

SBE Show
 Opens in Kansas City
 See our preview coverage p. 10

Translator Group Formed

by John Gatski

Las Vegas NV The ongoing battle over FM commercial translators has heated up with the formation of a special interest group.

FM translator companies and supporters said they are forming the American FM Translator Association in order to specifically promote the service that has been under an 18 month FCC freeze.

Dupree Power Broadcasting Inc. Presi-

dent John La Tour said he is in the process of filing articles of incorporation for the new association. His company currently operates 55 translators and has 150 more waiting for approval at the FCC.

The NAB will oppose the new group on any proposals that do not meet the FCC's original intent for translators, according to an NAB executive.

Translators, which now number in the thousands, enable radio and TV stations to relay programming to communities

that do not receive a particular format by normal broadcast. According to the FCC, as of 31 July, 1772 FM translators and boosters were on the air, along with 4870 VHF and UHF translators.

Translators are more popular in the midwest and rural sections of the US where many areas cannot be served by a normal over-the-air broadcast.

Some translators also are used to increase stations coverage without actually serving any community interest, accord-

ing to the FCC.

The NAB, however, opposes the use of translators purely to increase coverage area where there already is service.

Translators as a means to increase station coverage is also a point of contention at the FCC, which led to the freeze on new (commercial) FM translators in March 1988.

La Tour said the new FM translator group is necessary to counter the anti-

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NJ Translator Fight

by Benn Kobb

Fort Lee NJ A broadcast engineer is fighting for the right to give his hometown its own FM station.

But Bergen County, NJ, is right across the Hudson River from the super-saturated New York City market, and FCC allocations have left this most-populated county in the US without a licensed commercial FM facility.

The station may come to pass, but it may take an act of Congress to do it.

Gerry Turro, the man behind this move, is a contract engineer for stations in New York and New Jersey, including WNEW-FM. As a teen-age radio buff, Turro identified 103.1 MHz as the only

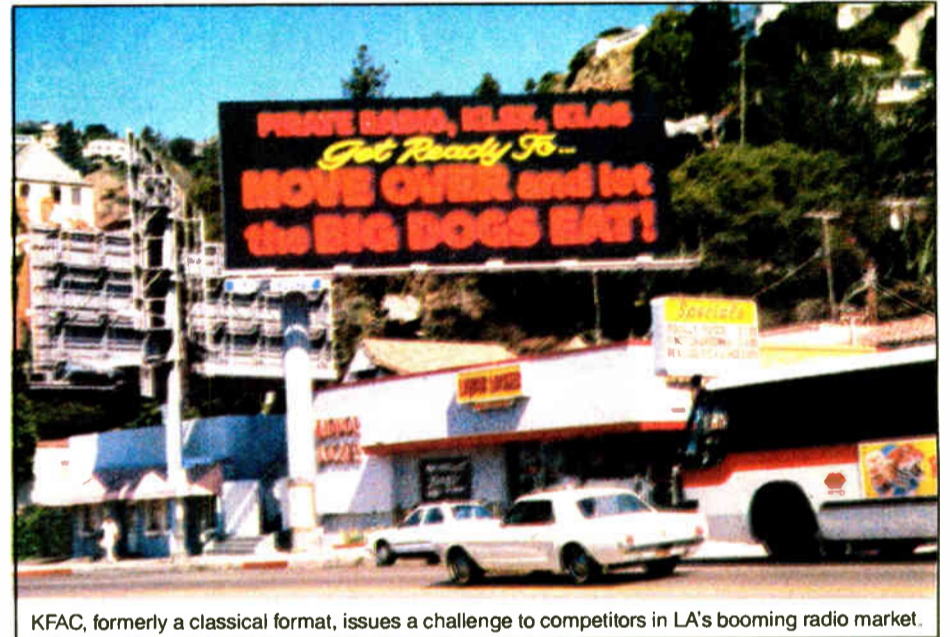
frequency that could conceivably support a local station in Bergen County, but only if it operated at very low power.

Low power operation

Today, Turro operates a translator on that frequency: W276AQ in Fort Lee. The 1 W transmitter puts out 8 W ERP, rebroadcasting WALK from Long Island.

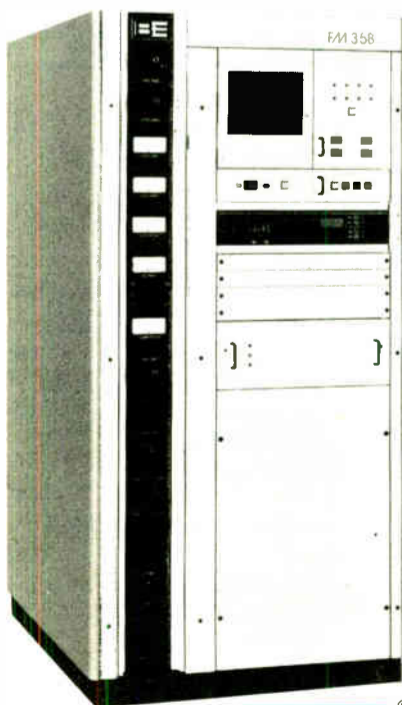
FCC rule 74.1231 limits a radio translator to 30 seconds per hour of local programming. The intent of the rule is to allow translators to briefly appeal for donations if needed, but to prevent them from becoming "low-power FM" stations that could compete in local markets. The rule allows unlimited local programming

(continued on page 20)



KFAC, formerly a classical format, issues a challenge to competitors in LA's booming radio market.

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Gold Fever Strikes LA's Radio Market

by Frank Beacham

Los Angeles There's a new surge of gold fever sweeping the sunny hills of Southern California. But this time the search is on for a different kind of precious metal: shiny, tall FM antenna towers with the power to turn the area's nine million car radios into gushing slot machines.

Though the Los Angeles radio market has long been the nation's most lucrative, new ad sales numbers, which are fueling the radio boom of 1989, are simply breathtaking.

In July alone, national advertisers spent more than \$10 million in the Los Angeles market, an unprecedented increase of 41% over last year.

Up, up and away

That's the highest monthly take by any radio market in the history of the medium. And the figure includes only the national ads for the 30 member sta-

tions of the Southern California Broadcasters Association (SCBA), not the total 62 stations in the entire market.

The extraordinary numbers prompted the SCBA to predict a record \$399 million year in ad sales. The LA market, which hit record highs each year for the past 12 years, has exploded in 1989 with national sales ahead by 26%, local by 8% and total sales 12% greater than last year.

But the fertile ad climate has propelled record breaking prices for LA stations and is having a negative effect on the diversity of programming in the market.

KFAC, for 58 years a popular classical music source for millions of Southern Californians, is the latest victim in the city's high stakes radio real estate shuffle. As of 20 September, the station abandoned its call letters and switched to a contemporary hits format.

This leaves Los Angeles as the only city in the United States with more than a million in population that does not

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AM Talks Urged

by Alan Carter

Washington DC In an effort to make AM issues top and immediate priority as the Sikes FCC takes its seat, the NAB has called for a comprehensive meeting to discuss "critical AM issues" with industry-wide participation.

In a letter to Chairman Al Sikes NAB members have asked the Commission, which in addition to Sikes includes new commissioners Sherrie Marshall and Andrew Barrett, to call a special meeting in September or October.

The NAB suggested the meeting include radio receiver manufacturers, engineering consultants, broadcasters and FCC staff from Mass Media, General Counsel, Plans and Policy, and Engineering and Technology.

Time to talk AM radio

"We trust that you share our goal of AM Improvement as well as our desire for a useful, open and timely dialogue on how this goal may be achieved," stated the letter signed by 35 NAB-member broadcast executives and NAB President and CEO Eddie Fritts.

NAB also said it wanted to present an audio/visual presentation that would outline the state of AM radio. "This presentation would go on to suggest a number of alternatives that we believe would be in the best interest of the public and all those industries involved with AM radio," NAB stated.

Inequality in receiver design, interference and audience erosion are some areas that could be addressed, according to Art Suberbielle, President/GM, KANE-AM, New Iberia, LA, and chairman of the NAB AM Improvements Committee.

"We don't want the Commission to mandate programming, we just expect it to do what it

does best; and that's address the technical disparity between AM and FM," Suberbielle said.

Issues to examine

On the subject of interference, Suberbielle noted that man-made interference can be addressed by the FCC with a possible ceiling on spurious emission allowed by power companies. He said RFI such as that from power lines is not only harmful to AM radio but wasteful for power companies.

Audience erosion is another area that needs to be documented at the FCC, Suberbielle contended. Making a correlation between listening statistics and technical regula-

tions, he said research indicates that listeners do not make a differentiation between AM and FM if there is "comparable" sound and programming.

"What we're looking for in this meeting is to level off the playing field," Suberbielle said. "The playing field is weighted heavily for the FM guys."

Suberbielle also suggested the Commission could consider setting minimum design standards for AM receivers, similar to type-acceptance standards it requires for other electronic devices. "That, in my opinion, is one of the FCC's opportunities."

New faces on the scene

NAB Deputy General Counsel Barry Umansky said that with a "new slate of folks" at the FCC, the meeting would be an opportunity to review work on AM, suggest what can be done and emphasize where responsibilities lie.

He stressed there can be work "across the board from manufacturers to Congress."

At the congressional level, Umansky referred to legislation before Congress that would institute a "parallel philosophy" to receiver design. If a receiver has FM, it would have to receive AM; if it has FM stereo, it would have to receive AM in stereo. He said the idea is the same as that legislated in the All-Channel Receiver Act of 1962 that requires TV receivers to have UHF if they have VHF.

In calling for the meeting, the NAB reminded Sikes of work at the Commission that addressed AM. Included are proceedings aimed at reducing intra-industry interference on the AM band and establishing more accurate propagation and interference models.

For information from the NAB, contact Barry Umansky at 202-429-5301. Contact Art Suberbielle at 318-365-3434.

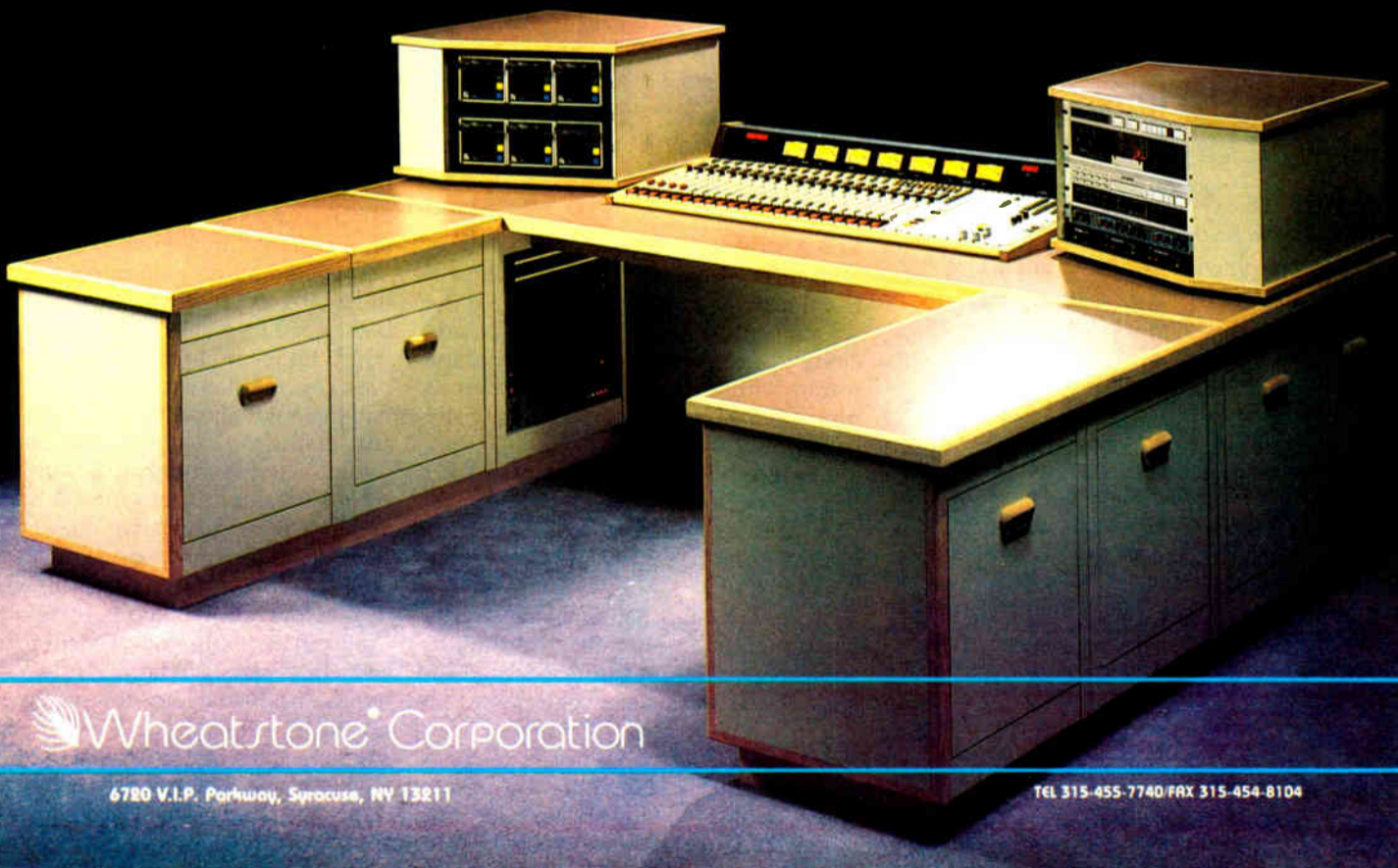
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Studer Revox Buys Out IMS

by Frank Beacham

Menlo Park CA Dyaxis, the popular low cost Macintosh-based digital audio workstation, now is a Studer Revox product.

The announcement came hours before the Labor Day holiday when Studer In-

ternational A.G. of Regensdorf, Switzerland, completed acquisition of Dyaxis manufacturer Integrated Media Systems (IMS) of Menlo Park, CA.

Studer called the acquisition "perhaps the most exciting and potentially rewarding merger in the entertainment program equipment field for some time."

The receptionist at IMS immediately began answering the phone: "Studer Editech Corporation" (SEC). That's the

new name of the organization that will be operated as a wholly-owned subsidiary under the Studer International umbrella. A Studer spokesman said he was unable to reveal the amount paid for the California editing system manufacturer.

Studer Editech is headed by former IMS president Lee Cochran, who as-

sumes the title president and CEO of the new venture. Studer credited Cochran, a former Ampex audio executive, with being the driving force behind the move to merge IMS into the Studer organization.

"We are particularly excited about the long term prospects for SEC," Cochran said. "Much of the future of the professional music recording, broadcast and post production industries lies in the digital domain. The next 12 months will be an exhilarating time for all of us at SEC, as we continue to provide state-of-the-art digital systems in addition to enjoying the solid support and cooperation of Studer."

IMS was founded in 1984 and sells its hard disk-based workstations to radio, television and recording facilities. At the spring NAB convention in Las Vegas, the company announced it had sold more than 160 systems worldwide.

The Studer announcement left no

doubt the Dyaxis system will continue to evolve. A new multichannel version with expanded digital signal processing is on the horizon, Studer said.

In addition, serial control interfaces are being added to the long list of options to allow Dyaxis to slave to many popular video editing systems. Future product development will be carried out and expanded in close cooperation with the Studer organization in Switzerland.

Studer Revox, founded in 1948 by Dr. Willi Studer in Switzerland, manufactures a widely-used line of professional analog and digital audio equipment. Dyaxis now will be available through Studer's existing worldwide sales facilities.



Finalizing the acquisition: (from left) Studer America President Tore Nordahl and VP Bill Muggler confer with IMS's CEO, Lee Cochran.

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Clipping Furor Rages

by Alan Carter

Washington DC An NRSC FM subgroup tackling the issue of composite clipping is attempting to include information from both proponents of the technology as well as its opponents, in light of presentation of a paper critical of clipping and subsequent protests by one manufacturer.

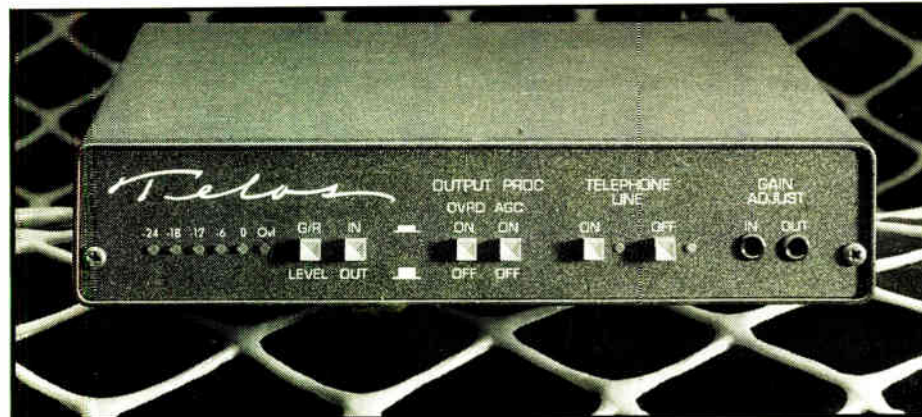
After questioning why a paper critical of composite clipping was accepted without also seeking input from proponents, Modulation Sciences Engineering

VP Eric Small has been invited to participate in the work of the Composite Spectrum Working Group.

The invitation comes approximately four months after the paper, by Chuck Adams of CRL, was accepted, about six months after the working group was formed and after Small's attorney questioned NAB and NRSC co-sponsor Electronic Industries Association (EIA) about possible anti-competitive action.

It also comes after the paper was distributed at a full NRSC meeting at the

(continued on page 17)



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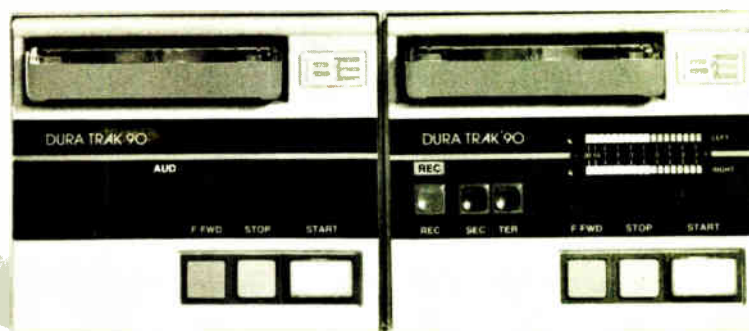
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Circle 71 On Reader Service Card

Chewing Them To Ribbons in LA

by Judith Gross

Falls Church VA KFAC, under its new call letters, may consider itself one of the "Big Dogs" now, as its billboard announcing the switch from classical to rock indicates.

What I want to know is just what are they suggesting these big dogs are ready to "eat?" Local advertising dollars ... or listeners' eardrums?



Should be very interesting, in a market which has already spawned a modulation and processing war, to see what a station with one of the strongest signals, which has been no doubt using relatively little processing on a classical format, does to its audio chain now that it's one of the "big (rock) dogs."

Will we hear a clone of the *Pirate Radio* sound?

The *Pirate*, meanwhile, continues to swallow up larger portions of the LA audience, mateys. And now it's going to be syndicated by *Westwood One* to other markets at certain times of the day.

The message that's being sent here by listeners and ultimately by the advertisers who want those listeners is clear: **be loud and be rock**. At least in LA, if you want to make those big bucks.

Some long-time readers may remember that oh, about six or seven years ago the intricacies of clipping were debated on the pages of *RW* by **Bob Orban** and **Eric Small**.

OK, now the subject has shifted to **modulation**. The debate sparked by Small's new FM *ModMinder* has the center stage and the great debate, with **Greg Ogonowski** joining the fray, rages on the next page.

All right guys, keep your heads down and no punches below the belt. Come out fighting at the sound of the bell.

It's wait and see for the **SBE convention**. Lots of exhibitors and good sessions. Now the question is, can it get the

attendance needed to keep everybody smiling?

There are some new products set to make a big splash. I hear **Gentner** has a new gizmo, so run, don't walk to its booth to have the first look-see.

And I'm sworn to secrecy here (honest), but don't pass up the **Continental booth** either, if you're hungry for new products. That's all I can say. Really.

☆☆☆

Interesting phenomenon that right around trade shows is when the buying, acquisition and **merger mania** hits the industry. Rumors are flying about a few companies, but the only one I've been able to confirm concerns the **ITC** part of **3M**.

A 3M spokesperson did say that "discussions" were ongoing considering a **selling off** of ITC. But that's all I could pry out of the good folks up in Minnesota for now. So stay tuned ...

In the never-ending quest to get new



listeners for AM comes a novel approach that has a nice ring to it. How 'bout **Walden Radio**?

Conjuring up shades of the gentle flower children (before psychedelia and drugs took hold), **WADN**, 1120 AM ste-

reo in Concord, MA is playing an all folk-music format.

'Course, they are defining "folk" rather loosely (Springsteen, the Beatles and Elvis Costello are on the playlist) but

but you never know. You can call him at **WICO** at 301-742-3212.

Just a few other little tidbits before I head off to N'Awlins and Kansas City ...



the prerequisite Peter Paul and Mary, Joan Baez and Dylan are included along with many others.

Hey, it's AM, it's **stereo** and I kind of liked the yellow balloon and the logos, including the earth-mother with family in tow walking off into the sunrise.

Shades of **Thoreau**. "Our lives are frittered away by detail," he said, "simplify, simplify." Ah, yes.

☆☆☆

Bill Prettyman, who owns several stations including one on Maryland's Eastern Shore called to raise issue with the idea that engineers can't find decent paying jobs at stations anymore.

Seems he's been looking around for a **qualified CE** for awhile (at least he had been when he called) and still hadn't found one even with the decent wage he was willing to pay. I won't quote numbers, but let's just say it's in line with the **cost of living** on the Eastern Shore, where he'd want his CE based.

Anyway, he was desperate for a CE that knows not only the ins and outs of the studio, but also **basic RF**. And he has plans to expand his company, so it's a growing operation. So where are all the qualified engineers?

He may have found one by this time,

KBEE, the beautiful music FM in California's Central Valley wanted me and the world to know that they are **all digital**. Not only do they play the tunes from CD, but spots, IDs, news and weather are all on DAT. The custom automation switcher for the station is from **IGM**, the DAT from **Radio Systems**.

Emmis has branched out from radio ownership to buy a baseball team: the **Seattle Mariners**. There's that mysterious link again: baseball and radio. So I'm not the only one ...

Speaking of mishaps, if news reports hadn't documented the incredible flight of communications attorney **Thomas Root**, currently mired in the allegations against **Sonrise** for the latter's FM filings, you would have thought some Hollywood movie mogul had made it up, right?

You may be right yet. Seems Root has had some discussions with **Hollywood** about a film based on his crash and shooting. Hmmmm. "Tom Root: The Movie." Maybe those mysterious questions will be answered at last.

Heard something interesting? Spill your guts to **Earwaves**. Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted 1989 edition **Radio World** mug.

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Modulation Debate

by Greg J. Ogonowski
and Robert A. Orban

San Francisco CA Eric Small has recently proposed modifying the industry-standard techniques for measuring FM peak deviation to permit "lightly-processed stations" to legally produce higher peak deviations than "heavily-processed" stations. In principle, the idea seems reasonable. The problems lie in its execution.

Small proposes to use the peak flasher tone-burst specification in the old FCC Rule (part 73.332(d)(4)) as a basis for the new measurements. As far as we know, this specification was derived without analyzing the effects of overshoot upon psychoacoustically perceived adjacent channel interference, or upon the audible distortion produced by deviations which exceed the design parameters of the IF filters in FM receivers. These Rules called the peak flashers "modulation

peak indicating devices," not "weighted peak indicating devices," and represented the *minimum* per-

formance standard expected of the flasher peak-detector circuitry—not the nominal or "design-center" specs. As FM monitor technology improved, the response time and accuracy of the monitors' peak indicators improved accordingly.

Although the current rules are probably imperfect, at least they provide a level playing field: stations know where they stand. Certainly, the Commission did not foresee in 1963 that the Rules would be manipulated by broadcast monitor manufacturers to help stations fight "loudness wars."

The consequence of such exploitation is inevitable: clever circuit designers will

GUEST EDITORIAL

by Eric Small

New York NY Although Bob and Greg may find it hard to accept that ModMinder's true mission is improved FM quality, I can assure one and all that is the case. Don't let the cynics fool you—the FM battleground of the '90s will be quality. That's how FM trounced AM and how CDs sunk LPs.

Objectively, broadcast FM in the US sounds pretty awful today. There's no mistaking the villain causing poor FM quality—it's processing boxes of all types which allow overzealous PDs and engineers to maximize loudness at the expense of quality. This isn't news. But up until now, the only solution espoused has been "don't process so much." Try telling that to a ratings-hungry PD! ModMinder represents the first real-world hope for improving FM quality while maintaining competitive loudness.

Here's how ModMinder came about:

In the past, I felt that the FCC's imposition of a "brick wall" limit at some arbitrary deviation created the incen-

tive for heavy processing and that the Rules would have to be changed to allow for some kind of stepped overmodulation limits.

It wasn't until Modulation Sciences delved into the overmodulation issue for stereo TV that we realized that the Rules already made provision for a degree of reality to prevail in the measurement of overmodulation. The relevant excerpt from section 73.332(d)(4) reads: "The peak preset indicator must also respond correctly to tone bursts at repetition rates from one to ten bursts per second with the following composition of the bursts: (i) Ten consecutive cycles of a constant amplitude 10,000 Hz sinusoid . . ."

This section means what it says. It's hard to imagine that such a specific standard (written in 1966 as part of the new rules governing stereo modulation monitors) was the result of sloppy engineering. In fact, the specific wording of the rule shows that the FCC engineers were very clear in their thinking.

Bob and Greg's assertion that the Commission refers to peak flashers as "modulation peak indicating devices" and not "weighted peak indicating

(continued column 4)

The loss of commercial classical radio in LA touches on issues which go beyond that of one format or one city's listenership.

The decision by new owners of KFAC to compete with the plethora of rock music stations was clearly the result of the financial speculation running rampant in the radio industry.

Record-breaking station prices continue to carry a heavy debt service and force new owners to take drastic revenue-producing action.

In some stations this takes the form of cutbacks which take their toll on the technical plant. In other markets, the cost is one of format diversity, as is the case with KFAC, which was LA's only commercial classical station.

Weighing The Costs

While the demise of the three-year anti-trafficking rule is certainly a factor in the leveraged buyouts, it is by no means the only culprit.

Reducing a station's value to that of an "investment" is a far cry from the public interest man-

date of the Communications Act of 1934.

While it's true that a prosperous station is in a better position to serve its community of license, it's also true that when financial gain is the sole motivation for station acquisition the concerns of the public—as well as many in the broadcast industry—can get lost in the shuffle.

The newly seated FCC should take a second look at its deregulatory policies and weigh them carefully against public interest concerns.

And those involved in the buying and selling would do well to factor in the idea of service to their communities of license along with entrepreneurial concerns.

A broadcast license should be more than a license to make money.

—RW

G. Ogonowski and R. Orban

(continued from column 1)

compete to see who can design the modulation meter that permits the absolute *highest* loudness with program material while still meeting the FCC response specification for tone bursts.

As always, the guy who gives you the highest program modulation wins. This invites chaos: in the November 1988 BTSC TV Stereo Monitor tests (which attempted to introduce weighted-peak measuring techniques similar to Small's), monitors which met the proposed tone-burst specifications for monitoring BTSC TV stereo transmissions (which were substantially more detailed than the specs in 73.332(d)(4)) disagreed 3 dB or more when measuring certain program material!

Small's article reports that his meter permits average and peak deviations to increase substantially beyond current industry norms. Instantaneous deviations could approach ± 150 kHz (200% modulation), which is much larger than the deviation that any common tuner is designed to pass without distortion! Consequently, the broadcaster loses control of quality, which instead becomes randomly determined by the IF bandwidth and detector design of the individual receiver on which the transmitted signal is received. Experience in the mid 1980s with the 150-plus stations in Paris, France, most of which were deviating in excess of ± 150 kHz, proved that receiver distortion and adjacent-channel interference were severe problems under these circumstances.

Further, because many stations develop a significant portion of their income from subcarriers, they must consider the effects of increased modulation upon main program-to-subcarrier and subcarrier-to-main program crosstalk. Crosstalk due to receiver non-linearities becomes unpredictable at these levels of baseband deviation: a wideband radio may be well-behaved, while a narrowband radio suffers severe intermodula-

(continued on page 19)

E. Small

(continued from column 2)

devices" is rhetorical and irrelevant. After all, a Peak Program Meter isn't called a Weighted Peak Program Meter. Yet it is obviously making a time-weighted peak measurement.

They also cite a 3 dB variation in some program material readings among BTSC monitors which had met the proposed tone-burst specifications for monitoring BTSC TV stereo transmissions, as part of a dire warning that clever circuit designers will design modulation meters which will meet the tone burst requirements while allowing higher loudness ("absolute highest") than other meters.

A full reading of the files clearly reveals a less sinister explanation for that 3 dB variation: Not all the monitors in the BTSC tests met the static performance requirement. These monitors were nevertheless included in the program tests. It's no surprise that they therefore didn't show perfect agreement with monitors that did pass the static test.

They further claim that improvements over time in FM monitor technology have improved the response time of peak indicators. Not so. We've found that the peak indicators on most monitors manufactured in the last 25 years have similar response times, and are much faster than the old FCC Rules required.

Will ModMinder allow the loudest stations to get even louder? No. ModMinder will not allow a heavily processed station to increase its instantaneous peak deviation significantly. But a station using less processing will be able to increase its instantaneous peak deviation up to 4 dB. This change will result in more nearly equal occupied bandwidths for the two stations.

Nor will ModMinder allow a heavily processed station's average deviation to increase. All other stations will be able to increase their average deviation, but in no case will ModMinder allow average deviation to exceed presently existing maximum levels. Thus ModMinder

(continued on page 19)

Editor's note: These two opposing editorials debate the issue of peak modulation monitoring and its relationship—for better or worse—to audio quality. The argument stems from the introduction by Modulation Sciences, Inc., of the FM ModMinder, which ignores peaks of less than one millisecond (see RW, 28 June, 1989, p. 42). For more information, contact the authors.

(continued column 3)

Radio World Vol 13, No 18
September 27, 1989

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Next Issue RW — October 11

SIMPLE SOLUTION TO A BIG PROBLEM

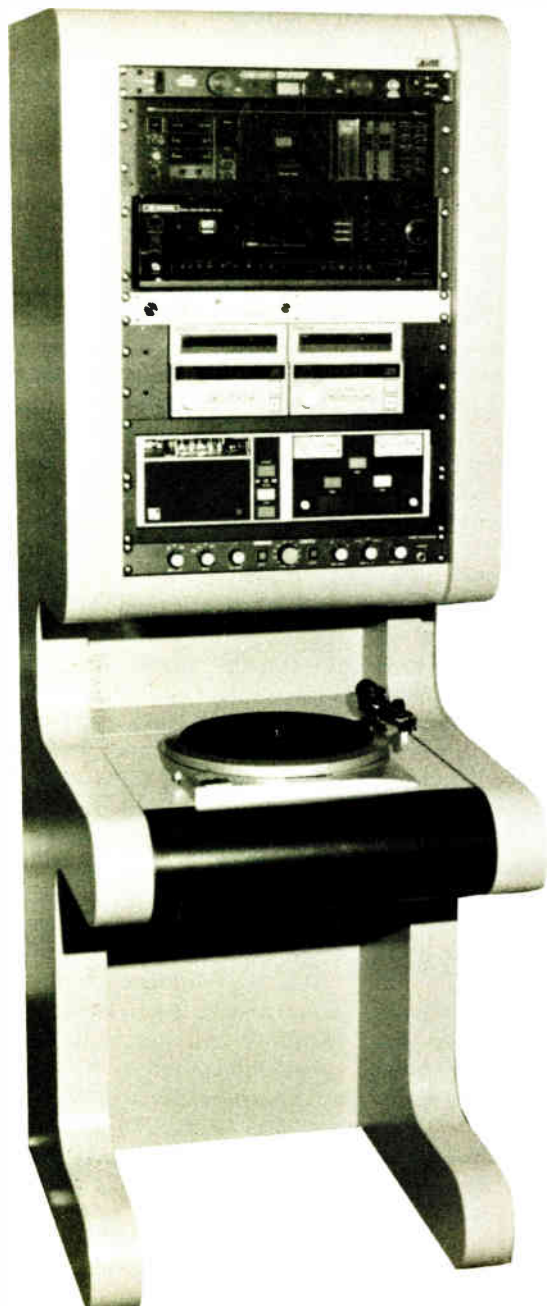


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Hail and Farewell at the FCC

by Charles Taylor

Washington DC While most government agencies were content to bear the heat of the Washington summer, commissioners at the FCC were busy with a game of musical chairs.

First, outgoing chairman Dennis Patrick vacated office 2 August with plans undecided, aside from a fall wedding.

Before his office had time to be scrubbed and whitewashed, newly appointed Chairman Al Sikes took the oath and began making himself comfortable at 1919 M Street.

Comings and goings

On 21 August, Sherrie Marshall, the second of three new commissioner appointees, took the oath of office at a brief ceremony in Washington. The third, Andrew Barrett, was expected to take his oath later in the month in Illinois, where he is finishing a term as a commissioner of the Illinois Commerce Commission.

Finally—also on 21 August—Commissioner Patricia Diaz Dennis, as

expected, announced her resignation effective 30 September. She will join the Washington office of the law firm Jones, Day, Reavis & Pogue as a partner and chair of its communications section.

Dennis, who was a commissioner since 1986, asked President Bush not to consider her for reappointment after her



Commissioner Sherrie Marshall (left) takes oath of office, administered by Commissioner James Quello (right).

term expired in June.

"Although I have enjoyed the rare privilege I have had to serve the public, it is time for me to return to the private practice of law," she said in a letter to the president.

Meanwhile, the new commissioners announced appointments within their offices. Sikes named Cheryl Tritt as his telecommunications advisor, effective 11 September. Tritt formerly was an assistant VP of regulatory affairs for GTE in Washington, where she was responsible for strategies concerning federal regulatory affairs.

Legal advisors

Marshall named Lisa Hook, Diane Cornell and Peter Ross to serve as legal advisors.

Hook, named senior legal advisor, previously served as Patrick's legal advisor. Cornell, legal as-

stant for common carrier matters, served in the same capacity for Dennis. Ross, legal assistant for mass media issues, has been with the firm of Wiley, Rein & Fielding since 1986, primarily practicing communications law.

Stewart Heads MMB

by Charles Taylor

Washington DC Newly appointed FCC Mass Media Bureau Chief Roy Stewart said an area he intends to focus on will be finding ways to efficiently expedite the processing of station applications at the Commission.

Stewart, currently chief of the Mass Media Bureau's video services division, will take on the new role 1 October, following the resignation in mid-August of current bureau chief Alex Felker. The FCC made the appointment last month.

"I think we still have as a primary responsibility the authorization of service," Stewart said. "This includes not only the authorization of new stations,

but changes in the facilities of stations, licensing stations and acting on sales applications and renewal applications."

The goal is particularly relevant in light of the recent passage of a selective Class A station power increase, which will prompt hundreds of the stations to send applications for the boost, causing an excessive burden on the FCC's allocations division.

According to Felker, the ruling likely will increase the processing time for new station applications from four months to 12 months. Minor modification applications probably will increase from six months to 18 months, he said.

Stewart joined the FCC in 1965, when he served as an attorney in the television



Roy Stewart is the FCC's newest MMB chief, replacing Alex Felker.

application branch of the Broadcast Bureau. In 1974, he was appointed chief of the broadcast bureau's renewal and transfer division.

He was named to his current video services position in 1982.

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The Commission also appointed Robert Pettit FCC general counsel, effective 5 October. He currently is a partner with the Washington law firm Wiley, Rein and Fielding. He has served as a staff attorney in the Commission's broadcast bureau, renewal and transfer division, and as a summer intern in the office of then-FCC Chairman Richard Wiley.

Also, Linda Townsend Solheim was named director of the FCC's office of legislative affairs. She took office 5 September. Since February, she had served as Counsel to the Chairman of the United State International Trade Commission, where she advised the chairman on topics including unfair trade practices in import trade, copyright and false advertising.

For more information, contact the FCC public affairs office at 202-632-5050.

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NC Probes Sonrise

by Charles Taylor

Washington DC A new cloud was cast over the future of Sonrise Management Services when the North Carolina Secretary of State announced he has secured cooperation from Thomas Root regarding alleged securities violations by the company.

Secretary of State Rufus Edmisten told reporters at a 24 August press conference here that he had met with Root's attorney Gene Propper regarding disclosure of information about how Sonrise attracted investors to apply to the FCC for radio station licenses.

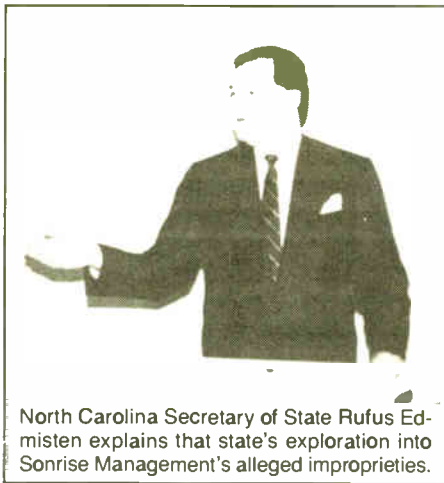
The Columbus, GA, company's activities, which have been under investigation in North Carolina for 19 months, gained national exposure when Root, who represented most of the company's organized partnerships before the FCC, was rescued in July from a mysterious plane crash in the Caribbean.

Information has since surfaced regarding the legality of Sonrise's business dealings. The company has organized 161 investor groups that applied for 165 station licenses under docket 80-90 since 1985, and has collected more than \$116 million, according to the NC Secretary of State.

Edmisten declined to outline exactly what was discussed in his meeting with Propper, but he said, "We can say that we met for about an hour and that the

subject of our talk was on North Carolina's concerns about disclosure of what investors are being told to make a sale . . . The discussion was frank and productive."

He added that no charges have been filed in the matter, though if Sonrise is eventually found guilty, North Carolina



North Carolina Secretary of State Rufus Edmisten explains that state's exploration into Sonrise Management's alleged improprieties.

law could put violators in prison 15 years for each violation.

Edmisten noted that before the national exposure gained by the publicity surrounding Root's flight, cooperation from involved parties has not always been easy.

"We had the case before us for a year. After the plane crash a lot more information came forward," he said.

The FCC began an investigation into Sonrise's activities last month. FCC Administrative Law Judge Walter Miller claimed the applications filed by Sonrise "bear all the indicia of the classic sham."

Edmisten said that he also is exchanging information with authorities in Florida and Georgia. In all, Sonrise has arranged partnerships in 26 states.

Edmisten blamed Sonrise's ability to get away with the alleged crimes, in part, on the FCC's deregulatory demerence.

"Deregulation has been very harmful. If we hadn't had deregulation, we wouldn't have had this pancake of (Sonrise's) 160 filings," he said. "It may work when you're selling cars, but it doesn't work too well when you're attempting to give away the nation's airwaves.

"Maybe Congress will realize that deregulation is throwing things into total chaos," Edmisten added. "Deregulation has spawned a laissez-faire attitude that is brutal. It's caused more bureaucracy."

Meanwhile, Sonrise is facing a breach of contract lawsuit filed by SFA Inc. (formerly Sachs/Freeman Associates Inc.), an engineering consultant in Landover, MD, for allegedly failing to pay a \$46,030 bill for services.

According to papers filed with the Cir-

cuit Court of Prince George's County, MD, the company signed an agreement with Sonrise in January 1988 to provide assistance in processing broadcasting applications for the company's FM investors. Specific services included FM market demographic research, FM station site studies, engineering exhibits required for FCC and FAA applications, and testimony at Commission hearings.

SFA said it billed Sonrise for the work, but Sonrise has failed to pay.

"The thing that bugs me about this is that we did these applications for \$1000 apiece—which is a pretty low price—and they made several million dollars on this and they won't even pay their bill to me," said Ernest Freeman, a company principle.

Sonrise counter-claimed that SFA was not paid because its services "were (not) performed in a timely, proper or professional manner," costing Sonrise \$10,000.

The company also charged that Prince George's County lacks personal jurisdiction over Sonrise because it is based in Georgia.

The matter is scheduled for a settlement conference 16 February, 1990 and, if necessary, a trial on 16 May, 1990.

For information, contact Edmisten's office in Washington at 202-624-5460.

FCC Cites Indecency

by Charles Taylor

Washington DC The new FCC administration chaired by Alfred Sikes frowned on indecency in its first significant broadcast-related action when it cited three radio stations for allegedly airing obscene material.

The Commission sent by certified mail letters to Great American TV and Radio, licensee of WFBQ-FM in Cincinnati; Evergreen Media Corp, licensee of WLUP-AM in Chicago; and Narragansett Broadcasting Co., licensee of KSJO in San Jose, CA.

Dated 24 August, the letters cite specific instances where station disc jockeys made off-color, sexually explicit

comments to callers or about celebrities in 1987 broadcasts. The FCC called attention to the US Criminal Code, which prohibits the broadcast of obscene or indecent material during daytime hours.

FCC can impose action

According to the Commission, the Communications Act authorizes the FCC to determine whether a violation has occurred and to impose action.

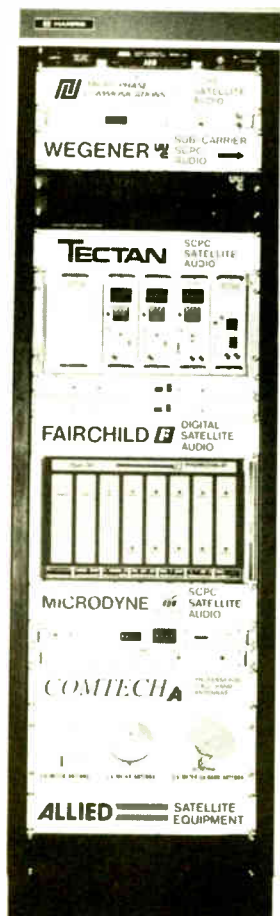
The alleged violators were asked to respond to the charges within 30 days "in order to assist the Commission in its evaluation process," the letters said. "Your response will be used to assist us in assessing whether any violation

(continued on page 17)

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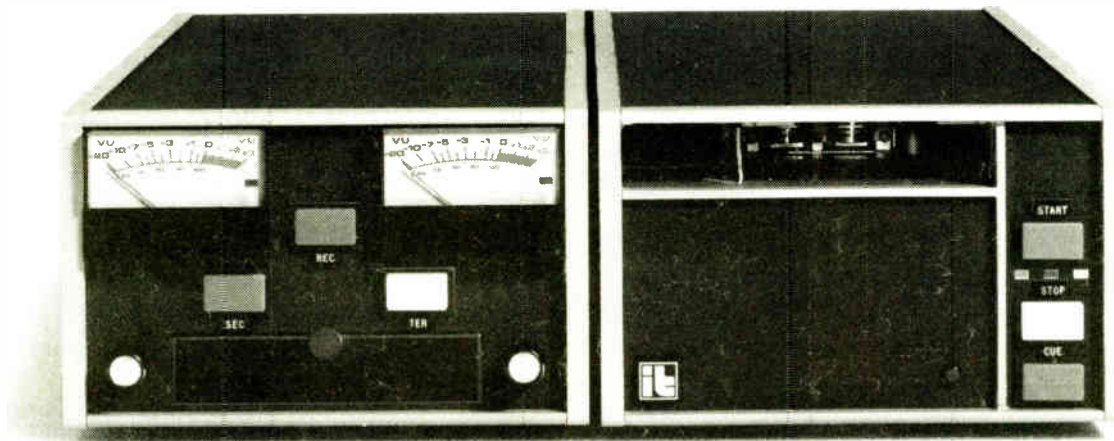
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Vendors Gear Up for SBE Show

by John Gatski

Kansas City MO Despite the lackluster attendance for the Society of Broadcast Engineers' national show last year, companies exhibiting at this year's SBE convention are hopeful that the show will attract an enthusiastic turnout.

About 130 companies—more than half vendors of radio products—will exhibit at the convention here 5-8 October, with products including new transmitters, computer remote control programs and new tape machines.

Exhibit hours will be 10 AM to 3 PM

each day on Friday, 6 October and Saturday, 7 October. Although exhibit hours are cut in half from last year, SBE officials defended the move by pointing out that there is no overlap with engineering sessions.

New products, companies

Some of the new products to be introduced include Studer Revox's A779 compact mixing console and its A764 FM tuner that features ARI and RDS capabilities.

Studer also takes under its wing the marketing of the Dyaxis digital worksta-

tion with its acquisition of Integrated Media Systems, now Studer Editech (see related story, this issue).

Newcomer National Supervisory Network (NSN), which recently started a satellite remote monitor and control service, also will have an exhibit.

According to NSN President Bill Sepmeier, the display will include some of the equipment used at the company's headquarters "hub" in Avon, CO, and possibly a demonstration of the system's capability.

The company is ready to sign up its first five stations, according to NSN.

Moseley Associates will show its new MRC 1620 personal computer remote control software that can be used with a variety of PCs, according to National Sales Manager Dave Chancey.

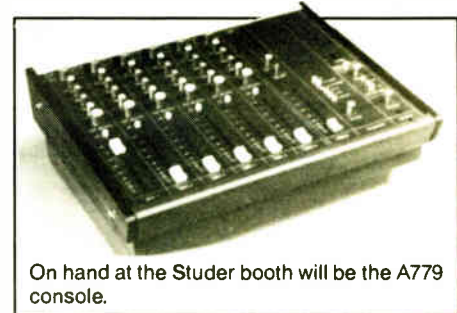
"You don't have to be a computer genius to use it," Chancey said.

And at least one transmitter company, which declined to be identified, was anticipating a major new product announcement.

Established lines

In addition to new products, other companies were set to display established products and some which were recently introduced, many at the spring NAB convention.

Broadcast Electronics will show a restyled AX10 AM exciter with a second RF output and an FX50 FM 60 W exciter,



On hand at the Studer booth will be the A779 console.

according to Ed Anthony, an RF designer.

QEI Corp. will exhibit its Model 400 CAT/Link digital STL, which was introduced at NAB and has drawn a lot of interest, QEI Domestic Sales Manager Jeff Detweiler said.

Other QEI products to be displayed include the FMQ-10,000, the company's recently introduced 10 kW single-phase transmitter, Detweiler added.

Other exhibitors include Broadcast Supply West, which will bring products from its line of consoles, audio test equipment and processors.

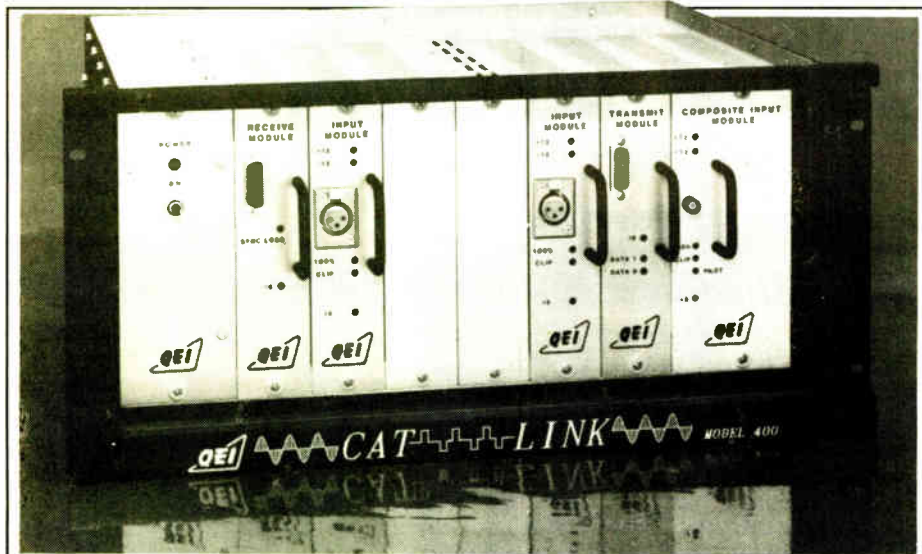
Radio Systems Inc. President Dan Braverman said his company will show its Rs-1000 DAT machine and the studio console line.

Kintronic Laboratories Inc. plans to show its RFC-40-20-2 RF contactor, SER-1-78 19" equipment rack and its directional antenna cabinet, company President Tom King said.

Also at the show will be Fidelipac Corp., which will display its line of cart machines, carts and accessories.

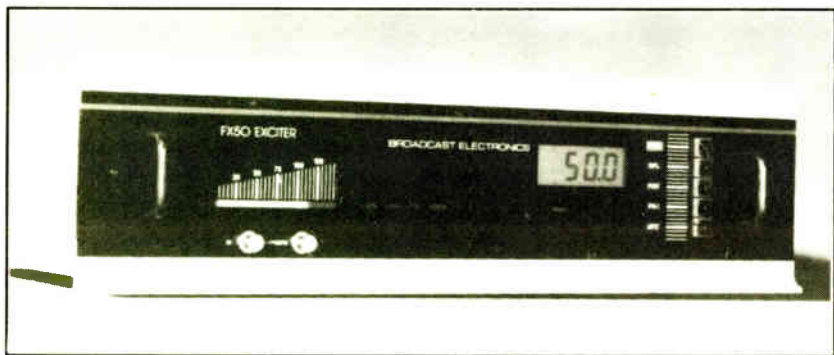
Pacific Recorders & Engineering was expected to feature its Radiomixer con-

(continued on next page)



QEI's CAT/Link will be featured on the exhibit floor.

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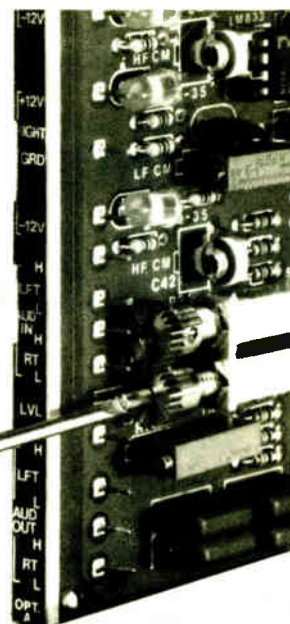
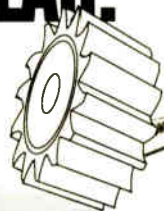
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SBE Sessions Spotlight Radio

Streamlined Schedule Covers Regulatory and Technological Topics

by John Gatski

Kansas City MO Organizers of the 1989 Society of Broadcast Engineers (SBE) convention are betting that exclusively scheduled technical sessions, which will not conflict with exhibit hours, will strengthen the national show now in its fourth year. The convention



will be held here 5-8 October.

Engineering sessions actually begin Wednesday, 4 October, with the Ennes Engineering Workshops running all day. The workshops are manufacturer-sponsored, hands-on presentations of certain equipment. Pre-registration is suggested because seating is limited to a first-come, first-served basis.

Radio-related workshops include use of solid state components in transmitters by Harris Broadcast, demonstration of the new FX50 FM exciter by Broadcast Electronics and a seminar on FM and AM antenna systems conducted by con-

sultant Don Markley, consultant Ralph Evans III, John Sadler of the FCC and Gaeza DiEnes of Andrew Corp.

An engineering management workshop, hosted by Sim Kolliner and Brad Dick, also is scheduled Wednesday.

FCC, NAB and regulation

Beginning at 8 AM, Thursday, 5 October, the first session will be The Regulation Front. The four-hour session will include segments on the state of the broadcast industry by Wallace Johnson of Moffett, Larson and Johnson, an NAB outlook on broadcasting by NAB Science and Technology VP Michael Rau, an FCC update and a communications technology round table.

At 1 PM, Thursday, the sessions will resume with a focus on broadcast technology. Segments will include PC use at stations to reduce on-air errors, by Ben Evans of Evans Associates, and computer assistance in calculating antenna patterns by WMNI-AM CE Dave Matthews.

Other afternoon segments include complementing EBS with a Direct Warning System by KQMJ-FM CE Troy Langan, making stations natural-disaster-proof and an FCC roundtable with Keith Larson, Robert Greenberg and John Sadler. The Thursday "night owl" session will feature an audio processing discussion.

On Friday, 6 October, the New Technology for Radio session Part I is scheduled to begin at 8 AM. The first segment is a

paper on noise-free radio by consultant George Yazell. Other segments include an update on FMX by Broadcast Technology Partners President Emil Torick, use of FM/AM boosters, translators and slave

The Thursday "night owl" session will feature an audio processing discussion.

stations by Ralph Evans and the status of NRSC-FM by John Bisset of Delta Electronics.

The New Technology for Radio session resumes in the afternoon and includes segments on solid state transmitters, high fidelity (76 kHz) SCAs by KBSU-FM DE Tim McCartney, signal coverage, new FM processing methods by Robert Greenberg of the FCC and a panel question/answer session on station operations.

Digital FM

On Saturday, 7 October, a Radio Transmission session begins at 8 AM with a discussion of transmission lines and waveguide by consultant Dane Erickson of Hammett and Edison. Other discussions include tower efficiency by consultant Jerry Westberg, optimum FM bandwidth by Ed Anthony of Broadcast Electronics and total digital FM baseband signals by Bill Gillman of Gentner Electronics.

The afternoon radio session includes computer-assisted manipulation of audio by John Statner of CompuSonics and Greg Dean of Computer Concepts (two segments), digital signal processing, digital STLs and use of VHS video cassettes for broadcast quality audio.

On Sunday, 8 October, the Engineering Safety workshop will feature segments on work environment safety, RF radiation compliance, transmitter maintenance safety and PCB component handling.

For information, contact SBE national headquarters at 317-842-0836.

Trade Show

(continued from previous page)

sole, introduced at the NAB spring show.

Allied Broadcast, under the joint Harris-Allied banner was expected to show a wide variety of station equipment. Also at the Allied booth will be the new FM ModMinder from Modulation Sciences, which has generated widespread interest from stations seeking to increase modulation cleanly and legally.

And Harris Corp. itself was expected to show its line of transmission products including the DX digitally modulated AM transmitter line.

For more information about the SBE exhibition, contact the show management firm of Eddie Barker and Associates at 214-720-1335.

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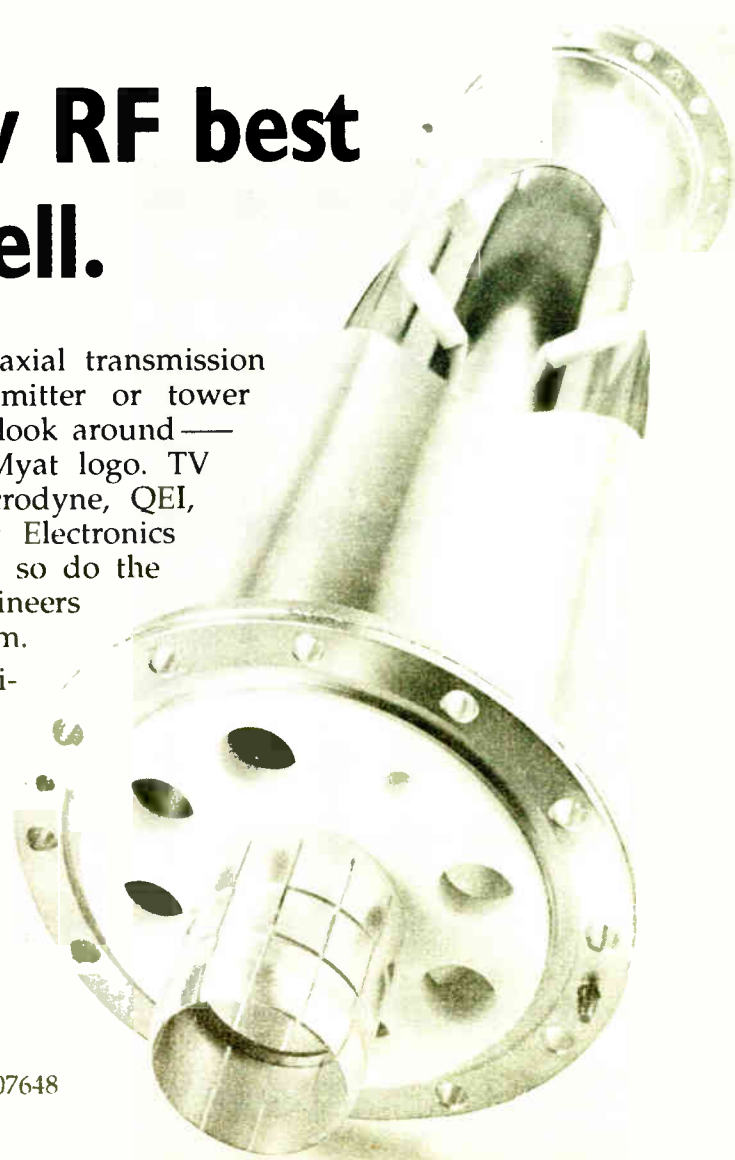


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Madison Clinic Enters 35th Year

Madison WI The University of Wisconsin's Madison Broadcasters Clinic—sponsored in part by Radio World and TV Technology—is slated for 16-19 October. It's the 35th year for the grass roots conference, which will be held at the Holiday Inn Southeast, in Madison.

The format is a bit different this year, with radio and TV technical presentations enjoying separate days including in-depth, hands-on discussions as well as management topics.

Evening will be devoted to equipment exhibits as well as the popular nuts and bolts engineering forum and the not-to-be-missed pizza-engineering forum.

For more information contact Don Borcherch at 608-263-2157.

MADISON BROADCASTERS' CLINIC PROGRAM

Monday October 16

7:45 AM Registration and continental breakfast

9:15 AM General Broadcast Engineering Sessions:

- The Educated Technologist Citizen—Mark Durenberger, director of network development, WCCO Sports Networks
- A Practical Approach to Getting the Greatest Benefits From NRSC—Bill Ammons, CRL Systems
- FMX™: A Discussion of Consumer and Professional Applications—Tom Keller, Broadcast Technology Partners

12:15 PM Luncheon

1:30-4:30 PM Simultaneous Workshops:

- Antenna Systems For Radio—Don Markley, D.L. Markley & Assoc.; Ralph Evans, Ralph Evans & Assoc.; John Saddler, FCC
- Technical Management—John Cummuta, Market-Line
- FX-50: The FM Exciter With Audio Performance That Rivals CD Specs—Ed Anthony, Broadcast Electronics

7:30 PM The Famous Pizza/

Engineering Forum—Moderator: Mark Durenberger

Tuesday October 17

7:45 AM Registration and continental breakfast

9:00 AM Engineering Sessions (Radio):

- Where Are You? Use the Global Positioning System—Garrett Lysiak, Owl Engineering
- Off-Premises Monitoring and Remote Control Via Satellite—Peter Burk, Burk Technology
- Do Folded Dipoles Really Work?—Lawrence Behr, LBA Group
- 950 MHz Aural STL/TSI Systems Including Alternatives in Congested Areas—Jeff Nordstrom, Allied Satellite

12:15 PM Luncheon

1:30 PM Engineering Sessions (Radio):

- ISDN—Its Impact on the Broadcast Engineer—Ameritech
- Satellite Communications for Broadcast: A Ku Band Update—John Bimrose—Mark Durenberger—Ray Connover—RCA/GE Americom

4:30 PM Equipment Exhibits Open (Reception and cash bar)

Wednesday October 18

7:45 AM Registration and continental breakfast

9:00 AM Engineering Sessions (Radio & TV):

- Integrating Leading Edge Technology in Current Audio Production—Bill Mullin, Pyramid Audio
- Compact Disc Theory and Maintenance—Denon America
- Utilizing CAD for Broadcast Operations—Kahn, Phillips and Associates
- PC Controllable Automated Video Measurements—Mel Infanzon, Tektronix

12:00 NOON Equipment Exhibits Open

6:30 PM Engineering Forum—Moderator: Kent Dixon, WHA Television

Thursday October 19

9:00 AM Engineering Sessions (TV)

12:15 PM Luncheon

Adjournment



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OTARI

Taming of the Shrew

Dear JG:

You ought to see some of the critters I share space with here in these trenches. Besides all of the Production Rats (both digital and analog) and the Programmin' Possums, there's one little rodent I'm wary of getting too close to.

Remember that Disney show where lemmings leaped off cliffs by the truckload, oblivious to everything but that one futile act? Wander yonder down these Sonexed halls, JG, and meet radio's very own kamikaze rodent, the Techno-Lemming.

The Techno-Lemming is blind to new technology by choice, flatly refusing to work with it or learn about it, and will actually put as much distance as possible between him/herself and it.

Whether motivated by fear (risk of the unknown), tradition ("I'm from the old school"), ignorance ("I can't break what I don't know"), or outright prejudice ("I won't even touch it if it looks like it's got a computer in it"), this critter is poised for a leap smack into the icy murk of a stalled-out career.

Oh, we've seen him before . . . the en-



FROM THE TRENCHES

by Alan Peterson

gineer who doesn't trust "them new-fangled Eye-See circuits," the jock who cites every drawback of using CDs on-air, the production director who passes

up the REV-7 in favor of tape echo. All the qualities one notes in the Techno-Lemming.

I've worked with him, too. At lots of places. Be he man, mouse, manager or morning drive maniac, he won't use the synth because it doesn't say "Baldwin" on it.

He won't multitrack because he has to fly in all the effects, music and voices on one pass . . . even if it takes half the day.

He'll tape-loop a background effect (splice-thump and all) because he "can't be bothered" sampling and looping digitally, in less time.

He will splice, but don't expect him to get too chummy with a hard disk cut-and-paste unit.

It isn't a question of unfamiliarity with the new technology. The Techno-Lemming simply will not work with it. He sees that equipment rack as a giant cartoon buzzard (WMMS, please don't chuck my resume for that line), looming over him. And that's where we step in.

It's high time we set a few humane Lemming Traps. Every engineer I know keeps dozens of trade publications and journals (including RW) back issues, packed with plenty of articles on new gear, techniques and philosophies.

The trick is to pry them out of the GM's and CE's hands and get them in front of the on-air and production folks. Will it be as scary if the mystique is unveiled to be just another version of your friendly chip-and-widget combo?

An in-house incentive program could get things rolling; WMAS Springfield used to hand out 20 bucks extra to whomever had the most innovative commercial of the week. (Sort of like an in-house contest, without the 10 callers.) This could fly for creative use of production gear.

And how about the sales staff? Those IBM clones could help hike sales (in flashy ratecards, graphics et al). Inspire those would-be lemmings. Turn those critters away from the cliff edge of hi-tech ineptitude and back into increased productivity for the station.

My farmsy friends tell me weasels have no fear at all, just animalistic fury; enough to ravage an entire farmyard. I'd hate to think of myself as a weasel for writing this, but it's a lot better than being a Techno-Lemming headed for oblivion.

Technology isn't scary, JG, it's just the way some of us furry animals choose to handle it.

Ya don't think the Humane Society will be on our case for stamping out the Techno-Lemmings, do ya?

Not yet over the edge,

—Al

Al Peterson is a monthly contributor to RW, sleeps in hollow trees and can hold five pounds of acorns in his cheeks. He also works for WSBS/WBBS, Great Barrington, MA.

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Lyman Launches Radio Ventures

by Charles Taylor

Washington DC When the FCC changed rules in 1982 that allowed for the rapid turnover of broadcast station ownership, the connection between broadcast properties and Wall Street became imminent.

In an environment where deregulation has turned airwaves into dollar signs, radio has become big business where profits from sales can tower as high as any antenna on the horizon.

The latest potential powerhouse radio station group to hit the skyline is Radio Ventures I based here, headed by former RKO General President Jerry Lyman.

Formed in January

The group was formed in January as RKO disassembled, and consists of Lyman, Washington's The Carlyle Group merchant bank, and 1255 Equities, made up of a group of DC communications attorneys.

For Lyman, creation of a station group was an obvious choice.

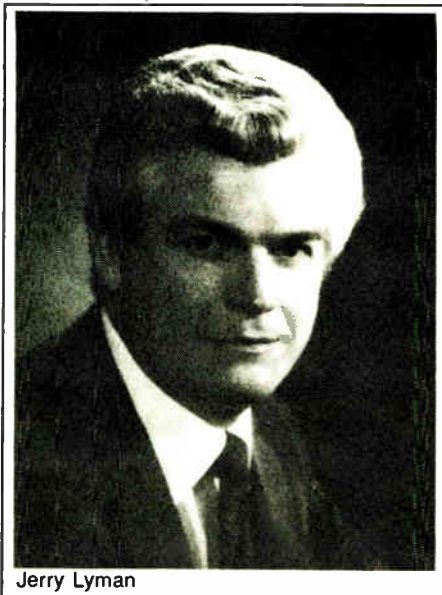
"Radio is what I do best," he said. "When you're in the business for almost 25 years, that's what you do. I've been a group operator and when you're working for a company that is obviously terminating its existence, you look for what options there are out there.

"I think I'd worked for someone long enough," Lyman added. "It was time to work for myself and take my assets and the record that I have built and market it as you would with any

track record."

In mid-August, Radio Ventures I made its initial purchases: first, an AM/FM combo in Asheville, NC, on 10 August, and five days later, an FM in Richmond, Va., the state capital. The combined value of the acquisitions is nearly \$50 million.

According to Lyman, the purchases



Jerry Lyman

represent what he hopes will be a long-term investment—apart from the current "buy to sell" trend that deregulation prompted.

"I'm doing this for all the reasons that you do this: because you enjoy the business, because you want to build fine radio stations and as an investment. No-

body does this for fun. The bottom line of everything is investment," Lyman said. "But I intend to operate these stations for a reasonable period of time. I don't have a crystal ball, but it's my intent to build a group."

Wise investing

The stations, according to Charles Giddons, a partner with Media Venture Partners in Washington, represent wise investing.

"(Lyman is) buying stations with proven cash flow and market positions," he said. "He thinks if you buy good properties in protected situations, they'll continue to appreciate. They certainly have. We've had double digit value increases for 20 or 30 years now."

The first purchase, WWNC-AM and WKSF-FM in Asheville, was made for \$25.5 million. The AM-country and FM-CHR stations were sold by Heritage Broadcast Group, which bought the pair in 1986 for \$13.5 million.

The market, said Lyman, is "a good one to help the company get launched. Asheville is a very strong market and gives us a successful combo in terms of its cash flow delivery."

Richmond's WMXB-FM was bought for \$23 million. The adult contemporary

station was owned by Ragan Henry Communications Group, which paid \$13 million for the stations just over a year ago.

The purchase price for WMXB was the highest ever paid for a station in Virginia. Arlington's WAVA-FM set the previous record in 1986 with a \$16 million price tag.

One of primary markets

Richmond was one of the company's primary target markets: "I believe that Richmond has tremendous potential as a marketplace. It's not over-signaled as a radio market and it's just really popular right now in every aspect," he said.

No changes are planned for any of the stations, Lyman said.

The group intends to purchase one more station by year end.

"There's nothing right now in the hopper, but we're looking at a number of different opportunities," he said.

Beyond that, Radio Ventures I intends to continue buying toward the legal limit of 12 FMs and 12 AMs. "A lot," Lyman continued, "depends on the structure of the company as it's put together, where the growth potential is, how quickly the stations are coming together. Everything's based on cash flow and servicing your debt.

"But the ideal is to go forward and buy as many as we can," he said.

For information from Radio Ventures I, contact Jerry Lyman at 202-347-2626.

Colorado Broadcaster Goes Far on a Dollar

by Alan Carter

Ouray CO A dollar doesn't buy much these days, but on a good day you might pick up a . . . radio station.

Yes, that's correct: \$1 for a radio station.

The "opportunity" came to Tim Cutforth, he said, when the original owner of 3 kW KURA-FM here in the Colorado mountains about four hours from Denver, couldn't make a go of the new station.

The second owner of the Ouray FM, a friend of Cutforth's, "gave" him the license and lease on the facility. The transaction cost Cutforth a mere dollar.

As Cutforth, a broadcast engineer who is president and director of engineering for Vir James Broadcast Engineering Consultants in Denver, told the story, the original owner built the new station several years ago with state-of-the-art equipment.

That turned out to be a mistake because, he said, KURA could not support the debt service. The second owner gave himself a year to turn the station around but had no luck, Cutforth noted, and decided to sell off the equipment to cut his losses.

Little investment

When Cutforth puts KURA back on the air, hopefully this month, he will have invested about \$5000 in a station he projected will have an annual income of approximately \$50,000.

With old equipment collected over the years—and a deep down yearning to own a radio station—Cutforth planned to offer listeners in this town of 700 a mix of music from classical to beautiful and, of course, sports reports

from the local high school.

"It's an adventure in radio," Cutforth said. "You know, everybody who works in radio wants to own a station. Well, over the years I've collected a lot of old equipment and I guess I was closer than I thought."

Cutforth started in radio after graduating from high school in 1967 and working around a station. While studying for a degree in electrical engineering, he became director of engineering for his college station.

KURA will be automated, with one full-time employee who will act as manager, ad salesperson and sports reporter, and several part timers. From Cutforth's personal collection of about 230 hours of music on tapes and CDs, he'll put together enough tapes to have a 30-cassette rotation plus eight CDs.

Old but still working

Among the "old" equipment that will be a part of KURA are Collins tube cart machines, RCA mics, a four-channel Telex tape deck for the production room and an FM antenna he picked up from a salvage yard for about \$500.

"This is a case where I can run a frugal radio station that sounds good in a small town," Cutforth said. He operated a bankrupt station in Denver for 11 months and said he believes he can pull KURA out of its slump.

He is confident that he can turn the station around where others failed because he doesn't have to contend with a large debt service.

"I'm going to back up," Cutforth said, "and hit it again."

For information from Tim Cutforth, call 303-937-1900.

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NAB Opposes ANSI RF Draft

by John Gatski

Washington DC The NAB opposes a current draft revision of the American National Standards Institute (ANSI) RF radiation standard that would lower the exposure limit for the general public, but maintain the current limit for broadcast station workers.

The seven-year ANSI RF radiation exposure standard of 1000 mW/cm² may be revised by 1990, according to members of a subcommittee that is working on the two-tier draft revision of the standard.

The new RF exposure draft includes a proposal to change the 1000 mW/cm² safe exposure level for FM to 200 mW/cm² for non-controlled (residential) areas, but leaving it at 1000 mW/cm² for controlled

exposure (station workers).

IEEE Standard Coordinating Committee 28 on Non-Ionizing Radiation and its Subcommittee 4 have been charged with the task of developing the revised standard, which was originally established under the ANSI C95.1 Committee, said Subcommittee 4 secretary Dr. John Osepchuk, a researcher at the Raytheon Corp.

Opposition from NAB

NAB Engineering, Regulatory and International Affairs Director Ralph Justus said the NAB is against the two-tier approach because it is based on public pressure more than scientific fact.

Justus, a member of the IEEE subcommittee, noted the NAB's objections at the

group's June meeting in Tucson, AZ.

"We objected to it because there is no scientific evidence that RF radiation affects humans at the current limit," Justus said.

Justus said public outcry over claimed RF radiation effects has triggered a rash of local government RF exposure limits and ANSI appears to be bowing to that pressure, despite lack of scientific re-

... the NAB is against the two-tier approach because it is based on public pressure ...

search to determine what "safe" exposure is.

A lower "unnecessary" limit could have an "adverse economic impact" on stations if they had to move their towers or raise the height to meet the standard, Justus emphasized.

Hot topic

RF radiation has become a controversial environmental topic because it is believed by some researchers to cause internal body warming and other adverse

health effects under certain conditions.

The ANSI standard has been used as the de facto standard by most broadcasters because no mandatory standard has ever been enacted.

In the absence of a national mandatory standard, which the Environmental Protection Agency ceased working on last year, local jurisdictions began approving their own standards, many of which have been more stringent and have been opposed by broadcasters.

Seattle, for example, is considering a 100 mW/cm² exposure level, which is opposed by the NAB and numerous stations in the area.

Despite NAB objections to the proposed two-tier standard, Osepchuk said the majority of the 100-member subcommittee, who are mostly from the scientific community, supports it.

"It's an idea that is catching on around the world," he said. "You have to be on the safe side. It doesn't make sense to treat a person in his home the same as you would someone at a transmitter."

AM transmitter emissions also are affected by the new standards draft, but in the opposite direction. The new standard would leave the AM electric field strength the same as the current limit and relax the magnetic field limit, according to Justus.

For information, contact Ralph Justus of the NAB at 202-429-5341 or Dr. John Osepchuk of IEEE Subcommittee 4 at 617-860-3320.

FCC Targets Indecency

(continued from page 8)

has occurred.

Officials at each of the three stations said they were meeting with attorneys to plan a formal response to the Commission's charges.

Larry Wert, VP and GM of WLUP, added that while he understands that a broadcaster's level of responsibility must be taken seriously, the FCC is addressing a gray area in its definition of indecent programming.

Take a look at Oprah

"I'm a relative neophyte to radio; I come from a television background," Wert said. "With the visibility of TV and what goes on on Oprah and Donahue and Geraldo, it's hard to believe a more selective medium like radio where it takes more effort to make a choice on the dial is getting this much scrutiny."

Wert said he had received hundreds of letters from listeners who "vehemently

want to express their right to listen to that type of show if they want. They view it as an honest show. When you tune in to the Dahl and Meier show, you've known what you're going to get for 10 years."

WFBQ's GM and VP Chris Wheat expressed surprise that the FCC had acted on a broadcast that was two years old, but otherwise, offered only that his attorneys were formulating the station's official response.

John Peroyea, president of Narragansett Radio Inc., associated with KSJO, said he preferred to withhold comment until the station had responded to the Commission.

Maximum fines for the stations would be as much as \$10,000 in fines, two years in jail or both for the charges, according to the Criminal Code.

For information from the FCC, contact the Office of General Counsel at 202-632-7020.

NRSC Responds to MSI

(continued from page 3)

spring NAB show and quoted in an industry trade publication.

Modulation Sciences, through a letter by its attorney, has informed both EEIA and NAB, which conduct NRSC business, that the paper was accepted at a meeting in which only subgroup members were invited to participate and without the NRSC having sought the diversity of opinions mandated of standards-making bodies by anti-trust considerations.

NAB maintains that although the working group discussed the paper, no action was taken and that during discussions staff was instructed to contact manufacturers and engineers involved with composite clippers for input.

As of early September, Small had been the only manufacturer of such devices notified. Neither Frank Foti of Cutting Edge Technology, a well-known audio specialist, nor Jim Somich of Somich Engineering, another maker of a composite clipper, had been contacted.

The next meeting of the working group was to be scheduled at a full NRSC meeting during Radio '89, according to NRSC Staff Coordinator Stan Salek, an NAB staff engineer.

Small said he was pleased NAB had

responded to his inquiry, but noted that discussion of composite spectrum issues was not on the agenda of the full NRSC meeting scheduled during the Radio '89 convention.

Salek said the work of the group was not listed because it had not met since the issue was discussed during full NRSC meetings at the NAB spring show and the Consumer Electronics Show.

On a related note, all references to the work of the NRSC FM subgroup on composite clipping had been deleted from a Radio '89 convention session program on FM engineering. The topic was not included for discussion during the session, although previous reports on the convention program had included it as a topic.

Asked why a progress report on composite transmission studies was not listed on Radio '89 schedules, as previously highlighted by the NAB Science and Technology Department, Salek said clipping is referenced in "general terms" in a paper on receiver design tradeoffs by Rick Zerod of Ford Motor Co.

For information on the Composite Spectrum Working Group, contact Stan Salek at the NAB, 202-429-5391 or Chairman Ed Anthony of Broadcast Electronics, 217-224-9600. Call Modulation Sciences at 800-826-2603.

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World Radio History

Point-Counterpoint On Modulation vs. Quality

G. Ogonowski and R. Orban

(continued from page 5)

tion between the main program and the subcarrier(s).

The bottom line is simple: *At present, we have grossly insufficient data regarding the effects of such increased modulation upon adjacent-channel interference and receiver distortion.* We believe that the Commission must carefully weigh any such effects. Given the huge number of receivers of widely disparate circuit design in the field (however *all* designed to receive signals transmitted using current industry modulation practices), responsibly assessing the effects of increased peak modulation will be a huge task—but a necessary one. Without such thorough investigation and study, we believe it is exceedingly irresponsible to sell a product which encourages radio stations to increase transmitted deviation. Small preaches "quality," but we all know that a large number of individuals in our industry will instead read "loudness."

It is possible that *some* specification for weighted peak measurement may permit the amount of audio peak limiting to be decreased (and/or overshoot control to be eliminated) while reducing the customary loudness penalty and without increasing interference or receiver distortion. We submit that the algorithm for such weighted testing is still unknown, and that any proposed algorithm must be rigorously tested (possibly through the NRSC, and *certainly* with the cooperation of receiver manufacturers) before being adopted by the industry. It must be "loophole-proof": *any* meter meeting the proposed specification must agree closely with *any* other meter *on all program material*. Above all, it must not degrade quality by increasing interference or distortion.

■ ■ ■

Greg Ogonowski is the owner of Modulation Index, Diamond Bar, CA: 714-860-6760. He is also technical director at Heftel Broadcasting in Los Angeles: 213-465-3171. Robert Orban can be reached at Orban Associates in San Francisco: 415-957-1067.

E. Small

(continued from page 5)

will not cause problems in this area—except, perhaps to the sales forecasts of the current generation of processing boxes.

While ModMinder will allow lightly processed stations to increase peak deviation, it is extremely unlikely to ever reach the 200 percent range. In fact, with most types of program material, peak deviations of 200 percent are not possible without exceeding occupied bandwidth limits. With respect to adjacent channel interference, there is no insufficiency of data: When occupied bandwidth limits are exceeded, adjacent channel interference occurs. This almost certainly accounts for what happened in the case of those very heavily processed Paris stations.

We are NOT proposing altering occupied bandwidth limits. ModMinder simply allows stations to more fully utilize their allowable occupied bandwidth under the current rules.

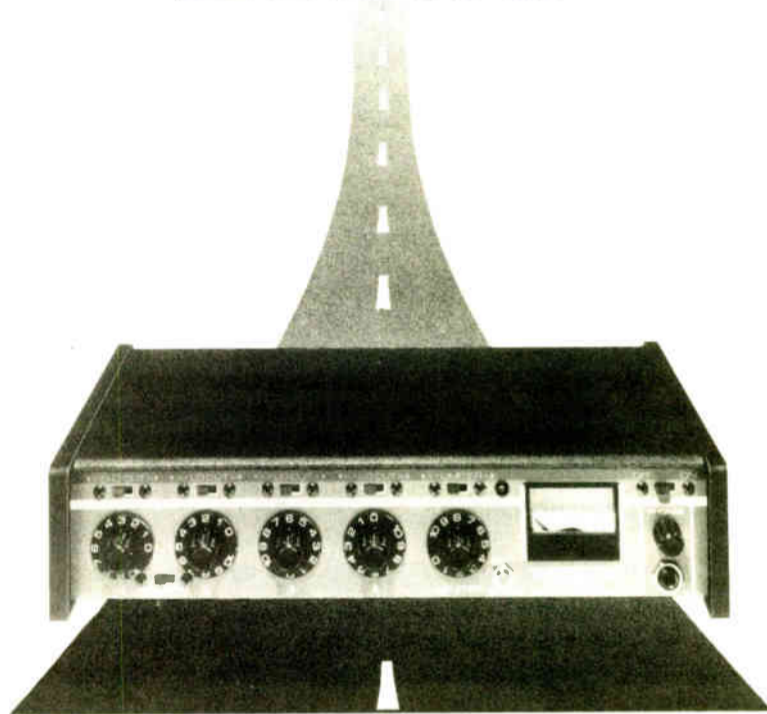
In extensive monitoring with a measuring circuit conforming to the old FCC Rule, the highest peak deviation we have ever observed was 160 percent, and this was on a station which was employing no peak limiting whatsoever at the time. For most stations, even after they remove clippers and reduce peak limiting, instantaneous peak deviation should be in the range of 120-140 percent. Gross increases in receiver distortion (another of Bob and Greg's concerns) at these modulation levels are very unlikely.

In closing, the critique acknowledges (finally!) the potential benefits of weighted peak measurement and stresses the need for flexibility and experience in determining the best algorithm. Greg and Bob have underscored the validity of our design approach which allows ModMinder's measurement algorithms to be easily and inexpensively updated in the field, as additional data is gathered.

■ ■ ■

Eric Small is VP, Eng. of Modulation Sciences, Inc. Call him at 800-826-2603.

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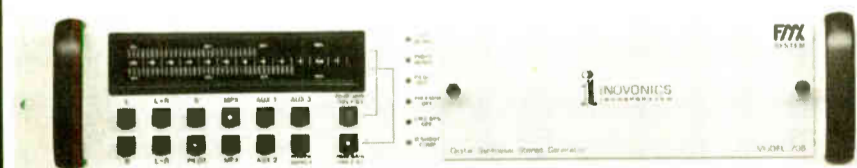
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Translators Form New Group

(continued from page 1)

translator sentiment by the NAB and other opponents of the service.

For example, La Tour said the NAB supports and helped draft recent legislation to stymie translator use, referring to the introduction of a bill by Rep. Matthew Rinaldo (R-NJ) that contains a provision limiting their use.

"The NAB hates us," he said. "That bill would basically put us out of business."

NAB Deputy General Counsel Barry Umansky said the NAB does not oppose all translators, but only those that do not offer a bona fide service to a needy community.

"The NAB supports translators in the way they were originally envisioned by the FCC," he said.

Umansky said the NAB will oppose the new FM translator association if it promotes "misuse" of translators.

At Tepco Inc., a translator manufacturer, Sales Manager Jerry Johnson said he has "mixed feelings" about the NAB's attitude toward translators.

Tepco, which has made FM translators such as the J-317 10 W unit since 1978, also supports an FM translator-only association. The company also makes TV translators.

Johnson said the NAB's opposition to translators in crowded urban areas that are only used to further coverage area is understandable. But he said there is a legitimate need for them in other areas,

in which continued opposition could jeopardize translators overall.

Potential members of the new association said they also need a more concentrated voice for FM translators because of their current group's, the National Translator Association, less than enthusiastic support.

"We are not being represented as well as we think we should," Las Vegas-based Outreach Radio Inc. President Bill Goode said. His company operates several translators in Nevada, Colorado and Arizona.

He and other translator companies said the National Translator Association has drifted toward TV translators at a time when FM needs a lot of attention.

"The other association (National Translator Association) has kind of drifted off toward TV . . . and left FM in the dust," Tepco's Johnson agreed.

National Translator Association President Darwin Hillberry defended his association's record on support of FM translators at the FCC and said the association has not neglected FM translator issues as proponents of the new as-

sociation have suggested.

Hillberry said their criticism may have been prompted by disappointment when the National Translator Association did not support a proposal before the FCC that would have allowed satellite programming via FM translator.

"We felt it (support of the satellite programming via translator proposal) was not in the best interest of all our members," Hillberry said.

For more information, call John La Tour of Power Dupree Broadcasting Inc. at 1-800-544-6969, Barry Umansky of the NAB at 202-429-5456, Bill Goode of Outreach Radio Inc. at 702-870-3840, Jerry Johnson of Tepco Inc. at 605-343-7200 and Darwin Hillberry of the National Translator Association at 307-856-3322.

Ft. Lee FM Translator Battle Waged

(continued from page 1)

only in emergencies.

Thirty seconds an hour isn't enough to meet the needs of a county with 850,000 residents, Turro said. He petitioned the FCC two years ago to permit 24-hour local program origination on W276AQ. The Commission rejected his request because he didn't establish "compelling public interest reasons" to warrant a waiver of the rule, according to FCC documents.

Not the first attempt

Turro took the FCC to appeals court. The court found merit in his case, he said, but decided not to second-guess the FCC's complex allocation procedures

—sending the engineer back to square one.

Bergen needs local radio for local news and to warn of weather conditions and hazards, Turro argued. (Three educational FMs are assigned to Bergen County: WFDU, WRRH and WRPR.)

According to Turro's petition, recent flooding caused \$1.3 million in damages in the county. Bergen had a staggering 154 hazardous chemical spills in the first quarter of 1989 alone. In March, a water main broke, leaving 750,000 residents completely without water for drinking, washing or fire protection.

"The New York City radio stations can't cover these events," Turro said in an interview. "They are 50 kW, they get out 50 or 60 miles. They can't cover everything that happens in Bergen County, and I don't blame them."

Local support abounds

Community members called out for a local radio station that could broadcast emergency news. Politicians and government agencies joined in.

The list of supporters on the record includes New Jersey Governor Thomas Kean, Senators Bill Bradley and Frank Lautenberg, congressional Representatives Robert Torricelli and Marge Roukema and the New York Port Authority, as well as borough officials.

County officials told the FCC, "It is no longer realistic to accept the fiction that Bergen County can rely on other metropolitan New York stations for local news, traffic reports, school closings, local fund raisers, or coverage of local government meetings. . . (A)s each season goes by, the hardship becomes more intense."

With these endorsements in hand, Turro returned to the FCC on 28 July with a beefed-up request for waiver of the local origination rule. The Commis-

sion did not dismiss this filing as moot in light of the previous finding. Instead, it placed the petition on public notice and is soliciting comments.

To date, there has never been a formal filing against the proposal—either at its earlier stages or at the current stage. Comments were due 5 September, with the NAB—which has a long standing opposition to translators—promising to file in opposition.

"The NAB probably knows in their hearts that this station is needed," Turro said, "but they are concerned about the hole in the dike (setting a precedent).

"We're saying, it's the largest county without FM service and it's in New Jersey. The FCC's allocations system has failed miserably in New Jersey," he continued. "New Jersey and Delaware have probably the worst dole of radio frequencies in the country."

An exception to the norm

Turro's attorney Ray Kraus said that the W276AQ proposal is "not the opening wedge to low-cost competition for broadcasters. There are very few areas that will ever be in a position to duplicate the showing we've made. This is such an unusual case; it's an engineering purple cow.

"Also, we've told the Commission that we are fully prepared to be bound by all the requirements that apply to full-service stations: equal time, lowest unit rate, EEO. Nobody can say that we have any special dispensation in comparison to full commercial stations."

The petition outlines an ambitious slate of programming for the station. With local origination capability, W276AQ will have a minimum of 20, five-minute newscasts per day. On a weekly basis there would be a minimum one-hour telephone talk program ad-

(continued on next page)

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Translator Seeks FM Privileges

(continued from previous page)

dressing issues of local interest.

The station would broadcast at least 168 free PSAs a week, and local disaster information would be aired immediately with the aid of direct lines to county police and emergency agencies.

Kraus said his client has shown that there is "no conceivable way" to allocate any Class A or B channel to Bergen County. "But we went beyond simply showing that there was no A or B available. A translator is a secondary service,

and could be knocked off the air by a change in allocations elsewhere.

"However, it seems extremely unlikely that the situation would arise in which this station was on the air for a while and then there would be a change in allocations requiring the translator to go off the air—raising the specter that people would have gotten used to a local signal and then would be deprived of it. So it's doubtful that the translator would be displaced in the foreseeable future."

Turro dismissed the idea that he's

merely looking toward creating a low-power FM network. "I have a translator in Stamford, CT, rebroadcasting WQXR, and one on the Jersey Shore that rebroadcasts WHTZ. I have no intention now or 20 years from now of petitioning the FCC for local origination on those translators. Those markets already have FM service, and I would be foolish to use these little 5 and 6 W translators to compete with full-service stations."

What happens if the FCC rejects the proposal a second time?

"Congressman Bob Torricelli has stated to local newspapers that he will work with Senator Bill Bradley to pass this proposal into law if the Commission doesn't grant it," Turro said. "The law would allow this particular translator to do local origination."

"I'm just an engineer who came up with an idea," he said. "I applied; they denied. I appealed; they denied the appeal. I took them to court, and now I'm back again. I won't go away. If I don't get it, it will be passed into law. And when I do get the station, I better do one hell of a good job, or I'm in trouble."

For information on the translator proposal, contact Ray Kraus in Washington at 202-467-5700.

Voting On In SBE Race

by Alan Carter

Kansas City MO The results of the first contested SBE presidential election in several years will be announced during the Society of Broadcast Engineers national convention here 5-8 October.

Candidates Brad Dick, radio technical editor for *Broadcast Engineering*, and KXKL-AM/FM Engineering Director Paul Montoya both said reaction to the campaign has been "positive."

Other offices are uncontested, but 11 people are vying for six, three-year term seats on the board of directors.

Voting is by mail ballots, due to be received at national headquarters by 28 September.

Dick said engineers are looking to SBE to address their concerns about changes in the industry.

"Engineers want to know if they are going to have a job tomorrow," he said. "People are saying it (the industry) has changed a lot."

Dick said SBE needs a president with experience in both radio and TV to lead the society as broadcast engineering faces this evolution. "People have talked to me and said it (the choice in candidates) is a clean cut choice," he said.

Montoya said SBE members have questioned him about the direction SBE is taking and have suggested that the society has become a "stagnated group."

Montoya also said members have suggested that SBE consider an engineering education program within a station for non-technical people such as general managers and program directors. Also suggested was continued education for engineers as managers.

Another area people have noted, Montoya said, is the national convention. He said some members say it is too costly to attend both regional SBE shows and the national convention.

Other candidates and offices to which they are seeking election are: Richard Farquhar, Columbus, OH, VP; Paul Lentz, Toledo, OH, secretary and William Harris, Denver, treasurer.

Nominated for the board are: Phil Aaland, Tucson, AZ; Frederick Baumgartner, Aurora, CO; Terrence Baun, Milwaukee; Dennis Behr, Madison, WI; Stephen Bramham, Smyrna, GA; Dane Ericksen, Burlingame, CA; William Hineman, Indianapolis; Charles Kelly, Quincy, IL; Joseph Snelson, Lenexa, KS; Tom Weems, Simi Valley, CA, and Larry White, Tulsa, OK.

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Station Sales Skyrocket in LA

(continued from page 1)

have a commercial classical music radio station.

The format change, which has caused staunch vocal opposition from cultural leaders and classical music fans here, comes in the wake of the 18 January purchase of KFAC by Evergreen Media Corp. of Dallas for \$55 million. It was the highest price ever paid for a classical music station.

The KFAC change follows another significant Los Angeles station sale in 1989. KIQQ, a soft rock station, was sold to Westwood One for \$56 million and hours later, on 17 March, a new high energy rock programming concept called "Pirate Radio" was born.

"In the broadcasting industry, Los Angeles is the pot of gold at the end of the rainbow," said Ray Stanfield, chairman of Chapman Associates, a radio brokerage firm. "Most of Los Angeles is in a car. It's a city on wheels. The area is geographically vast. The automobile market here is larger than anywhere else."

A city on wheels

Indeed, nine million radio-equipped autos roam LA's 650 miles of freeways and 22,000 miles of surface streets. Traffic is so heavy that 7.2 million Southern California commuters are delayed an average of 1.1 hours each day due to congestion on the roadways. Many simply sit and listen to the radio.

"I really look for—I can't tell you how soon—an FM station selling in Los Angeles for \$100 million," said Roy Rowan,

Beverly Hills-based vice president of Blackburn & Co., one of the nation's largest radio and television station brokers.

But when station prices go so high, what happens to the diversity of programming for listeners in the market?

"Will we have less diversity in radio programming? The answer to that question is yes," said Stanfield. "Classical music will not generate the kind of revenue you need to retire a \$50 million debt. KFAC has been in the classical mu-

. . . the fertile ad climate has propelled record breaking prices for LA stations . . .

sic business for years and it is, as they say in the trade, 'maxed out.' It was a very well-run station that was generating, for a classical station, significant revenue.

"The principal audience to FM radio is music and the great number of people listening to music are listening to pop music—rock 'n' roll of some kind or another," Stanfield said. "The jury is still very much out on formats like Pirate Radio. I don't know whether it's here to stay or not, but it has certainly made a big splash."

Not a snap decision

KFAC's Robert Goldfarb, vice president of programming and operations, tried to help Evergreen Media find a way to

make the classical format profitable enough to support the new debt load.

"I couldn't find a way to support that kind of debt with classical music even though KFAC has been the most profitable classical station in the country," Goldfarb said. He confirmed KFAC's operating profit was steadily between \$2 and \$3 million a year, far below what was needed to service Evergreen's huge new debt.

"It's like any neighborhood when the real estate gets expensive," Goldfarb

not. "Elimination of three year rule was simply a business convenience. The fact is most people who buy stations don't plan to sell them in one or two years. The average station turnover is probably once every seven years.

"There are 10,000 stations out there," Stanfield noted. "The sale of one in two years instead of three is not going to change mankind."

KFAC, soon to get new call letters, took early aim at its new competitor with a billboard placed along LA's famed Sunset Strip. Termed "an inside joke," the sign proclaimed: "Pirate Radio, KLSX, KLOS Get Ready To Move Over and Let the Big Dogs Eat!"

Trying to keep peace

The format switch has not set well with the classical stations devoted listeners.

In order to help soothe tempers, KFAC President and GM James deCastro announced the station would donate part of its extensive classical library to KUSC, a classically programmed public station. In addition, KFAC will give its call letters to one of the KUSC satellites and make an unspecified cash donation to the public station. A print and on-air advertising campaign will try to steer classical fans to KUSC.

But the KUSC signal is not as powerful as its commercial benefactor. KFAC broadcasts with 43 kW from Mt. Wilson with an antenna whose top is 2910' above sea level while KUSC is licensed to operate with 25 kW from Flint Peak in Glendale with an antenna height of 667'.

Ernest Fleischmann, managing director of the Los Angeles Philharmonic Orchestra, was one LA cultural leader who expressed criticism of the radio situation. "What is at the bottom of this is the crazy leveraged buyout stuff that is going on throughout the radio business," Fleischmann said in a Los Angeles media interview. "People buy stations with no money and then get themselves into such enormous debt they have to go for the lowest common denominator listener."

said. "You just can't have businesses in the neighborhood anymore that can't pay the rent."

FCC deregulation

There is disagreement over whether a factor in the newly inflated radio prices was the FCC's 1982 elimination of the "three year rule," which prevented buyers of a radio station from selling at a profit in a period of less than three years.

"The three year rule very decidedly had an impact," said Rowan, who noted the rule change allows for quicker station turnover and increased speculation in the radio station market. "It's anybody's determination whether that is good or bad.

"I do know venture capitalists and they will back anybody where there is a good deal," Rowan said. "But they want to triple their money in three years. And that's been done many times. Whether that will continue to be done all over the United States or not I don't know. I rather think not."

Stanfield downplays any meaningful effect of the rule, whether operative or

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FCC Releases C3 List

Washington DC The FCC released its list of 149 Class A radio stations eligible for an upgrade to the new Class C3. The hike will allow the stations to transmit using up to 25,000 W with an antenna height above average terrain of 328'.

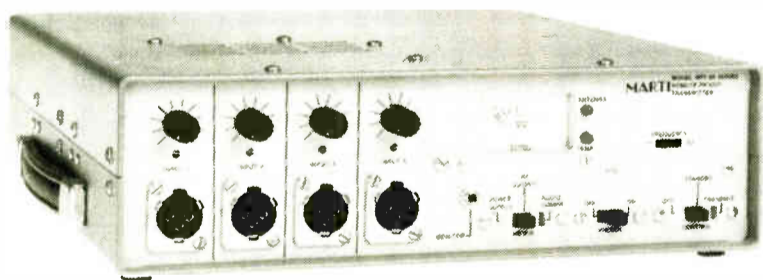
The new class was established by the Commission 30 March. Reply comments on the upgrade assignments were due at the end of August.

The 149 stations granted upgrades are as follows:

KSBS-FM, Pago Pago, AS; KRBZ, Grand Canyon, AZ; KBLJ, La Junta, CO; WMMK, Destin, FL; KOWO-FM, Waseca, MN; KRRB, Dickinson, ND; KATK-FM, Carlsbad, NM; KWJY, Woodward, OK; KWVR-FM, Enterprise, OR; KORT-FM, Grangeville, ID; KYZZ, Wolf Point, MT; KBRB-FM, Ainsworth, NE; KLBN, Albion, NE; KMXQ, Socorro, NM; KQAY-FM, Tucumcari, NM; KBXS, Ely, NV; KPAH, Las Vegas, NV; KWNA-FM, Winnemucca, NV; KKBS, Oklahoma City, OK; KKRS, Walnut, CA; KGFX-FM, Pierre, SD; KIQZ, Rawlins, WY; KDCZ, Delta Junction, CA; KXAZ, Page, AZ; KVWM-FM, Show Low, AZ; KALQ-FM, Alamosa, CO; new station, Port St. Joe, FL; KPOA, Lahaina, Maui, HI; WZRK, Hancock, MI; KLAN, Glasgow, MT; KWMC, Columbus, NE; KBUY-FM, Ruidoso, NM; KQIK-FM, Lakeview, OR; KROO, Breckenridge, TX; KBUX, Quartzsite, AZ; KCRE-FM, Crescent City, CA; KVIB, Albuquerque, NM; KADQ-FM, St. Anthony, ID; KYEE, Alamogordo, NM; KRTN-FM, Raton, NM; KYXX, San Angelo, TX; KLRZ, Red Oak, IA; KLER-FM, Orofino, ID; KECH-FM, Sun Valley, ID; KKAN-FM, Phillipsburg, KS; KQKI-FM, Bayou Vista, LA; KXOX-FM, Sweetwater, TX; KOPI, Moab, UT; KSPN-FM, Aspen, CO; KGLM-FM, Anaconda, MT; KSWW, Raymond, WA; KTBA, Tuba City, AZ; KPOD-FM, Crescent North, CA; KUDO, Milton-Freewater, OR; WMLB, Glenn Arbor, MI; KGUC-FM, Gunnison, CO; WCMZ-FM, Sault Ste. Marie, MI; KDBM-FM, Dillon, MT; KIDD-FM, Bend, OR; KFYZ-FM, Bonham, TX; KKHQ, Odem, TX; KPTX, Pecos, TX; KRDF-FM, Spearman, TX; KARB, Price, UT; KERM, Torrington, WY; KCBZ, Clarksville, TX; KVFC, Silverton, CO; WIGM-FM, Medford, WI; WWIS, Black River Falls, WI; KYKD, Bethel, AK; KWHQ-FM, Kenai, AK; KMXT, Kodiak, AK; KMMR, Malta, MT; KZOQ, Missoula, MT; KATQ-FM, Plentywood, MT; KDOT, Kimball, NE; KWRL, La Grande, OR; KICY-FM, Nome, AK; KRJT-FM, Bowie, TX; KAKN, Naknek, AK; KFSK, Petersburg, AK; KJCO, Yuma, CO; KXPO-FM, Grafton, ND; KOVC-FM, Valley City, ND; KFNC, Sulphur, OK; KIXC-FM, Quanah, TX; KSRL, Soldatna, AK; KPEN-FM, Homer, AK; KSTK, Wrangell, AK; KTNY, Libby, MT; KELY-FM, Ely, NV; KACA, Prosser, WA; KAQU, Huntington, TX; new station, Basile, LA; KHNS, Haines, AK; WAAH, Houghton, MI; WTKI-FM, Gulfport, MS; KRNY, Kearney, NE; KWDQ, Woodward, OK; KRWA-FM, Waldron, AR; KNDY-FM, Marysville, KS; WGDN-FM, Gladwin, MI; KKEI, Imperial, NE; KOFM, Enid, OK; KRUN-FM, Ballinger, TX; KSUA, College, AK; KJFP, Yakutat, AK; KNEI-FM, Waukon, IA; KNLV-FM, Ord, NE; KVEZ, Smithfield, UT; KVXO, Spokane, WA; KTOO, Juneau, AK; KDOA, Tulia, TX; KWYD-FM, Security, CO; KELR-FM, Chanton, IA; KMAV-FM, Mayville, ND; KSUP-FM, Juneau, AK; KRQS, Pagosa Springs, CO; KRJB, Ada, MN; WNMX, Newberry, SC; KTQN, Belton, TX; KPAN-FM, Hereford, TX; KLEN, Cheyenne, WY; KOTB, Evanston, WY; KCID-FM, Caldwell, ID; KWLX, Many, LA; KKDQ, Fosston, MN; WLSM-FM, Louisville, MS; KSTA-FM, Coleman, TX; KWKQ, Graham, TX; KBTB, Bethel, AK; KKBC-FM, Baker, OR; KURY-FM, Brookings, OR; KLXS-FM, Pierre, SD; KMRE, Dumas, TX; KGHO-FM, Hoquiam, WA; KING-FM, Fairbanks, AK; KKMx-FM, Hayden, CO; KBMG, Hamilton, MT; KLVM, Lewistown, MT; KHwy, Santa Rosa, NM; KXIT-FM, Dalhart, TX; KDIU, Dimmit, TX; KYXS-FM, Mineral Wells, TX; KWCL-FM, Oak Grove, LA; KGVW-FM, Belgrade, MT; KDRE, Deer Lodge, MT; KWDG, Idabel, OK; WMFG, Hibbing, MN.

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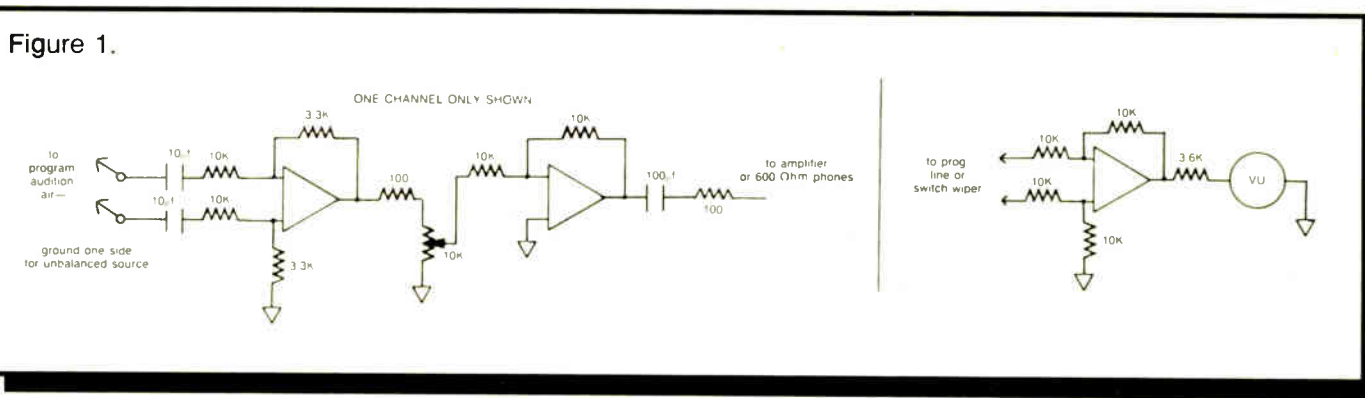
Reviving a Worn-Out Console

A Guide to Making Cueing and Monitoring Circuits Work Properly

by Bill Higgs

Louisville KY We've been looking at ways to revamp that old workhorse: the console.

We now have a gutted shell, a preamp transplant, a cleaned and painted (hope-



really old boards, you'll likely find a bridging transformer of some sort or another. Ancient (pre-1970) practice was to monitor program and audition lines by switching a pair of headphones or an au-

ohms impedance, and were well deserving of their nickname. After all, this was a telephone technology and it expected a carbon mic on the other end. Frequency response was usually terrible, but there were other problems as well.

switch is called a key? Ask a telephone old-timer . . .)

Not only do VU meters load the line, but they usually contain copper-oxide diodes. When these things conduct, they are anything but linear. Isolation resistors help, but the distortion is there and measurable.

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fully) front panel and a new outlook on life. Our rebuilt console is ready to go, right? Wrong.

Every board, whether for on-air use or production, has several circuits used for housekeeping. These include remote starts, tally contacts, lighting and, of course, cue and monitor amps.

Unless you are one of the small college stations using a refurbished Altec sound mixer (I know of at least one!), your console has controls connected to cueing and monitoring circuitry. In this installment, we'll look at ways of making these features play properly.

If you are working with one of the

The monitor amps incorporated two stages for isolation from the line . . .

dio amp directly across the lines themselves. In some cases (my old Sparta, for instance) the headphones were switched across the line with only a resistive pad.

This was cheap, but lousy. Older "cans" varied between 600 and 2000

First of all, even the 2 K to 10 K impedance reflected to the line was significant to a line amp with a true 600 ohm output. The frequency response of the board output was usually rolled off and all the highs disappeared.

Distortion figures suffered as well. Very few headphones, even modern ones, exhibit a constant impedance over frequency. Therefore the loading changed with frequency and harmonics become abundant.

The same was true for VU meters, another relic of the console's telephone ancestry. (Ever wonder why the program

Isolating circuits

Our task, then, is to isolate the measuring and monitoring circuits from the lines as completely as possible. Unity gain amplifiers with high-impedance inputs do this nicely, but in olden days this meant tubes, transformers and especially expense, which is what we wish to avoid. Modern chips perform the task easily.

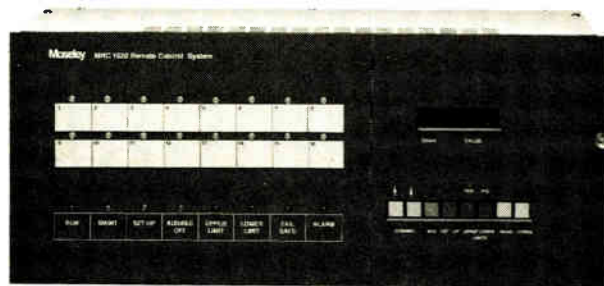
Figure 1 shows such a circuit in detail. The output impedances are low enough (continued on next page)

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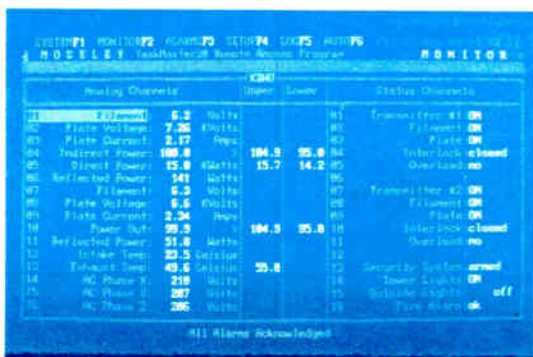
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The TaskMaster20 Software

- The easy to use software automatically adjusts out of parameter conditions according to user defined control strategy.
- Current alarm conditions are displayed on an "alarm" page. Up to 20 of the latest alarms and hourly log data from the last 30 hours (stored in battery backed RAM of the MRC 1620) can be reviewed at your convenience.
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For your free TaskMaster20 software demo disk, contact Moseley Marketing at 805-968-9621.



Moseley Associates Incorporated 111 Castilian Drive Santa Barbara, CA 93117-3093 a Flow General Company Phone 805 968 9621 Telex 658448 FAX: 805 685 9638

You Can Put New Life in Old Boards

(continued from previous page) to drive 600 ohm phones or a high-impedance stereo power amplifier directly. Should you desire a built-in headphone amplifier, get an LM377 (1877) and a spec sheet.

Because the circuit is inexpensive, I recommend you use one for the cans and one for the monitor. The muting circuit is also recommended—tie it into the

the VU circuit. Often these are built in, but in older boards they may be external.

The audio op amps are NE5532s for good quality, while the meter amps are garden variety 741s (the 1458 is a good dual version). I have always been intrigued by console specs that are squeaky clean through the program channel, but monitor specs show much higher distortion, hum, etc. Build it right

Figure 2.

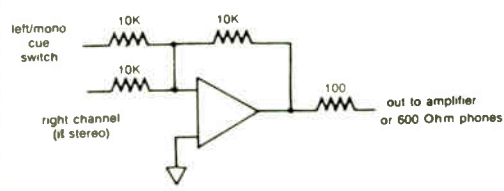
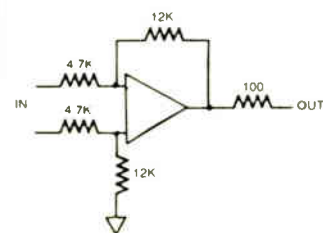


Figure 3.



mic key.

The monitor amps incorporate two stages for isolation from the line and are straightforward in design. The 10 μ f capacitors should be tantalum for long life and good frequency response. The 100 ohm resistors at the stage outputs are there for protection of the chip and offer some isolation from the following power amplifier.

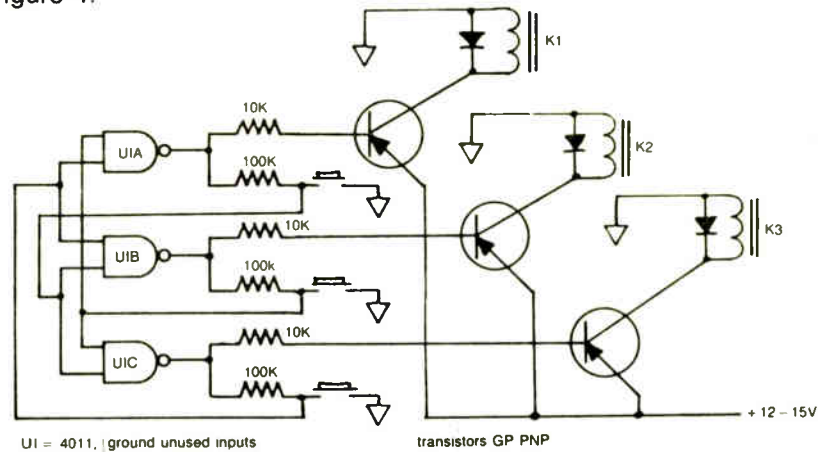
Don't forget the 3.6 K series resistor in

so you'll know what you are listening to.

Air monitor inputs can be tricky, because of balanced/unbalanced outputs, ground loops and so forth. If your console has a transformer input (or if you have a 111C coil laying around), use it. Otherwise, the circuit shown in Figure 2, a differential input, works well.

For an unbalanced situation, such as older TFT mod monitors, ground one side of the input. This circuit, by the

Figure 4.



way, is also handy to feed any balanced source into an unbalanced input, such as a console output into a cassette recorder. A resistive pad will help to match levels.

A cue amp is easily made using the same summing amp circuit noted last time. Use the first stage into a small audio amplifier as shown in Figure 3. Consoles vary as to how the cue circuit works, although most have a switch at the far counterclockwise position of the fader. If not, a small pushbutton can be added to the lower left of the knob.

tor switching function. This circuit is handy, not only here, but for signal routing. If you have a rotary switch to do the job, fine—it will be less expensive.

By now, you should have the old battle wagon up and playing—and we will have met our budgetary goal. Next time we'll look at some inexpensive console enhancements, including a discussion of mix-minusing techniques. So put on a good Buddy Holly record, watch your newly-isolated VU meters kick to a happy beat and impress the GM with some great sound.

Bowing to modern times

I couldn't resist one small concession to digital technology, as shown in Figure 4. A three-way flip-flop circuit made from a 4011 CMOS and gate triggers small reed relays to perform the moni-

Bill Higgs is on the engineering staff of WHAS-TV, was CE for WXLN/WFIA and has also done station consulting work. He has a PhD. in Theology which helps explain his patience with small market radio. He can be reached at 812-945-9414.

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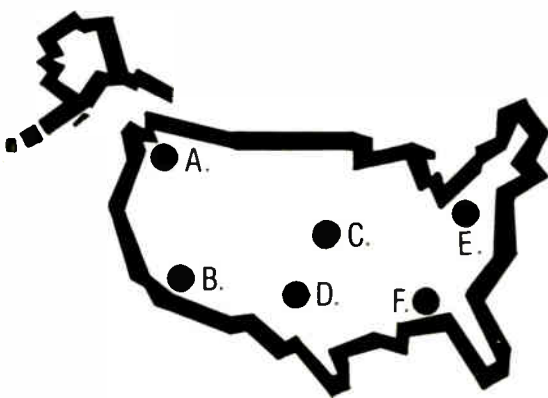
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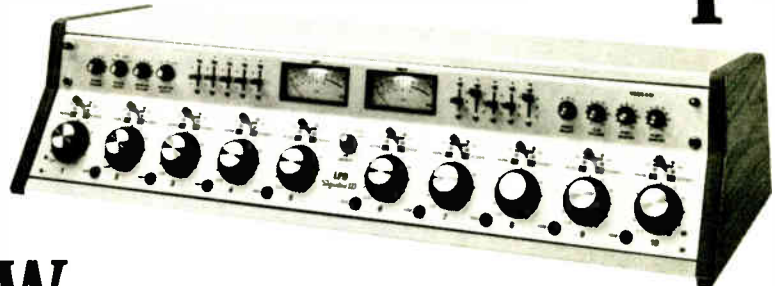
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Facts About Booster Synching

by Martin Hadfield and Eric Lane

Seattle WA How does an FM radio station serve an area within its licensed contour which is shadowed or blocked from its transmitter by terrain obstructions?

Ideally, you place a second transmitter where it will provide coverage to the obstructed area. A difficulty arises in the area where the main and secondary FM signals overlap. These overlap areas can cause more degradation of coverage than the secondary transmitter achieves.

On-frequency boosters

An FM booster is an on-frequency secondary transmitter; its purpose is to fill in areas within a station's contour, but not served because of terrain obstructions.

The FCC rules affecting FM boosters changed in 1987. This enabled more effective booster operation and made wide-scale booster usage feasible for the first time.

The old rules severely limited transmitter output power of a booster. Under the new rules, the booster's transmitter output power can be up to 20% of the main station class maximum. This means that sizable obstructed service areas can now be served. As we will discuss later, however, more power is not always a benefit with a booster.

Currently, treaties with both Canada and Mexico limit booster installations within 200 miles from these borders to a maximum power of 50 watts ERP.

Prior to the 1987 changes, the signal

instead of an on-air pickup eliminates the limitations on booster site selection, and increases the choice of possible booster sites within a given area.

An aural STL link enables boosters to

the obstruction causing the problem now becomes an asset. So, if you have a mountain in the way, hope it's a big mountain—one which can give maximum isolation between the main and booster signals.

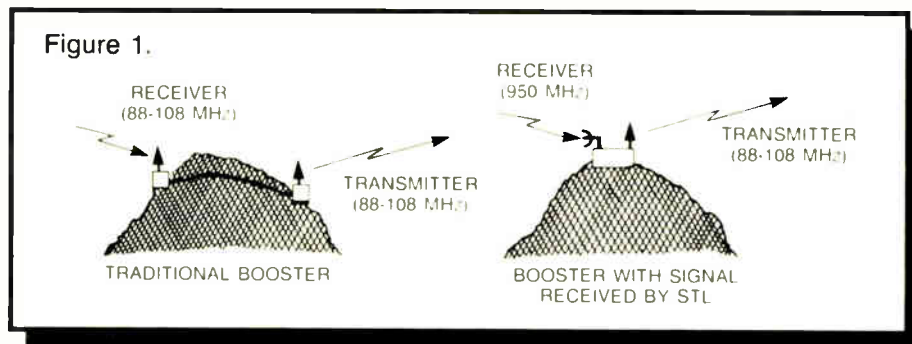
Exactly what happens in the signal overlap area? This area is the region where the signal strength of the main and booster signals are close enough that a receiver's capture circuits cannot lock onto either one. Typically, a receiver needs to distinguish in excess of 20 dB capture ratio between the two signals in order to provide effective capture.

To keep the overlap area at minimum, the booster should cover as focused an area as possible. Traditional FM antenna site selection criteria include placing the antenna as high as possible with as wide a coverage as possible.

With a booster, the opposite may be the case. Typically, you will place the antenna low and have its beam fairly tight to focus on the area to be served. Going too high and too wide may cause extensive areas of overlap.

Figure 2 shows a map of the San Francisco Bay area, and depicts contour lines of equal signal strength from both the main and the booster transmitters. In this example, the booster transmitter is placed at a fairly high location and has significant overlap with the main trans-

(continued on next page)



had to be received at a traditional booster directly through space at 88-108 MHz. This created a problem in implementing traditional boosters, because it was critical that the transmitted booster signal be isolated from the booster receiver to avoid rebroadcasting and creating an RF feedback loop (see Figure 1).

This also placed severe limitations on the choice of booster sites, since significant distance and terrain obstructions were required to isolate the booster receiver from its booster transmitter.

The new booster rules allow the signal to be delivered to the booster site by whatever means feasible. Delivering the signal to a booster with a microwave link

be located where an on-air signal is not available, thereby increasing the areas which can be served.

Using terrain obstructions

The major problem in booster implementation is manipulating the booster and the main signals so that the two do not overlap. Where they overlap, the signals will fight each other and in fact cause very severe multipath-type problems. (An improperly implemented booster can be thought of as a very expensive multipath generator.)

When terrain obstructions such as a mountain block your signal and require the use of a booster to serve the far side,

Clean up

For some listeners, waiting for things "you can't say on the radio" is part of the fun. But with today's free-wheeling talk radio formats, controlling what actually goes out on the air is more essential than ever. Now Eventide's BD941 and 942 Broadcast Audio Delays are here to make effective obscenity protection more affordable than ever.

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OK, you're on the air, and someone's just opened his or her mouth a little too wide. Just hit the *Delete*

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button to delete an obscenity, and you're instantly back in real time. The BD941 and 942 delays also have a set of relay contacts that close automatically when *Delete* is pressed. You can use the relay to start a cart or other device to fill the delay period. Then, after the delay period expires, the unit automatically switches back online for full delay protection. What could be simpler?

The full bandwidth audio performance of the BD941 and 942 is everything you'd expect from Eventide, the world leader in talk show delays. All at a price that makes talk cheaper than ever. How much cheaper? Talk to your broadcast distributor, or call Eventide for the good news.

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Figure 2.

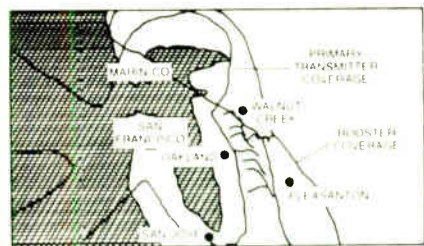
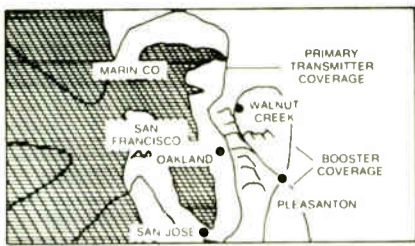


Figure 3.



Basic Booster Principles

(continued from previous page)
mitter.

Figure 3 shows the same station with the booster transmitter relocated to a much lower site near Pleasanton. Antenna placement, tilt and orientation now enable the target market to be served by the booster and the overlap is eliminated.

When two signals are processed together by a receiver, there are significant problems caused by the lack of synchronization in frequency, phase, modulation level and delay time.

Frequency and phase sync

When the two transmitters have slightly different carrier frequencies, a beat tone at the difference between the two frequencies will occur in receivers in the overlap area. This beat tone is usually about 30 dB below the signal level, and is audible.

Non-synchronized transmitters can drift by up to a few thousand Hertz and still be within FCC limitations. Also, if the two signals are not phase-synchronized, you will hear self-induced multipath.

With proper frequency and phase synchronization, reception in an overlap area will not exhibit a beat tone and multipath-type anomalies will be greatly reduced. Additionally, a receiver's capture ratio will work more effectively when the two signals are synchronized and can usually provide effective capture with only 8 to 10 dB of difference between signals rather than the 20 dB normally required.

This means that proper frequency and phase synchronization will reduce the size of the overlap area, as well as the level of the interference in it.

Several schemes have been used for providing this synchronization. One

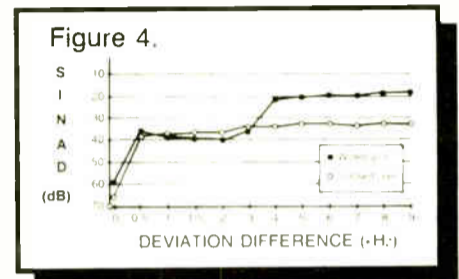
synchronization scheme uses a count-down method from the carrier frequency. Another uses an SCA to carry a timing reference signal.

A new approach has recently been developed which uses the 19 kHz pilot signal as a reference time base upon which the main and booster transmitters can synchronize. In this scheme, all transmitters synchronize on a stabilized pilot signal and are thus synchronized with each other.

Modulation synchronization

While frequency and phase synchronization are developed technologies, little attention has been paid until now to matching modulation levels and other complex waveform characteristics.

Differences in modulation level between transmitters can severely degrade THD and noise performance in overlap areas. Laboratory tests as well as field



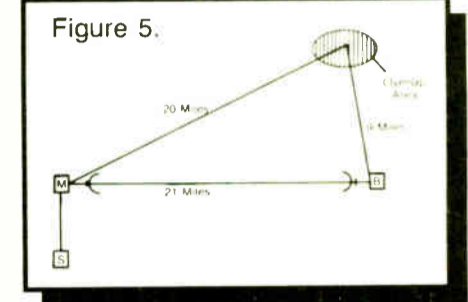
studies show that as little as 1% difference in modulation levels between main and booster transmitters can result in a 30 dB loss of sinad (see Figure 4).

A recently developed process uses an IF interface between the STL receiver and FM exciter to achieve modulation

synchronization. This process aims at avoiding demodulation of the signal to baseband after its initial modulation.

By avoiding the baseband, and using exciters with like characteristics at both the main and booster transmitter sites, modulation synchronization can occur.

A significant side benefit of this approach is that demodulation to baseband between the STL receiver and FM exciter has always been the limiting factor in signal quality. Using an IF interface not only



provides modulation synchronization in a booster system, but will significantly improve the THD and SNR of an FM station.

Speed of light delay

The last factor to be considered in booster synchronization is the path lengths that the two on-air signals travel to get to the overlap area. Because both microwave and on-air signals travel at the speed of light, different path lengths can result in signals arriving at different times.

Tests have shown that if the signals arrive more than 10 microseconds apart, (continued on page 40)

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Seeking a Radio Curriculum

by Ty Ford

Baltimore MD Several months ago *Producer's File* published the results of a scouting trip into education. It seems there are a lot of people in the industry who feel that college and university graduates often don't have the qualifications for even entry level positions.

How come? One of the leading reasons is that schools are often heavy on theory and light on practice.

The primary importance of hands-on training is not so much to familiarize students with the equipment as it is to allow them to perfect their operating and

listening skills.

The proper development of these skills (learning your chops) takes time because the student is also developing the ability to listen professionally.

Students should be doing more projects and spending more time in the studio. Schools should be spending more money on the number of basic studios and not worrying about what new boxes are in them.

PRODUCER'S FILE

In most cases, it's not what you use, but how you use it. And because students can't be expected to have developed a good critical ear, the responsibility for direction lies with the faculty. To that end, faculty members who don't have a good sense of what's going on in the "real world" become a liability to the students and the system.

In the previous article, I asked people to contact me with their recommendations for broadcasting schools that actually prepare graduates for the job market. One of the most interesting responses led me to John Hitchcock at Vincens University in Vincens, IN. All of the faculty members at Vincens U. have professional experience.

Although it's a two-year vocational

community college, it operates two city-wide cable FM stations, a 50 kW public radio FM, a 3 kW commercial FM and a TV station! There are seven audio production studios, including an eight-track studio, for basic through advanced courses. They also offer advanced MIDI courses and work with outside studio facilities to broaden the students' experience base.

First semester students begin on-air work on the cable stations four weeks into the semester. Second year students work on the larger facilities.

In addition to state-of-the-art consoles and equipment, the school also runs an older RCA slant-top console in one of the studios.

"We know that the first job our graduates take may be at a place that doesn't have top-of-the-line equipment" says Hitchcock. "We want them to be as prepared as possible."

For more information about Vincens, call John Hitchcock at 812-885-5359.

Isothermal

Isothermal Community College in Spindale, NC doesn't have quite the number of media outlets as Vincens. However, the school is in the process of building a tower site for WNCW-FM, which will put out 17 kW from a height of 6600 feet. It is also in the process of starting up a cable FM station.

Andy Abdow, who works at WRFX in

Charlotte and teaches at Isothermal, started the radio/television program there five years ago. According to him, it's a model program so well designed that it attracts the attention of other schools.

Aware of the problems many graduates face in getting their first job, Abdow says the curriculum was designed for a small number of students and emphasizes hands-on experience.

Burr Beard, station director of soon-to-be-on-the-air WNCW, agreed with Abdow and furthered the point by saying that they prefer to speak in terms of audio and video rather than radio and TV.

In an effort to prepare students for the real world, Isothermal has expanded the curriculum to include writing, announcing, equipment trouble-shooting, programming, industrial/instructional video, advertising, sales, promotion, computer applications, law and management courses.

According to Beard, the two-year degree offered gets jobs for most people, even though some major market stations prefer applicants with four-year degrees. For more information, call Isothermal Community College at 704-286-3636.

NY state of mind

Robert Mugrdech in attended Rockland Community College in NY state. Based on his experience there, he feels the school does a good job in preparing students for the "real world."

Being only 25 miles northwest of the Big Apple means you get lots of exposure to major market work, the good and the bad.

After ten minutes of being bounced from one office to another, I was about ready to give up when I was connected with Dr. Barbara Viniar, Dean of Instructional and Community Services.

According to her, Rockland offers Liberal Arts degrees and Associates in Arts degree in a two-year curriculum.

Communication Media Art program is a Liberal Arts degree. In addition, there's an Electrical Technology program for the more technical parts of production.

(continued on page 31)

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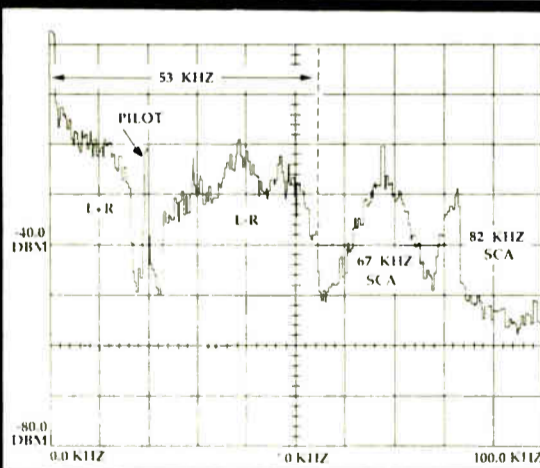
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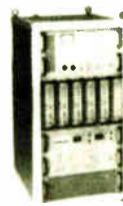
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World Radio History

Courses in Radio

(continued from page 27)

The Communication Media Art program requires that students go off campus to intern at a number of facilities in the area. Dr. Viniar said the trend of hiring teachers based on professional experience was working at Rockland. She was also familiar with the problems of getting funding to keep studios up to date. You can contact Rockland Community College at 914-356-4650.

NW Missouri State

Steve Griffen is news director and mid-day air person at KLIR Columbus, NE. His story gets the "Go For It" award. According to Griffen, while at NW Missouri State University, he contacted Rick Dees at KIIS-FM and asked to be an intern. It worked.

NW Missouri State is a four-year school. Speaking with John Jasinski, Director of Broadcasting, I was told this kind of attitude is not at all unusual. Jasinski said within the last year, three student interns had been offered jobs before they had graduated.

Curriculum, class size, and real world attitude all contribute to create a competitive curriculum. According to Jasinski, class size is limited to 20-25 students. The 300 possible majors in Mass Comm combine to create a curriculum which focuses on sales, production, promotion, news and sports.

There are seven teachers in radio and TV, four of whom are assigned to the radio side. According to Jasinski, all four have recent professional experience. There are seven production studios from basic to four-track. Students begin working in real world situations during the first semester.

Like many other good schools, NW Missouri State holds "industry days" where graduates and industry leaders are brought in to speak to students.

The school has two broadcast outlets: KXCV-FM, a professionally managed NPR affiliate run by a paid student staff; and KDLX, a commercial cable FM station.

For more information about the curriculum, call John Jasinski at 816-562-1333.

NACB

On a tip from Louisa Nielsen, executive director of the Broadcast Education Association (BEA), I contacted Doug Liman at the National Association of College Broadcasters. In 1988, Liman and others started the NACB in an effort to provide support for college radio and

(continued on page 42)

Leads on Broadcast-Oriented Curriculums

Houston State University
Huntsville, TX, Mr. Bob Eubanks

Dean Jr. College
Franklin, MA, Mike Keith: 617-528-9100

Full Sail Center for the Recording Arts
Altamonte Springs, FL, Charlie Camorata

Belmont College
Nashville, TN, Bob Mulloy

University of Miami
Gary Lindsay: 305-284-2265

American Institute of Technology
Ed Sheppard: 615-360-3300

American School of Broadcasting
Columbus, OH, Earl Bailey: 614-262-2453

Berklee College of Music
Boston, MA

Transamerica
Madison, WI

Clemson University
Clemson, SC, 803-656-3311

Wake Forest WFTD
Winston-Salem, NC, 919-761-5257

CT School of Broadcasting
Dick Robinson: 203-203-9988

Institute for Communication Law Studies
Harvey Zuckeran: 203-635-5147

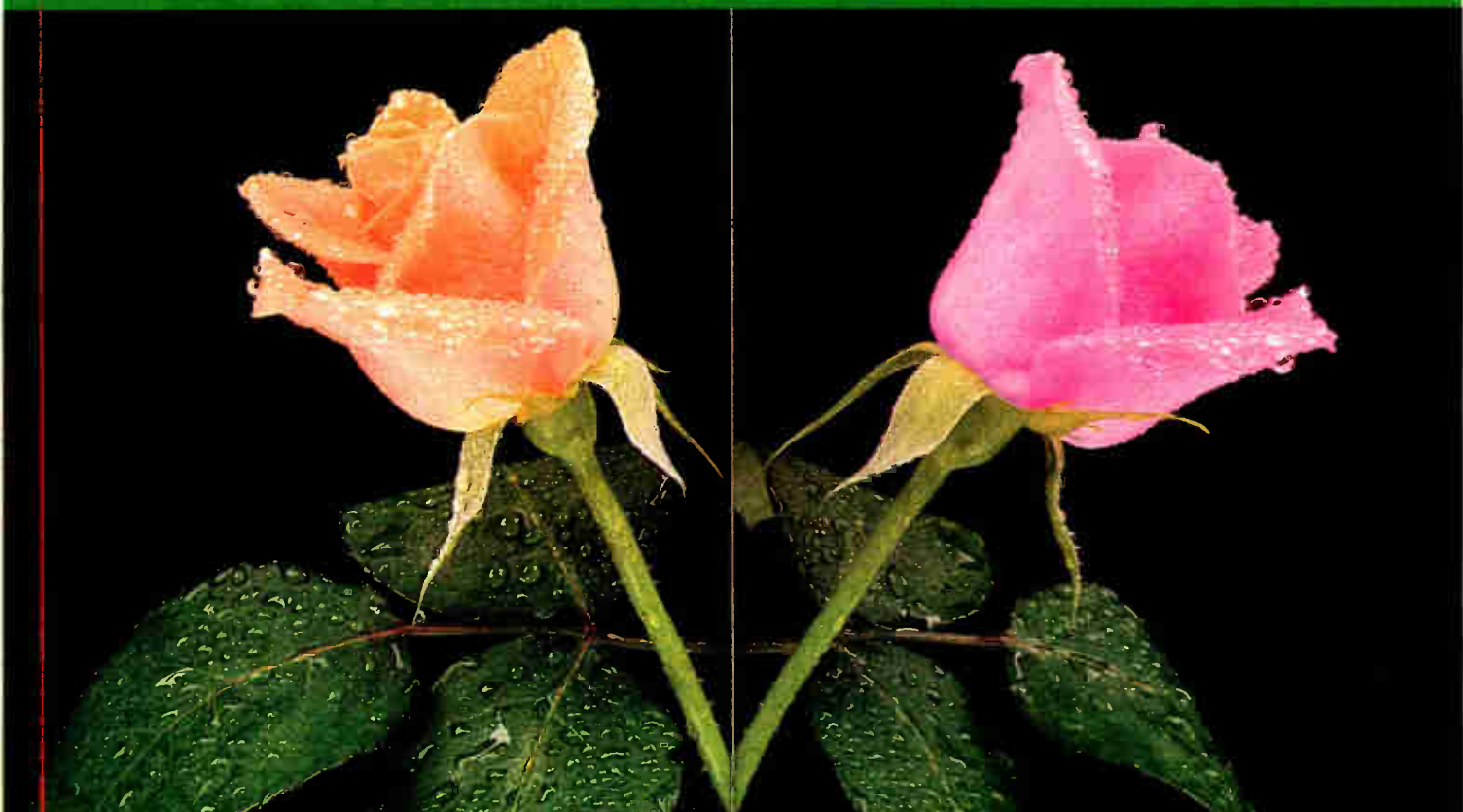
Columbia School of Broadcasting
Rich Rynders: 213-469-8321

Education Mgmt. Corp.
Bob Peterson: 412-562-0900

UCLA Extension Music Professions
213-825-1901

Sony Inst. of Applied Video Tech.
Steve Gach: 213-462-1987

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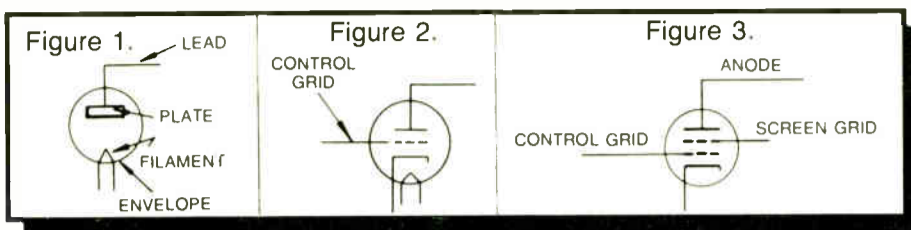
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The Venerable Vacuum Tube

This is the final installment in a 12-part series called *An Introduction to Active Devices*. Readers who have registered with Northern Virginia Community College will receive a test in the mail. The College will mail a test to you the first week of October 1989.

Complete the test and return the answer sheet to the college. PLEASE USE A PENCIL TO MARK YOUR ANSWERS ON THE ANSWER SHEET. All students who passed the test should receive continuing education certificates no later than December 1989.

For more information, contact the Director of Continuing Education, Annandale Campus, 8333 Little River Turnpike, Annandale, VA 22003, or call 703-323-3159.



by Ed Montgomery

Part XII of XII

Annandale VA The active device that led to all of the electronic developments we have today was the vacuum tube. Of-

ten left out of many study courses, this device still plays a role in electronics today.

The vacuum tube was developed from the experiments of Thomas Edison in 1883, after he invented the incandescent light bulb. At one point Edison placed a metal plate within the glass envelope.

When he applied a positive voltage to the plate, he noted a current flow. In later years this current flow was termed the "Edison Effect."

In 1905 J.A. Fleming developed the diode. An extension of Edison's research, this was the first practical vacuum tube. Known as the Fleming Valve, it consisted of a filament (cathode) and a metal plate (anode) in a glass envelope (see Figure 1).

This valve along with all its successors worked on the principle of thermionic emission: If a piece of metal (cathode) is heated until incandescent, electrons will fly into the space surrounding the metal.

If a positive voltage (anode) is placed in the same vacuum, then electron flow from negative to positive (cathode to anode) will be present. Unlike solid-state devices, vacuum tubes have no minority carriers. There is pure electron flow.

First amplifying tube

The first tube that could amplify a signal was developed by Dr. Lee DeForest in 1906. DeForest placed a third element in the glass envelope. The control grid (illustrated in Figure 2) varied the amount of current that could flow between the cathode and anode. DeForest discovered that a very small change in voltage on the grid resulted in a very large change in plate current.

The plate, grid, and cathode are similar to the collector, base, and emitter of a transistor, or the drain, gate, and source of an FET. The tube's plate current can be cut off if a sufficiently high negative voltage is applied to the grid. Removing the negative voltage allows the plate to be saturated with electrons resulting in maximum current flow.

Over the years vacuum tubes were modified to improve performance. The tetrode (Figure 3) contains an additional "screen" grid. It is operated at a positive potential assisting in the acceleration of electrons to the plate.

The screen grid makes the current flowing between the cathode and plate less influenced by changes in the plate voltage, and almost entirely by the control grid. This action increases plate resistance, lowering the loading on other amplifiers. The tetrode also reduced the capacitance that exists between the cathode and plate allowing the tube to work more effectively at radio frequencies.

The pentode was another adaptation of the audion containing a third grid. Known as the suppressor grid, it usually operates at whatever the cathode voltage is. This negative voltage next to the plate tends to stop electrons from hitting the plate and dislodging other electrons.

The pentode exhibits a much higher amplification level than tetrodes and triodes along with a very high plate resistance. Until the development of field effect transistors (FETs), tetrodes and pentodes were used exclusively in high power audio and radio-frequency amplifiers while junction transistors handled audion and switching functions.

Design evolution

Over the years variations of these tubes were designed to meet special needs. The "variable mu" or "remote cut-off" tube was employed in mobile

(continued on next page)

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Active Devices Fall Section

Annandale VA Due to the many requests for enrollment in *Introduction to Active Devices*, Northern Virginia Community College has offered a fall section.

Individuals interested in taking the course must fill out the application form below and mail it to Northern Virginia Community College.

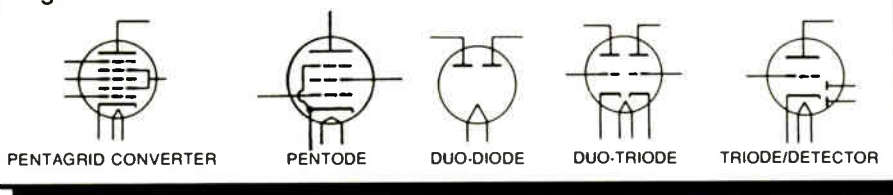
If you need to obtain the course material (any or all of the 12 installments which appeared in **Radio World**), they can be obtained by sending an additional check or money order for \$10, payable to *Edward T. Montgomery* along with your registration fee to the school. (Do NOT contact **Radio World** for reprints.)

All registration and requests for material should be received by Northern Virginia Community College not later than 1 November, 1989.

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Enclosed is my check payable to Northern Virginia Community College. I understand that enrollment may be limited and if the course is cancelled for any reason, my check will be refunded in full.		
For office use: <input type="checkbox"/> SA 91 <input type="checkbox"/> RU 97 <input type="checkbox"/> SD 91 <input type="checkbox"/> RU 98		

Tube Developments

Figure 4.



(continued from previous page)

receivers to improve reception. Beam power pentodes permitted higher amplification and reduced harmonic distortion. Figure 4 is an example of specialty tubes employing various tube configurations permitting them to rectify, switch, and amplify within one glass envelope.

Vacuum tubes still play a part in modern electronics. Often they are used in power audio systems and transmitters. Their ability to withstand power

Ed Montgomery currently is an electronics teacher at Thomas A. Edison High School in Fairfax County, VA. He has taught broadcast engineering at Northern Virginia Community College and worked as a broadcast engineer for several radio stations.

surges and lightning strikes still exceed what solid state devices can withstand.

The main drawback of tubes is the fragile nature of construction, size and the amount of power required to make them operate.

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FCC Plan May Help AM Coverage Area

Allows AM Stations to Receive Interference Up To the 1 mV/m Contour

by Steve Crowley

Washington DC Today, most AM stations are in the frustrating position of seeing population grow beyond coverage areas that were adequate decades ago.

CONSULTANTS CORNER

Many stations can't provide service to these new areas due to rules prohibiting overlap of their 0.5 mV/m contour with the 0.25 mV/m contour of another co-channel station. They would otherwise gladly accept some interference within areas of the newly expanded 0.5 mV/m contour, if it meant an overall improvement in service.

Some stations don't have that handicap. They are able to increase power or let out their patterns accepting interference up to their 1 mV/m contour, maintaining, of course, full protection to other

stations.

This is possible due to Section 73.37(b) of the FCC Rules. In essence, the rule states that interference may be received up to the 1 mV/m contour of those facilities providing first service—either to a community or to a substantial portion of their service area.

This rule has worked well and has allowed the construction of facilities that are able to more efficiently serve the public. Many stations, of course, are not providing first service, and cannot take advantage of the rule's limited application.

Eliminating restrictions

This may be changed if the FCC adopts a rule proposed in Mass Media Docket 88-376. It would eliminate the

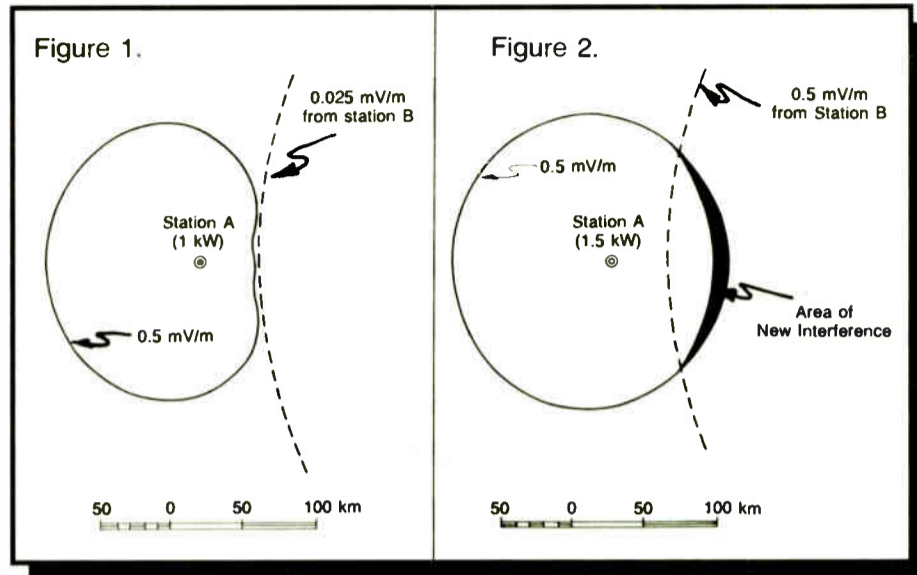
interference will be able to be received within the 0.5 mV/m contour, it will only occur in those areas not presently served by the station. No existing service will be lost.

Here's an example. In Figure 1, Station A is shown operating with 1 kW and a suppressed pattern in order to avoid pro-

Though there is now interference within the 0.5 mV/m contour of station, the service that is subject to interference will still be better than it was before.

Not about negotiation

The proposed rule is not about negotiated interference. No agreements



Anything involving interference sounds bad—in this case, it isn't.

restrictions of 73.37 (b) and allow any AM station to receive interference up to its 1 mV/m contour.

Anything involving interference sounds bad—in this case, it isn't. Though

hibited overlap of its 0.5 mV/m contour with the 0.25 mV/m contour of a co-channel Station B.

In Figure 2, Station A takes advantage of the proposed received-interference rule to increase its power and let out its pattern. The interference area is that area within Station A's 0.5 mV/m contour where the 20-to-1 desired-to-undesired ratio is not met.

Note that the interference is in areas not presently served by the station.

can be made to infringe on existing service areas. Full protection must be maintained to other facilities.

Some stations will not be able to take advantage of the new rule. This will be the case where the limiting factor is interference-caused instead of interference-received.

Also, if the improvement is only marginal, the station may not find it economical to implement. For many AM stations, though, adoption of the proposed rule will free them to make a significant AM improvement today.

Steve Crowley is a registered professional engineer with the consulting firm of du Treil, Lundin & Rackley, Inc. He can be reached at 202-223-6700.

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Don't Be a Know-It-All Boss

by John Cummuta

Downers Grove IL Nobody likes a know-it-all. You've heard that, and it's true. But you may not have heard that no business or department within a business can thrive under the direction of a know-it-all. King Solomon, considered by many to be the wisest man who ever lived, taught that there is wisdom in a multitude of counselors.

ENGINEERING MANAGER

Now, while I don't believe that old Solomon was fostering decision-making by committee, I do believe that he realized that one person's perspective alone was too limited in scope to produce sound reasoning in every situation.

So, what does that have to do with you?

Your choice

If you're managing a station, or a department within a station, you will have a variety of people working for you. You will face, on a daily basis, opportunities to either capture the energy of that diversity in your strategizing and decision-making or to simply impose your singular perspective down on them.

If you choose the latter, you will diminish your success potential in whatever you're attempting to accomplish. There are two reasons for that.

If you just dictate strategies, procedures and other factors that influence what your organization does to accomplish its goals, your people will have no personal investment in them.

But if you allow ideas and alternatives to bubble up from the people who will actually execute them, they will then be working on their own proposals and will obviously have more at stake in the outcome.

You can't know it all

Let's assume that you are pretty near as brilliant as you think you are. I hate to be the one to tell you, but that's no guarantee that your ideas will always be superior to those of your subordinates. Let me give you an example.

There was a large tractor-trailer rig traveling through a midwestern city. The driver miscalculated the clearance under a railroad bridge and he jammed the trailer in there good and snug. Within minutes the area was filled with flashing lights, police cars, tow trucks, fire engines, city traffic engineers and a large crowd of onlookers.

After about an hour without any progress in freeing the trailer, a little boy walked up to one of the police officers and asked, "What ya' trying to do?"

"Get that big trailer unstuck from under the bridge," the policeman answered.

"Well . . . why don't you just let some air out of the tires," the little guy mumbled, matter-of-factly, as he turned and walked away.

The best minds in the business had been working on the problem for over an hour, yet the solution came from an uncluttered, unsophisticated mind with

a different perspective. That's the beauty of engaging every possible source of thinking during a problem-solving or decision-making effort.

You want to encourage, maybe even reward, participation and innovation by everyone in your department, station or business.

Developing idea generation

Let's start with your employees' personal considerations. You must reward success, but be slow to criticize failure. What we're talking about here is minimizing an employee's risk in being innovative. They must trust you, and

your fairness, in encouraging exploration of alternative ideas.

That doesn't mean that you just turn them loose and hope it all works out. You can have structure and accountability. Just don't ask them to innovate, then bite their heads off if they come up empty.

The best way to maintain this kind of idea-incubating environment is to foster a strong flow of two-way communications. And that bi-directional information stream doesn't need to be equal. In fact, it's been said that God gave us two ears and only one mouth for a reason.

If you listen to your people twice as

much as you dictate to them, you'll benefit greatly in both their attitudes and the quality of the things you'll learn.

When one of your subordinates comes up with a good idea and it proves successful give *him or her* the glory. Your superiors will be more impressed with your mature management attitude than they would have been had you claimed credit for the idea yourself.

You should also allow employees to investigate ideas in their own areas of interest, not necessarily in unstimulating tasks that you simply decide to impose on them. Their creativity lies where their interests lie.

This doesn't mean that you can never assign a job to them that they don't like. Doing things that a person doesn't necessarily like is just a part of being a

(continued on page 38)



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Top Ten Radio in a Small Town Market

by Dee McVicker

Muskegon-Grand Rapids MI

Grand Rapids, Michigan is not a top-ten market on the Arbitron map. Nor is Muskegon, which is approximately 40 miles from Grand Rapids and where good fishing holes can still be found.

This is perhaps why WMUS, an AM and FM simulcast, seems so out of place in the relatively small communities of Grand Rapids and Muskegon; in March the station settled into a facility that is a grade or two above most studios, even by top market standards.

Contrast in facilities

The newly renovated facility on Green Street, overlooking Mona Lake, is a sharp contrast to the old WMUS studios.

FACILITIES SHOWCASE

Operations Manager Mike Murphy still has fond memories of the old facility, including creating a studio from a closet—the only remaining option for expansion there. But he doesn't miss the modular buildings that had housed the budding

staff, or the old Sparta gear that needed to be kick started every now and then.

Bringing a top-rated studio to rural-radio Muskegon, however, wasn't easy. Murphy found the local contractors scratching their heads when it came to



WMUS evening personality Peg Daniels runs the station's on-air console.

noise and isolation concerns.

The original plan, for instance, didn't fit the bill at all for heating and cooling design. "So we walked through the studios and spent some time with them, telling them what we wanted to do, and giving them an idea of the kind of heat the equipment was going to give off,"



A gleaming new production room was part of WMUS's new facility plan.

related Murphy.

Once these concerns were understood by the contractors, Murphy found that the project went a lot smoother. In fact, overall, he was impressed by the sophisticated construction methods recommended by the architect. "Except for some minor modifications," he said, "it worked out well."

The dividing walls between the large on-air studio, the two-track and the eight-track studios are fitted from floor to ceiling with 5/8" drywall on each side. "Underneath that we have what we call sound clips, metal bars that go across the studs to offset the drywall so they never really touch the studs," Murphy said. Beneath the sound clips and between the studs, 3M acoustic insulation was used as padding.

But, said Murphy, "We had a problem

with isolating the window glass." To alleviate bass resonance from rattling windows, they isolated the glass with rubber sealer all the way around window casings—they even isolated glass on double-paned windows with separate sealers.

For the equipment and studio furniture, the station brought in another local. Only this time they had every indication that their big-market ideas would be met with a warm reception—and plenty of understanding.

From nearby Grand Rapids, the crew at Audio Broadcast Group, familiar with the market and experienced in top-rated studios, set up their shop to build the cabinetry and furnish the equipment.

Studio considerations

The studios designed by Audio Broadcast Group took into account every architectural nuance. David Veldsma, ABC's president, said they met with building contractors and the staff at WMUS during various stages of the project to make sure they were maximizing available space and were on target with the station's equipment needs.

WMUS simulcasts a popular homebrew country format on its AM and FM frequencies, so the on-air studio needed to deliver both feeds. It also needed to be sturdy and reliable, with plenty of workspace for busy on-air personalities.

Audio Broadcast Group designed the on-air room to be a stand-up or sit-down studio, with the new Broadcast Elec-

(continued on page 38)

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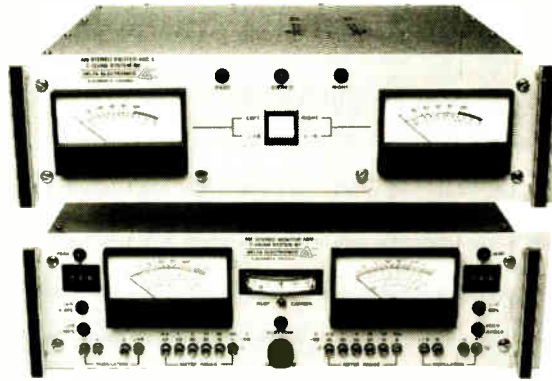
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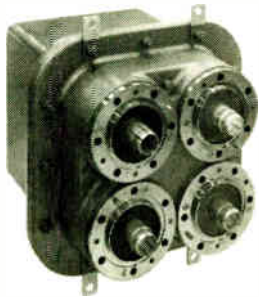
AM Splatter Monitor—Spectrum analyzer performance at a significantly reduced price! An inexpensive means of verifying FCC and NRSC spectral compliance. This frequency agile instrument tunes from 1700 kHz down to 450 kHz, with 9 or 10 kHz channel spacing. The monitor also measures incidental phase modulation (IPM). Designed to be rack-mounted or operated from a vehicle's 12 volt supply using an optional antenna.



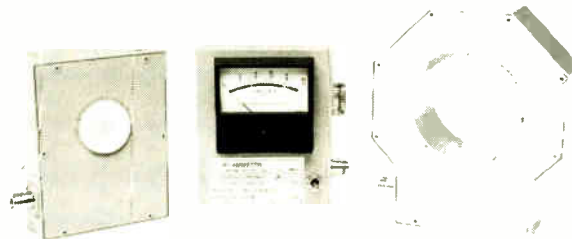
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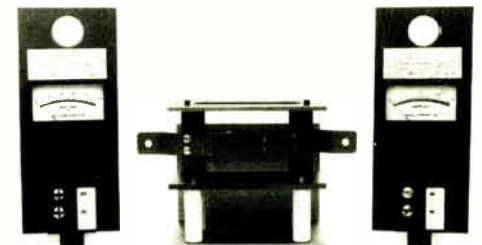
High Power Pulse Reflectometer—Strong interfering fields that would destroy time domain reflectometers are virtually ignored by the PRH-1. This instrument can handle up to 1,000 watts of induced power on an intermittent basis as it locates faults on transmission lines. Provides a visual representation of the transmission or sample line, STL coax, or antenna, using your oscilloscope.



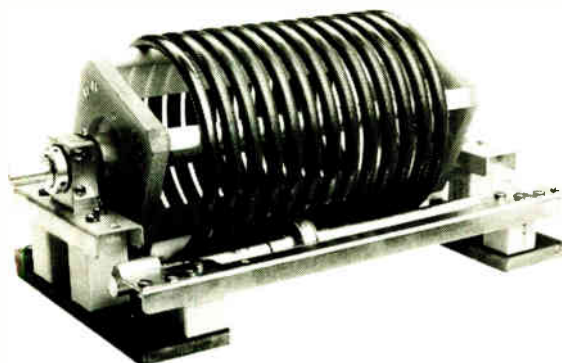
Coaxial Transfer Switches—These 1 7/8" and 3 1/8" motorized four port switches are designed to switch between antennas, transmitters, or dummy loads both quickly and efficiently. The switches can also be operated manually and are fully interlocked.



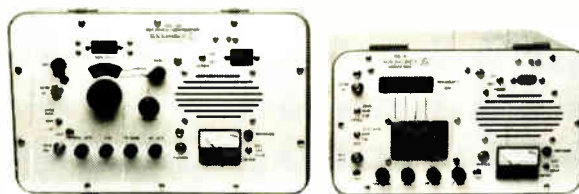
RF Ammeters and Sampling Toroids—Precision toroidal current transformers (TCTs) provide stable antenna monitor sampling while eliminating the problems associated with loops. TCTs also work well in supplying additional modulation monitor or test sample RF outputs. The transformer coupled ammeter (TCA) offers stable base or common point current readings, independent of modulation. The dual and single scale meters also provide remote DC outputs.



Low Power RF Ammeters—When every milliamp of current counts, depend on the accuracy of the TCA-Jr. This portable RF ammeter is designed to plug into either a Delta MJ-50 Meter Jack (pictured above), or a standard J-plug jack. Two current ranges are available: 0.2 to 1.0 Ampere, or 0.4 to 2.0 Amperes.



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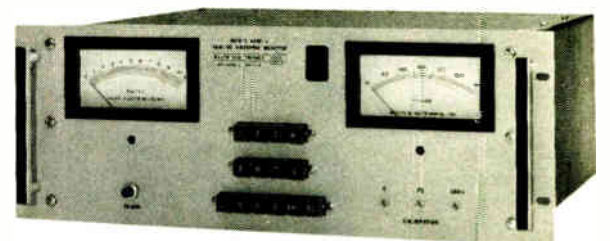


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Top Ten Comes to Muskegon

(continued from page 36)

electronics 18-channel Mix Trak 90 console as the studio workhorse.

Above the console, ABG crafted an overbridge module to fit the eight new Dynamax CTR10 stereo playback cart machines, lined up with console level controls for intuitive access. A workspace area next to console control also doubles as a lift-up cover for the studio's new Technics SL-1200 MK2 turntable below.

Close to the console, within easy reach of the operator, is a rack mount wing that houses two new Revox PR99 recorders. Another extension wing holds three 200-unit cart carousels.

ABG also took advantage of available back wall space by designing a cart rack that matched the style of the studio. "It holds 1500 carts," said Murphy, adding that their cart library has a long way to go before more cart racks will be needed.

The new 18-channel Mix Trak 90, designed as a true radio console with mix-minus busses selected internally to eliminate on-air blunders, proved to be an ideal console for the two-track production studio as well. Since this studio serves a myriad of functions, including backup on-air and morning newscasts, ABG designed it to be as flexible as possible.

As in the on-air room, Dynamax cart machines as well as an ITC 99 cart ma-

chine bridge over the console in a furniture pod. To the right of the console, a new Eventide H3000 Harmonizer and Nakamichi MR2 cassette player sit in another furniture pod, along with a Sony CDP compact disc player that WMUS brought over from the old facility. Two Studer Revox PR99s are slant mounted nearby for easy visibility and threading.

Double duty

Since WMUS originates only the morning news and brings in national news via a network satellite service, the station elected to set up a newscaster's workspace in the two-track production studio rather than dedicate a separate studio to news activity. This is located off to the side of console control, where, for a few hours in the morning, the studio serves as a news room.

For the eight-track production room, WMUS shopped for a true pre- and post-production board. They reasoned that they would gain very little by purchasing a board that was both multitrack and on-air capable; for on-air capability, they were confident that the Mix Trak, with a backup twin in the two-track production studio, would be more than adequate for their needs.

They elected to go with the eight-track Ramsa WR-8616. "For just straight production, which is what we wanted to do, it was a very cost effective and ver-

satile board," said Murphy.

In light of the station's independent programming, the multitrack studio also needed to be equipped with ample production wares. The Eventide H3000 Harmonizer, for instance, was one such item they needed for multitrack production.

For source material, the station brought over its Sony CDP compact disc player, and purchased the new Nakamichi MR2 cassette player and the

Technics SL-1200 MK2. As in the on-air studio, ABG was able to save space by encasing the Technics in a hideaway cabinet.

The studio also puts to use a new Studer Revox C270 eight-track recorder and a new C270 two-track recorder, both enclosed in ABG custom built furniture. "We have the Revox machines mounted in a slant-mount tabletop," said Murphy, "so you're not working straight down on it."

The guest mic, to the operator's left, is located well outside the hearing range of console control. According to Murphy "We have it designed so that if we have

(continued on page 40)

Let Staff Get Creative

(continued from page 35)

grownup. But it does mean that you should not expect innovative ideas to come out of these situations.

Clearly lay out parameters

Whether you are working on a special project or simply trying to make your business more profitable, you need to at least focus your people's innovative activities. Unharnessed, free-form thinking may work in R&D labs, but it's too inefficient for an operational business environment.

So, develop goals. Notice that I didn't say to give your people goals. They must own the goals the same way they need to own their own ideas.

Get together with them and explain the things that must be accomplished, then let the collective energy of the different perspectives come up with long-range and near-term goals. This kind of process gets everyone on the team emotionally involved in goal achievement.

You, on the other hand, must supply leadership. That's the one element that cannot be collectively contributed. Although, when one of your people exhibits dynamic leadership qualities, others will tend to follow his or her lead. Don't interfere with that—channel it.

Work closely with those people and make them feel like an insider.

Once your team is on a job or project, and they see it as their own campaign, stay out of their way. If it ain't broke, don't fix it. Sometimes the best way to manage is to stop managing and just let a good process move along unhindered.

Stability and reward

The final but foundational elements of successful innovation breeding are to exhibit rock-solid organizational stability to your employees and to establish a set reward system for successfully implemented ideas.

Before people will throw themselves fully into developing a business, they need to know that the business is at least equally committed to them, and that it will be there in the long term, to provide the promised rewards.

And, of course, there must be rewards. No normal person will continue contributing to anything when there's nothing in it for him. The rewards must be clear. How to earn them must be clear. And the rewards must be quickly and publicly distributed when earned.

If you do this, you will have an ongoing flow of ideas. Many of them will surprise you. Even though you really do know it all ... right?

■ ■ ■

John Cummuta is president of Advanced Marketing Concepts, Inc., a broadcast management and marketing consulting firm, and a regular RW columnist. He can be reached at 312-969-4400.



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Maximizing Remote Quality

by Barry Mishkind

Tucson AZ Most radio stations feature remote broadcasts at one time or another. The broadcasts may range from traffic reports to news to phone-ins from a client's store to a full stereo live program.

The problem presented to the station is that old story of conflicting priorities: The remote audio must be as good as possible, at the least possible cost and on the shortest notice.

Each station has its own answers to this problem, ranging from the standard telephone to satellite backhaul.

It would be good to consider how we can maximize the tools available to the station engineer for taking care of our remote needs.

Choices start at the basic level

Perhaps the most basic and widely used method for getting audio back to the station is the simplest—the standard telephone.

Literally hundreds of thousands of remote broadcasts have been handled by air talent simply using the client's phone and dialing the studio. The engineer then hard-wires the audio into the console and it's on the air.

ECLECTIC ENGINEER

What can you say? The remote got on the air. The client's message ran. It may have sounded as if the announcer was pinching his nose while talking, but the connection cost little or nothing.

For many station managers and sales managers that is sufficient. The remote was profitable, with little expense to the station.

On the other hand, the program director might feel the sound quality might prove bad for the ratings. Or, the manager may find client resistance due to the "great sounding remote" done by the station across town. So, they call in the engineer and ask for a solution.

Usually, with the emphasis on minimum cost and no lead time, the options are limited to using some equalization from the production room, or cleaning up the phone connection to the console.

Equalization can help clean up and crisp the audio a little, as can having a clean connection to the incoming line. DC blocking and impedance matching are necessary to optimize the received signal.

Yet, the basic problem is the limited bandwidth of the telephone system. Somewhere around 300-3000 Hz is all you get. The challenge is to squeeze the most out of that bandwidth.

Hooking up a microphone to the phone line at the remote end quickly achieves a definite rise in quality, since you are bypassing the carbon microphone in the telephone. That works for some situations.

Still, the limit is about 300-3000 Hz.

Several companies produce excellent phone interfaces for the studio that can automatically optimize the connection impedance, even adding some dynamic equalization to the audio.

Still, the limit is about 300-3000 Hz.

To get around that limit, many stations have turned to a product known as a frequency extender. A very popular product, they are often seen at remotes and sporting events.

A frequency extender uses digital technology to accomplish frequency shifting. A change in the lower frequency limit of the phone line is effected, making for a more natural sound.

Happily, this is not a very expensive approach.

A remote setup of a microphone or two, mixer, phone, cables, encoder and monitor radio can be easily laid out in a suitcase. Remotes can be set up in a few minutes by anyone.

(Some stations have purchased models with several bands and, using two or more phone circuits, can send clean, crisp, flat audio from literally anywhere in the world. This is a real boon to stations that want to send someone to broadcast from England or Venezuela.)

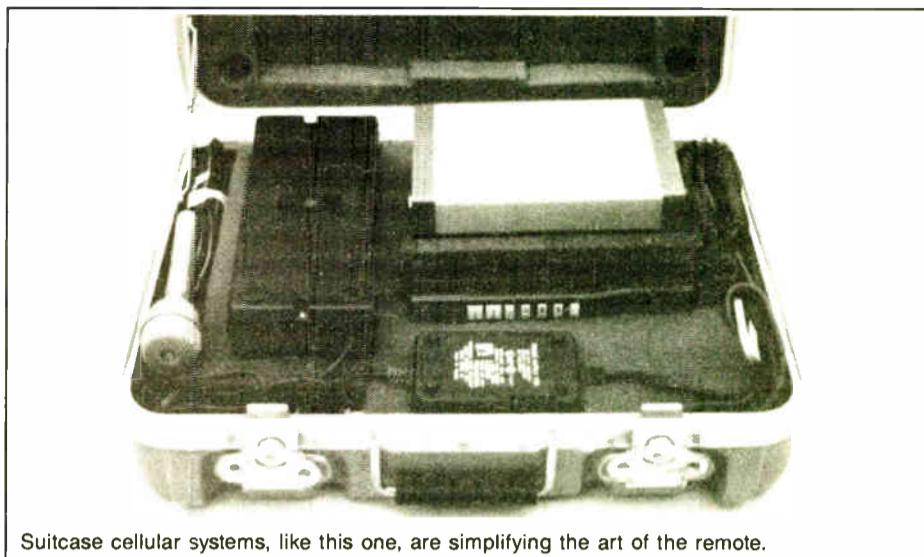
The main drawback to this method of feeding remotes back to the studio is the availability of telephones. In other words, your client may not like you tying up his phones for the entire time of the remote. Or, worse yet, there may not be a phone close to where the remote is scheduled. Stereo is often out of the question.

Dealing with phone people

With enough lead time, a dedicated phone loop can be installed, even equalized flat to 8 kHz or 15 kHz, so your remote can sound as if it were coming from the main studio.

The key words are "lead time."

One option is a simple phone line. It can usually be ordered for installation within a few days. This works well for many situations like sporting events. The cost is moderate and convenient.



Suitcase cellular systems, like this one, are simplifying the art of the remote.

On the other hand, a request for an equalized line usually results in a demand of 15 or more working days to install it.

Occasionally, the phone company will even reply that there are no equalized lines available in the area of your desired broadcast.

Recalling the last time I used this approach, I well remember the installer showing up the day before the "due date." This does little for anyone's blood pressure!

Oh yes—the cost. If you haven't had an equalized line installed since the

degeneration of the telephone industry, please sit down and take a deep breath before asking about the cost.

In fact, experiences like these with the phone company likely will remind you why you long ago converted to STL transmitters to get your audio to the transmitter.

And add to that the reality that the sales department is doing well to give three days' notice of a remote. Sometimes, Friday afternoon is when a Saturday remote gets set up.

It's enough to drive a guy crazy.

(continued on page 40)

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FM Booster Synchronization Explained

(continued from page 27)

degradation of reception will occur. Since light travels at a rate of approximately 5.3 microseconds per mile, this corresponds to about two miles; if the difference in path lengths is greater than two miles, delay must be added to the shorter path.

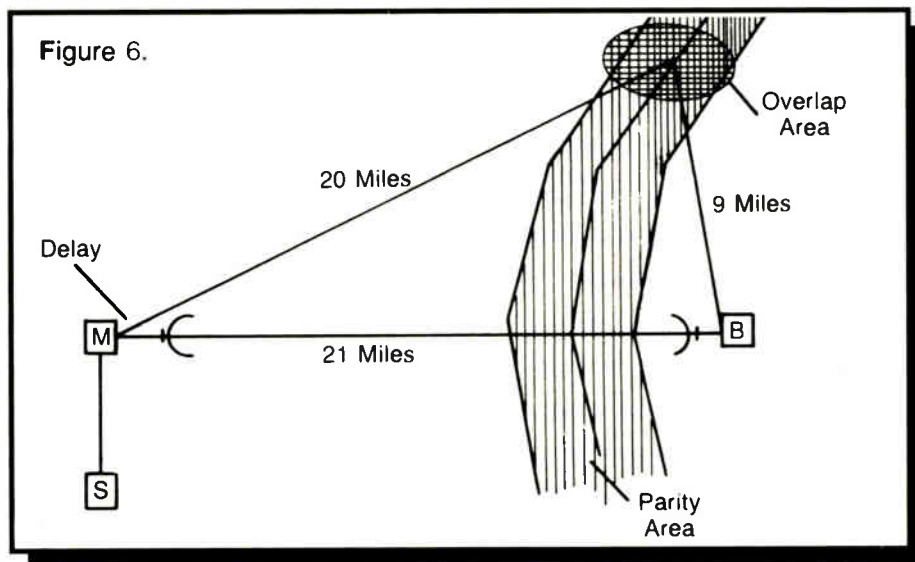
Figure 5 shows a booster system where the path lengths to the overlap area differ by 10 miles; the two signals will arrive at the overlap area 53 microseconds apart. Assuming a 100 MHz carrier, 53 microseconds of delay corresponds to an approximately 18° phase shift in the 1 kHz audio component and 180° in the 10 kHz component (etc.). This will result in significant degradation to the received audio.

A "parity area" can be determined where the two signals arrive close enough together so as not to deteriorate the audio. The trick is to get as much of the parity area to coincide with the overlap area as possible.

The location of this parity area is adjustable by varying the delay in one of the signal paths so that the signal will arrive at a prescribed time to coincide with the other.

The parity area is determined by looking at the sum of the microwave and the on-air distances from the point of initial modulation where the two signals are split and subsequently follow different paths. This also assumes that all devices after the point of initial modulation are phase coherent and that there are no internal delay factors caused by demodulation to baseband in any of the devices.

For example, the proposed booster system in Figure 5 has the path from the main transmitter (M) to the overlap area as 20 miles. The distance covered by the booster signal is the distance from the main transmitter (M) to the booster site (B), via STL, to the overlap area, total-



ing 30 miles.

The difference between path lengths is 10 miles, which means (at 5.3 microseconds per mile) that the signals will arrive in the overlap area 53 microseconds apart.

If 53 microseconds of delay is added to the main transmitter, the signals will arrive in the overlap area at the same time. The resulting parity area is pictured in Figure 6.

Adjustments in the exact position of

the parity area can be made by fine tuning the delay time: less delay will move the parity area to the left; more delay will move it to the right.

Some general rules

Several general rules can be established from these factors on booster operation:

- Boosters are easier to implement where there is substantial terrain obstruction.
- Significant engineering is needed to determine the proper booster site plus antenna selection and placement.
- The problem region is the overlap area where the main and booster signal levels are fairly close to each other.
- Synchronization of frequency, phase, modulation level and signal arrival time can greatly enhance reception in the overlap areas.

Martin Hadfield is a consultant based in Seattle, WA. Eric Lane is an engineer with TFT, Inc., Santa Clara, CA.

Steps to a Better Sounding Remote

(continued from page 39)

Actually, one of the more welcome and efficient solutions to the lead time problem has come from the explosion in the cellular phone industry.

Think mobile

Handheld and suitcase cell phones are allowing many stations to go out to a remote site and get it up and on the air without any worries about finding or arranging for a phone "out there."

Just as with standard telephones, a whole series of packages has been laid out by different suppliers to upgrade the audio that can be sent back over the cell phone.

One package, for instance, bundles a cell phone with a frequency extender and external inputs for microphone or high level audio.

With proper cables and a carrying case, any station employee can grab the phone and be on site for a remote broadcast or to report a news story live within minutes.

Perhaps the one drawback to the cellular system has been the per minute cost of cellular air time.

Air time costs have been coming down, though and compared to the installation costs for dedicated lines, cell phones may well be the more economical approach for you.

By handling telephone communications properly, we can have flexibility without the listening audience perceiving any major drop off in audio quality.

Of course, while we have been concerned here with audio transmission using the public telephone system, there are ways to bypass the phone company entirely. And we will explore those next time.

Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797.

More information on remote broadcast equipment appears in this issue's Buyers Guide.

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Circle 40 On Reader Service Card World Radio History

Top Ten in Muskegon

(continued from page 38)

multiple recordings, we can swing the mic into one area away from the board and actually have an operator mixing the session while someone else is doing voice work."

All the studios, including a small dubbing studio self-contained within the program director's office, terminate in the engineering room. The Gentner punch block system is used to route bussing assignments, which, noted Murphy, makes it easy to change a feed.

Murphy admits that they probably went to extremes in designing and building their new facility. "You don't change your studio environment that often," he said. "So, we decided to build in the features that we wanted and that would accommodate what we are doing now, as well as on into the future."

For now, Murphy and the rest of WMUS's staff are taking advantage of the rare opportunity of being the big fish in a small pond.

Dee McVicker is a free-lance writer and regular contributor to RW. To inquire about her writing service, call 602-899-8916.

Paying a Visit to the VOA's Greenville Transmitter Sites

by Tom Vernon

Harrisburg PA In the first part of our tour of VOA's Greenville, NC facilities, we visited the receiving station and the control room at transmitter site C. This time we'll look at the high power transmitters at the Greenville site.

One can easily see the history of transmitter technology here, for under one roof are transmitters with conventional high level plate modulation, Doherty and advanced PWM technologies. The circuit designs span a period of about 40 years.

Venerable equipment

Among the oldest rigs at the site is the General Electric 4BT250A1, a 250 kW plate modulated transmitter. It's contained in four large cubicles. Additionally, all large HV transformers, chokes and the modulation transformer are contained in a separate, fireproof room.

Unlike broadcast transmitters which are fixed-tuned to one frequency, shortwave equipment must be continuously tunable over the HF range of 430 Mc. Frequency control may be via either switch-selected crystals or a VFO. Motor-driven inductors and capacitors tune the intermediate and final stages.

Among the important specifications for a shortwave transmitter is frequency changing time, as these switches are usually made between programs. The GE can tune from one end of its range to the other in five minutes. Within-band frequency and antenna changes can usually be made during a station break.

Efficiency and cooling

Efficiency usually isn't as good as we're used to in commercial AM, with this transmitter doing a little better than 45%.

This is largely due to the necessity for operation over a wide frequency range.

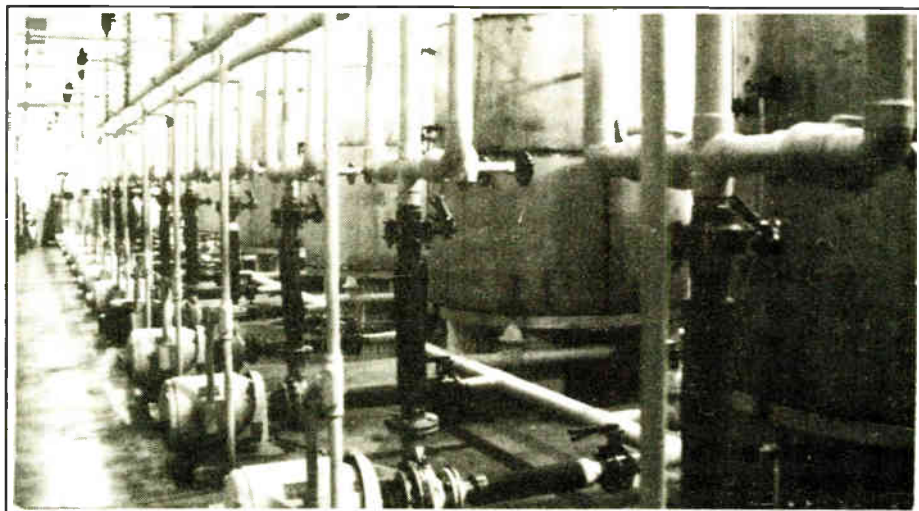
Although the GE has options for balanced or unbalanced RF output, all of the transmitters at VOA are set up for open wire 300 Ohm transmission line.

Another unique characteristic of high power shortwave transmitters is the need for water or vapor cooling of the PA and modulator stages, in addition to air cooling for the cabinets. This necessitates water reservoir tanks, distilled wa-

ter, plumbing, low water level interlocks, heat exchangers and other special equipment.

band changes can take up to a half hour. Contrast this with the VOA's new 500 kW transmitters, which can perform a band change in one minute.

ing functions is accomplished via a console in the control room. While Doherty amps have the advantages of better efficiency and higher fidelity than a high level plate modulated system, they also have one disadvantage. Adjusting the amplifier for the proper 90° phase shift between peak and carrier tubes is a time consuming procedure involving the use of an oscilloscope. Within-band frequency changes therefore can take up to 15 minutes, while



An endless row of water reservoir tanks gives some idea of the immense facilities needed to cool transmitter power tubes at the Greenville station.

ter, plumbing, low water level interlocks, heat exchangers and other special equipment.

The GE uses vapor-phase cooling for power tubes. This has the advantages of being more efficient than a water cooled system, requires reduced water flow, and is almost silent in operation.

Sites A and B each have three Continental 420A 500 kW transmitters. These use Doherty high efficiency amplifiers as the final stage. Servo control of all tun-

band changes can take up to a half hour. Contrast this with the VOA's new 500 kW transmitters, which can perform a band change in one minute.

Good maintenance

All of the transmitters at Greenville are very well maintained. Even the oldest meet or exceed original specifications, while the physical appearance is almost like new. The transmitter areas are spot-

(continued on page 42)

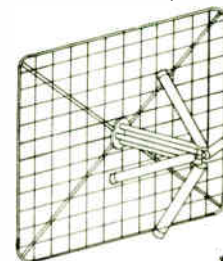


The AEG Telefunken S4005 is one of the four 500 kW transmitters purchased by the VOA for evaluation. Shown at right is John Moss, station manager.



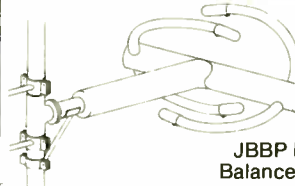
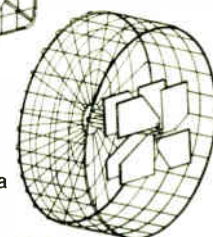
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Circle 59 On Reader Service Card

World Radio History

VOA Combines Old and New

(continued from page 41)
less.

The older transmitters could probably run a few more decades. The main incentive for their replacement is the vastly improved efficiency of newer models.

Obtaining replacement parts for older equipment is also a problem, although many obsolete parts are stockpiled in the warehouse facilities at each transmitter site. Both sites also have complete machine shops for fabricating mechanical assemblies. Replacing obsolete transformers is a bit more difficult, and defective units are usually sent to an outside shop to be rewound.

Transmitters are usually shut down daily for maintenance between 0500 and 1300 hours GMT. A minimum of four hours is usually required for each unit. This may seem to be more than broadcast transmitters require, however the additional time is needed to maintain the many moving parts and electromechanical assemblies associated with band changes and retuning that are cycled several times daily.

Transmitter evaluation

The Greenville relay station is the site for evaluation of new 500 kW transmitters, one model of which was selected for use in the world-wide modernization program. Four transmitters were purchased and evaluated on the basis of their technical performance, as well as support and training provided by the manufacturer. Countries represented by

the purchases were West Germany, Great Britain, the USA and Switzerland.

AEG Telefunken, Marconi, Continental Electronics and Brown Boveri Corp. (BBC) all delivered state-of-the-art transmitters.

The AEG S4005 and BBC SK55 were installed at Site B, while Site A houses the Marconi B6127 and Continental 420B units. Since we're touring Site B, we'll look at the AEG and BBC transmitters.

The Swiss-made BBC 500 kW unit uses a minimum number of tuned stages, opting for broadband amps where practical. As a result, only two tuned stages are employed. These are motorized and controlled from the front panel of the transmitter.

Frequency control is via a remote controlled synthesizer that delivers one volt of RF to the preliminary stage. Crystal control is also available as an option. The remote synthesizer and minimum tuned stages combine to give a very short time for band changes.

Pulse step modulation

Modulation of the BBC is via a unique pulse step modulator. It is comprised of 32 separate microprocessor controlled voltage sources that are instantaneously switched in and out to provide the required modulating voltage. This ranges from 0 to 28 kV for 100% modulation.

Coupling between the microprocessor controller and the switching stages is via fiber optics. This insures complete isolation between the two sections.

The West German entry in the 500 kW competition is the S4005 from AEG Telefunken. Like the BBC, it uses PDM modulation, although in a somewhat different form.

With the high voltages used in this equipment, arc detection and suppression becomes a prime concern, and the S4005 has a unique system for dealing with this problem. Ultraviolet detectors

are mounted at critical points inside the cabinets, and the visible emissions from an arc cause a near instantaneous shut-down of the transmitter.

When we next meet in these pages, our tour of Greenville will continue with a look at the different types of antennas used by the VOA, as well as some unique problems encountered in maintaining such large facilities.

■ ■ ■

Tom Vernon, a regular RW columnist, divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-249-1230.

Radio as a Curriculum

(continued from page 31)
TV stations.

At the head of their agenda is the promotion of college broadcasting facilities. They are now in the process of gearing up for radio and TV satellite networks for school-owned stations.

Since the focus of the NACB has more to do with the running of the stations than the education of students, it does not necessarily follow that their member stations will offer the best education.

In fact, at some schools the connection between students and the campus stations is non-existent. A good campus station does not always mean a good curriculum.

Glenn Gutmacher, NACB's director of publications, kindly forwarded a list of schools he knows to be noteworthy by size or quality of training. His picks, plus those referred by SCMS's Bob Cauthen and others appear as a sidebar to this article.

To find out more about the NACB, call Doug Liman at 401-863-2225.

The future of broadcast education, based on the the evidence given by these schools, appears to be in good hands. However, with tightening operating budgets fueled by increasing competition, the real question is, will those now in school find that the salaries offered by stations fall well below their expectations?

One final note: In the last *Producer's File I* reviewed the Symetrix 501 Comp/Limiter. Somewhere in the transfer of information, the model number of the 163X dbx unit I was referring to got lost. While there are dbx comp/limiters with features similar to the Symetrix 501, the simpler 163X does not have the same number of controls.

■ ■ ■

Ty Ford, audio production consultant and voice talent can be reached at 301-889-6201 or by MCI mail #347-6635.

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BUYERS GUIDE

Reel-to-Reel Recorders & DAT

WZLZ Cart-Free with Harris

XD-001 DAT Performs Live, Live Assist and Full Automation Duties

by Ron Crook, Station Mgr
WZLZ-FM

Quincy IL WZLZ is one of the very few radio stations in the country that does not own or use a cart machine. Although "Z-FM" has only been on the air for 90 days, the plan to use digital audio equipment for playback of all program elements was developed during the five-year struggle to get the station licensed.

The plan first called for the use of Beta video tape machines and PCM encoded audio for the playback of commercials, and CD players for music elements.

It took ten minutes to realize that the medium was perfectly suited for radio broadcast, both in a live situation as well as for full automation and live assist.

a digital copy is made.

By having two exact copies of the spot reel, it is a simple matter to have every commercial and promotion available on

giving us a digital copy of the master. Another benefit is that if copies have to be made for other stations in the area, they also get copies with no generation loss.

On-air DAT

We have an eight-track production studio. All mixing is done through a Yamaha DMP 11 directly to DAT for air. Needless to say, our commercials sound every bit as good as the music we play, making programming sound much smoother.

This in itself is a competitive edge compared to the limitations and noise of playback from older cart machines. Although listeners do not know why, they do know that our station sounds better. The quality of sound from DAT has been well documented, and DAT is every bit as good as other digital technology.

The Harris DAT machine is very easy to use and operate. A quick inspection inside the machine reveals excellent circuit board design as well as the use of a heavy duty chassis.

The transport is similar to that of a

(continued on page 51)



Harris' XD-001 has allowed WZLZ to do without cart machines.

Six Harris DAT machines were purchased as part of a package that included a new transmitter, tower and antenna. We decided that six machines would be needed to handle program playback—three for music, two for commercial and promotion material and one for use in production studio mastering.

Commercial playback

As is well known by now, DAT machines have the ability to quickly access 99 separate cuts. In using DAT for commercial playback, each time a new commercial is added to the "spot reel,"

each machine. On-air personnel do not have to individually load and unload separate elements of a commercial break. We simply "bounce" back and forth between the two machines.

When we receive a copy of a reel spot from a client it is dubbed directly to DAT,

USER REPORT

With the long awaited release of DAT technology, we decided that all program elements—both commercials and music—could be handled in a live programming situation by the new machine.

With the Harris Broadcast Products Division located only four miles from the station it was an easy matter to test and evaluate its DAT machine, the XD-001.

Otari's MX-50 is a Reliable Workhorse

by S. Parks Hall, CE
WDDO-AM/FM

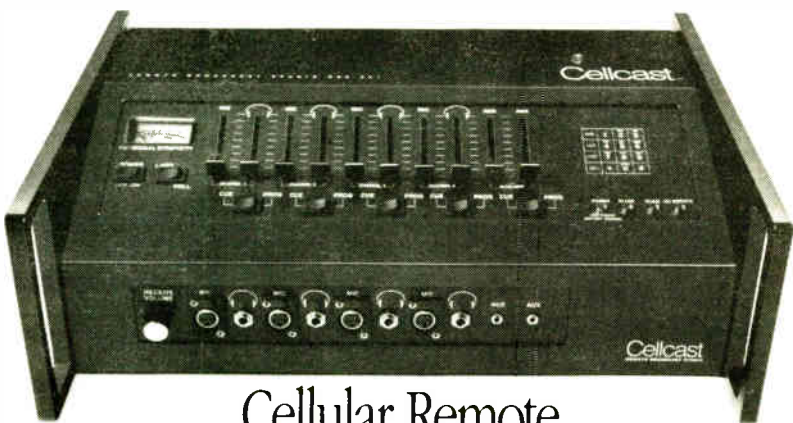
Chattanooga TN In my almost 30 years as a broadcast engineer, there have been few constants. One, however, has been the presence of the venerable analog (how grand that the technology now has a name!) reel-to-reel tape machine.

It still stands as a versatile, if not indispensable, production tool both on and off the air. Truly nothing, and everything, has changed in the evolution of this blending of electronics and mechanics.

Enter the new Otari MX-50. It stands as a prime example of just how far the affordable workhorse reel-to-reel tape machine has come.

Otari's newest offering is built on an

(continued on page 53)



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Also, Technology Updates from Henry Engineering and Panasonic.

USER REPORT

New studios were completed in early August at WJTT-FM in Chattanooga, Tennessee. Centrally located on the ground floor of the downtown Sheraton hotel, the facility has been designed in its entirety to be one of the city's finest.

But when it came to equipment, this did not mean cost was no object. It meant we were to prudently purchase equipment of contemporary design from manufacturers with proven track records.

Assessing the DAT Compromise

by Richard Farrell

Falls Church VA By now word of the compromise that has been reached between DAT manufacturers and the RIAA has made its way through the broadcast industry. Consumer DAT decks reaching these shores must now be equipped with Philips-developed Serial Copy Management System (SCMS) circuitry.

The consumer-on-the-street will benefit in the usual ways. Audiophiles will have a new digital toy at their disposal, and some suggest that they will have R-DAT in their cars before long. All of this, of course, would hinge on whether or not DAT takes off in the consumer market as has the CD.

Not as quickly as CDs

"Its progression will be slower than that of CDs," says Ron Frillman, Harris sales manager of broadcast radio and RF. Harris currently markets a DAT machine designed for broadcast use. "R-DAT is a more expensive media, a more expensive capital expenditure for consumers.

"Compare what a VCR currently costs, and you will probably be in the ballpark of what an R-DAT consumer machine is going to cost," offers Frillman. "An R-DAT machine has a rotary head and records in the same kind of format as a VCR. Mechanically, they are probably pretty close."

The consumer market for DAT may be more relevant to the professional than at first blush, the general logic being that with millions of DAT units flooding the US for sale to consumers, the resultant "buzz" and general familiarity with the technology may promote R & D that would be beneficial to the smaller, more function-demanding pro market.

Mel Lambert, audio consultant and RW columnist, sees the coming consumer flood as a possible R & D benefit, and he predicts "an accelerating economy of scale being affected because a lot of pro machines are based on consumer transports that have been radically re-designed and enhanced.

will take the easy way out and opt for consumer equipment, as happened in the early days of CD.

"The Copycode stuff is done and, short of SMPTE, the R & D is done." He expresses disappointment at the possibility of pro deck sales being lost to con-

Braverman is concerned that the RIAA compromise may not bode well for radio.

sumer decks, with the resultant usage by broadcasters of what he sees as systems not suitable for broadcast.

Of the pro systems, most of which have been shipping for about two years, Braverman says "broadcasters should have flocked to DAT because it is a great format. Based on how big it is today, there should have been a bigger response."

And, too, where new digital formats are concerned, pros can, have and will use consumer-intended products because of their lower prices, a prospect that worries charters of DAT's progress in the pro market.

"Operationally, it will cause a problem

for some radio stations that will insist on using consumer-grade stuff," says Lambert. "Primarily because they do not have the features necessary for broadcast and because they were not designed for life in the fast lane, if you will," he says.

Lambert feels that some important features a broadcaster should look for in a DAT machine include full remote control, digital interfaces with transfer of Start IDs, digitized audio at 44.1/48 kHz and time-code capabilities.

Braverman is concerned that the RIAA compromise may not bode well for radio. "I think there is a danger in it," says Braverman. "There is now going to be a plethora of consumer equipment available and broadcasters will buy a bunch of it. They will mislearn about R-DAT what they mislearned about CDs."

Braverman's chief worry is, of course, that the consumer units just will not be able to pass muster for the broadcaster's needs. His company's Rs-DAT, a modified-for-broadcast-use version of Sony's DTC-1000, "has been well accepted," according to Braverman. "But it has been a slow start in the US," he says.

The Rs-DAT "has had great results in Europe, South America and Canada," he says. To Braverman, the sluggish start in the US is "because US broadcasters are slow to adapt to new technology."

(continued on page 49)

INDUSTRY ROUNDUP

"That is where we can get some of our R & D. A healthy consumer market makes for a progressive and expanding market, and anything we can do to improve consumer DAT will only benefit pro DAT," Lambert says.

Stealing the market?

Radio Systems President Dan Braverman sees it differently. His company also markets a DAT machine designed for broadcast use. He worries that stations



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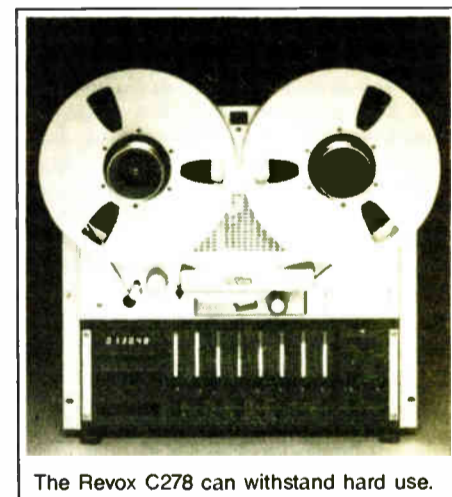
Revox C278 Makes Multitracking Easy

by Michael Maciejewski, CE
WMUS-AM/FM

Muskegon-Grand Rapids MI When designing new studios for WMUS, we decided to include a multitrack production studio and determined that any complex stereo production would require an eight-track tape machine.

After hearing of its existence, the Revox C278 machine was a natural choice. WMUS has had good results in the past with the Revox line, having owned a few of just about every model from A77s and B77s to PR99s to PR99MKIIs.

Revox has always offered a rugged line of machines that have withstood just about any abuse given them. The



The Revox C278 can withstand hard use.

from rack mounting for adjustment.

Audio performance of the C278 is superb. The Dolby HX Pro headroom extension record circuitry gives the machine a clean, open audio signature. Frequency response at 15 ips was measured at 30 Hz to 20 kHz within ± 1.5 dB.

However, the high frequency response is somewhat degraded in the sync play mode, with a roll-off point of 12.5 kHz. Crosstalk between tracks is very low, somewhere near the noise floor of the tape (-56 dB).

Layout of the front panel controls and indicators is very straightforward and well arranged. Eight LED bar graph peak reading meters are used for input/output level indication and give the front panel its sleek appearance.

(continued on page 46)

USER REPORT

C270 series is no exception. The machine is solidly constructed and well designed.

The electro-mechanical noise has been reduced, which is a definite improvement over past Revox machines. The C278 is very quiet when engaging (almost silent, in fact).

Maintenance of the electronics is helped by a front metering panel that swings up and outward for access to the audio electronics. This makes minor tweaks easy because the machine does not have to be taken apart or removed

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WOCL, Orlando FL*



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*Sonny Reschka, Dir. of Eng.
WNIC, Detroit, MI*



"SUPPORT. The AA-4 is a very good cart, period. And Audiopak stands behind their product better than any other company in the business. They really are a customer-oriented organization."

*Tom Cox, Technical Director
KKLQ, San Diego CA*



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*Chuck Waltman, Eng. Mgr.
KSAN, San Francisco, CA*



"CONSISTENCY. We've used about 7,000 AA-4s over the past five years, with very few problems. In fact, we just carted our entire easy-listening music library in stereo on AA-4s. They're tops in my book, and the only cart I use."

*Dwight Weller, Dir. of Eng.
WLIF, Baltimore MD*

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KSO/KGGO, Des Moines, IA*

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World Radio History

Rs-DAT Key in WKSZ's Arsenal

Digital Quality and User Friendly Features in a Professional Deck

Douglas W. Fearn, CE
WKSZ-FM

Media PA This summer WKSZ took another step into the world of digital audio with the purchase of a Radio Systems Rs-DAT digital audio cassette recorder.

This machine consists of a Sony DTC-1000 deck coupled with a Radio Systems interface unit. The DTC-1000 is essentially a consumer machine, but it is also the basis of the Sony professional DAT machines and seems to be fairly robust in construction, if not entirely up to broadcast standards as to serviceability.

USER REPORT

Most "professional" machines meet the needs of the recording industry, with balanced +4 dBm inputs and outputs. But few, if any, offer the type of control interfacing necessary for on-air or production work.

Most other units use either a wireless remote control, or will work only with the manufacturer's remote control box since the various function keys are sequentially interrogated.

Like a reel-to-reel or cart

Radio Systems has built a remote control interface that works the way radio stations are accustomed to with any reel-to-reel or cartridge tape machine.

The Rs-DAT interfaces easily with console start switches, console remote control buttons, or automation systems with simple closures required to initiate a ma-

chine function.

Rather than just being an "add-on" chassis, the Rs-DAT interface is intimately wired into the modified Sony deck. Added features include the ability

sign cut numbers for up to 99 selections on each cassette. Locating a cut is very similar to the procedure used with a CD player. The time to locate a particular cut is somewhat longer than a CD player

fect, but close enough.

After all this operational discussion, you are probably wondering how the machine sounds. These days it seems to me that digital audio is pretty much the same in all formats. It may not be perfect, but it certainly is better than any other recording format commonly found in radio stations.

Durability of the tape and hardware has yet to be proven, although I have been using the straight Sony DTC-1000 machine for location recording for about a year and have had no problems whatsoever. That application is less demanding than daily radio station use, but it does involve frequently transporting the machine.

Minor tape drawer problem

In the first few hours of operation we did encounter one problem: after working properly for several days, one morning the tape drawer refused to open (no tape was loaded). We opened the top cover on the transport and carefully exercised each of the several microswitches in the drawer mechanism. The drawer then worked fine and we have had no further problems.

The input, output and remote control connections are made with 9- or 25-pin D connectors. I would prefer XLR connectors for the audio. For automation interfacing, there is a serial port but we currently have no use for it in our studio.

I asked our production director, Bill Purdom, what he thought of the machine. "It has the best combination of digital quality and user friendly features," he said. "I wish I had one at home."

■ ■ ■

Editor's note: Doug Fearn is a frequent contributor to RW. He may be reached at: 215-565-8900.

For more information on the Rs-DAT from Radio Systems, contact Paul McLane at: 609-467-8000, or circle Reader Service 94.



The Rs-DAT controller (bottom), with a Sony DAT deck

to record at 44.1 kHz (for compatibility with compact disc digital transfers), and an increase in sensitivity of the audio sense circuitry (which can automatically write the Start ID when audio is first detected).

We obtained the Rs-DAT machine for use in our eight-track production studio. On average, we produce about a dozen spots a week, some of which are jingles written and produced in house. We have been mastering these commercials on 1/4" tape at 15 ips, using a 10" reel of tape in less than two weeks.

Offered storage savings

The tape expense and storage space used is significant, and we felt the DAT format offered some savings in this area. DAT 120-minute cassettes are less than one-fifth the cost of the four reels they replace. And storage space required is ridiculously smaller; an entire year's production will take up about as much space as three or four open reels.

Another advantage is the ease of locating a particular cut. The machine can as-

takes, but much faster than on a reel-to-reel machine.

One big concern was the accuracy of cueing the cut. The most common use of our DAT machine would be for dubbing commercials to cart where consistent cueing accuracy is essential. The Rs-DAT does a good job at this.

The Start ID is digital data written in the subcode area of the tape. When commanded to go to a cut, the machine searches for the Start ID and then goes into the pause mode. Starting time from pause is quick, although not as fast as a cart. It is faster than the start time of a reel-to-reel, however.

Flexible writing of Start ID

The Start ID can be written automatically, upon detection of audio, or it can be written manually. Either way, you are not stuck with the start location if it is not correct. There is a simple procedure for moving the Start ID forward or backward in 300 ms intervals (the technique takes longer to describe than to do). Starting consistency is therefore not per-

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World Radio History

WMUS OKs Revox C278

(continued from page 44)

Below each bar graph are the input level controls, which are defeated by a selectable, calibrated/uncalibrated button that is also on the front panel. Record enable buttons for each track are located below the input level controls (again a logically placed location for a very frequently used function).

Controls for the built-in auto-locator are located below the counter readout and allow the operator to automatically rewind and cue to zero, cue to an entered address, and loop (repeat) from zero to an entered address.

Working with the Revox C278 has been the first experience with multitrack recording for many of our announcers, and all agree that the machine is definitely user friendly.

■ ■ ■

Editor's note: Mike Maciejewski may be reached at: 616-798-1149.

For more information on the C278, contact Charles Conte at Studer Revox America: 615-254-5651, or circle Reader Service 78.



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Circle 34 On Reader Service Card

World Radio History

Tape Copying Takes a Fast Trac

Free Your Console From Dubbing Duty with Henry Engineering's Latest

by Hank Landsberg
President
Henry Engineering

Sierra Madre CA The production people at virtually every radio station spend many hours each week (or day) on the mundane but necessary task of dubbing. They dub records to cart, CDs to cart, CDs to R-DAT

TECHNOLOGY UPDATE

and agency spots to cart as well as make copies of carts, copies of spec spots, etc., etc., etc. It is boring and time consuming, but necessary.

Most stations use a dedicated studio for dubbing. But is it really necessary to tie up an entire studio just to go from one source to a recorder? Do you really need a ten-channel console when you are not actually *mixing* anything?

A rational alternative

Do you really need to fill an entire studio with limiters, EQs, telephones, intercoms, mics, the EBS receiver, etc., just to make a clean and accurate dub of a CD track? Of course not!

What you actually need is a

"thing" that combines most of the functions of an audio console, but has only one channel (i.e., a "one pot board").

The Fast Trac Dubbing System from Henry Engineering is ex-

a ± 6 dB limited range for "fine tuning" the stereo balance. A push button defeats the balance control for those who do not want to use it.

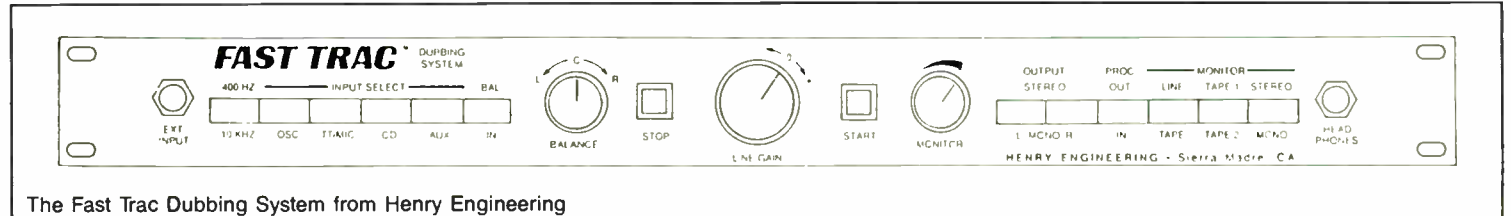
Two other buttons allow the

The timed auto-start facilities of the Fast Trac eliminate these problems by automating the dubbing process.

Each source feeding the fast Trac (TT, CD, etc.) has as-

modulation meets the stylus.

The scenario changes when dubbing from a CD. The cart recorder is started first to allow for the faster start-up time of the CD player. (These are examples



The Fast Trac Dubbing System from Henry Engineering

actly that. It is a self-contained audio and machine control system specifically designed for dubbing from one source to another.

It occupies 1 3/4" of rack space, duplicates the functions of a console and automates the dubbing process to eliminate guesswork.

One pot console

The Fast Trac is essentially a four-input, one pot console. There are inputs for four stereo sources, each push button selectable. Gain trimmers for each source allow you to mix a +4 dBm balanced phono preamp with an -10 dBv unbalanced CD player.

An optional mic preamp can be installed in place of one of the line level input positions. The Fast Trac also includes a test oscillator with 400 Hz and 10 kHz frequencies selectable.

The overall gain (recording level) of the system is controlled with the large Line Gain knob while a balance control provides

user to select the recording mode: Stereo, Mono-summed (L+R), Left-into-both, or Right-into-both outputs. If you want to use a limiter or EQ, a Process In/Out button will allow for the insertion of this equipment into the recording chain.

Playback monitoring

The Fast Trac also has two playback monitor inputs so that you can monitor the recording quality of two record machines such as two cart recorders. A push button selects either Line or Tape Monitor. Another button selects either Tape 1 or Tape 2. A Monitor Mono button switches the monitored signal to mono for checking mono compatibility and phase error.

Perhaps the most unique aspect of the Fast Trac is its machine control system. How many times have you had to re-dub a cart because it was too "loose?" And have you ever noticed that carts dubbed by different people have different "tightnesses?"

sociated with it two timing adjustments. One sets the start delay of the recorder or source ma-

Fast Trac is a compact and efficient dubbing center that does the job every time . . .

chine and the other sets the audio-muting delay for that source.

Dubbing from vinyl

For example, when dubbing an LP to cart, the turntable is started first, with audio muted during the start-up. Then, just as the beginning of audio approaches the stylus, the cart recorder is started and audio comes back on at precisely the moment the beginning of

of how the timed auto-start functions of the Fast Trac are used to eliminate the guesswork of dubbing from any source).

Once the timing circuits have been set, pushing the Master Start button will create perfect dubs with one-button ease every time. There is also an output to start and stop a digital timer automatically.

Fast Trac was developed to solve two problems faced by most of us: one, there is never enough time; and two, there is never enough room in the studio! Fast Trac is a compact and efficient dubbing center that does the job every time, and allows your production studio to do production!

Editor's note: For more information, contact Henry Engineering at: 818-355-3656, or circle Reader Service 70.

BUYERS BRIEF

Tascam has recently added a third sampling rate to its DA-50 R-DAT recorder. Now, in addition to sampling at the standard baud rates of 32 kHz and 48 kHz, the DA-50 deck will record at the rate of 44.1 kHz, which will permit two-track mastering direct to compact discs with no additional interfacing required.

The rack-mountable DA-50 has four zero-distortion circuits that should add to sonic performance and eliminate granulation noise. The unit also features an oversampling digital filter, four direct-drive tape transport motors, a remote control unit and a seven-way power supply system with independent transformers for the digital and analog circuitry.

Operational functions include direct search/CPS, ID code write and erase, cue and review, renumber, blank search, intro scan and four counter modes.

For more information, contact Greg Hildebrandt at Tascam: 213-726-0303, or circle Reader Service 98.

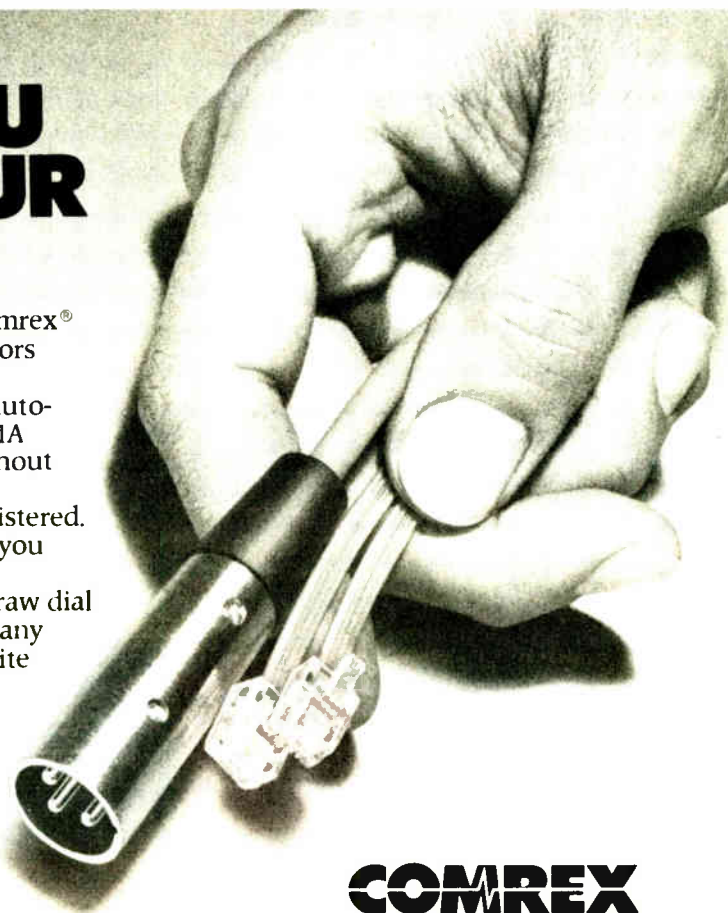
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Comrex also makes frequency extenders to turn raw dial lines into broadcast quality. For more information on any Comrex product, call toll-free 1-800-237-1776. Or write Comrex Corporation, 65 Nonset Path, Acton, MA 01720. Tel. (617) 263-1800. TWX 710-347-1049.



COMREX

What's in Store for DAT in the Market?

(continued from page 44)

Sony Marketing Manager for Professional Audio David Kawakami takes a different approach. He sees a need for a more definable splitting of the technologies.

"There has to be a clear kind of divergence of product lines between true professional DAT and consumer machines," says Kawakami. "Until now, our machines have been based on consumer designs. In the future, they need to be planned and developed for more specific professional purposes.

"The radio market, which is a potentially huge market for DAT," continues Kawakami, "needs a machine we currently do not have. What radio needs from a performance standpoint DAT already offers. It has the sound quality sufficient for broadcast. What is missing are the functions. Radio has very specific needs," he says.

Kawakami cites better cueing ability, for one thing. "The ability to cue to a certain spot, hold the event and instantly access the music.

"These things were not on the engineers' minds when they first made DAT machines. They were thinking of the consumer market," says Kawakami. If the functional-type features were addressed, "DAT would instantly have a place in radio stations," he adds.

Current industry rumors put the wait

for the DAT decks to reach market here no sooner than next spring.

"I am disappointed that consumer hardware is taking so long," says Mel Lambert. "Not that pros would use consumer audio, but it just helps (DAT's acceptance) credibility-wise," he adds.

What lies ahead

And what of the future? Clearly, broadcast radio will make use of DAT decks as they become available. But to what extent and in what applications remains to be seen.

Panasonic showed a prototype DAT editing system (see the Technology Update in this issue) at the 1989 NAB. While that technology is said to be one to two years away from shipping, the potential for editing DAT removes at least some of the obstacles.

Meanwhile, manufacturers are busy adding the SCMS chip to their units, a chip that will do the sampling of the digital bit stream coming from the tape necessary to detect a tape that has been recorded once.

But perhaps they should be busier. With units not hitting America before the spring, the companies will be months removed from Santa Claus and his reindeer. Quite a potential boon to miss. And as Mel Lambert puts it: "If I was a manufacturer, I would make sure I had product in the stores by Christmas."

People ... The Professional Audio Division of Sony Corporation has appointed Robert Ott to the newly-created post of national business manager of microphone products.

Ott was formerly a district manager working out of Itasca, IL and spent 12 years previously with Shure Brothers where he held several positions in microphone and electronic sales.

Speaking of Shure Brothers, the



company has recently named Robert Gilbert as its new vice president of sales and finance. He will handle Shure's financial operations and sales activity worldwide.

Also at Shure: John Phelan becomes director of technical markets; Donald (Sandy) Schroeder takes responsibility for the overall management of Shure microphone products worldwide; Michael Pettersen gets a promotion to director of mixer products; and Alan Shirley becomes product line manager for wired microphones.

Meanwhile, at AMEK/TAK's broadcast sales department, Gary Taylor has joined in the position of broadcast sales coordinator. Taylor previously served in AMEK's production department.

Studer Revox America (SRA) gains fifteen-year pro audio veteran Jim Kurowski, who becomes that company's director of technical operations. Kurowski will handle all technical operations at SRA. Kurowski is a former Rupert Neve, Inc. manager of technical services.

Wins Contract ... Broadcast Electronics received an order valued at \$521,000 to equip 13 new 1000 W FM stations in Thailand. The contract calls for BE to supply: 13 Model FM-1B, one tube, 1000 W transmitters; 13 FM transmitting antennas; control consoles and turntables for the thirteen studios; and other related equipment.

New manufacturer ... Family Marketing Group recently formed a new manufacturing company, Hit Design, which will manufacture broadcast and related products for the broadcast, recording and pro audio industries. The company has just released its newest product, the Tailor multi-band dynamic equalizer for enhancement of music without conventional processing artifacts.

Family Marketing is accepting any dealer inquiries. For more information, contact Jim Trapani at: 904-622-2779.

Call toll-free ... Delta Electronics has recently begun offering its customers a toll-free number for sales and service information. For use throughout the US, the number is: 1-800-8-DELTA-8 (1-800-833-5828).

Sometimes We're Judged



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Sony D-10 Field Tested by AP

by Paul S. Courson,
Anchor/Reporter
Associated Press Network News

Washington DC Sony's low-priced entry into the R-DAT market has been on sale in Japan for more than two years. The D-10 is marketed as a consumer-grade unit, and has the sort of connections and technical features that cater to a non-broadcast user.

USER REPORT

The D-10 Pro uses the same transport and chassis, but includes a digital I/O connector not found on the consumer model. Other differences include XLR 3-pin connectors for analog mic or line inputs, instead of the 1/4" phone jacks found on the D-10.

The D-10 and the D-10 Pro have LCD displays, but there are differences between the two that confirm the Pro model's broadcast orientation.

Different level indicators

The consumer model has a seven-segment, miniature LED recording level indicator off to the right of the main LCD display. Seven segments offer rather poor resolution, and only the upper two segments colored red distinguish over-level recording.

The pro model incorporates record level indication within the main LCD. And with 20-segment resolution, it is much easier for the user to set level accurately. An overload segment also kicks in when input levels get extreme.

Sony has taken care to provide all the digital sampling rates likely to be needed for direct digital-to-digital copying. The early machine the manufacturer supplied did not include the Philips anti-

copying circuit that is the centerpiece of an agreement between the music industry and electronics firms.

The digital I/O circuit on the D-10 Pro handles AES/EBU digital signals of 32 K, 44.1 K and 48 K sampling rates, as well as the Sony/Philips format in 32 K or 48

information is lost.

Dynamic range is quoted by Sony at 85 dB, with frequency response from 20-22 K. These specifications are far better than any portable analog cassette unit, but are bested by some R-DAT portables on the market.



Sony's D-10 professional portable DAT, with mics

K rates.

Both models incorporate record start IDs, which enable the user to cue to a given point in the tape, the same way a selection is picked on a CD player. Programmable play functions are also similar to those available to sequence a CD. The subcode ID allows high-speed searches in either direction on the tape.

The consumer model includes an elapsed tape-time index that holds its accuracy fairly well from end to end. The pro model includes additional time information that can permanently "date" the recording.

Time coding yet to come

But Sony has yet to install full-featured time coding in the D-10. And on the consumer model, as soon as the tape is removed (or power lost) the elapsed time

The user can also fast-scan in either direction with audio. Competing brands mute the audio in rapid shuttle modes. The sound heard with such fast-scan is similar to that found when moving through a CD.

Some complexity

The tape loading system on the D-10 Series is awkward and not completely idiot-proof. An outer door must be opened, exposing an inner tray with its own button to raise it up to insert or remove a tape.

The system is mechanical and does not normally require any power to function. But it is possible to turn the machine off with the tape threaded. And the unit does not have an interlock that would automatically de-thread the tape. If power is lost with the tape threaded, it

is impossible to remove it.

Despite some standby, battery-saving circuitry, battery life is the biggest drawback in using the Sony portable. On a full charge, the 6 V sealed pack lasts just over 1.5 hours. Two such packs are supplied with the D-10/D-10 Pro.

There is no external DC connection. The AC adapter fits where the DC pack inserts, but ends with a line cord. This same adapter is used to charge the batteries.

But it is via a separate drop-in tray that the AC pack is linked with the DC pack that needs a charge. That ties up most of the power system and leaves the user with whatever life is left in the second DC pack.

Reloadable DC pack . . .

Sony would do well to offer a reloadable DC pack that could contain alkaline cells. For now, it is a tedious exercise to carry along the power entourage for this machine.

The company does offer an external

Dynamic range is quoted by Sony at 85 dB . . .

battery pack (model NP-4000), but it is 12 V and requires a DC-to-DC converter (DCP-80) which inserts in the D-10 just like the other packs. The same DCP-80 accepts a cigarette lighter cable (DCC-16) for use in a car's 12 V system.

One positive note on the battery situation: the DC pack is the same unit used in some of Sony's portable video equipment, which makes locating spares an easier assignment.

It is a pleasure to have full fidelity
(continued on page 58)

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XD-001 DAT from Harris Replaces Carts at WZLZ

(continued from page 43)
video tape machine. The optional wired remote allows easy cueing to any cut on the tape and places the machine into a cued and ready-to-air condition.

By using the Skip ID function, the machine automatically cues up to the next cut on the tape, making the cut ready for air.

Other applications

After working for the CBS O & O, KCBS, in Los Angeles for five years as a central control supervisor, I can also see a very definite use for DAT in a TV master control situation.

CBS makes use of a noisy 48-tray cart machine. Each night after the news, the announcer has to record spot elements that air during the time no announcer is on duty. Many times the same elements are recorded over 10 times a week.

It would be a simple matter, using DAT, to have all station announcements contained on just one tape. It would alleviate the problem of jammed carts and

limited frequency response, along with having to make duplicate messages. It is also very easy to interface the Harris DAT machine to automation systems.

Because WZLZ had the luxury of being a new station starting from scratch, it was an easy decision to make extensive use of DAT technology. The Harris machine is very affordable and should provide years of excellent service.

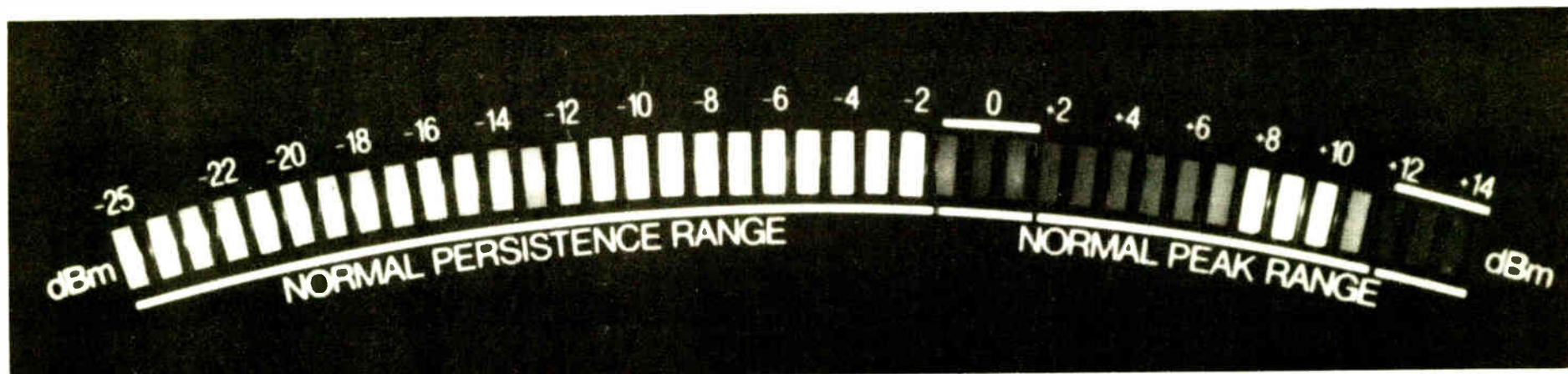
We plan to add six more DAT machines, making it possible to have more of the station's extensive music collection on-line at all times.

Because I work nine hours a day on the air in addition to my other duties as Station Manager, it is a very welcome thing to not be constantly loading and unloading carts and CDs. I highly recommend the Harris XD-001.

Editor's note: Ron Crook may be reached at: 217-222-3322.

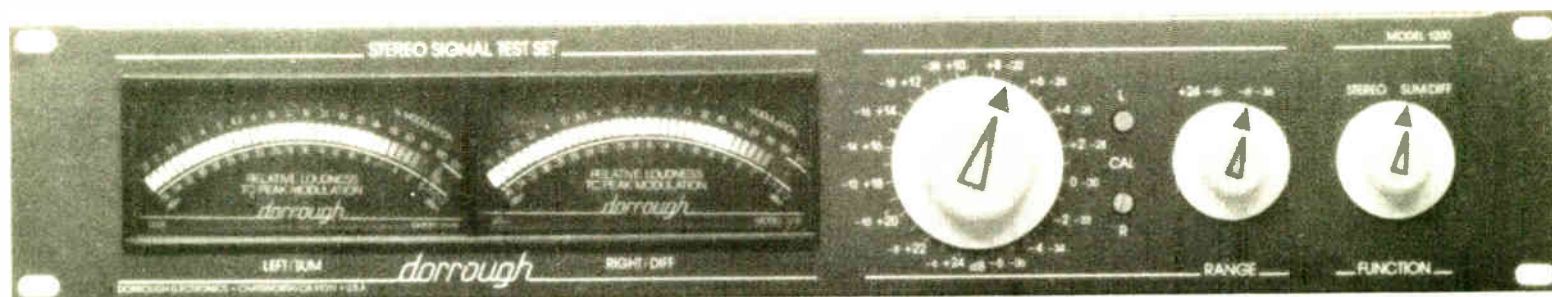
For more information on the Harris XD-001 DAT unit, contact Ron Frillman at: 217-222-8200, or circle Reader Service 92.

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WMTR Goes All-DAT with Sony

by Max E. Smith, Sr., Pres/GM
WMTR-FM

Archbold OH On 12 January, 1989, WMTR began broadcasting an all-DAT format. Thus after investing over \$200,000 in new studios, tower, transmitter and processing equipment, WMTR became the first all digital tape radio station in America.

We utilized five Sony RSI DTC 1000 DAT machines and one Sony digital audio recorder PCM 2500. Software was from FirstCom in Dallas, TX—2338 cuts of DAT gold.

DAT gold is a completely re-mastered

gold library of rock's greatest hits, from 1954 to the present. Each cut was taken from an original studio master and transferred to DAT.

The quality is unbelievable and is far superior to any other source I have heard including any CD library or satellite service.

No failures

After eight months of continuous operation we have had literally no down time. The PCM 2500 is a workhorse and without question the cart machine of today.

Basically, the Sony digital audio re-

recorder PMC 2500 consists of a digital audio tape recorder and an interface unit. The interface unit is designed so that the PMC 2500 can be used in professional audio fields, enabling the recorder to be connected to various digital and analog audio equipment.

Such equipment includes: digital audio equipment having the AES/EBU standard I/O connectors; digital audio equipment having the SDIF-2 (Sony Digital Interface 2 format) I/O connectors; equipment using the Sony-Philips digital format I/O connectors; as well as analog audio equipment having the XLR-31 type analog input connector and XLR-



Sony's PCM 2500 professional DAT recorder

3-32 type analog output connector.

Our on-air sound and commercial production quality is absolutely excellent. The PCM 2500's four times oversampling digital filter and D-to-A converter unit are employed for the left and

(continued on page 58)

Otari Reel-to-Reel Unit Features Dependability

(continued from page 43)

aluminum deck plate and is a single unit design. As supplied it is an upright standing machine, which does make the vertical front panel hard to work with. In the future, Otari will offer an optional cabinet to allow the front to be face up.

I know of at least one major equipment supplier, Allied of Richmond, Ind., that offers very inexpensive wood side plates to accomplish the same thing. We used them at WJTT.

Another option would be to purchase a Tascam CS 607B roll-around stand and mount the MX-50, using Otari's ZA5 EK rack mount adapters.

Once the MX-50 was situated in a face-up position, station personnel gave it

... personnel gave it high marks for ease of use.

high marks for ease of use. Its push buttons are large, well marked and have a nice touch. Mechanical action is smooth and precise and there is good access to the tape path.

Standard features impress

The MX-50 has a noteworthy list of standard features as well as some very worthwhile options that you do not have to pay for if you do not need.

Just about everything the machine does can be remote controlled via its 32-pin remote connector. Or, for \$250, you can purchase Otari's remote control box and just plug it in.

Speed can be varied $\pm 8\%$ from the front panel or up to $\pm 50\%$ with an external sync source.

Welcome also is the real time tape timer, which displays hours, minutes and seconds. It incorporates a search-to-cue locator with one cue point memory, as well as a zero location memory. I am glad to see these "cassette deck" features in a professional reel machine.

Standard speeds are $7\frac{1}{2}$ and 15 ips, although the machine is available with $3\frac{1}{4}$ ips as an option. Of course, you can select NAB or IEC equalization with a provided switch.

It is also interesting to note that two

MX-50 machines are available, the MX-50N (NAB, two-track, two channel) and the MX-50D (DIN Stereo).

Interfaces to switcher

A feature exclusive to the MX-50D is its interfacing of the transport play control to switch contacts on the broadcast console fader or some other switching arrangement. Access to this function is through a separate "fader" port on the rear panel.

By far the most fascinating option available on these machines is the Voice Edit Mode (VEM). This requires the simple installation of a VEM-PCB inside the machine. Placing the machine in the VEM speed mode doubles the selected play speed (e.g., 15 ips becomes 30 ips).

However, the pitch of the recorded material during the VEM speed mode remains normal and constant. I see this as a real boon for those who edit lengthy lectures and similar material.

Three MX-50N machines were installed at WJTT—one in the control room and two in the production studio. As of this writing, all have performed flawlessly for several weeks.

Everything in place

A few fast performance checks, such as frequency response, noise, tracking error and the like, were made on all machines before placing them in service. All had survived shipping in good order, and I found that no adjustments to factory settings of heads or controls were needed.

As stated before, operating personnel are very vocal about how much they like these machines. This kind of unsolicited praise is not often forthcoming relative to a new piece of gear.

At a suggested list price of \$2495, the MX-50 is a lot of reel-to-reel tape machine. I believe it will quickly become an oft-seen item in stations across the country.

■ ■ ■

Editor's note: S. Parks Hall, in addition to his duties as CE at WDOD, works as a contract construction engineer at several stations including the aforementioned WJTT. He is an SBE-certified senior broadcast engineer. He may be reached at: 615-265-9494.

For more information on the MX-50 recorder, contact John Carey at Otari: 415-341-5900, or circle Reader Service 96.

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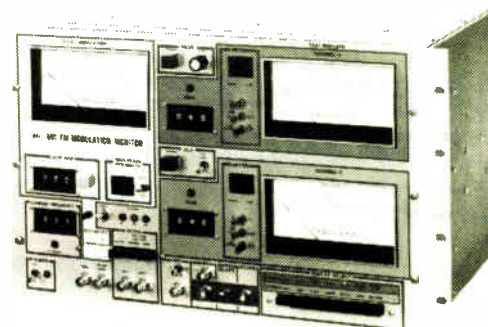
Other benefits of the 691 include over 40 proof-of-performance and signal quality measurements. Add a scope and use the 691 as a spectrum analyzer... or get a vector display of L/R phasing. Perform a Bessel-Null calibration in minutes. Measure clipped composite accurately and quickly.

The 691 can now be optionally ordered to measure two SCAs. There are many other features... write or call for complete information.



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Panasonic Previews DAT Editing

by Chris Foreman,
Pro Audio Mktg Mgr
Panasonic Professional Audio

Cypress CA At this year's NAB convention in Las Vegas, Panasonic demonstrated prototypes of two high-technology digital audio tape recorders and a DAT editing controller.

The portable and studio DAT recorders included several advanced features, including four heads (two for recording, and an additional pair for off-tape monitoring), AES/EBU-format digital inputs and outputs and time code recording and playback.

The DAT edit controller, designed for use with a pair of studio machines, allows frame-accurate assemble and insert editing of DAT tapes in a manner similar to VCR-based techniques.

The purpose of these demonstrations was to solicit comments from broadcast industry professionals concerning what features and capabilities the final products should have, likely applications for such products and prices that would be acceptable to the industry.

Positive reaction to DAT

Hundreds of radio, television and other industry professionals offered valuable comments on the prototypes and the enthusiastic response has convinced Panasonic that professional DAT

products can be utilized effectively not only by radio and TV engineers and production staff, but also by professional users in many other communications markets.

As a review, we include here a digest of the main features and capabilities of the prototype Panasonic DAT editor and portable and studio machines demonstrated at the NAB convention, along with comments on applications for the radio broadcast industry.

Four-head design benefits

Current DAT recorders utilize a VCR-type helical recording system with two recording/playback heads located on opposite sides of a rotating cylinder.

TECHNOLOGY UPDATE

The pair of heads record alternating tracks diagonally across the tape. Unfortunately, such a two-head system does not allow true off-tape monitoring since, after the first head has recorded one track, the tape must move far enough to allow the second head to record the next track.

Thus, a recorded track moves out of reach before it can be accessed for monitoring/playback during the recording process.

A four-head design solves the problem by placing two extra "read" heads between the two "write" heads. Because the head spacing is now 90° instead of 180°, the "read" heads can access the most recently recorded track before it moves too far out of reach.

True off-tape monitoring is invaluable during any studio or remote recording

... such a two-head system does not allow true off-tape monitoring ...

session, but will be especially valuable during live sessions and for recording programs off-satellite for re-broadcast at a later time.

There are no "second takes" for these types of recordings. Off-tape monitoring also makes a portable DAT recorder much more valuable to a journalist who wants to be sure that his on-site interview is actually being recorded to tape.

A DAT machine equipped to record conventional SMPTE time code can "chase" and "sync" with a video recorder so that the DAT deck can be used in video (and film) production and post production.

This could be valuable not only to television stations and independent video and film producers, but also to a radio station handling simulcast playback with a local TV outlet.

Editing possibilities

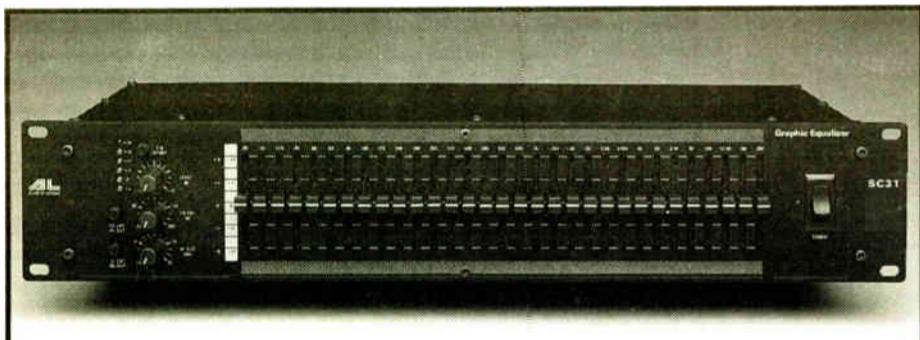
More likely, however, a time code capable DAT recorder will allow a radio station to do sophisticated, subframe-accurate tape editing similar to that offered by video technology.

Current DAT recorders allow simple editing via "PNOs" (Program Numbers or Index points similar to those offered by a CD player), Start IDs and Skip IDs. But these current DAT recorders do not provide the kind of precise location and editing that a time code equipped DAT will allow.

The DAT recorders demonstrated by Panasonic convert conventional SMPTE/EBU time code into the NHK standard "DAT Time Code," which is recorded into the subcode area on each tape track. On playback, this DAT time code is then reconverted into 25/29.97/30 fps SMPTE/EBU time code.

Two major benefits are offered by this time code recording technique. First, synchronizers and editing systems, etc., connected to the DAT recorder, need only deal with SMPTE/EBU-format time code, which makes the units fully com-

(continued on page 57)



This Baby Can Handle the Curves

Audio Logic graphic equalizers from DOD stand up to the tough tasks of smoothing out audio rough spots. Balanced inputs and outputs, predictable filtering, and sparkling audio performance are only the beginning. From the switches to the power supply, DOD overbuilds the guts of these EQ's, so that they will provide years of reliable service.

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Interfacing with the Panasonic SV 3500

by Mark Gallaher,
Computer Operator
Pasadena Star Newspaper

Montrose CA Most of those reading this publication will be familiar with the Panasonic SV 3500 Digital Audio Tape deck, or DAT.

This recorder has several valuable operating features. The one that is probably the most clever is the tape index codes. A code may be placed at the beginning of a particular track and this can be used for cueing. If a number of tracks are recorded on a single tape, you could access them randomly by using the index codes.

TECHNOLOGY UPDATE

This is where my DAT Interface Unit, or DIU, comes into its own. With this interface and the computer of your choice, you can create multitrack tapes, index the individual tracks and place this information in your computer.

Commands come from computer

To play a particular track, you could type in the track name, or perhaps select from a list of tracks. Your computer would then issue the appropriate commands, via the DIU, to the SV 3500 DAT.

With a modest programming effort, you could catalog a number of tapes this

way, and have a programmable audio playback system. One good use for this would be commercials and music selections for commercial broadcast studios.

Allow me to describe the actual operation and design of this interface. The SV 3500 has front panel controls for rewind,

The control code your computer sends must be translated on two levels to what the SV 3500 expects.

play, etc. It also has an internal set of commands, accessible via a serial interface.

By sending the equivalent of the "Stop" command through this port, the SV 3500 will stop tape movement. The idea is the same with all of the front panel controls. Each front panel feature has a matching, unique port code.

This serial port is not compatible with any computer I know of. The electrical characteristics are wrong, and the code itself does not match the way your computer deals with its data.

Code translation

The control code your computer sends must be translated on two levels to what the SV 3500 expects. The electrical part

(continued on page 57)

The Un- Processor.

Introducing FM ModMinder from Modulation Sciences

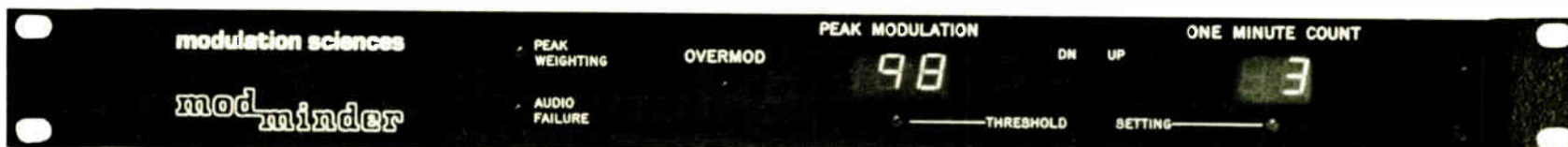
Now you can increase modulation with less processing, and still stay within FCC limits. Another "miracle processor?" Not at all: Modulation Sciences' FM ModMinder™ is *The UnProcessor*. It doesn't alter your signal in any way. It gives you a new, more correct measurement of modulation.

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—Bryan King,
Chief Engineer, KLBJ AM-FM

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3M

Designing a Computer Interface For DAT

(continued from page 54)

could be handled by a relatively simple circuit. The software could be handled by your computer, but it would be specific to a particular machine, and would require a thorough knowledge of the machine's hardware systems.

The interface I designed addresses both problems. It is a microcomputer in itself. The original design used a Motorola 6809 advanced microprocessor, static RAM, an EPROM, an SY6551 ASCII to interface to the computer and a handful of chips to drive the DAT output cable.

Once the system proved operational, I redesigned the interface to use a Moto-

of interrupts to determine when to perform its next action. The interrupts are only used while actually sending a code to the DAT. When idling, the interface simply waits for a command byte from the computer.

Many of you may be familiar with a programming language or two, such as BASIC, Fortran, COBOL, etc. You write a program and your computer executes it.

But, how does your computer *know* Fortran or BASIC? It has lower-level programming, usually written in assembly language, known as the Operating System. In most cases, it is called DOS (Disk Operating System) because the computer uses disk drives. Assembly language is cryptic and difficult to use because it is closer to the computer's instruction language than to anything humans use.

The process of installing software into EPROM is known as burning.

rola 6802 microprocessor. This IC also has some static RAM on-chip, so I reduced the chip count by one.

The software needed was relatively straightforward, although it took considerable design effort. I had several program ideas and finally decided upon an interrupt driven program. This type of programming was needed to provide the precise timing the DAT requires.

Programmable interrupts

To do this, I needed a source of programmable interrupts. The Motorola 6840 Programmable Timer Module was then included in the interface. This chip can be programmed to generate attention-getting signals for the MPU.

The Panasonic documentation on the serial command stream used time units (T) whose length was 434 microseconds. As the smallest T group was 2T (two time units, or 868 microseconds), I set the programmable timer for this value.

The program uses this regular source

Machine code programming

But a more primitive level exists. It is called Machine Code; programming the computer in its own special language, a language composed of zeros and ones. No Print or Input statements here. And Machine Code is unforgiving; a mistake is usually disastrous. The microprocessor does not have any inherent error-checking or recovery routines.

In BASIC, a mistake may cause your program to stop, or yield incorrect results. But the computer is still running. BASIC will allow you to retype a line, or otherwise fix your error. It told you of the error, because BASIC expects and looks for errors.

In Machine Code, the computer is absolutely confident in your ability to code perfectly. It does not look for or expect any errors at all. When one occurs, the machine can do just about anything. It usually just stops, or hangs and you need to reset it to start again.

Burn, baby, burn

When building a computer, such as the DAT interface, I program in Machine Code. The program itself is installed in-

side an EPROM, which is a semi-permanent memory device.

The process of installing software into EPROM is known as burning. Once inside the device, the program will stay for nearly 80 years. If the program is small enough to fit into an EPROM, no disk drives are necessary.

This is a fun hobby; the work never ends. I had to design a computer to burn EPROMs! I have several computers that do nothing but test the hardware of other computers.

I have computers that digitize audio signals, modulate laser beams, control the stepper motors of robotic arms,

translate Morse Code from audio to characters on a terminal, and multi-user computers which will soon be the heart of a multi-user bulletin board system.

An interesting project I have going at the moment is voice recognition circuitry for computers. When this new technology is fully realized, I will no longer be able to say that nobody listens to me! Now, if I could only install this on the lawn mower . . .

■ ■ ■

Editor's note: For more information on computer interfaces to DAT decks that utilize interface ports, contact the author at: 818-248-8372, or circle Reader Service 76.

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DAT Editing System In Preview at Panasonic

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patible with existing and future time code devices.

Secondly, because Panasonic chose to implement the NHK-proposed standard DAT time code format, a tape recorded on a Panasonic time code equipped recorder can be played back, with full time code implementation in any other brand of DAT recorder that uses the same NHK time code standard.

Complications arise

There are at least three digital transfer standards currently in use, and at least two common sampling rates (44.1 kHz and 48 kHz).

This situation greatly complicates what should be a simple process: making a digital backup copy of a digital tape recorded either in the studio, or from satellite during a remote session or on-site interview.

To help solve the problem, the AES,

in cooperation with the EBU, has developed a recommended digital audio transfer standard, AES3-1985 (CCIR-647), which has already been implemented on the majority of professional digital reel-to-reel recorders, signal processors and workstations. It has also been adopted by Panasonic for its new-technology DAT recorders.

Panasonic incorporated many other advanced features into its demonstration DATs, including a four-motor direct-drive system, a multifunction LCD display, high-speed cueing and high-speed audible locating, edit preview/rehearsal, digital cross-fading, serial or parallel remote control and DAT subcode editing.

Additional features and capabilities may be incorporated into the final products, which are expected to be made available during 1990.

■ ■ ■

Editor's note: For more information, contact the author at: 714-753-7277.

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WMTR Sings Praises of Sony PCM 2500

(continued from page 53)
right channels independently.
The 2500 allows us to perform high-speed search operation and we utilize all three subcodes. For example, Start ID, Program or Commercial number and Skip ID are written into the subcode area. A commercial or musical selection can thus be located at high speed or searched for directly.
The Skip ID is used to skip over any unwanted portion of material during playback. When utilizing our request lines on WMTR, we can call up any one of over 3000 selections in less than 50 seconds. The selection is simply cued,

paused and ready for on-air.
Audience reaction to this has been more than positive. I continually get comments from people wondering how

USER REPORT

we are able to get their selections on-air as quickly as we do.
For commercial production, we utilize both 48 kHz and 44.1 kHz when recording from analog source material, and we utilize the unit's built-in em-

phasis circuit extensively.
The emphasis circuitry is activated for analog material because the SNR of high frequencies is improved by raising the recording level and lowering the playback level. When the 2500 is connected to another digital tape recorder for mass production of digital material, sound can be dubbed digitally with no distortion.

No going back
At WMTR we are very pleased with the operation and performance of the Sony PCM 2500. I cannot imagine going back to standard cart machines. The DAT

machine is definitely today's best record/playback source.
The Sony PCM 2500 is without question the best DAT production machine manufactured, and I can easily recommend it to the broadcast industry. What it will do for your production and on-air sound will amaze you and your audience. Your on-air staff too will love working with the PCM 2500 for production.

■ ■ ■
Editor's note: Max Smith may be reached at: 419-445-9050.
For more information on the PCM 2500, contact your nearest Sony representative.

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Sony D-10 Handles AP News Responsibilities

(continued from page 51)
recording and playback available in a portable tape machine. The light weight of the D-10 makes it easy to lug around an entire day.

I thought there might be a problem using broadcast-quality microphones, since the input impedance of the D-10 is specified at 10 kilohms. The Sennheiser MD-421 and the Electro-Voice RE-16 I use are both low impedance. But there was no audible frequency response roll-off or level problems.

Sony has included a remote-control on the D-10/D-10 Pro. I thought this would be rather silly to use, since the machine is so small and available at arm's reach.

But the remote (wire-type) includes a threaded assembly that accepts a mic holder, facilitating on/off tape transport. Again, the bulk of the assembly is something that detracts from the portability of the D-10, but its use is worth considering.

The unit also has an interesting self-diagnostic circuit that checks rotation of the head assembly, capstan and transport spindles. It also checks for condensation moisture on the tape, which could damage the head surface.

There are some useful features miss-

ing from this machine that reporters have come to expect of any primary portable tape deck. Mic/line mixing is not possible. Nor is it possible to monitor tape/source.

But the outstanding fidelity of R-DAT helps make up for shortcomings that will likely be ironed out as this emerging format develops.

I found the best way to use this machine was to record whatever on-location event was unfolding, then bring back the recording to dub onto a studio open-reel machine. This allowed razor-blade editing and mixing as if the open-reel "dub" were the master.

Bringing back the tape for a final mix-down is a luxury not always available to street reporters. But even the crude field production possible with R-DAT can result in coverage whose fidelity really conveys the old radio newsreel feeling of "you are there."

■ ■ ■
Editor's note: Paul Courson is an AP correspondent and former assistant engineer at WLMD in Laurel, MD. He is also a ham radio operator. He may be reached at: 202-955-7250.

For more information on the Sony D-10 Pro, contact your nearest Sony representative.

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those supplied as optional items on competing products, allowing much greater creative freedom. Input channel auxiliary send sections are designed to be the most versatile in the industry, providing 4 different auxiliary buses to allow digital delay, reverb, talent foldback, and mix-minus feeds. Stereo input channels can provide either mono or stereo effects sends. Even more, the SP-6 has 4 auxiliary effects return inputs that allow effects to be recorded onto the multitrack or sent to the monitor buses.

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