operational needs. And it's expandable. Start with a single channel DAD system. Add additional channels and workstations as your needs grow. Expand it to a multiple user, multiple channel system to allow simultaneous production, recording, and playback so you can operate at maximum efficiency.

Because the DAD system is designed for use on a standard 486 PC platform, you can choose to purchase a complete system including hardware and software or select your own hardware platform and let ENCO provide the DAD486x software.

Add the friendliest digital audio delivery system to your station. Simply touch & go . . . with DAD. Contact the digital audio specialists at Harris Allied.

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"Call me, I'm interested." Circle (42)

World Radio History

"Send me literature." Circle (88)

USER REPORT

Mind the Three R's with Energy-Onix

by R. Bryan Jackson
Owner/President
WCDA(FM)

ALBANY, N.Y. Do you remember the three R's—reading, 'riting and 'rithmetic? In broadcasting, they have become reasonable cost, reliable operation and reduced maintenance. That's exactly what I looked for when buying a new FM transmitter for my station.

My experience with Energy-Onix began at the NAB radio show in Atlanta a few years ago. I spent some time at the company's display booth with Bernie Wise, founder and president of Energy-Onix. His advice and help were invaluable. I also learned that we were neighbors, with Energy-Onix located in Hudson, N.Y.

WCDA(FM) originally signed on in May 1991 as a 3 kW Class A station. Because the station site was located on a mountain-top TV tower, I had the luxury of installing a used low-power tube transmitter which just met the required ERP. I then filed to upgrade to the equivalent of 6 kW, which would require a little over 600 W.

Suits three R's

I decided to buy a new 1 kW rig, and because I'd be writing the check myself, I looked for a unit that would suit my three R's. The Energy-Onix Legend 1000 fit them to a "T." Among the features immediately catching my attention were its solid state

design and its high level of redundancy.

The Legend 1000 system uses the exciter to drive a 100 W IPA, which goes into a splitter and drives two independent 500 W power amplifiers. The PA outputs are combined to the antenna output. In addition, each final has its own power supply. Front panel breakers control line voltage to the IPA and each PA.

In the event of a PA failure, the Legend 1000 stays on the air at roughly quarter power. At the site, the bad PA can be powered down, removed for service and bypassed. Patch options into the antenna line include running just one PA, bypassing the IPA and using the exciter to drive the PAs directly, running off the IPA alone or even using just the exciter output.

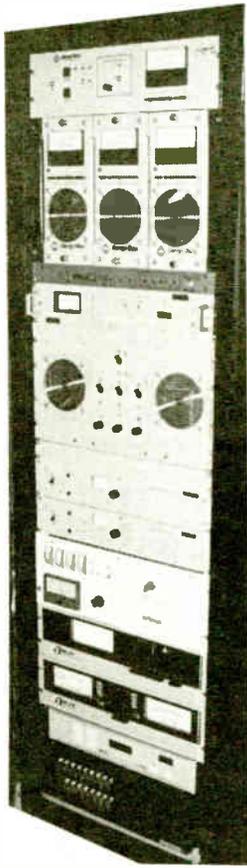
The exciter can provide up to 30 W out, although only 10 W are normally required. Simply put, a lot can go wrong and you're still on the air.

I am especially impressed with the Legend's extensive metering, simple control circuitry and "wind-tunnel" cooling system.

Throughout the entire RF chain there are various meters on each module, providing current, voltage, forward and reflected power readings. Each gives a clear picture of operating status at a glance. Remote operation is a breeze as well, with start, stop, metering and VSWR reset available. No special interface is required.

The Legend's control system is also simple and straightforward. It's basically "set it and forget it." It then regulates itself to compensate for line voltage variations. In addition, there's automatic VSWR foldback. It's nice to know that no operator intervention is needed in the event of ice build-up.

Heat is probably the greatest threat to a transmitter, but Energy-Onix's cooling system handles the heat easily. The system employs both intake and exhaust fans on each power module, producing a wind-tunnel effect. Two additional high volume exhaust fans are mounted on top of the transmitter cabinet. Thermal protection is also built into each IPA and PA module. I did not find another transmitter



WCDA(FM)'s
Energy-Onix
Legend 1000

that offered as many safeguards.

Installation of the Legend 1000 was fast and easy. Other than a couple of extra hands to move it into place, the whole job was accomplished in little more than an evening, including relocating our STL receivers, processing equipment and dial-up remote control system into the base of the Legend's cabinet. It makes for a neat, compact unit that's literally a "radio station in a box."

More punch

Operation has been flawless. After a while I tend to forget it's even there. Thanks to its heavy-duty power supplies, it stays on the air during power interruptions until the back-up generator kicks in.

While the Legend 1000 meets WCDA's needs nicely, it's also available from Energy-Onix in 2500 and 5000 W versions. For lower power requirements or for an inexpensive back-up, solid state units are available in 100, 300 and 500 W levels. If you need more punch, Energy-Onix offers up to 50 kW in its MK series which feature its proven grounded-grid triode design.

Certainly many good transmitters are on the market, but in speaking with other Energy-Onix users, we all tended to agree that few manufacturers, if any, offer as many outstanding features for the price as Energy-Onix does. I would buy another one, but with so much built-in redundancy, I don't have to.

□□□

For information, contact Ernie Belanger, vice president of marketing at Energy-Onix, in New York at 518-828-1690; fax: 518-828-8476; or circle Reader Service 137.

THE RF EXPERTS KNOW—MYAT DELIVERS

MYAT DELIVERS QUALITY

You can rely on MYAT rigid line and components to deliver a clean, powerful signal to your antenna. Pure highest quality copper, brass and silver plus computer-aided design and manufacturing ensure consistency and accuracy. No wonder demanding broadcasters worldwide choose MYAT products for their passive systems. We take Quality Control very seriously.

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Major transmitter manufacturers with strict production schedules rely on MYAT to deliver quality components on time and within budget. So do leading broadcasters like the Empire State Building's newest TV tenants. At MYAT, commitments are kept.

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Whether you're planning a new tower, upgrading an older installation, or coping with an emergency, you can depend on MYAT rigid line and components. Thousands of RF experts around the world already do. Contact your RF distributor, or phone us for our catalog, installation planning guide and engineering reference. Its detailed drawings can help you put together an efficient, trouble-free transmission line that will last for decades. For a free copy call 201-767-5380 or fax 201-767-4147.



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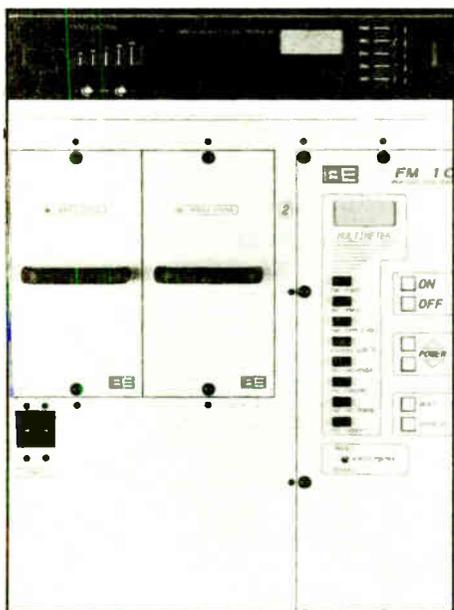
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USER REPORT

BE Is a Blast at World Trade FM

by Al Kirschner
Chief Engineer
WYNY(FM)

NEW YORK Not too long ago, to speak of a reliable transmitter was considered an oxymoron. In the last few years, however, reliable transmitters have become a reality. In fact, many station engineers now are as popular as the Maytag repairman, when it comes to transmitter repair due to downtime.



BE's FM-1C solid state transmitter

Station owners and managers have long sought this sort of reliability. Keeping this in mind, in 1990, I began looking for transmitter equipment for the new WYNY main transmitter site at the World Trade Center in downtown Manhattan. It was decided that WYNY would install two Broadcast Electronics FM-10B transmitters in main/alternate configuration.

This system would provide WYNY with excellent reliability as long as there was primary AC power at the World Trade Center and the master antenna functioned normally. I also recognized that WYNY would have some downtime at World Trade when tower maintenance was required. These concerns prompted me to install an emergency transmitter site at a second location.

The WYNY studio was selected for several reasons: the facility already has emergency power, an equipment shed on the roof of the building and a decent height (570 feet HAAT). A quick evaluation of the proposed site revealed that the AC power delivered to the roof was only 201 V due to the long run from the 208 V emergency power distribution panel on the ninth floor.

The search is on

I began a search for a 1 kW transmitter that would fit the following criteria: 1) operate off 201 V single phase, 2) be extremely reliable, and 3) require minimum rack space. I found that many manufacturers were building solid state transmitters that met my demands. However, after seeing the prototype of the Broadcast Electronics FM-500C (500 W) transmitter at the 1992 NAB convention—along with a promise from Bill Harland at BE that they would be building a 1 kW version and my satis-

faction with the FM-10B transmitters—I decided to go with BE.

Both the FM-500C and the FM-1C (1 kW) solid state transmitters have specifications that easily meet or exceed my expectations. The primary input power (my largest concern) is rated at 196 to 252 V single phase, a 208 V air conditioning outlet can power the 500C and did for a short period of time. Power consumption is 1.2 kW (38 percent overall efficiency) and 2.2 kW (45 percent overall efficiency), respectively.

Both transmitters are packaged with

BE FX-50 exciters, and the whole package occupies only 26.25 inches (15 units) of rack space in a standard 19-inch equipment rack. The output connector is a type N female allowing it to be coupled to any feed line by a simple flex jumper.

Very little heat is produced by the transmitters, resulting in a low air conditioning demand in the summer. Needless to say, the proven FX-50 exciter has excellent audio performance resulting in a very transparent composite transmission system.

WYNY originally placed the FM-

500C in service as a beta test. The transmitter was "placed" on top of a workbench in the equipment shed, plugged into an air conditioner receptacle, had basic remote control to the ninth floor wired to it and attached through 7/8 line to a single bay Scala FMO-1 horizontal folded dipole transmitting antenna pole mounted on the roof.

Placed a rush order

The pre-preliminary manual that arrived with the transmitter left a lot to be desired. The remote control installation section was missing and took some time to figure out, however this was the only problem we experienced.

When the transmitter was turned on, it worked and made full rated power. This set up was immediately pressed into

continued on page 59 ►

some days, it's tough to stay humble

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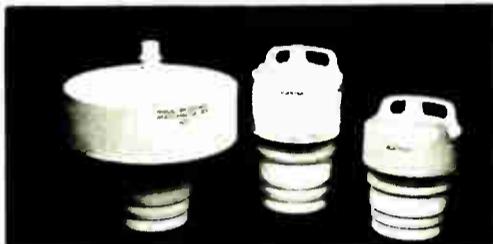
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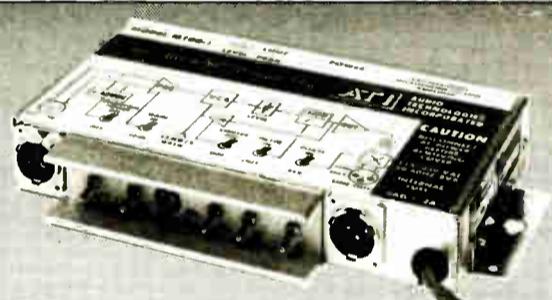
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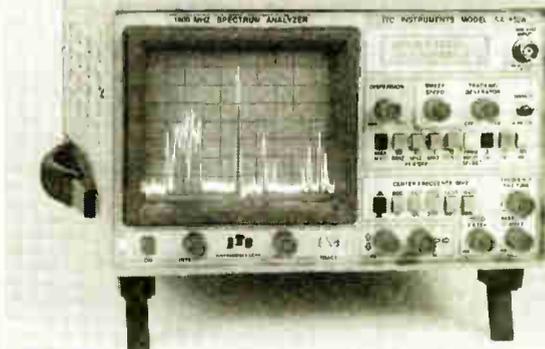
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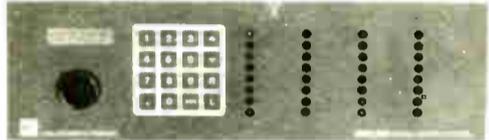
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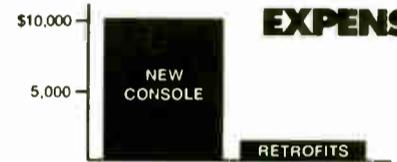


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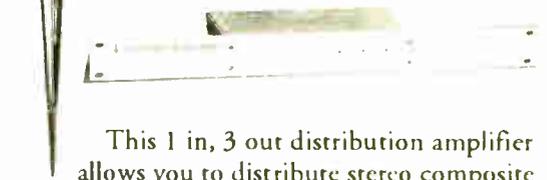
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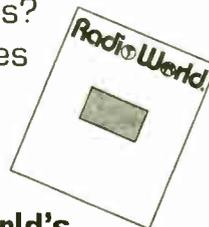
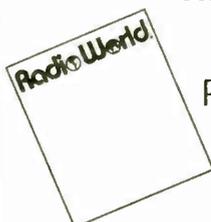
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READER SERVICE NO. 195

USER REPORT

Spain Is Elenos' RF Proving Ground

by **Antonio Fabriquez**
Managing Director
Video Medios

MADRID Video Medios S.A. (VIMESA) installs and maintains transmitters for FM and television stations. In particular, we specialize in FM installations.

VIMESA is a medium-sized firm with 20 employees; we have been in business since 1980. We began installing Elenos transmitters in 1990 with excellent results. Currently, we have a large number of Elenos transmitters in place, including: 15 5 kW units, four 2 kW, two 20 kW and one 12 kW.

We also have installed a number of the company's low- and medium-power solid state transmitters. To date, the only maintenance

required by any of this equipment has been "electronic tube" replacement after an average of 15,000 hours and new air filters.

Among the features that have sold VIMESA on Elenos transmitters are: RF amplifiers designed with both a control and a screen grid; a cathode drive; filament soft-started by a ramp generator, which keeps the switch-on current within the limits of the device to avoid thermal and electromechanical shock; and a two-step soft-start circuit used to control anode current at switch-on to avoid current spikes.

Some system options include automatic power control, power control relative to VSWR, remote control and an interactive

computerized driver.

The automatic power control system (APC) protects the units from outside stresses (for example, an inadequately performing irradiating system, or an improper adjustment by a less-than-qualified technician), which gives Elenos transmitters a high level of reliability.

The APC feature also solves the problem, common in triodes, of unstable temperature levels in the power output stage, by fixing the temperature at the desired level.

One of my favorite features is the RF Diagnostic system—a telemetry and remote control system. It is designed to resolve amplifier problems and to monitor

the necessary parameters to intervene in the event of a malfunction. Data is transferred via radio or telephone link to a PC at the station.

With the system, I can keep track of our gear in the field from the comfort of my office, which, as some of our units are located in remote places that are not very accessible, is quite helpful. The software package is available in a number of languages, and it automatically acquires and archives data. Both historical and real-time data are presented graphically.

The system requires one data acquisition card that can monitor 16 analog signals, 23 digital signals and has 12 control outputs.

□ □ □

For information, contact *Patrizia Mollari* or *Leonardo Busi* in Italy at +39-532-829-965; fax: +39-532-829-177; or circle Reader Service 165.

USER REPORT

RDS Data Sidekick

by **Tom Grenga, President**
New England Commuter
Electronics

DALLAS For years, subcarriers proved their popularity and usefulness by delivering background music over FM. Today, subcarriers are alive and well, making money for FM broadcasters in new and unique ways.

Animated LED signs inside mass transit buses is one application that shows a lot of promise for growth. Currently operating in Dallas and Providence, R.I., these signs deliver news, weather, transit information, jokes and commercial spots to passengers.

The real-time communications link between the operations center and the buses on the road is a broadcast data subcarrier. Using the **Modulation Sciences Data Sidekick®** system, in conjunction with an LED display built by Sunrise Systems of Pembroke, Mass., a 4800 bps 67 kHz or 92 kHz subcarrier provides the capability to load fresh information into the sign at anytime during the day.

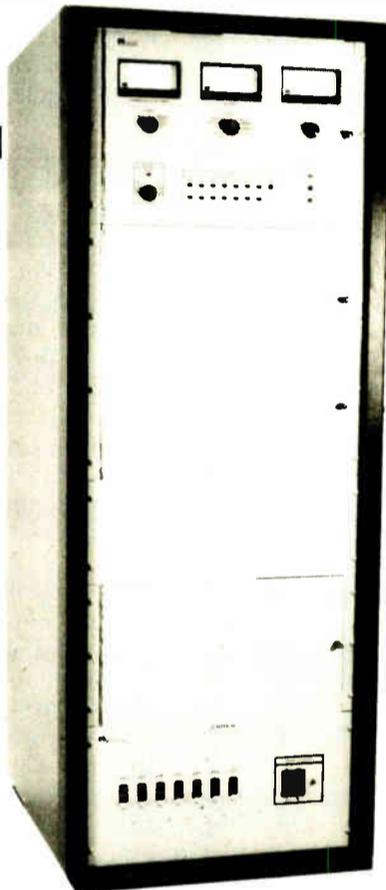
The subcarrier is a bipolar, frequency-shift keyed signal with cosine-squared shaped transitions. Shaping the frequency transitions before modulation avoids the need for extensive filtering of the FM subcarrier. This also minimizes intersymbol distortion, and makes the system more reliable.

The baseband bandwidth of the data subcarrier is about the same as that of a standard audio subcarrier. In fact, viewed on a baseband spectrum analyzer, it's impossible to tell a Data Sidekick signal from an audio subcarrier.

The Modulation Sciences Data Sidekick receiver is a 4-inch by 4-inch circuit board built into the Sunrise Systems sign controller. It delivers an RS-232 data output to the sign electronics. The receiver is crystal controlled on the carrier frequency and is agile between a 67 and 92 kHz subcarrier frequency. The receivers are very rugged, having withstood pounding in almost 1,000 Dallas Area Rapid Transit System buses for more than 18 months with hardly a problem.

□ □ □

For information, on Modulation Sciences' subcarriers, contact *Art Constantine* in New Jersey at 800-826-2603; fax: 908-302-0206; or circle Reader Service 21.



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USER REPORT

KUSC's Funds Well-Spent on TTC Gear

by Lyle Henry
Director of Engineering
KUSC(FM)

LOS ANGELES In public radio, there is seldom an opportunity to outfit a new transmitter site. When our golden opportunity appeared, we had to make the most of it.

Minimum transmitter maintenance was the guideline, and that meant solid state. Price came right after reliability on the priority list. The TTC FMS-8000 fit both requirements. I was immediately comfortable with the choice, and have been pleased since.

KUSC(FM) was building a transmitter site

on Mt. Harvard, near Mt. Wilson, the site of most of Los Angeles' FM transmitter sites. Ours would be the only broadcast station at the new communications site; a great location free from the many RF problems of Mt. Wilson, but also at the end of a dirt road which became impassable after each rain shower or earth tremor. We couldn't count on getting there easily.

No lightning damage

Another concern was lightning. Because we were the only tower around, we really needed lightning immunity. None of TTC's transmitters have been damaged by anything coming down the transmission line.

There is a DC short in each harmonic filter.

TTC already had about 90 of its solid state units in the field, more than twice as many as the competition, and had been producing them longer. All the owners I called were very happy with their TTCs.

TTC uses its 4 kW solid state transmitter as a building block. An outboard combiner with reject load joins two units for 8 kW; three can be combined for 12 kW, etc. A 5 kW basic unit is due to be introduced soon.

The 30 W TTC Model X exciter has outstanding specifications: FM SNR over 90 dB; AM over 80 dB; THD, IMD and TIM under 0.01 percent, for instance. Frequency is programmable all the way from 76 to 108 MHz and it is convection cooled without a fan. I especially like the separate level controls (front panel adjustable) for the mono, composite and five SCA inputs.

KUSC utilizes three SSB SCAs in the 67 kHz region as well as a conventional FM SCA at 92 kHz and will be adding RBDS at 57 kHz. The exciter also has a composite audio BNC on the front panel for testing and another providing an RF sample with the frequency trim pot right under it.

Each transmitter includes an IPA and four 1 kW power amplifier modules. Any PA can be used as the IPA in an emergency. Alternatively, the exciter can be connected directly to the PAs. Each PA module contains four 320 W amplifiers conservatively operating at 250 W.

Quick change

A module can be changed easily while on the air. Just back the power down about half way, open the back door (no interlocks, only 50 V inside), remove the drive coax from that module, then unscrew the control, DC power and output cables. Slide the module out, the replacement in, and screw the four cables on again, connecting the drive last. I timed myself at just over three minutes.

The next step is where I have suggested an improvement to the factory. In order for the replaced module to come on line, the controller must be reset. This is done by pressing STOP, then START, which causes a carrier drop for a fraction of a second. While it is not a serious problem, it was obviously not designed with the PD in

mind. TTC is rethinking this.

All FMS series use ferro-resonant power supplies, which operate ± 15 percent of input voltage, 208 or 240 single phase. That keeps generator costs down and permits operation where three-phase is unavailable. Our 208 has been as low as 188 with no power change. Regulation of the 50 V output is done on each amplifier module, which spreads the head load and increases redundancy and reliability. Overall efficiency, AC to RF, is 62 percent.

Cooling and meters

Two squirrel cage blowers keep the system cool, again providing redundancy, but the transmitters will stay on at reduced power even if both fans fail. Earlier transmitters used noisy dual high speed fans, which were about 14 dB louder than present models. The TTC blowers are a welcome improvement in small rooms.

Metering is entirely digital. You can monitor more than you may ever want to know about, much less wire in to the remote control. One parameter new to solid state is a multitude of temperature sensors on the IPA and PA modules. Even the combiner module has one. The highest PA reading we see is about 53 degrees Celsius.

The aforementioned START and STOP buttons take the transmitter on and off the air. There is no tuning whatsoever. Each transmitter has its own controller, which constantly monitors for load changes during ramp-up and operation. Automatic power control is accurate to 1 percent. Proportional VSWR and temperature fold-back are standard.

The controller itself is CMOS for RF and static immunity, and is self-diagnosing and self-correcting. It is designed around a fail-on concept. It tries to keep you on the air at as much power as possible without incurring damage. Automatic AC restart and multiple overload recycle operate quickly with no warm-up delays, of course.

Warranty on the exciter is two years with one year on the transmitter unless you opt for TTC's S1A line surge protector. This is a truly rugged device and so inexpensive that I cannot imagine not purchasing one. TTC doubles the transmitter warranty to two years if you have it. We have had zero power line damage to anything in the building.

□□□

For information, contact Paul Phillips or Russel Erickson in Colorado at 800-TTC-1099; fax: 303-673-9900; or circle Reader Service 205.

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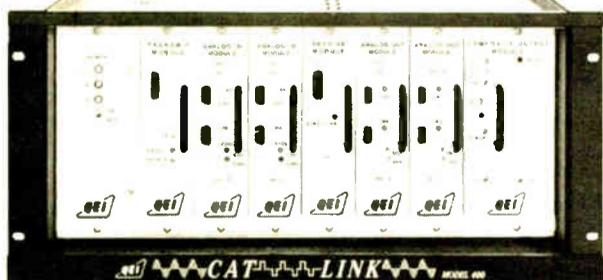
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USER REPORT

Difficult Market Has Bext Gear

by Dennis Gilliam
Chief Engineer
KJZZ(FM)-KBAQ(FM)

PHOENIX KJZZ(FM)-KBAQ (FM) is a dual FM stereo station setup, licensed to Maricopa County Community College. Jazz and classical music are the station's respective formats. KJZZ, a class C station operating at 1,600 HAAT, has been on the air since 1951. KBAQ is a newcomer to the Phoenix market, and in being so, is enjoined by the Mexican-American broadcast treaty.

This treaty limits the operation of KBAQ to that of a class A station. With its antenna height the same as KJZZ, KBAQ's transmitter output power is 155 W. This makes it diffi-

KJZZ currently is using several Bext exciters for both main and translator service.

cult to serve our market, especially with 14 high-power FMs looking for a share.

Keeping this in mind, we spared no expense in designing KBAQ. From the fully digital reproduction of the studio and STL, to the Bext transmitter, only the best was used. The transmitter works alongside other world-class units, and no one, from the DJs to our most critical classical listener, ever complains about its performance.

KBAQ uses the HPT agile exciter and the 250 W solid-state amplifier, both from Bext. It is fully compliant with the FCC type-acceptance regulations for main transmitter services, has easily interfaced control and metering functions and is utterly stable and cool running.

The HPT exciter and the amplifier take up only 10 1/2 inches of rack space, and are front-panel supported without the need of slides.

KJZZ currently uses several Bext exciters for both main and translator service, and the stability and advantage of being agile have paid off times over in terms of reliability and flexibility.

If you are ever in the Phoenix area, look up the station and I will be glad to show you our plant and how our Bext equipment is on-line and working.

□ □ □

For information, contact Edd Forke in California at 619-239-8462; fax: 619-239-8474; or circle Reader Service 53.

BE: Reliable and Easy to Maintain

▶ continued from page 53

service while the tower was being painted at World Trade. The main site had to be shut down every weekday from 1:45 a.m. to 6 a.m. The FM-500C came on every day without a problem. I immediately placed a rush order for the FM-1C.

The FM-1C arrived in the second week of the tower painting project. It was installed the day it arrived. The new 208 V circuit to the roof was already installed, and a new four bay Scala FMO-4 antenna was on the way. The Scala antenna was chosen since it does not "look" like a transmitting antenna, a concern of the building owner.

The total time for installation, including permanent rack mounting and wiring in the complete remote control (all functions and readings) took less than four hours. Like the FC-500C, the transmitter came on the first time at full rate power, 1 kW. This configuration of TPO and antenna gain gives WYNY an ERP of 1.89 kW.

Wide band operation

Installation was quick since we were already familiar with the FM-500C and the preliminary manual that came with the FM-1C is excellent. In fact, it is better than some other manufacturers' regular manuals.

A side benefit of this transmitter is its wide band operation. By resetting the frequency switches in the FX-50 exciter, the transmitter can be placed on any frequency. If another exciter is used, it should be capable of 20 W output to drive the final amplifiers to full output power. If it is necessary to place the transmitter on another frequency (if a sister duopoly station has transmitter

problems, for example), it is recommended that the output power meter be re-calibrated on the new frequency. This is easily accomplished by comparing the output power indicated on the transmitter to that on an external wattmeter (like a Bird 43).

Easy maintenance

I am extremely pleased with the transmitter's reliability and its excellent layout that make maintenance extremely easy. The power modules (the FM-500C uses one module while the FM-1C uses two) are removable from the front by removing two screws. The logic controller is located behind another front panel with a few more screws, and the pleated air filter is removable from behind while the transmitter is running.

The only item, other than the air filter, requiring regular maintenance is the 9 V battery, located in the logic assembly. The battery holds memory during a power failure. If the battery is removed or goes bad, the transmitter will not remember its output power level. However, it can be raised to rated output power when the AC is restored either at the transmitter or via remote control.

The only feature that is lacking in the FM-500C and FM-1C is an AC connection between the transmitter and exciter. The exciter comes set up for 208 V and must be plugged into a separate 208 V receptacle. It can be operated from 110 V but must be set in the field for this voltage. This is simple, just reverse the power-determining PCB on the back of the unit. This change enables the exciter to plug into a standard 100 V receptacle.

I would recommend these transmitters to any Class A station looking for a new main transmitter or to any station needing an extremely reliable back-up transmitter.

The only regret I have is that the transmitter was not installed at the time of the bombing at World Trade this past February. WYNY lost almost one hour of air time while I arranged for an emergency site in New Jersey during the disaster.

□ □ □

For information, contact David White in Illinois at 217-224-9600; fax: 217-224-9607; or circle Reader Service 124.

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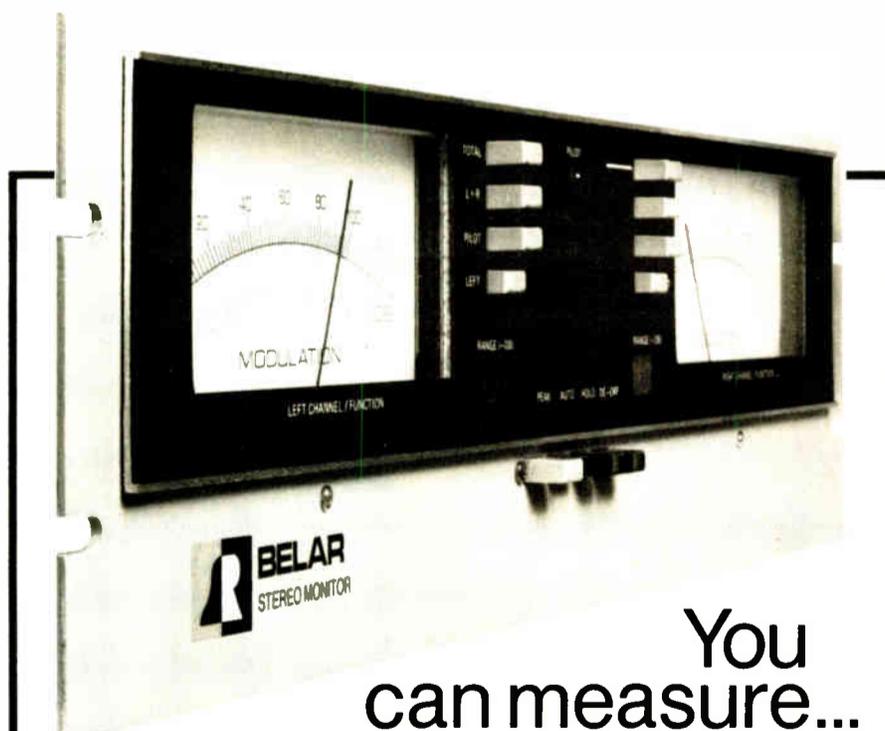


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World Radio History

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BUYERS GUIDE

People, Promotions and Appointments

The executive committee of the **United States National Committee of the International Electrotechnical Commission** appointed **John Schimelfanick** to a four-year term as the U.S. Technical Advisor for RF Cables. His responsibilities consist of numerous ANSI IEC/ISO recommendations including determining U.S. position on ISO international standards and providing U.S. delegates with guidelines for IEC/ISO meetings.

Narda Microwave Corporation promoted **Vinod Chitkara** to vice president of sales. He is in charge of all sales activities for the domestic and international markets and customer service for Narda. Chitkara has been with Narda since 1973.

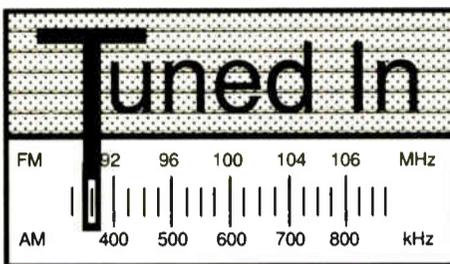
Narda also recently appointed **Daniel Duris** regional sales manager for Southern California, New Mexico, the District of Columbia, Maryland, Delaware and Virginia. Duris also manages some international territories.

StandardNews, a subsidiary of **Broadcast Equities Inc.**, appointed **Mike Anthony** director of affiliate relations for StandardNews' full-service radio network. Before joining StandardNews, Anthony worked for Gannett Company, where he established and managed the Gannett Radio News Service.

Radio Computing Services Inc. (RCS) tapped **Earl Boston**, former program director at WMMJ(FM) in Washington, D.C., to join its customer service team.

Boston will answer questions, troubleshoot problems and train customers of RCS's radio software product line.

Rane Corporation added **Jack Ewer** to its sales team as regional sales manager for territories covering half the country. Ewer is responsible for developing new accounts and product training.



Murphy Studio Furniture had **Sandy Berenics** join its sales team. She comes to Murphy with 14 years of broadcast experience from Pacific Recorders.

Scientific-Atlanta appointed **Jack Simpson** group president of its Network Systems businesses and senior vice president of Scientific-Atlanta.

Company News

Harris Corporation received a \$24.4 million contract from the U.S. Navy for 17 shipboard HF radio systems. Deliveries will take place over the next 24 months. The shipboard radio equipment consists of a solid state broadband transmit system, receive system and integrated computer control and monitor system.

Intraplex Inc. signed a domestic distribution agreement with **Applied Communication Technologies Inc. (ACT)**. ACT will now distribute Intraplex products in Midwestern markets.

Wegener Communications established a Western region field sales office outside Seattle. The company headquarters are in Georgia. The west coast office is located at 1050 N. Bayshore Dr., Camano, WA 98292; telephone: 206-387-1245; fax: 206-387-2932.

Audix opened a sales and marketing office in Southern California. The corporate offices in Oregon will now focus on manufacturing and distribution. The California office is located at 24981 Calle Arenal, Lake Forest, CA 92630; telephone: 714-588-8072; fax: 714-588-8172.

According to an open letter to its membership, **ASCAP** (the American Society of Composers, Authors & Publishers) plans to expand its radio and television surveys immediately. The goal is a complete census of radio within ten years and of TV within the next few years.

During the recent NAB radio show in Dallas, **Broadcast Electronics** raffled off five of its AudioVAULT-100 PC boards. The winners were: **KKDL(FM)** of Detroit Lakes, Minn., **WFXC(FM)** of Durham, N.C., **WZFX(FM)** of Whiteville, N.C., **WQIK-AM-FM** of Jacksonville, Fla., and **WZQK(FM)** of Coeburn, Va.

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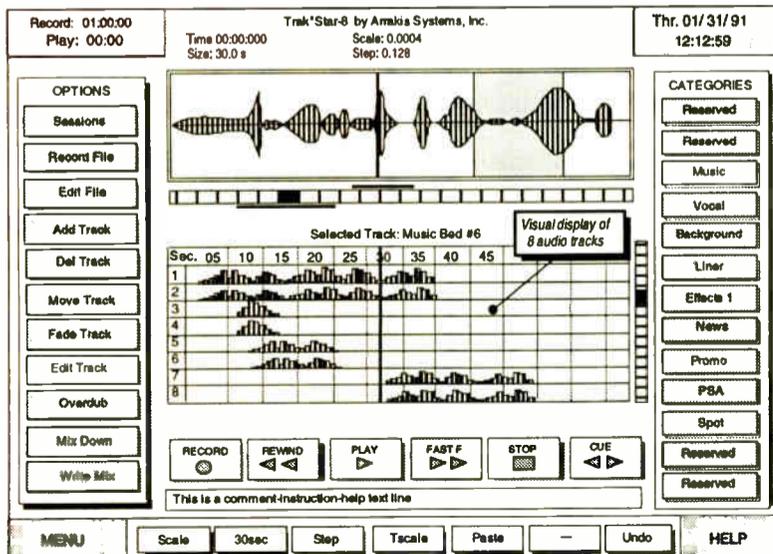
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I don't sweat when it comes to our spot-heavy morning drive or complicated LMA formats. The reason is simple: First I did my homework. And then I bought a DCS hard disk system from Computer Concepts. In fact, I bought several.

I smile at the thought of multiple program formats and satellite automation, live and live assist. I laugh at complex spot rotations, two-channel crossfades with simultaneous recording and networking to traffic—they're no problem for the DCS.

And Computer Concepts customer support is terrific. Their software experts can even troubleshoot my DCS and upgrade the software remotely, via modem.

No wonder Computer Concepts DCS has turned hundreds of stations into happy customers. I'm glad I'm one of them. Oh, I almost forgot. The price was right, too.



I thought I'd impress HQ by buying the cheapest hard disk system I could find. After all, they all look the same! Their promises sounded good and I wanted to believe.

I found out promises come cheap. But their system wasn't really cheap—not once you added up the little "extras" it took to do the bare minimum. And it still couldn't do all the things our station really needed.

I found out the hard way, at 3 AM when the system we bought crashed. And in morning drive, when missing spots meant dollars down the drain. When I finally reached customer support, they said they were working on software they thought would fix my problem, but they weren't sure when it would be done. Guess what I told them?

Now I know better. We're getting a Computer Concepts DCS. I learned a costly lesson: Get it right the first time. Call Computer Concepts first.



"I should have bought a DCS in the first place."

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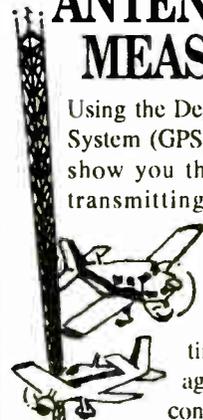
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MARKETPLACE

A compendium of new and recently introduced radio broadcast products

Super-VU LED Meters

Logitek introduced its Super-VU line of LED VU meters. These meters have an expanded range with 40 tricolor LEDs.

The meter series provide not only simultaneous loudness and peak modes, but also information on stereo image and mono sum. Other features include a user adjustable zero point, brightness adjustment and max hold. Max hold indicates the highest peak level attained, until manually reset.

Up to six displays fit in a 1 RU box. And the meters come in analog and digital input versions.

The Super-VU meters start at \$895 for a single stereo loudness and peak meter including rack-mount enclosure and power supply.

For information, contact Tag Borland in Texas at 800-231-5870; fax: 713-782-4592; or circle Reader Service 113.

High-Performance 60 Watt FM Exciter

The FM60G from CCA is a synthesized, FM broadcast exciter for operation in the 88 to 108 MHz band. The operating frequency can be set, in 25 to 50 kHz increments, to any channel within that band. The output power is variable from 5 to 60 W. It mounts in 5 1/4 inches of rack space in a standard 19-inch rack.

The exciter has three analog meters displaying final transistor collector voltage and current and exciter power output/VSWR.

Modular construction is used for most major subassemblies, allowing for easy maintenance. Frequency programming switches and input level controls are accessible through the lid of the unit.

The exciter's driver and final power amplifier transistors are cooled by a massive aluminum heat exchanger. The heat exchanger is forced-air cooled.

For information, contact Steve McElroy in Georgia at 404-964-3530; fax: 404-964-2222; or circle Reader Service 97.

Low Cost Utility Amps

The NanoAmp Series from Audio Technologies Inc. has two additions: the MX100 three input microphone/line mixer and the XP100 four input expander.

Both amplifiers feature low noise balanced inputs switchable for microphone or line

levels, phantom power, independent headphone output and a metered, high-level, low-distortion, protected 600 ohm output for balance or unbalanced lines. XLR and 1/4-inch TRS connector models are both available.

For information, contact Samuel Wenzel in Pennsylvania at 215-443-0330; fax:

215-443-0394; or circle Reader Service 78.

Waterproof Wireless System Introduced

Gient Communications Inc. has introduced the SWIM (Submersible Wireless Microphone) System, a waterproof wireless microphone system.

SWIM uses the G-762 receiver and the T-677G transmitter, and it broadcasts in the 494-704 MHz UHF band. The transmitter offers 100 mW of output with a maximum range of 1,500 feet. Its wireless circuitry is by Vega.

The SWIM System is powered by an internal rechargeable battery, and comes with a water-

resistant neoprene pouch that can fastened to a belt or strapped directly to an arm or leg. The receiver is rack-mountable and has XLR output, a headset monitor and up to four frequencies.

For information, contact James Stoffo in Florida at 407-240-2880; fax: 407-240-5091 or circle Reader Service 144.



The original Shure FP32 set the standard in field production for portable stereo mixers. Now, with the new FP32A, you can count on getting even less. Noise, that is...30dB less! In fact, the FP32A is so quiet and improved that it's perfect for use with DAT and other digital recording media.

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The Shure FP32A is a 3-input, 2-output portable mixer specifically designed for:

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The FP32A weighs just 3.5 lbs and is only 2-1/4" H x 6-3/8" D x 7-1/4" W in size.

FP32A

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You get all the features of the original FP32 plus:

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TECHNOLOGY

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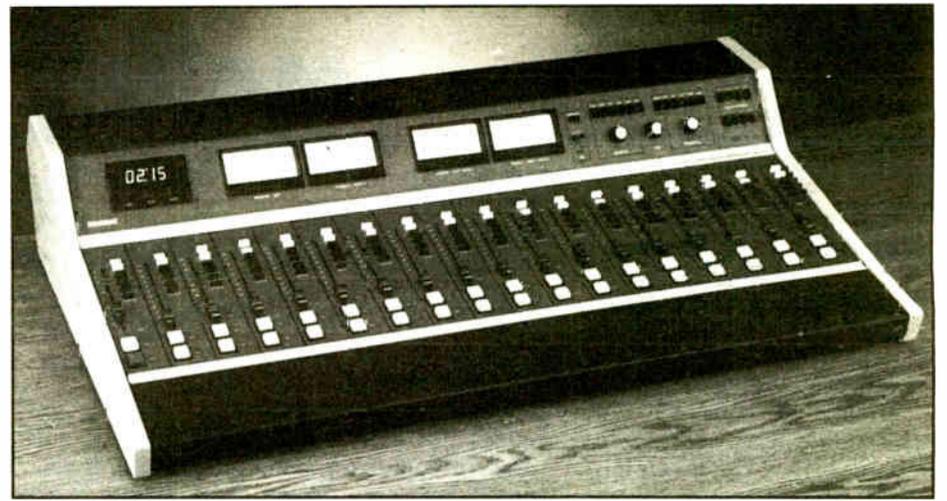
Downconverters for Satellite Headend Market

The Digi-Ready product line, manufactured by California Amplifier Inc., allows phase-locked downconverters to receive digitally compressed satellite programming.

The Digi-Ready line includes phase locked low noise amplifier block (LNB) downconverters and a commercial phase-locked downconverter.

The Digi-Ready downconverter has an input frequency of 3.625 to 4.2 GHz and an output frequency of 950 to 1525 MHz. This covers the standard C-Band Frequency of 3.7 to 4.2 GHz for U.S. usage, and an extended range for international C-Band applications.

For information, contact Dennis Schwab at 805-987-9000; fax: 805-482-5842; or circle Reader Service 25.



Fidelipac's New Console

Fidelipac introduced its new MX18E modular audio console. The new unit is available in eight, 10, 12, 14, 16 or 18 channels.

New features on the MXE include fader start, pre-fader patch points, independent gain controls, remote module on/off and remote start terminals.

For information, contact Fidelipac in New Jersey at 609-235-3900; fax: 609-235-7779; or circle Reader Service 39.

STL Optimizer

Orban, a division of AKG Acoustics Inc., released its 8200ST Optimod studio chassis.

The 8200ST is designed to optimize the left/right STL, allowing the audio processor to perform at its best when located at the transmitter. It protects the STL from overload, providing a well-controlled signal with dynamic control

matched to the main audio processor.



The 8200ST uses Orban's Class-A VCA proprietary topology to ensure negligible distortion. It combines automatic

THE IDEAL COMBINATION

TH-02EX



TLE-02



Digital Telephone Hybrid - TH-02EX

- ◆ Frequency Extender Mode as standard feature.
- ◆ Works with one or two telephone lines.
- ◆ The second line provides full multiconference mode. The operator and two callers can talk and listen to each other simultaneously.
- ◆ Hybrid Null of 60 dB's.
- ◆ No adjustments required.
- ◆ Ideal companion to work with AEQ Portable Digital Line Extender TLE-02.

The TH-02 EX introductory price is \$1295.

Portable Digital Line Extender - TLE-02

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- ◆ Ideal for field reporters, totally portable. Light weight: 3.3 Lb.
- ◆ Great operation autonomy, uses 8 AA batteries.
- ◆ Dialing pad in front panel and pulse/tone selectable.
- ◆ Independent level control of mic/line input, auxiliary input and headphones.

The TLE-02 is available to all broadcasters for the amazing introductory price of \$895.



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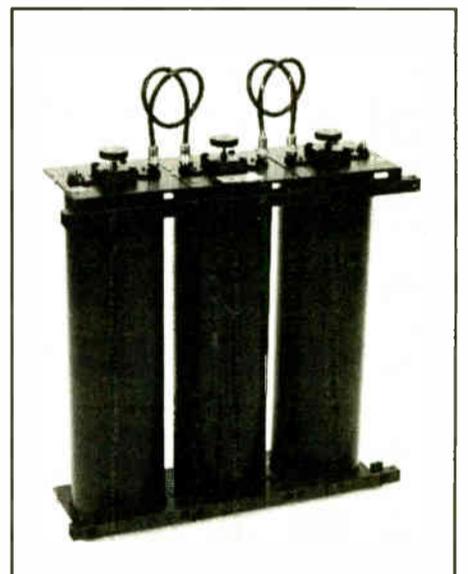
World Radio History

gain control, high frequency limiting and final peak control. User features include a built-in 100 percent modulation calibration tone generator, variable density and stereo couple/uncouple switch.

For information, contact Amy Herndon in California at telephone 510-297-2727; fax: 510-351-0500; or circle Reader Service 129.

High Q Bandpass Filters

High Q bandpass filters from Microwave Filter Co. offer tunable quarter wave cavities for increased Q, selectivity and low loss while suppressing interference from 30 to 950 MHz.



The filters are adjustable ± 5 percent from center frequency. Bandwidth is up to 3 percent. VSWR is 1.5:1 maximum and connectors are type N female (50 ohms). Insertion loss is 0.5 dB at 350 W, 1 dB at 250 W and 2 dB at 100 W. Single, double and triple cavity models are available. The filters are also available for multiplexers and in custom configurations.

For information, contact Tom Parker in New York state at 800-448-1666; fax: 315-463-1467; or circle Reader Service 201.

Broadcast Equipment Exchange

"Broadcast Equipment Exchange" accepts no responsibility for the condition of the equipment listed or for the specifics of transactions made between buyers and sellers.

NOTICE

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- 1 We can help you select new equipment and supplies available from quality manufacturers such as Digistation, Nel-Tech Labs, Scala, Henry Radio and many others.
- 2 We have available rental test equipment such as:
Potomac Field Strength Meters (AM & FM)
Tektronix Spectrum Analyzer
Delta Impedance Bridge
Delta Receiver/Generator
- 3 Looking for a piece of quality pre-owned equipment? We have a great selection that is always sold with a 30 day guarantee! Let us know what you need.
- 4 Do you have excess equipment you would like to sell? We have customers looking for transmitters, optimods, field strength meters, STL and RPU equipment plus many other items. Let us know what you have available.
- 5 Need just good sound advice on equipment selections that both fit your needs and your budget? Call the two best sources of information in the industry, Steve or Chuck. They can help you save money!

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Circle (206) On Reader Service Card

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AMPLIFIERS

Want To Sell

RTS-405 stereo TT preamp, 2 @ \$145 ea plus shpg, used 6 mos, then stored. B Lord, Lord Bldg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Crown D-60 rack mount in gd cond, \$200/BO. R Gleen, WJUR, Wimauma FL 33598. 813-634-1940.

LA Sound LEP512 5 band preamp, EQ, w/2 Hermosa 1505 150 W pwr amps, BO. B Cameron, WWKS, 1316 Seventh Ave, Beaver Falls PA 15010. 412-846-4100.

Peavey Musician Mark III guitar/instrument amp, 2 chnl, 400 W, auto-mix w/footswitch, 4 x 12" speaker cabinet, mint cond under 100 hrs total use, \$450 firm plus shpg. J Tanis, Civitas, 925 N Northlake Dr, Hollywood FL 33019. 305-920-4218.

Digital Process 4 chnl stereo head-phone amp, very clean, like new, \$129. W Dougherty Jr, WLD Recdg St, Music Valley Rt 1, MMill Spring MO 63952. 314-998-2681.

Hafler DH500/DH200, \$325 ea; Symetrix A220 (4), \$250 ea. Los Angeles CA. 310-372-4329 or 818-763-2461.

Stanton 310 pre amp, BO. J Kesler, WOBZ-TV, POB 220, Livingston KY 40445. 606-642-2209.

Crown PS-MOD/X 2 chnl input module mic/line balanced, plug-in amp w/octal socket, used, \$25. MRG Prod, 516-447-1041.

Altec-Lansing 1588B transistor pre-amps (6), new, \$60. MRG Prod, 516-447-1041.

New 250 W solid state amp, \$1800. Call for details. Bill Hoffman, 518-583-9490.

Want To Buy

Heathkit AA-1640, 200 W solid-state amp w/manuals. R Rosenow, KTTS, POB 2180, Springfield MO 65801.

Harmon-Kardon, Marantz, McIntosh amps, preamps, tuners, tubes, owners/service manuals, etc wanted. R Gleen, WJUR, Wimauma FL 33598. 813-634-1940.

ANTENNAS TOWERS/CABLES

Want To Sell

Phelps Dodge CPLPFM4 4 bay w/radomes tuned to 95.3, \$990; 170' 7/8" coax, \$150. R Boosan, KDKD, Box 448, Clinton MO 64735. 816-885-6141.

Utility Tower (2) 380' w/insulators, guys & lights, on ground ready to ship \$4560 ea. J Proctor, WCRJ, 980 FM 1746, Woodville TX 75979. 409-429-3679.

FM - ANTENNAS

Designed and built for your frequency. Choose from 1 to 12 bays and five power levels. Financing available. Call Jimmie Joynt at S.W.R. **214-335-3425**

3-1/8" hard line bullets (8 ea), fair coned, free, you ship. M Everhart, KGON, 4614 SW Kelly, Portland OR 97201. 503-497-0313.

Windcharger 45G, 100' iron tower, 5-20' sections w/guys, on ground, BO. J Kesler, WOBZ-TV, POB 220, Livingston KY 40445. 606-642-2209.

JENNINGS VACUUM CAPACITORS FOR SALE

Approximately 85 pre-used vacuum capacitors from government 50 kW AM station that changed over to FM. ALL NEW appearance & approximately 10 yrs old. Will sell for 35% of current NEW price. Phone/fax for list of Type, Capacitance & Voltage.
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Fax: 416-421-3880

SWR 6 bay, A1 power, tuned to 101.3, on air only 2.5 yrs, anti-ice coating, avail 1/94. \$8000/BO. J Stevens, KCHQ, 269 W Alameda #D, Burbank CA 91502. 818-954-0214.

Tower, 500', 3' face, 2 yrs old, in place or re-locate, Charlottesville VA; 500' 1-7/8" transmission line; ERI 92.1 MHz FM antenna, 2 bay. R Fries, WWSY, 800-990-1019.

160' Rohn 45 with hardware, disassembled, Bob 409-560-3173.

H&P PC-140 photo-eye tower light controller w/ext eye, weather proof housing & adjustable delay set, \$50/BO, trade possible. A Wasilewski, KMWX, POB 1460, Yakima WA 98907. 509-248-1460.

Andrew coax on spool, approx 400' of 4", w/connectors, BO. B Lacy, KARX, 3611 Soncy, #6A, Amarillo TX 79121. 806-359-4000.

ERI GP55 5 bay 4" end feed rotolill, gd cond, top bay needs repair, tuned to 106.1, BO plus shpg. B Brintzer, WDNC, 1000 Park 40 Plaza, Durham NC 27713. 919-361-1429.

TOWERS...bought and sold. Call 1-800-393-2266.

Want To Buy

Self supporting tower 200' w/marker lights; 4-bay antenna w/deicers for use on 99.5, transmission line & mounting brackets. R Williamson, KWEI, POB 791, Weiser ID 83672. 208-549-2241.

Shively or comparable fairly recent FM antenna tuned to 106.3, 3-bay, 4200 W in need for back up. L Maierhofer, WOHG, Fairground Rd R.D. 4, Huntingdon PA 16652.

1-5/8" rigid transmission line, unflanged. Elbows, bullets, couplings. 305-757-9207.

AUDIO PRODUCTION

Want To Sell

Orban 111B stereo reverb, \$300. M Rollings, WZNF, 400 Broadway, Urbana IL 61801. 314-458-5595.

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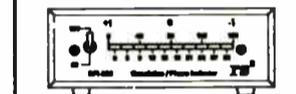
DigiDesign SoundTools 1 w/DAT interface, \$1200/BO; DigiDesign Session 8, \$3000; 1.55 Gig SCSI drive, \$1700. R McMillen, Super Duper Audio Duplicating, 1634 SW Alder St, Portland OR 97205. 503-228-2222.

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Datatek D507 audio DA cards (3) with D-507 GRA power supply, no rack frame, new, BO. MRG Prod, 516-447-1041.

Sennheiser wireless infrared stereo headphones & xmtr, \$195; dbx 4BX dynamic range expander, \$275. R McMillen, Super Duper Audio Duplicating, 1634 SW Alder St, Portland OR 97205. 503-228-2222.

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Compuserve: 75366,311

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Smartcaster, computer, digital audio: live or automated. D Nelson, 619-758-0888.

ADC 48 patchbay phone jack. D Nelson, 619-758-0888.

Want To Buy

Phase Linear 1000 autocorrelator schematic & IB, original or good copy OK. R Caldwell, WTVF, 474 Jas. Robertson Pkwy, Nashville TN 37219.

Eventide H-969 or similar pitch shifter. K Carlson, KTFI, POB 2820, Twin Falls ID 83301. 208-733-3381.

Fairchild 600 conec or 602 Conex high frequency limiters. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

AUTOMATION EQUIPMENT

Want To Sell

Scully 100, BO. J Kesler, WOBZ-TV, POB 220, Livingston KY 40445. 606-842-2209.

VRC-2000 compatible data terminals, QUME QVT-1C1, \$75 ea. G Finney, WPWB, 7137 Healer Ln, Macon GA 31206. 912-788-2124.

Otari ARS1000 PB, like new, (3) \$1000 ea. J Fuller, WJF, 26 Woody Hill Rd, Hope Valley RI 02832. 401-539-8502.

Revox PR99 (3) PB units with 25 Hz tone detectors, 7.5 & 3.75 ips, rack mounted in great condition, \$700 ea. E Gross, KEYZ, POB 2048, Williston MO 58802. 701-572-5371.

Harris 9002 (5) ITC 750/720 PBs, 48 trk mono Instacart, (3) cart deck PBs, (2) VOTs, manuals & schematics, in use. J David, KMPL, PB 907, Sikeston MO 63801. 314-471-1520.

NBC Hotline decoder, hook to NBC audio, gives contact closures for automation & alerts, \$250. E Cary, WLKX, 15226 W Freeway Dr, Forest Lake MN 55025. 612-464-6796.

Systemation X-7 avail for use as parts, BO. B Kenney, WOYC, POB 1646, High Springs FL 32643. 904-454-3666.

Smartcaster, 2 yrs old, still in service, with 3 relay cards (24 relays), SX-8 audio card, monitor, keyboard, etc. A Clawson, WFFF, POB 444, Sturgeon Bay WI 54235. 414-743-7443.

SMC 350 Carousel, stereo in oak laminated cabinet, working when removed, \$350. D Koehn, KKPR, 403 E 25th, Kearney NE 68847. 308-236-9900.

SMC MSP12 controller, DAS12 switcher with (4) 452 Carousels, (4) Otari ARS1000 reel decks, (2) remote control heads, (2) Amdek video monitors, complete system in 3 racks, excellent condition, BO. M Roberts, WKAA, 128 1st St 322, Tifton GA 31794. 912-386-5679.

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Up to 64 channels of control and metering

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Want To Sell

ITC Delta III triple stack stereo cart machine w/record unit, like new, will pay shipping, \$4000. C Curelop, KLOS, 301-840-4836.

Pacific Recorder Micro-Maxx, like new w/standard heads & speeds, rack mountable metal casing, manuals & pwr cords, \$1200/pair. K Rosato, Sound Bdcg. 914-645-1626.

Great Prices on original equipment tape heads for ITC, BE, Fidelipac, Otari, Tascam & others!



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Harris Criterion compact stereo R/P decks (2), \$400 ea/BO; (2) Harris Criterion 90 stereo R/P decks, \$500 ea/BO; (3) Harris CC-III stereo triple decks, \$500 ea/BO; Fidelipac CTR-112 stereo play, \$600/BO. K Carlson, KTFI, POB 2820, Twin Falls ID 83301. 208-733-3381.

BE 5300 triple deck mono, excel cond, in use w/sec & tertiary tones, \$600/BO. K Carpenter, Fietz/Sleman Prod, 40 Fourth St #217, Petaluma CA 94952. 707-763-0191.

Gates Cartrite II mono play only cart decks (2), \$150 ea. M Everhart, KGON, 4614 SW Kelly, Portland OR 97201. 503-497-0313.

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IT Delta record electronics, no transport, \$800. T Parks, WONU, POB 592, Kankakee IL 60901. 815-939-5330.

Spotmaster 500B R/P lever type, gd heads, mono, excel cond, \$600; Spotmaster 500B R/P lever type, mono, gd shape, \$400. K Stevens, In House Audio, 5354 Cortez Ct, Mobile AL 36609. 205-666-4232.

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BE 5300C tripledeck, stereo, PB, mint less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Want To Buy

ITC RPD, must be in gd cond, three tones w/rack ears. DJ Williams, Lincoln County Bdcg, 1103 Utah Ave, Libby MT 59923. 406-293-6234.

ITC, BE, Fidelipac cart machines: single, triple, mono, stereo, play & record/play. Call M O'Drobinak @ 619-758-0888.

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Otari ARS-1000 w/tone sensor, plus second deck for parts, \$300/BO. K Carlson, KTFI, POB 2820, Twin Falls ID 83301. 208-733-3381.

Various drive motors, (3) Scully 270, UMC, Nidec, Ampex 440, negotiable. C Arnold, KIPR, 415 N McKinley #920, Little Rock AR 72205. 501-663-0092.

Tascam 85-16B 1" 16 track with dbx in roll-around cabinet, mint condition. T Dupuy, Holbrook Media Prod, 108 Exchange Pl, Lafayette LA 70503. 318-234-3768.

Fostex 80 8 track with remote, NR, manuals; Fostex 812 recd console, phantom power, fader mute, 12 channel x 8 buss, 3FX sends & 4 channel digital headphone amp, \$2350/all. W Dougherty Jr, WLD Recdg Std, Music Valley Rt 1, Mill Spring MO 63952. 314-998-2681.

Ampex 602 mono FT, gd cond, \$60 plus shpg. E Lightma, WEDL, 550 Merchant St, Ambridge PA 15003. 412-266-2802.

Studer A-80 master recorder, gd shape but need heads. BO. B Cameron, WWSK, 1316 Seventh Ave, Beaver Falls PA 15010. 412-646-4100.

Ampex MM1000 8 trk factory rebuilt heads by Ampex, less than 100 hrs on heads, mint cond, \$900; Ampex 440C 2 trk, very low hrs, \$1200. L Ponzek, Cypress Queen Recdg Std, 1019 New Market St, Philadelphia PA 19123. 215-934-6414.

Otari ARS 1000 (2), mint cond, BO. J Kessler, WOBZ-TV, POB 220, Livingston KY 40445. 606-642-2209.

Sony MCI 1" 8 trk, mint cond; Revox PR-99, mint cond; Teac 1/4", gd cond. Star Prod & Recdg Co, 618 Georgia St, Bethalto IL 62010. 618-377-5569.

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Cassette-CD-Open reel
Rebuilt A77s, \$800
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Otari MX-5050 MK III 1/2" 8 trk, excel cond, low hrs, \$2500; Otari MTR-9011 24 trk, \$27,000/BO. Los Angeles CA. 310-372-4329 or 818-763-2461.

Ruslang R-R push carts (2), new, never used, fits Otari or other, oak finish, \$50 ea or \$75/both. A Wasilewski, KMWX, POB 1460, Yakima WA 98907. 509-248-1460.

Otari MTR-10 2 trk w/ctr trk time code, \$2800; Otari MX-5050 MK III 2 trk (4), \$950 ea; Revox PR-99 mono (2), \$75 ea. Los Angeles CA. 310-372-4329 or 818-763-2461.

Telex 235 3:1 cassette duplicator, perfect cond, \$650 plus shpg. S Russell, Russell Studios, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

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Ampex 351 PB rack mount decks (2), \$300 ea. C Sigmon, WDKZ, POB 1398, York SC 29745. 803-684-4241.

Nakamichi MR-2 cassette decks (5), set up for dubbing in vertical rack w/gang remote, \$1500/all or may sell separately. Los Angeles CA. 310-372-4329 or 818-763-2461.

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Teac A-3300-SX 2T R-R, \$400; Teac X-1000 R-R, \$250; Audicord stereo double cart reproducer, \$300. T Parks, WONU, POB 592, Kankakee IL 60901. 815-939-5330.

Tascam 234 4 trk (5), \$325 ea. B Kenney, WYOC, POB 1646, High Springs FL 32643. 904-454-3666.

16 trk 2", \$3450; Otari 1" 8 trk, \$2450; 5050 III-8, \$1950; Ampex ATR800 mono, \$750; Tascam 25-2, \$750; Tascam 52 mint, \$1200; MCI Locator III, \$1195; Ampex AG350 solid st electr, \$100/ch. W Gunn, 619-320-0728.

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Otari Mark II-IV 1/2" 4-trk, multi-trk, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Want To Buy

Nagra IV-STC or IV-S time code or stereo, Denecke TS-1 time code slate. G Warren, 3765 N Lakeview, Chicago IL 60613. 312-327-4785.

Scully '100' recorders, record/play amps, 8, 16, 24 track heads. Sequoia Elects, 4646 Houndshaven Way, San Jose CA 95111. 408-363-1646.

Spotmaster TP-60B tape timers from cart tape winders (TP-1A or TP-1B). Mel Crosby, 408-363-1646.

Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

CD PLAYERS

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Adult Contemporary CD library, approx 1300 titles on 65 CDs, titles are 1980 to present, \$1800. Karen or Bob, 703-382-6106.

Denon DN-950FA in excel cond, \$750. R Michaels, KQFX, POB 7762, Amarillo TX 79114. 806-355-1044.

CONSOLES

Want To Sell

Tascam M-15B 16x8x18x2 console, mint cond. T Dupuy, Holbrook Media Prod, 108 Exchange Pl, Lafayette LA 70503. 318-234-3768.

Penny & Giles 10 Kohm faders, limited number, fits most late model consoles with 4" travel, \$50 ea; Sparta-Cetec 3410 10 channel stereo console, all Daven pots, with spares & book, \$850 firm, you pay shpg. B Mayben, WRVR, 5904 Ridgeway Pkwy, Memphis TN 38120. 901-767-0104.

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Harris Stereo 80, very clean, no mods, 8 chnl, \$750/BO; Harris Studioette 80, clean, no mods, 8 chnl, \$350/BO. K Carlson, KTFI, POB 2820, Twin Falls ID 83301. 208-733-3381.

BE 5-S-250 5 pot stereo board w/rotary faders, \$495; UREI Mod One 5-pot stereo, slide faders & external pwr supply, \$425. M Everhart, KGON, 4614 SW Kelly, Portland OR 97201. 503-497-0313.

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POSITIONS WANTED

GM for Florida medium or large market, 29 years experience in sales, programming & engineering, turnarounds or start ups, avail immed. B Elliott, 813-849-3477.

Seeking return to radio. On-air/production, great voice, experience several formats, computer literate, traffic manager exper, mild climate only. Jim, 813-461-3192.

Female graduate of bdcg school is eager to get started, prefer R&B, gospel or urban contemporary formats. Desire sales or production. Katrina Perry will relocate. 405-751-4022.

12 year host of college FM oldies show seeks weekends to continue show. D Hogenmiller, 4612 Theiss Rd, St Louis MO 63128. 314-894-8194.

Attention Arizona, recent graduate on the prowl, welcome me to your jungle, I want to rock. David Kyi, 602-378-0105.

Full time military reserve seeking PT radio work in Portland area, trained, willing to work odd hrs, eager to learn more. James Wilson, 503-244-7502.

GM, sales, announcer, PD, engineer, production, 30 yrs solid exper, south coastal Florida only. B Elliott, 813-649-3477.

Broadcasting graduate, young, energetic with great voice seeks entry-level position, trained on-air, production, sales & more, will travel, Christian, AOR, AC. Allen, 405-360-5434.

Janet, 502-895-5888. For unconventional, overworked broadcasters knowing experience isn't only years, tapes. Computer literate, P/T announcing, marketing experience. Wants FT announcing, programming. Serious replies please.

CE SW only with 20 plus years all aspects, major market experience, high power AM & FM, directionals, audio, seeks position in southwest Top 100 market, good references. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box #93-11-10-01RW.

HELP WANTED

CHIEF ENGINEER
For Rocky Mtn area, major mkt 1 station duopoly. Must have 10 yrs exp as chief incl directional AM. Send full resume to: Radio World POB 1214, Falls Church, VA 22041. Attn: 93-23-01-RW.

Auditronics 110-8 special 48 trk plus dual foldback mixing board, as is, BO. U George, Ugly George Satellite, 840 8th Ave, NY NY 10019. 212-969-0240.

Eddor AM 400 4 chnl automatic mic mixer, \$125. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Fostex 812 & 80 12x8x2 recdg console w/8 trk R-R & 4 chnl headphone amp, w/phantom pwr, remotes, mute, solo, original carton & manuals, \$2350. W Dougherty Jr, WLD Recdg St, Music Valley Rt 1, Mill Spring MO 63952. 314-998-2681.

TAC Scorplon 16x8x2, complete studio setup w/cabinetry, patchbay & interface wiring. Los Angeles CA. 310-372-4329 or 818-763-2461.

Tascam mdl 15 mixing console in excellent condition, \$2000. MPC. POB 29381, Shreveport LA 71149. 318-636-0545.

Pacific Recorders interface modules, TT-3 TT interface, TCI-2A cart interface, \$95 ea. M Everhart, KGON, 4614 SW Kelly, Portland OR 97201. 503-497-0313.

Soundcraft 1600 24x16x2, wired for 24 trk pro w/oak cabinet w/producers desk, patchbay & interface wiring, \$7500. Los Angeles CA. 310-372-4329 or 818-763-2461.

Autogram AC8, 8 chnl in vgc w/documentation, \$1750/BO. Barbara Feil, Survival Ministries, 795 Via Lata, Colton CA 92324. 909-370-3314.

Stellavox mixer prof & portable, sound mixer 5 input, 2 output, \$200. L Ponzek, Cypress Queen Recdg Std, 1019 New Market St, Philadelphia PA 19123. 215-934-6414.

Autogram Pacemaker 828 8 chnl stereo, slide control, excel cond, \$3200. R Michaels, KQFX, POB 7762, Amarillo TX 79114. 806-355-1044.

HELP WANTED

Goodrich Broadcasting, located in West Michigan, is seeking a Chief Engineer for its Muskegon/Grand Rapids based Radio Group. The candidate will have an AM/FM transmitter maintenance background and possess strong studio maintenance skills, including digital telephone hybrid, and automation systems. This individual will be self-motivated with a "Can Do Attitude" and one who has the ability and enjoys communicating with others. If you feel that you may be an asset to this company and would enjoy working in a state of the art, fully equipped facility, send your resume and a letter describing yourself and abilities to:

Mike St. Cyr
Goodrich Broadcasting
2517 E. Mt. Hope Avenue
Lansing, MI 48910
or FAX: (517) 487-0208

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

CONSOLES...WTS

Ramko DC5AR 5 channel mixers, 14 available, very good condition, \$225 each. 916-334-9449.

Want To Buy

Tascam M-320B, must be very clean, K Carlson, KTFI, POB 2820, Twin Falls ID 83301. 208-733-3381.

Sparta A-20, A-20-2, prefer stereo version, will consider mono. DJ Williams, Lincoln County Bdctg, 1103 Utah Ave, Libby MT 59923. 406-293-6234.

DISCO-PRO SOUND EQUIP

Want To Sell

AKG R-25 remote control w/cable & connector for BX-25 reverb unit, new, \$30; JBL D16R2405 replacement diaphragm for JBL 2405 slot tweeter, new in box, \$50. E O'Brien, Imperial Snd, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

Footex 3180 stereo spring reverb, rack mountable, 3 sec delay time, 24 mS pre-delay time, will swap for UREI Cooper Time Cube mdl 920-16. E O'Brien, Imperial Snd, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

JBL 2204H speakers (4), 12" mid 2 #2445 horns 2-2044H high mounted in 2 cabinets almost new, \$1500; JBL 5232 2-way electronic crossover, \$100. D Kocher, Digital Snd Makers, 1901 Hanover Ave, Allentown PA 18103.

JKR 985 rcvr/monitor programmable electronic keyboard simulator (2), BO. MRG Prod, 516-447-1041.

UREI 539 1/3 oct EQ (4), \$400 ea; UREI 525 crossover (4), \$400; Crown MX-4 crossovers (4), \$225. R McMillen, Super Duper Audio Duplicating, 1634 SW Alder St, Portland OR 97205. 503-228-2222.

JBL studio monitors in gd cond. Star Prod & Recdg Co, 618 Georgia St, Bethalto IL 62010. 618-377-5569.

JBL 4341 studio monitors, \$1500/pr. L Ponzek, Cypress Queen Recdg Std, 1019 New Market St, Philadelphia PA 19123. 215-934-6414.

JBL 4411 (2 pr), \$250 pr; Auratones (2 pr), \$50 pr; Sony SP80 (2 pr), \$75/BO pr. Los Angeles CA. 310-372-4329 or 818-763-2461.

Want To Buy

Roland DEP-5, used. S Russell, 80410 Klett Dr, Decatur MI 49045. 616-782-9258.

Early RCA 15" coaxial loudspeakers, LC-1A/MI-11411A; also early Tannoy 15" drivers, one or more. R Rosenow, KTTS, POB 2180, Springfield MO 65801.

FINANCIAL SERVICES

EQUIPMENT FINANCING
ON ALL RADIO EQUIPMENT

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- Fixed-rate, long-term leases
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- 100% financing, no down payment
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- Refinancing existing equipment

ENF EXCHANGE NATIONAL FUNDING

Call Mark Wilson
(800) 275-0185

FURNITURE

Want To Sell

STUDIO FURNITURE - 2 Studios used for NAB demo, excellent condition, stand-up type, both have twin racks and one turret, will separate. Vince @ Studio Technology 215-640-1229.

LEASING AVAILABLE

1-800 # lines available. Great for opinion lines, contest and information lines. Call Bill at 916-344-2504.

LIMITERS

Want To Sell

Alesis 3630 compressor/limiter, dual chnl, new w/warranty card, \$255. MPC, POB 29381, Shreveport LA 71149. 318-636-0545.

Orban Optimod 8000A, recently in service, \$1200/BO. G Finney, WPWB, 7137 Heather Ln, Macon GA 31206. 912-788-2124.

Audioliner AVS-100 processor, BO. J Kesler, WOBZ-TV, POB 220, Livingston KY 40445. 606-842-2209.

Orban 8000A stereo/gen processor, gd cond, \$1695. C Sigmon, WDKZ, POB 1398, York SC 29745. 803-684-4241.

Optimod 8000A \$1500. R Michaels, KQFX, POB 7762, Amarillo TX 79114. 806-355-1044.

Orban Optimod 8100A/1 FM in excel cond, factory update & re-alignment 8/92, \$2800 plus shpg. L Eichelberger, KCIX, 5257 Fairview Ave, Boise ID 83706. 208-376-6666.

MICROPHONES

Want To Sell

AKG D-202E 2 element mic, like new, \$120. D Kocher, Digital Snd Makers, 1901 Hanover Ave, Allentown PA 18103.

EV 103 like 635A, gd cond, XLR mount, many avail, \$35 ea. U George, Ugly George Satellite, 840 8th Ave, NY NY 10019. 212-969-0240.

RCA 77DX & 44BX, gd cond, BO over \$800 for either; RCA 77A circa 1937, gd cond, BO; RCA 90-A mic stand & 180 mic boom, excel cond, BO. RF Burns, RF Studios, 1326 High Meadow Dr, Garland TX 75040. 214-271-4386.

Mic security holders (5), new, \$15 ea. MRG Prod, 516-447-1041.

E-V N/D 257B pro vocal mics, brand new in box, \$135 ea. G Finney, WPWB, 7137 Heather Ln, Macon GA 31206. 912-788-2124.

AKG "The Tube" in mint cond w/light case & manuals, \$1495. P Trembley, Downtown Snd Prod, 23915 Via Rosa Linda Valencia CA 91355. 805-254-5213.

Getell Neumann UM57 tube mics, New capsules for SM2 & many others, New AC701 tubes for Neumann mics, \$275. W Gunn, 619-320-0728.

AKG 414's, \$695, original D12 like the Beatles used, \$295, Sony ECM54, \$150, Beyer M500 lk new, \$300, Demeter 4-ch tube DI rack mt lk new, \$875. W Gunn, 619-320-0728.

Want To Buy

Neumann U-47 tube mic, dead or alive w/original tube cable & power supply. Nick, 317-579-7850 or 317-841-3342.

77-DX's, 44-BX's, KU-3A's On-Air lights. Top price paid. Fast response. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131.

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

Phasemaster T-10,000 phase conversion unit, working when removed, \$1K. G Arroyo, WONQ, 1033 E Semoran Blvd #A, Summit Plaza Casselberry FL 32707. 407-830-0800.

Onan 5 kW power generator, natural gas or propane, used only 4 hrs, will sacrifice at \$2200. C Amok, KIPR, 415 N McKinley #920, Little Rock AR 72205. 501-663-0092.

Magnatek 223-3212 Jefferson Electric dry transformers (2 ea), input 240V Delta, out 208V WYE, \$700 plus shpg. D Morgan, KJYE, 1360 E Sherwood Dr, Grand Jct CO 81501. 303-241-9230.

Northern Technologies TCS-LAPE surge suppressor, 240V, 3 phase Delta configuration, 3 years old, great condition, \$700 plus shpg. D Morgan, KJYE, 1360 E Sherwood Dr, Grand Jct CO 81501. 303-241-9230.

Superior Electric Stabelline power conditioner, handles up to 8.33A, \$135; Lil Miss Moffat 48 volt phantom pwr supply, 2 @ \$20 ea; (2) new 6' rack rails, \$20 ea, other size pieces avail free w/purchase, all items plus shpg. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Tascam 48 extender board set of two cards, BO. MRG Productions, 516-447-1041.

NEC hand held wireless remote control RD-310E for IDC-1000 ID converter, like new, BO. MRG Productions, 516-447-1041.

Switchcraft 36 point balanced patch bay, \$75. T Parks, WONU, POB 592, Kankakee IL 60901. 815-939-5330.

Radio equipment, both studio & prod, send for complete list, very reasonable, no serious offer refused. S Friedman, Five Star Bdcg, 42 Marlo Rd, Wayne NJ 07470. 201-696-9662.

ADC ProPatch bay (2) 96 pt, 1/4" TRS w/punch block connections, \$300 ea. Los Angeles CA. 310-372-4329 or 818-763-2461.

Want To Buy

14'-16' box truck to be converted into remote production truck. T Dupuy, Holbrook Media Prod, 108 Exchange Pl, Lafayette LA 70503. 318-234-3768.

Used phone patch, consoles, tape cart equip & remote pickup equip. C Beard, KQYY. 817-596-8767.

Tube output transformers by UTC, Triad, Freed, WE, Acrosound, Peerless. L Blackmon, RQ Studio, Larson Rd #4, N Reading MA 01864. 508-664-0174.

Radio transformers by Chicago, UTC, Triad, Peerless, Freed, Sola, send list. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

Jazz record collections, 10" LP/12" LP be-bop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, NNYN 10003. 212-674-3060.

Ampex tube recorders and mixers. W Gunn, 619-320-0728.

MONITORS

Want To Sell

TFT EBS gen/mon, monitor tuned to 94.7, in great cond, \$250. B Brintzer, WDNC, 1000 Park 40 Plaza, Durham NC 27713. 919-361-1429.

Gates GTM88F freq monitor, \$145. C Sigmon, WDKZ, POB 1398, York SC 29745. 803-684-4241.

Want To Buy

McMartin (buy & sell) any model. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886 or fax 402-493-6821.

RECEIVERS & TRANSCEIVERS

Want To Sell

AM STEREO RECEIVERS
From \$34.95 Portable, Home, Auto
RRADCO
Phone/FAX 708-513-1386

Repro XJ-300 VHF 6 chnl radio, 30 W 150-174 MHz w/antenna, \$225. M Everhart, KGON, 4614 SW Kelly, Portland OR 97201. 503-497-0313.

Professional SCA demod card with excellent crosstalk rejection, \$20; Superadio III with SCA, \$85. performance guaranteed. 1-800-944-0630.

Want To Buy

Marantz, Karg, REL, Scott, Fisher & McIntosh FM monitors. L Blackmon, RQ Studio, Larson Rd #4, N Reading MA 01864. 508-664-0174.

RECORDING SERVICES

CD 1-off copies from your DAT master. 48 hour turnaround. Integrated Digital Systems
310-478-4264
fax: 310-444-9224

REMOTE & MICROWAVE EQUIPMENT

Want To Sell

Data Service Unit (DSU), 4 wire switched 56, rack mount mdl 1056R, \$745. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Bext 1989 mdl, 900 MHz STL 15 W amp, \$1100. W Harris, WNPC, POB 189, Newport TN 37821. 615-623-8743.

Symetrix TI-101 hybrid telephone interface, excel cond, \$300. M Vanhooser, KSKY, 4144 N Central Exp #266, Dallas TX 75204. 214-827-5759.

Burk TC-8 w/dial up speech SCA gen comp set, like new, \$1999; Burk TC-8 remote control studio unit, like new, \$750. J Fuller, WJF, 26 Woody Hill Rd, Hope Valley RI 02832. 401-539-8502.

Burk TC8 remote control system w/SCA modems, excel cond w/manuals, \$1500/BO. M Lightner, WPRR, 2727 W Albert Dr, Altoona PA 16602. 814-944-9456.

Marti STL-10 stereo, 2 TX & 2 RX, \$4000. R Michaels, KQFX, POB 7762, Amarillo TX 79114. 806-355-1044.

COMREX RENTALS
1, 2 and 3-Line Extenders
Switched 56 Systems
Call Steve Kirsch for details
Silver Lake Audio
(516) 623-6114 FAX: 377-4423

VRC-2000 compatible data terminals, Qume QVT-101, \$140 ea. G Finney, WPWB, 7137 Heather Ln, Macon GA 31206. 912-788-2124.

Micro Controls STL/TSL/remote control system, type accepted, \$3000/BO. J Stevens, KCHQ, 269 W Alameda #D, Burbank CA 91502. 818-954-0214.

Moseley PBR-30AW remote control, transmitter & std units, operating when removed, rebuilt stepper, new relays, recently aligned, \$300/BO, trade possible. A Wasilewski, KMWX, POB 1460, Yakima WA 98907. 509-248-1460.

Weacom 4 wire-2 wire hybrids w/balance network & EQ, network built-in, dial up line, w/prints, \$100 plus COD. R Weaver, WHEV, 413 S Faquay Ave, Faguay-Varna NC 27526. 919-552-8036.

RENTALS RENTALS RENTALS
COMREX
3-line extender
Frank Grundstein 915-642-0978
Audio/Video

Moseley TAU-2 tolerance alarm unit, multiple input, hi/low settings, alarm output, int/ext references for alarm, \$100/BO, trade possible. A Wasilewski, KMWX, POB 1460, Yakima WA 98907. 509-248-1460.

Moseley MRC-1600 currently in service, excellent condition, setup for telco, \$1100. B Kenney, WYOC, POB 1646, High Springs FL 32643. 904-454-3666.

1A2 key phone system, 4 lines plus touch-tone intercom, 6 phones, w/2 Touch-A-Matics, one wall set, all 6-button touch-tone, BO. Chris Ware Recording, 10806 Normont, Houston TX 77070. 713-894-1569.

Marti RMC2-AXT(A), RMC2-AXT(10), needs repair, \$350; Marti SCG-67, \$165. C Sigmon, WDKZ, POB 1398, York SC 29745. 803-684-4241.

Want To Buy

Need composite STL rcvr, any brand, any age, must be composite, would consider broken unit if repairable, must be reasonable or trade. D Payne, WZPL, 3500 DePauw Blvd #1060, Indianapolis IN 46268. 317-879-9999.

TFT 8300 needed, have xmtr. P Lotsof, KAVV, Box 18899, Tucson AZ 85731. 602-290-9797.

PHONE: 703-998-7600 FAX: 703-998-2966



Call Simone Mullins, Classified Ad Manager, to reserve space in the next issue. Use your credit card to pay, we now accept VISA and MASTERCARD.

Radio World

5827 Columbia Pike, 3rd Floor
Falls Church, VA 22041

Select from these categories for best ad positioning:

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| Audio Production (Other) | Leasing | Tapes, Carts & Reels |
| Brokers | Limiters | Tax Deductable Equipment |
| Business Opportunities | Microphones | Test Equipment |
| Cart Machines | Miscellaneous | Transmitter/Exciters |
| Cassette & R-R Recorders | Monitors | Tubes |
| CD Players | Receivers & Transceivers | Turntables |
| Computers | Remote & Microwave Equip. | Positions Wanted |
| | Satellite Equipment | Help Wanted |

Classified Advertising Rates Effective January 1, 1993

	1x	3x	6x	12x
1-9 col inch (per inch)	\$55	53	50	45
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Distributor Directory	90	85	80	75
Professional Card	60	55	50	45
Classified Line Ad		\$1.50 per word		
Blind Box Ad		\$10 additional		

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SURCOM ASSOCIATES

2215 Faraday Ave., Suite A
Carlsbad, California 92008
(619) 438-4420

REMOTE & MICROWAVE...WTS

Moseley RPL-2, RPL-3, RPL-4 transmitter, doesn't need to be in working condition, but complete, VHF or UHF OK. B Henry, KLLK, 12 W Valley St, Willits CA 95490. 707-459-1250.

SATELLITE EQUIPMENT

Want To Sell

Micro Phase MP2030-S Cubs baseball receiver, \$1100; Wegener 10767A CNN Headline News Unistar receiver, \$1900. M Rollings, WZNF, 400 Broadway, Urbana IL 61801. 314-458-5595.

Fairchild Dart 384 digital receiver with LNA downconverter, 1 dual 7.5K audio card & cue chnl card, call for more info, \$2500. E Cary, WLKX, 15226 W Freeway Dr, Forest Lake MN 55025. 612-464-6796.

OuterSpace Experts!

We SELL *TRADE*BUY
SATELLITE EQUIPMENT
317-962-8596

Scientific Atlanta DAT-32 receiver, 7.5 kHz dual audio decoder card, fits SA DAT-32 receiver only, \$500. Chip, KCPS, POB 946, Burlington IA 52601. 319-754-6698.

Fairchild Dart 384 with 4 frequency downconverter, 1-15 K card, 1-7.5 K card, 1-3 K cue card, \$4500. D Solinse, WWRM, 877 Executive Ctr Dr W, St Petersburg FL 33702. 813-576-1073.

Want To Buy

Scientific Atlanta 7300 digital sat receiver & down converter needed urgently. B Torstenson, WQSN, 4200 W Main, Kalamazoo MI 49006. 800-873-1074.

Scientific Atlanta 3610 satellite receiver, DAT 32 7300-7330 or Fairchild Dart 384. C Boies, WCOD, 105 Stevens St, Hyannis MA 02601. 508-775-6800.

SOFTWARE/DATABASES

Want To Sell

PC SOFTWARE for Broadcasters. Traffic, billing, accounts receivable, accounts payable, payroll, general ledger. Powerful, inexpensive. Automated, satellite or live operations. Try it for 90 days, no obligation. Absolute Broadcast Automation Naples, Florida (813) 643-3689

STATIONS

Want To Sell

Christian, non/comm w/Gates FM-1C 1K xmtr in S/W Oklahoma, w/established audience, 8 yrs on air, \$65,000 negotiable. P Galloway, KKVO, POB 787, Altus OK 73521. 405-477-4110.

Daytime 5 kW pre/post authority, \$12,000 down, assume note, located between Enterprise & Dothan AL, w/real estate & mobile home, \$80,000. N Davis, TV 24, POB 5160, Defuniak Springs FL 32433. 904-892-4038.

TAPES/CARTS/REELS & CD'S

Want To Sell

Adult Contemporary 10" tapes, over 40 reels w/25 Hz tones, \$599, also have Big Band & Classical. J Fuller, WJF, 26 Woody Hill Rd, Hope Valley RI 02832. 401-539-8502.



Music tapes (750), country, CHR, AC, AOR, oldies, various producers, Drake, Century-21, TM, BPI, \$1500/all or BO. K Carlson, KTFI, POB 2820, Twin Falls ID 83301. 208-733-3381.

Scotchcart II's, 420 3.5 min w/music, \$2 ea; also some longer sizes \$2.25 ea, plus shpg, all used 6 mos then stored. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Pams Jingles ref tapes, 1951-1976, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

MARATHON PRODUCTS COMPANY

Audio Cartridge Rebuilding Division

Rebuilding/reloading, like new, all brands, any length up to & including 3.5 minutes, \$1.95 ea. FOB out plant, 48 hrs delivery. (New rate effective 9/1/93)

New NAB Marathon cartridges prices on request.

35 Years professional experience!
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69 Sandersdale Rd. Charlton, MA 01507
1-508-248-3157 or 1-508-853-0988

Circle (183) On Reader Service Card

Sound FX library, CD formats, Sound Ideas 1000-4000 Series, 75 discs, \$1400; network library, 36 discs, \$450. Los Angeles CA. 310-372-4329 or 818-763-2461.

Over 5500 45's and 3-4000 albums, pop, rock, titles from 55 through mid 80's. C Mosley, WCNL, POB 166, Carlville IL 62626. 217-854-3131.

Scotch 8206 1" on 10.5" metal NAB reels, \$5 ea. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Want To Buy

Spotmaster TP-60B tape timers from cart tape winders (TP-1A or TP-1B). Mel Crosby, 408-363-1646.

TAX DEDUCTIBLE

High school radio station in Ohio looking for tax deductible donation of 1 kW xmtr or amp, will pay shpg or pick-up. B Long, WSTB, 1900 Annalane Dr, Streetsboro OH 44241. 216-626-4906.

High school radio station in Ohio seeks donation of 1 kW FM transmitter or amplifier to assist in power increase upgrade, will pay shipping or pick up. B Long, WSTB, 1900 Annalane Dr, Streetsboro OH 44241. 216-626-4906.

High school radio station seeks donations of consoles, cart machines, mics, CD players & R-R's including transmitting & monitoring equip. C Iannace, Woodlands HS, 475 W Hartsdale Ave, Hartsdale NY 10530. 914-761-6052 X3021.

TEST EQUIPMENT

Want To Sell

HP 4815A RF vector impedance meter, \$800. G Arroyo, WONQ, 1033 E Semoran Blvd #A, Summit Plaza Casselberry FL 32707. 407-830-0800.

Fluke 8012A true RMS digital multimeter, with battery option & low ohm range, \$135; Tektronix 5441 50 MHz storage scope with dual timebase & differential input high sensitivity 1 MHz audio plug in, \$295. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Potomac AT-51 audio test set in gd cond, \$2500. M Hendrickson, Hedberg Bdcg Group, POB 249, Blue Earth MN 56013. 507-526-4044.

Datatek D-607 color black generator cards (2) with D607RA power supply (2) & mount for generators, no rack frame, new, Best Offer. MRG Prod, 516-447-1041.

Elco 435 scope, condition unknown, \$45. C Sigmon, WDKZ, POB 1398, York SC 29745. 803-684-4241.

Heathkit scope, operating condition, ready to use, just rebuilt, \$50. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4476.

Want To Buy

Heathkit FM deviation meter, late mdl needed for missionary radio testing, donations accepted, all types equipment needed. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4476.

TRANSMITTERS

Want To Sell

CSI T-1-F 1 kW xmtr, excel cond, \$6100; CSI exciter, 20 W, gd cond, \$1450; Orban 8000A stereo/gen proc in gd cond, \$1695; Marti RMC2-AXT(A), RMC2-AXT(10) needs repair, \$350; (4) 575 mercury vapor rectifier tubes, cond unknown, \$40; Ampex 351 PB rack mount decks (2), \$300 ea; Marti SCG-67, \$165; Gates GTM88F freq monitor, \$145; Elco 435 scope, cond unknown, \$45. C Sigmon, WDKZ, POB 1398, York SC 29745. 803-684-4241.

DEMOED EQUIPMENT

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JR Cunningham CM 30-50, type approved AM, adjusts 5-36 W, rack mount tube type, \$650. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4476.

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Russco Mark IV TT's (4), no arms but has controllers & pre amps, \$60 plus shipping. D Rogosky, WTSR, Trenton State, Trenton NJ 08650. 609-771-2450.

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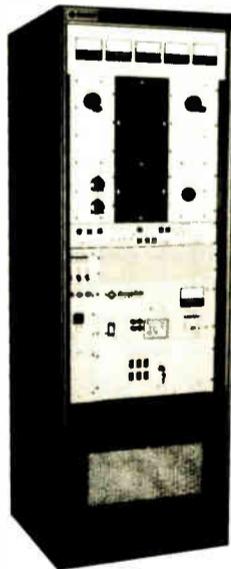
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