

REGULATORY NEWS

Hard Look Policy To Continue

by Alex Zavistovich

Washington DC ... Citing an increase in the number of major FM applications processed by the FCC, Mass Media Bureau Chief Lex Felker told engineers in Washington recently that the Commission would retain its "hard look" policy for applications in the FM service.

"The burden will be on the applicant to submit the information correctly in the first instance," said Felker, addressing a 19 November luncheon gathering of the Association of Federal Communications Consulting Engineers (AFCCE).

"The burden will be on the applicant to submit the information correctly"

In his informal, question-and-answer talk, Felker affirmed his intention to uphold the "desirability of market forces" in accomplishing certain objectives. He stressed, however, that the FCC will not remove itself entirely from regulatory activities.

"Even the marketplace needs its 'rules of the road,'" Felker remarked.

Among those rules, apparently, is the "hard look," a policy implemented by the Commission in late 1986 in which scrupulous attention is paid to FM applications. Applications deemed by the FCC to be "substantially incomplete" are returned.

The policy has been widely opposed in the engineering community as an excessive and extreme method of reducing the number of backlogged FM applications at the Commission.

Felker maintained that prior to the policy, particularly in the FM service, there was "a lot of give and take" between the applicants and processors to resolve inaccuracies or omissions.

"Our volume of applications is such that, if we were to pursue that course of action today, we would delay substantially the initiation of service to the public," Felker said.

Although he acknowledged that the hard look policy for FM applications has "not been without some cost" to engineers, the policy is "the best arrangement we could make for the public."

Felker cited a current 5% return rate on FM applications, compared with a 40% rate recorded just after initiation of the policy. This difference, he said, indicates that "the pain has passed" and that engineers now understand what the FCC is looking for when it processes FM applications.

He commented that complaints about the 5% return rate on applications were a case of "the tail wagging the dog," and were insufficient grounds to eliminate the policy.

Over the last several months, he continued, the Commission has increased the volume of applications processed "by 60 to 70 percent," which he admitted was due not only to the policy but to the imposition of new filing fees.

The number of new major FM applications processed "is well over 400 per quarter," Felker commented. He also speculated that "as a result of this record production, we'll be able to open the remaining 80-90 windows over the next 10-12 months."

That timetable for 80-90 windows "is nine months ahead of schedule," he

pointed out. One year earlier, the Commission estimated itself to be 18 months behind schedule on the window openings, Felker explained.

"On the basis of all that, I must conclude that the combination of policies has had the desired effect," Felker said.

Reactions from the engineers on hand at the AFCCE luncheon were decidedly critical of the Mass Media Bureau Chief's position. Typical of the engineers' attitude was a comment by Robert du Treil of the DC-based engineering firm du Treil Rackley.

"If he (Felker) had said applications were being processed in 30 days, or 60, or even 90, that would be one thing," du Treil said. "But when it still takes over a year sometimes to process an application, even with the hard look processing, that's a load of B.S."

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FCC Clips

Synchronous deadline extended

On 6 November, the FCC extended the deadline for comments and replies on docket MM 87-6, regarding standards for the use of multiple synchronous transmitters by AM radio stations.

With the extension, comments are due by 9 May 1988; the deadline for replies is 8 June 1988.

The additional time granted by the FCC marks the third extension of the deadline on this issue. Previous requests for extension have cited the lack of technical data on several experimental synchronous stations.

Contact the FCC news media information office at 202-632-5050.

Possible relocation of FCC

By some accounts, the FCC plans to consolidate its three Washington, D.C. headquarters buildings—1919 M St., 2025 M St., and 2000 L St.—into one, following the expiration of leases held on the buildings.

The lease on the Commission's main building, 1919 M St., expired this past October. The 2000 L St. and 2025 M St. leases are to expire in March 1988 and December 1989, respectively.

Contact the FCC news media information office at 202-632-5050.

New bureau appointment

Kathie A. Kneff on 5 November was named chief of Informal Complaints and Public Inquiries Branch of the Common Carrier Bureau (CCB) Enforcement Division.

Employed at the Commission since 1978, Kneff most recently worked in the FCC's Tariff Review Branch, joining that branch in 1985 after five years with the CCB Consumer Affairs Division.

Contact the Informal Complaints and Public Inquiries Branch at 202-632-7553.

Abuses in licensing, allocations

In comments recently filed with the FCC, the NAB has suggested the Commission remove any incentive for groups who may file against a station at license renewal time for private gain.

The NAB's comments are in response to an inquiry by the Commission into methods of preventing abuses in the broadcast licensing and frequency allocation processes.

Some individuals or groups, the FCC said, use petitions to deny to "extract some financial consideration from an applicant," rather than to raise questions of an applicant's fitness to be a licensee.

To combat the problem, the NAB suggested that "a petitioner should only be able to recoup the legitimate and prudent expenses incurred in preparing and prosecuting the petition."

FCC docket is MM 87-314. For additional information, contact Mark Solberg at the FCC's Mass Media Bureau: 202-632-7792.

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Hi-Fi AM Radios: On the Way?

Editor's note: Efforts on behalf of improving the technical quality of AM radio have given AMers reason to be optimistic again. Voluntary adoption of the NRSC standard is helping to clean up the band.

But the other half of the equation is the introduction of new, high fidelity AM radios. Prototypes have been developed but the marketing has not yet begun. This special report will look at some of the factors and possible obstacles in the development of new radios for AM. Part I examines a possible economic impediment in the form of a proposed tax on receivers.

by Alex Zavistovich

Washington DC ... A proposed excise tax on television and radio receivers, submitted to Congress by the NAB, has led some observers to wonder whether its implementation might slow the availability of National Radio Systems Committee (NRSC) compliant receivers.

Special Report

The tax, however, is not the only possible impediment sources see in the development of NRSC radios. Some suggest that receivers compliant with the standard will not be available until the AM stereo situation is resolved.

The NAB's tax proposal, made in early November, calls for a 1.5% to 2% excise tax on TV sets and radios. The proposed tax is a response to a Senate suggestion to charge a fee for license transfers as a means of reducing the federal deficit.

Strong opposition to the tax has been voiced by a number of parties, including the Electronic Industries Association (EIA).

In addition to general concern over the plan, industry sources suggest the proposed tax may also discourage receiver

manufacturers from building NRSC radios by reducing their profit margins.

Receivers unavailable

Since the NRSC adopted its voluntary national standard in September 1986, some 441 stations have converted to its prescribed 75 μ S preemphasis, and 10 kHz stopband, according to NAB Director of Spectrum Engineering Mike Rau, NRSC coordinator.

However, NRSC-compliant receivers are as yet unavailable, except in prototype form.

Dave Van Allen, a consulting engineer and NRSC member, maintained manufacturers may be reluctant to take action on NRSC receivers until the AM stereo issue is resolved.

"It is more enticing for a company like Delco to offer a brand new AM stereo Hi-Fi, with extended listening range than to say, 'This model has re-styled front displays,'" Van Allen said.

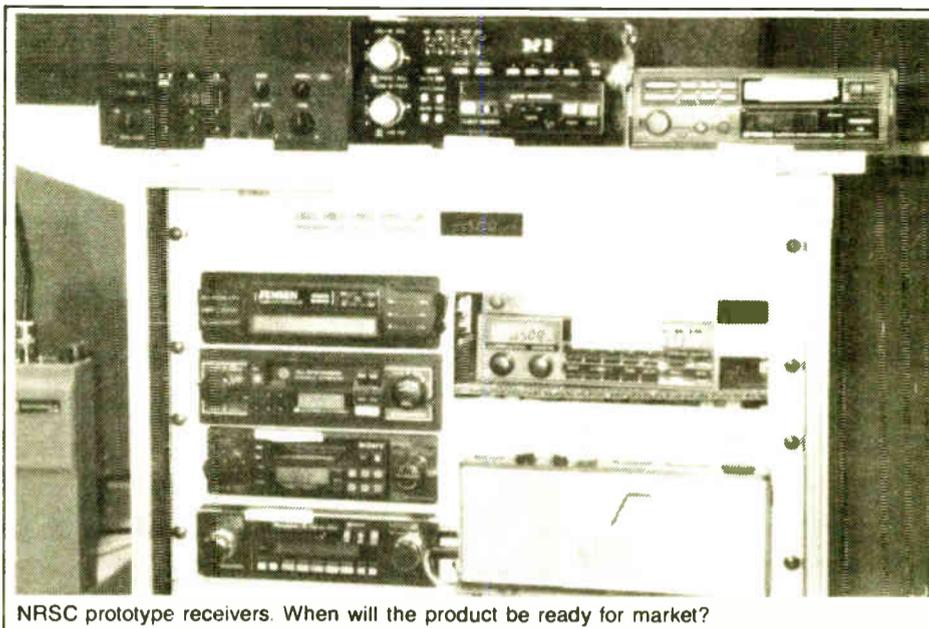
Delco Design Engineer Bill Gilbert acknowledged that design efforts to implement the NRSC standard in Delco components have been directed only in stereo radios. However, he stressed that there is "no lack of commitment to the NRSC standard" at the company.

Whether that commitment would be as strong if the NAB should succeed in having an excise tax imposed on receivers, however, is another matter.

Some observers are concerned that, if a receiver manufacturer determines the tax would cut into company profits, the company may be unwilling to put out an unproved new item—such as a NRSC-compliant radio.

NAB spokesperson Sue Kraus maintained that the tax would likely "not discourage manufacturers from building radios." She suggested that the tax represents such a small sum for each item that profit margins would not be greatly affected.

The excise tax proposal was one of several options suggested by the NAB as



NRSC prototype receivers. When will the product be ready for market?

an alternative to a measure put forth by Senator Ernest Hollings (D-SD), chairman of the Senate Commerce Committee.

Besides a 2% to 5% fee for station license transfers, the Hollings proposal also seeks to breathe life back into the fairness doctrine, by increasing the fee for stations which do not support the equal-time measure.

The NAB has been vocal in its op-

position of the transfer fee, labelling it "unlawful double taxation." Kraus explained that stations already pay fees for license transfers, based on the cost of processing applications.

As an alternative, the NAB suggested the excise tax of either 1.5% or 2% on the sale of VCRs and radio and TV receivers. A 2% tax would raise an estimated \$351 million in 1988, according to the NAB.

(continued on page 6)

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When Radio Was Your Cousin

by Judith Gross

Falls Church VA . . . As a radio listener I consider myself one of the lucky ones.

I grew up on New York City radio a la '60s: rock and roll, AM on a transistor set. That meant W-A-Beatle-C. That meant Cousin Brucie on a Saturday night.

Then I got to grow up and write about my first love: radio, and meet many of the on-air greats I idolized. And I find out that at least one of them is a genuinely nice guy whose feelings for radio run deep.

Bruce Morrow, for anyone who didn't know him through the airwaves, was and is Cousin Brucie: former WABC DJ, past owner of a group of stations, professor of radio at New York University, movie actor and now author of a book, *Cousin Brucie: My Life in Rock and Roll Radio* (co-

Unlike some books on that sparkling age of radio, when the *Cousin Brucie Saturday Night Dance Party* managed to corner an astounding 25% of the listenership (the number one station in NYC today gets a whopping 6%), Bruce Morrow doesn't take credit for every radio programming invention since the on-air caller.

Rather, he lets you see the crazy world of rock and roll '60s radio through his eyes, with a view that is always in awe about what is happening, whether it's the mob scene of the Beatles' concert at Shea Stadium, or the homey-ness of a twist contest at Palisades Amusement Park (swings all day and after dark!).

And one of the things you find out is that Cousin Brucie is more than an on-air facade. He's a student of radio's technical side as well.

"I loved technology," he says in the book, "I wanted to know how every electrical device worked."

NYU helped feed that technical hunger by allowing him hands-on use of the equipment. His devotion to the technical side of things led him to create the first radio station NYU ever had, a wired-up affair that played classical music on campus.

NYU still has a radio station, but by now the music is transmitted over the airwaves, instead of coaxial cable.

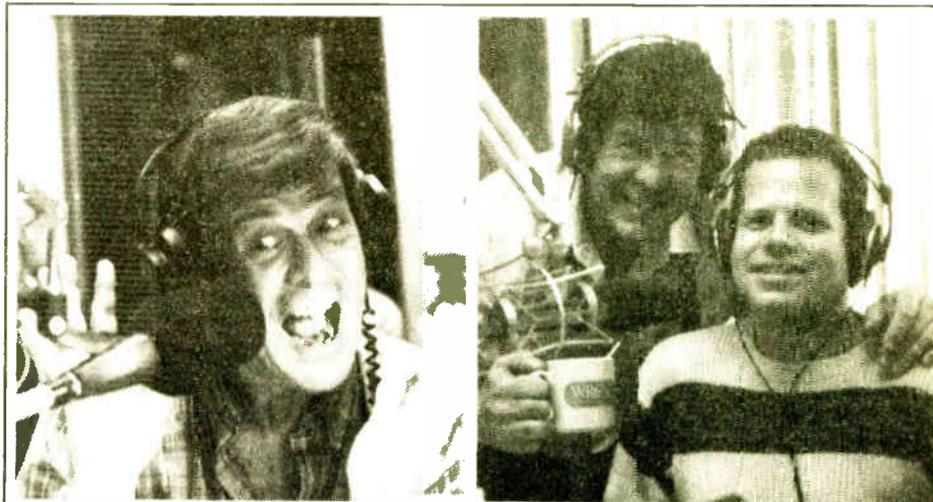
Brucie still likes to boast, "I can take apart a transmitter,"—a talent that no doubt helped him when he was acquiring radio properties in the 1970s.

☆☆☆

Especially interesting in the book are Brucie's analyses of the decline of AM and the rise of FM.

He calls stereo "the six-letter four-letter word" to AM and indicts AM managers for failing to recognize and keep pace with a changing music scene and listenership.

FM, something short of a monetary success, had fewer commercials, hired



Cousin Bruce Morrow lets loose with his famous "e-iyee" trademark wail at WCBS-FM's Rock and Roll Radio Reunion in 1983 (left) and joins WWRC morning news man Bruce Alan in October.

DJs who worked for less and sounded like your roommate in the dorm who knew where the "party" was, playing longer album cuts on the edge of the changing music scene.

And what did AM do? It continued to play commercial on top of commercial, hire big name DJs at high salaries and play top forty 45s.

"With FM largely identified as the freewheeling radio band, AM had become the radio of rigidity," he says.

And AM managers reacted by hiring consultants and bombarding their staffs with memos and formulas, becoming even more rigid.

And that was the beginning of the end for AM radio, and for the glorious days of WABC, which went all-talk in 1982.

But fortunately not the end of Cousin Brucie.

☆☆☆

Brucie has sold the stations he acquired, and now, "a happy man" as he calls himself, he gets to do radio the way he likes to, so it's fun again.

He hosts the *Saturday Night Dance Party* live on New York's WCBS-FM, and does a syndicated countdown show for

CBS' RadioRadio.

And, on a blustery Friday morning in early October in Silver Spring MD, there he was, the effervescent voice from the past, co-hosting the morning show on WWRC with Bruce Alan, in the place of vacationing Ed Walker.

Why? Because it's fun, that's why. Because radio is still his extended family, and he feels at home at the mic on an AM station where the listeners really do treat him like a cousin.

It makes you wonder how Cousin Brucie has survived to the frantic '80s, how a man corny enough (by his own admission) to consider radio his family could still be so popular in these days of *The Greaseman* and the likes of Howard Stern.

But he is. With some sobering thoughts on radio today.

"Radio is a sacred trust," he told me, "the most personal of all mediums."

"I'm very upset by radio today; it's not 'shock' it's schlock," Brucie says, calling it "hyper-drive bad taste."

He thinks that eventually audiences will tire of the bathroom humor and bigoted references characterizing radio today. "Personally," he says, "I find it boring."

He says that what AM needs these days is plain, simple "imagination."

"AM is being forced into doing creative programming, which we lost, when the radio business became the business of radio," he says.

And now, with a list of success stories in nearly every aspect of radio behind him, Cousin Brucie is content to do radio for the fun of it, educate a new crop of future broadcasters at NYU's Tisch School of Communications, and still be everybody's favorite cousin.

Which only goes to show that, at least in radio, nice guys don't always finish last.

☆☆☆

Keep in mind that we're still waiting to see how clever you are in coming up with a catchy name for the new, high-fidelity, NRSC, stereo AM radios that are promised to be the wave of the future.

Send them along to the address at the end of this column and we'll forward them to the NRSC and award a mug to the best one.

And that signs off another year. Happy holidays and tune us in '88.

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 Radio World mug.



authored by Laura Baudo and published by William Morrow—no relation).

Here's a great gift idea for anyone on your list who thinks fondly on times past and present when, as Cousin Brucie puts it, "Radio was an extension of your family . . . nearby friends, not faraway stars."

The "cousin" monicker is an example of that. In the book you find out it was a wandering woman (who would only be called a "bag lady" by today's jargon) coined the name for him after he agreed with her that all mankind is related.

She replied by asking, "Well, cousin, then can you give me fifty cents please?"—so she could take the subway home to the Bronx.

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OPINION

Readers' Forum

Got something to say about *Radio World*? Any comments on articles? Call us at 800-336-3045 or send a letter to Readers' Forum (*Radio World*, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776).

Help for RFI

Dear RW:

This letter is in reference to the article in your 1 October issue, page 15, "AM Faces Electrical Interference" by Michael Callaghan of KIIS-FM, Los Angeles.

We manufacture high voltage capacitors for the broadcast industry. We also do power supplies, transformers, and ohm's law family of weirdos types of custom filters.

The part of this article that caught my attention was "need for conditioners to temper the 6000 V spikes coming in the power line." Also the indication that there are problems with the new SF6 superfast switches.

Have any numbers been quantified, or are there any scope pictures of the spike waveform and computer power supply "ring?"

Usually with such applications as Snubbers, SCR Commutation, RF (induction equipment) we get ringing frequencies or pictures or harmonics to consider in the design parameters.

I can't imagine this problem hasn't been solved by the power line filter or conditioning people. Or the circuit protector people. Or the OEM's.

Maybe there is a niche product for us here? Maybe we could help?

Perhaps the high voltage is the problem for the majority of OEM's? (too expensive?)

I always find something in your publications.

Perhaps "dirty power" will become another of my favorite buzz words, like

"Danger High Voltage."

How can we help?

Tom Brown
Plastic Capacitors, Inc.
Chicago, IL

Action on RFI needed

Dear RW:

The article by Michael Callaghan (1 October RW) entitled "AM Faces Electrical Interference" has I think, a much greater significance than many of us realize.

A few years ago I suggested that the FCC set a standard for radiated emissions below 30 MHz such as those in effect in Europe.

There is no standard for interference radiated from power lines or the hundreds of electronic devices in our homes such as TVs, and as a result they cause a lot of interference on AM radios.

I believe the general public does not understand this enough to make a complaint to the FCC.

It is very difficult even for me as an engineer to begin to find the source of interference to my AM receiver especially when it comes from a leaking power line insulator a quarter of a mile from my house.

(continued on page 9)

The NAB's idea to stave off a transfer tax on stations by taxing VCRs, radio and TV receivers once again pits the political interests of the industry against those of technical improvement.

The receiver tax, which shifts the burden to consumers, comes at a time when many are trying to encourage the introduction of new, better fidelity AM radios.

The NAB itself has worked to encourage AM technical improvement with its support of the NRSC standard, among other efforts.

On the one hand the NAB optimistically assures receiver manufacturers that there is every reason to spend the time and money needed to design and market new AM radios, and assures AM stations that new radios are forthcoming.

Receiver Tax Will Hurt AM

Then on the other hand it gives receiver makers one more reason not to venture forth with an unproven product.

The consumer is price sensitive when it comes to buying radios, and recent technical improvements on behalf of AM already add incremental costs.

The idea of putting yet another obstacle in the path of improved AM radios (for the purpose of funding public broadcasting), at a time when commercial AMs are struggling for survival gives AMers reason to question whether the NAB has their best interests at heart.

In addition to the threat it poses to AM's hope for better radios, the receiver tax would be expensive to implement.

Collecting a tax on each and every one of the millions of receivers sold in stores ranging from the discount drug mart to the audiophile's haven, then allocating it to public broadcasting sounds like a bureaucratic nightmare.

By contrast, the transfer tax would affect only a limited number of transactions each year and involve a simple to administer collection process.

The NAB should go back to the drawing board if it wishes to find an alternative to the transfer tax.

And in doing so should keep in mind that the most politically expedient idea is not always what's best for the industry from either a practical—or technical—standpoint.

—RW

Carts vs Digital: Myth & Reality

by Art Constantine

Moorestown NJ ... Here's a terrific idea. We'll take a little reel of tape, splice the ends together and put it in a cheap plastic box, so consumers can listen to Perry Como in stereo in their automobiles.

Better yet, we'll add a cue channel which uses tones to recue the tape so radio stations can play jingles and commercials without the hassle of cueing up electrical transcriptions or threading up reel-to-reel tape decks every 30 seconds.

And, of course, we'll improve the original 4-track consumer tape cartridge and ruggedize it to make a state-of-the-art stereo broadcast quality device.

We all remember the professional Fidelipac Model 300 cartridge—some were blue, some green—complete with beryllium felt-covered pressure pads.

The year was 1954, and the yet-to-be-standardized NAB tape cartridge was just beginning to find its way into broadcasting.

And that is how most people perceive the NAB tape cartridge system today.

Not dead yet

Now there's growing pressure on all of you to get rid of your tape cartridge equipment and replace it with someone else's idea of a much better system.

But before you deep-six your cartridge equipment in favor of R-DAT, S-DAT, floppy disk, Winchester storage or magnetic banana peel, let's take a realistic look at the performance and benefits of

today's modern cartridges and cartridge machines.

First, the NAB cartridge is instant start and totally random access. When you're reading the last line of live copy and suddenly realize that nothing is cued up, only a cartridge can get you out of trouble.

And, when a sound effect or other drop-in would fit just right in that live telephone conversation, you can slam a cart into an open slot and get audio gratification in less than a second.

Guest Editorial

Cartridges are recordable and non-volatile. I've still got my old Sharpie Artie jingles from my early radio days. And yet, cartridges can be easily, if not always properly, erased and reused.

Cartridges can hold a big, fat label, right on the end that faces the operator, containing title, artist, intro time, outro time, total running time, tempo and date, to name just a few bits of information.

And the color of the label can signify music rotation. (The label remains on the cartridge even after the power fails).

"Smart" cartridge

Modern cartridge equipment permits interaction between cartridge and operator.

Carts requiring live tags can be labeled to signal a jock as soon as they're inserted in a machine. Carts can give you

a 15 second warning before the end of the message.

Carts can be encoded with logging information which can automatically print after each cart has been played.

Carts can be synchronized to video using SMPTE time code. And, of course, carts can be used to start other carts.

SNR and beyond

Let's consider audio quality. In RW's 1 October issue, Rob Meuser writes, "... the tape cartridge is now nearly 30 years old ... a 30 year old mechanical nightmare that has a 48 dB SNR ratio."

With all due respect to Mr. Meuser, I suspect he hasn't measured a modern cartridge system.

Today's carts and machines will consistently deliver dynamic range in excess of 70 dB, wow and flutter typically below 1/10 of 1 percent, and frequency response within 1 dB far beyond the range of AM and FM transmission.

If you're looking for 100 dB SNR, simply connect the machine to your favorite noise reduction system.

The flexibility of the cartridge system has allowed it to outlive its challengers for well over 30 years. Today, the system does more for you than most people know is possible.

If you're waiting for the next generation of cartridge machines, wait no longer. They're already here.

Arthur Constantine is VP, Marketing, of Fidelipac Corporation, Moorestown, NJ. He can be reached at 609-235-3900.

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ALLIED

MEMO

TO: ENGINEERING STAFF
FROM: AMD
SUBJECT: GENTNER PATCH PANELS

STOP! Don't wire these patch panels yourself. Just heard that GENTNER will wire them to our specs with the fast delivery we need. With this kind of service, we can have that new room on the air ahead of schedule!

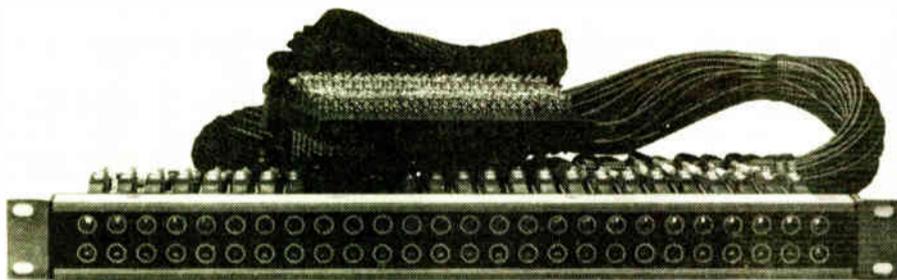
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New Radios for AM

(continued from page 3)

A percentage of that revenue, under the NAB's plan, would be set aside on out years for the support of public broadcasting. The provision echoes a similar stipulation made in the Hollings proposal.

Opposition to the plan

The NAB's excise tax plan has been met with opposition on a number of grounds. Some opponents of the measure have stated that support of public broadcasting should be voluntary.

Other alternatives for reducing the deficit and supporting public broadcasting have also been suggested by the NAB. A modified spectrum auctioning plan for nonbroadcast spectrum and a fee for cellular application lottery participants were also proposed.

While neither of those other two proposals have been particularly well-received either, it is still the excise tax which has heard the most vocal opposition.

EIA General Counsel Gary Shapiro called the proposal "outrageous" and noted the EIA has found "a total absence of support" for the excise tax plan.

The proposal is "unlikely to fly" in Congress, he suggested, because it pits the "economic elite" station owners against the balance of the Congressional constituency—consumers.

The concerns of the NAB about license transfer fees are ungrounded, according to Shapiro. Some opinions in the industry are that the transfer fee is "minor" compared to what ought to be imposed, and would scarcely affect the transfer of stations.

Although Shapiro would not say whether the EIA wholly endorsed the transfer fee, he commented that "anything is more practical than developing revenues by putting a consumption tax on individual consumers."

Where the proposed tax and the issue of NRSC receiver availability continue to cross is at the possibility that the tax might prevent manufacturers from making a unit whose profitability is undetermined.

The tax is also, in some respects, inconsistent with recent NAB action ostensibly for the promotion of AM broadcasting.

The NAB's request in November to have the NRSC standard made mandatory—to prompt the manufacture of higher fidelity AM radios—might seem to be counteracted by a proposal to have those same receivers taxed.

However, according to NAB's Rau, the association "does not believe the tax will dissuade receiver manufacturers from including the NRSC standard in future designs."

Like Kraus, Rau maintained that the cost to consumers if such a tax were implemented would not be prohibitive, and would not discourage the sale of those receivers.

Others disagree. Harry Simons, CE of WAEB-Allentown, PA, pointed out that receiver manufacturers operate on "very small profit margins."

Simons, a member of the NRSC, speculated that a tax on receivers would cause a "negative ripple effect," particularly in NRSC receivers.

"Implementing the NRSC standard in receivers will cost the manufacturer," he explained. Taxing the units in addition would mean a substantial increase in the purchase price of a new AM radio, which Simons said "would further deteriorate an already critical situation faced by the AM broadcaster today."

Van Allen concurred with Simons' position. He pointed out that adding the new NRSC standard may require a new layout for PC boards in the unit, and metalwork and other specifications may change.

"Cost assurance and control must be accounted for," Van Allen maintained. The addition of a new tax on receivers, he said, would undermine that assurance.

Early reaction from one receiver company, Delco, suggests that the tax proposal may not win many adherents among manufacturers.

According to Delco spokesperson Bill Draper, "Delco's interest is in the design and sale of receivers at a price our customers are willing to pay."

"Adding an additional cost burden on receivers would not be all that welcome a change," said Draper.

In part II, RW will examine how the controversy over AM stereo may effect the introduction of new AM radios.

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Antenna Construction Delayed

by Alex Zavistovich

Washington DC ... Although progress is still being made on the NAB's anti-skywave AM antenna project, difficulties in obtaining authorization for the project's test sites have delayed construction of the antennas.

In the case of one of the antennas—a monopole designed by Richard Biby, of Virginia-based Communications Engineering Services—the starting date has been pushed back another several months from the NAB's prediction earlier this year.

Expected this fall

NAB Director of Spectrum Engineering Michael Rau had expected a model

of the Biby design to have been constructed by this fall (see 15 August RW). However, approval was not given until late October by the owners of a Loudoun County, VA site, which the NAB wanted for the Biby antenna project.

A lease for the Loudoun County site was, at press time in mid-November, being drafted between the NAB and the property owners, Jack and Gloria Rickel, Rau said.

Once the lease is signed, he commented, the NAB will have a model of the Biby design constructed and erected on the Loudoun site.

The Biby antenna calls for a central monopole of 200'. However, for economic considerations, the model to be tested in Loudoun County will be

30' high. An operating frequency for the model was undecided at press time.

Rau expected that the Biby design project will be in full swing by the spring of 1988.

Prestholdt antenna

The second of the antiskywave antennas in the project is an array designed by Ogden Prestholdt, of A.D. Ring and Associates. At press time, the NAB had scheduled a mid-November meeting with representatives of Howard University.

The university is the property owner of a site in Beltsville, MD, on which the NAB would like to construct the Prestholdt antenna.

Also included in the November meeting will be consulting civil engineer Ed Osborne, who will survey the area prior to construction of the antenna.

Rau added that on 2 November the NAB filed a request with the Federal Aviation Administration (FAA), for permission to darken the lamps on the planned tower during specified times.

Observatory conflict

According to Rau, one of the reasons for the delay in implementing the Prestholdt antenna project was that Howard University operates an observatory in the vicinity of the intended test site.

Reportedly, Howard University spokespersons were concerned that, on the proposed 395' tower, warning lights—required by FAA regulations—might be an interference during astronomy classes' use of the observatory.

At press time, no word had come from the FAA regarding the NAB request for permission to periodically darken the lights. Rau commented that the agency's decision could determine where on the Maryland site the antenna would be constructed.

For additional information, contact Michael Rau at 202-529-5346.

duTreil-Rackley and A.D. Ring Will Merge

by David Hughes

Washington DC ... Two major Washington DC-based engineering consulting firms, A.D. Ring and duTreil-Rackley, have announced plans to merge effective 1 January 1988.

"It's no secret, the word is out," said Bob duTreil, who formed his partnership with Ron Rackley four years ago.

He indicated that the existing duTreil-Rackley firm will henceforth be known as duTreil-Lundin-Rackley, "a division of A.D. Ring, Inc."

The change in structure will allow parent A.D. Ring, with roots going back to 1941, to form other divisions in order to expand into other related areas, du Treil said. duTreil-Lundin-Rackley will be known as the "consulting engineering division," he added.

Neither duTreil nor John Lundin, of A.D. Ring, would say what those new areas are.

duTreil added that the merger will also be "more cost effective" for both firms, as well as fostering the computerization of the business. "Computer equipment is easier to afford with a larger firm," he said.

Keeping the duTreil and Rackley names as the title of the division, as well as A.D. Ring, will emphasize continuity, Lundin maintained.

"Both (duTreil and Rackley) have been in a business a long time, even though their firm is young," he said.

"We (A.D. Ring) needed help, and they (duTreil and Rackley) were looking to grow," Lundin added.

The new office, located at 1019 19th St., NW, Washington DC, will feature about 20 people—seven from duTreil-Rackley and 13 from A.D. Ring, duTreil said.

The previous phone number for A.D. Ring, 202-223-6700, will be the number for the new, expanded firm.

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COMREX®

AM Stereo

(continued from page 1)
stereo agenda item.

The petitions were filed by Press Broadcasting, Winfield Standiford, and Texar Inc., respectively. The first two suggested multisystem AM stereo receivers; the latter requested the FCC select a single AM stereo standard.

The NTIA examined the AM stereo marketplace, and suggested protection of the C-QUAM stereo pilot tone.

Indications before the item was tabled were that the petitions would be denied and that the FCC would not recommend pilot tone protection.

But the Commission was expected to issue some sort of comprehensive statement on the AM stereo situation.



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Wing Rumored As FCC Nominee

by Alex Zavistovich

Washington DC ... Although not officially announced, rumors in Washington suggest that Susan Wing, a communications attorney with the Washington-based firm of Hogan & Hartson, will be the next person to be nominated by the White House to fill a vacancy among the FCC commissioners.

The talk follows an official announcement in early November of the White House nomination of FCC attorney Bradley Holmes to a similar position.

Wing, who has worked for Hogan & Hartson for nine years, appears to be the White House favorite to replace Commissioner Mimi Weyforth Dawson. At press time, Dawson was engaged in Senate confirmation hearings for an appointment to deputy secretary of the Department of Transportation.

Wing was unavailable to comment on

the possible FCC spot.

If Wing's appointment comes through, it will no doubt come as a relief to the currently shortstaffed FCC. The Commission has been operating with only four members since April, when then-Chairman Mark Fowler left to pursue "entrepreneurial possibilities" in the broadcast industry.

However, the vacancy created by Fowler's departure seems sure to be filled by Bradley Holmes, currently chief of the Policy and Rules Division of the FCC's Mass Media Bureau. On 10 November, Holmes, who joined the FCC in May 1984, was announced to be President Reagan's choice for the position.

Long a frontrunner for the Commission position, Holmes was the preferred candidate of current Chairman Dennis Patrick.

Holmes declined to comment on his appointment. At press time, a confirma-

tion hearing for Holmes had not been set.

As for Wing, her name is not new in the search for FCC Commissioners. Prior to the selection of Holmes, Wing was in contention for the spot vacated by Fowler, and had interviewed at the White House for the position.

FCC Director of the Office of Public Affairs John Kamp was likewise unable to confirm rumors of Wing's selection to the Commission. He added, however, that "her (Wing's) friends are congratulating her, and she's accepting the congratulations."

Station Sales Slowed

Washington DC ... Corporate takeovers and market speculation created a "banner year" for radio sales in 1986, a trend which industry analysts say has made 1987 seem weaker by comparison.

According to Dan Gammon, President of Americom, a Washington-based media brokerage house, the market for broadcast properties in 1987, although strong, was not at the level it was in 1986.

In 1986, Gammon said, the market saw a "record year" for transactions.

Other analysts agree. Bruce Bishop Cheen, broadcast analyst for Paul Kagan Associates, said the projected sales in radio for 1986 totalled \$3.1 billion.

However, Cheen disputed Gammon's contention that the market in 1987 was not as strong as in 1986. If the industry trends continue along their projected course, he said, sales in radio for 1987 may reach \$3.8 billion.

Growth in 1986

The growth in broadcast sales for 1986 was attributed by both Cheen and Gammon to a number of conditions, such as increased "junk bond" transactions.

Another factor in the 1986 market condition was the purchase by multiple station owners of other such groups. Gam-

mon pointed to high-dollar "mega-deals" last year by companies such as Infinity Broadcasting as contributing to the rapid growth in purchases over 1986.

Tax reforms also affected the 1986 market, Gammon said. In particular, he noted that the capital gains tax is now at 28%, up from an earlier 20%. The change in tax laws caused many broadcast properties to change hands last year, he commented.

This year, however, Gammon has noted an "increased willingness to sell" over 1986. He attributed much of that willingness to the "crash" of the stock market on 19 October.

Uncertainty over the future of the economy, coupled with higher prices for broadcast facilities, have prompted many to sell, he said. He added, "I think prudent people are looking at these factors and thinking, 'Good time to get out.'"

Robert Szczepanski, of the auctioneering firm of Michael Fox Associates, said Fox has noticed "no slowdown" in sales arising from the stock market tumble.

"There may have been some contraction in larger deals," Szczepanski acknowledged. However, he stressed that 1987 Fox "made strides in reinforcing auctioning as a selling option."

Over 12 auctions have been conducted by Fox over 1987, as compared with 3 from the second quarter of 1986, which is when Fox began auctioning broadcast properties, according to Szczepanski.

Predictions for 1988

Despite what may have been a faltering after the stock market crash this year, analysts seem to feel the broadcast industry will maintain a healthy sales level in 1988.

"Radio deals through \$20 or \$25 million will be largely unaffected (in 1988), and will remain at the same activity level as this year," Gammon predicted. Above that, he said, transactions will "probably be a lot more rare."

Because of the absence of these higher-dollar "mega-deals," which Gammon noted were popular in 1986, the 1988 market will appear to be in a slowdown. However, he stressed, the more standard deals will still be taking place.

Cheen also anticipated fewer takeovers in the radio market in 1988. Longer term owning may be next year's trend, he said.

However, he added, if interest rates stay within 10%, transactions for 1988 will continue at a "respectable level."

For additional information, contact Robert Szczepanski at 301-653-4000. Contact Dan Gammon at 202-737-9000. Contact Bruce Cheen at 406-624-1536.

New Market for Vector

Doylestown PA ... A new player—Vector Technology—has entered the FM transmitter arena.

Vector, which also manufactures phasing and related RF equipment, officially entered the market with the display of the FMT-3, a 3 kW transmitter first shown at the SBE national convention in St. Louis in November.

Besides the 3 kW unit, Vector manufactures transmitters in a range of power levels—1 kW, 5kW, 12kW, 20 kW, 25 kW and 40 kW models are also available, according to Melvyn Lieberman, the company's president.

By some industry accounts, the transmitter market has become somewhat "soft" lately. In one case, CSI Electronics, a Florida-based transmitter manufacturer, filed Chapter 11 bankruptcy on 16 September.

However, Lieberman disagreed that the transmitter market is soft, pointing

to the number of applications for broadcast facilities on file with the FCC.

"People are getting grants for FM stations and upgrading all the time," he maintained. "Where are those transmitters coming from? Somebody's selling them," Lieberman said.

Lieberman suggested a trend among some transmitter manufacturers towards complex instrumentation on their products. The Vector line, he said, was designed to fill the void created by that trend.

All controls on the transmitter are grouped together, as are the control panel, exciter.

The simplicity of the Vector design makes for easier maintenance, and allows readings to be made by even inexperienced technicians, he noted.

For additional information, contact Melvyn Lieberman at 215-348-4100.

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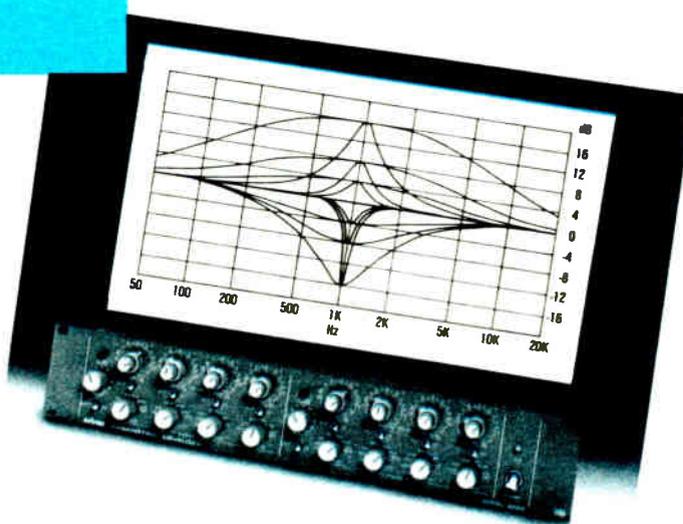


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Circle Reader Service 25 on Page 22

World Radio History



Vandals Fell Tower

by David Hughes

Roswell NM . . . At about 6 AM on 1 November, broadcast engineer Ken Bass was awakened by a phone call from the official of a local Roswell, NM, station he provides engineering services for.

The caller asked if he could still sign on the 1 kW AM daytimer even if the tower was not still standing, Bass said. Right away, Bass knew this was not a minor problem.

Sometime during Halloween night, vandals had climbed the barbed wire fence around KRDD's tower and cut three guy wires which supported the single 200-foot structure.

The collapsing tower hit a

corner of the station's studio building. No one was on the premises at the time. The portion of the building that was hit contained office space; no broadcast gear was involved.

Bass, who is the fulltime CE for KCKN/KBCQ, Roswell, said he thinks the act was more than a Halloween prank. At press time, police had not charged anyone with the act.

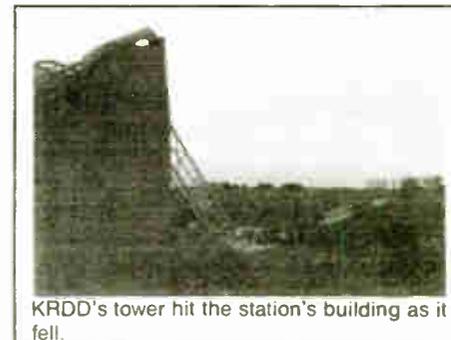
After surveying the situation, Bass said he got together with several other

engineers from the Roswell area.

In a time frame of only four hours, they managed to rig up a straight wire antenna, which radiates perpendicularly. They slanted the makeshift antenna to cover the southern portion of Roswell, where most of the Spanish-speaking population lives.

After the antenna worked under low power, Bass and the other engineers fired up the wire for a full 1 kW.

The station, which operates on 1320 kHz, does have some trouble during its critical hours operations—before 8 AM and after 3 PM—with skywave interference, though.



KRDD's tower hit the station's building as it fell.

Bass said that a new, permanent tower should be installed by mid-December.

For more information, contact Ken Bass at KCKN/KBCQ: 505-622-6450.

Letters

(continued from page 5)

I am not usually in favor of more government regulation or the expansion of a government regulatory body and feel that the FCC currently has its hands full trying to deal with the explosion of electronic devices in the marketplace today.

The FCC is doing the best it can, but the AM interference problem is getting worse all the time.

The utility companies make no effort to eliminate the source of it, and the members of the Electrical Manufacturers Association are trying to prevent any legislation which would increase the cost of anything whether it causes interference or not.

The TV and video display manufacturers don't understand or care that the deflection systems in most TVs make AM radio unusable in many homes.

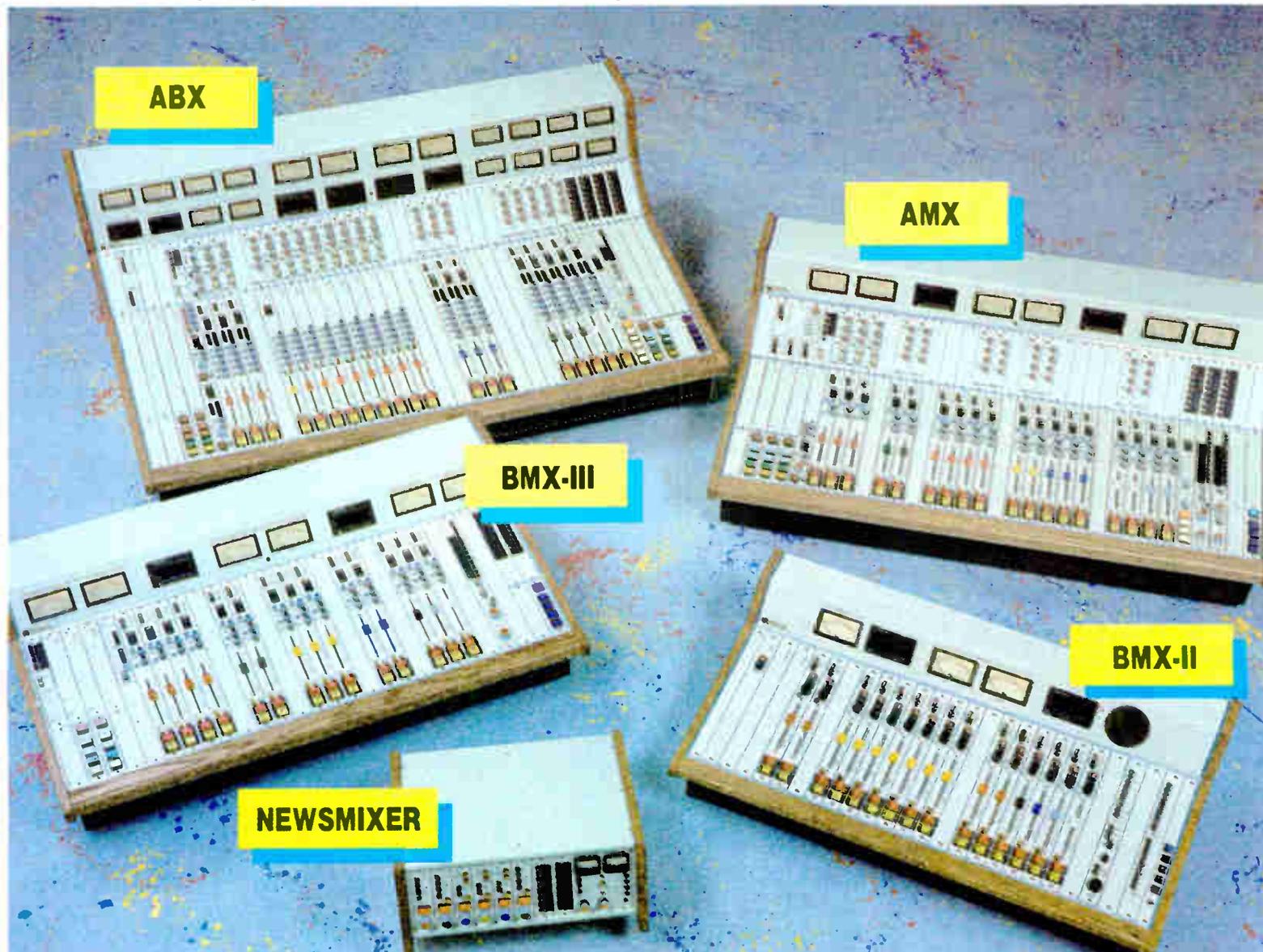
My solution has been to put an active antenna away from the house in a field and feed the signal in with a coaxial cable, but many listeners do not have this luxury, and even with this set-up a TV 100' away will still cause interference.

I think the only solution is for the broadcasters to put pressure on the FCC for radiated emission limits below 30 MHz.

The time is especially opportune with the increased emphasis on improving the quality of AM.

It will cost some manufacturers money and increase the cost of their products, but maybe we can reach a good compromise on a good simple testing method and a reasonable limit for emissions from 150 kHz to 30 MHz.

Jon GrosJean
Woodstock Engineering
Woodstock, CT



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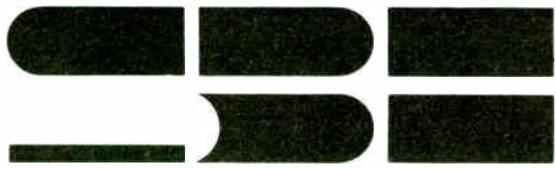
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CONVENTION REPORT

St. Louis, MO

10-12 November, 1987

A Working Engineer's Show

by Barry Mishkind

St. Louis MO ... The Second Annual SBE National Convention, held 10-12 November in St. Louis MO, may just have been the single most positive and productive thing the SBE has ever done on behalf of the broadcast engineering community.

Twice the size of last years' convention, approximately 3200 engineers from around the country enjoyed a series of papers and discussions presented in an atmosphere designed to help the working engineer do his job better.

Meanwhile in the exhibit hall, over 178 exhibitors set up booths to provide an opportunity for the attendees to get information.

Another high point was the chance to see and hear the new chief of the Mass Media Bureau, and try to get a measure of Alex Felker and what impact his stewardship at the FCC will bring to us.

The mood was great

One of the most interesting feelings evident throughout the convention was that this program was by and for the en-

gineering community.

The SBE organizers planned well; the seminars seemed unusually free of ego stroking and full of information relevant to the working engineer.

Meanwhile, on the exhibit floor, each of the booths was manned by professionals ready and willing to speak at length with the engineers about the merits of their equipment.

As Chuck Kelly of ITC remarked, "It was so good to see engineers going around without being ashamed of wearing their engineers' badges."

Some new products

While there were relatively few product introductions at the convention, several companies did show some new items for the first time to broadcasters.

There was Otari's MX-55 tape recorder, audio spatial enhancers from Orban and 7 Seas, new consoles from Autogram and Broadcast Electronics, and redesigned CD players from Studer and Straight Wire Audio.

On the RF front, there was a single phase version of the SX series transmitters from Harris, Vector Technology's new line of FM transmitters, a splatter

monitor from Delta and more. (See related product story, this issue).

There was a good mix of topics on the program.

The question and answer sessions, such as the one on radio station maintenance, took advantage of the wide range of experience of the panelists and covered topics ranging from heat measurement to studio maintenance to RF radiation safety considerations.

Some low cost solutions to common problems were shared, as well as the mutual frustrations encountered in keeping control room equipment in top

shape despite the nicotine clouds and other destructive effects of the staff chipmunks.

Huge crowds not missed

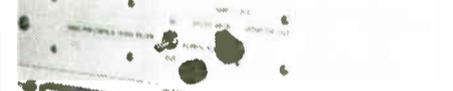
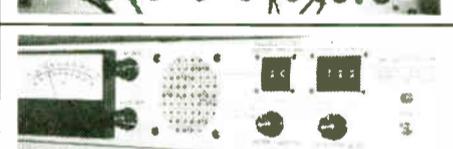
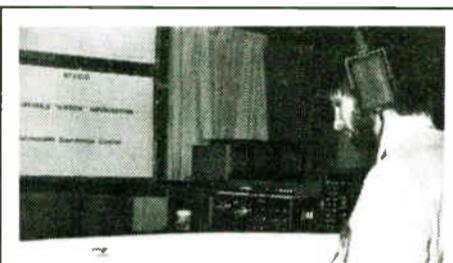
Certainly the lack of the huge crowds associated with the spring NAB convention contributed to the relaxed, friendly atmosphere at the SBE convention.

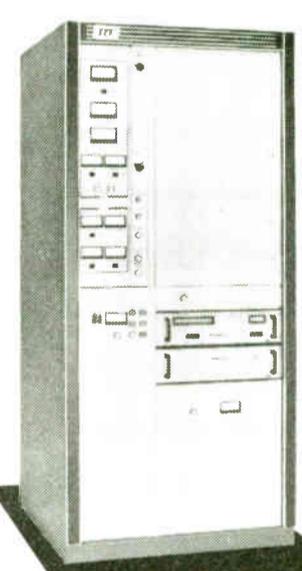
While there was a drop-off in floor traffic on Thursday, many exhibitors were quite pleased with the turnout on Tuesday and Wednesday.

It appeared that overall everyone got *(continued on page 12)*



New Products Shown (clockwise from above) Series 10,000 production model console from Arakis shown by Allied; Seven Seas stereo spatial image enhancer; Eventide H3000 Ultra-Harmonizer; Delta's Splatter Monitor for AM; Broadcast Electronics Mix Trak 90 Console.





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Circle Reader Service 4 on Page 22

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Surprisingly, many broadcasters may not know that the correct answer to this question is no. Large sums of money are spent each year to purchase new transmitters, new studio equipment, new audio processing equipment and to modify antenna systems for improved AM sound. Unfortunately, until now, there has been no such thing as a professional quality AM monitor receiver. As a result, the perceived fidelity of an AM signal has been severely restricted by receiver performance.

Potomac has developed the SMR-11 Synthesized Monitor Receiver which will let you hear and measure the quality of your transmitted AM signal ... perhaps for the first time. Features include: Crystal Stability; 60 dB Signal to Noise Ratio; Audio Frequency Response ± 0.5 dB, 20 Hz to 8 kHz; Total Harmonic Distortion less than 0.2% (95% Modulation) at audio frequencies above 40 Hz ... please write for complete descriptive brochure.



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Circle Reader Service 33 on Page 22

SBE CONVENTION REPORT

New RF Products Introduced

by Dave Hebert

St. Louis MO ... The 1987 National Convention of the Society of Broadcast Engineers featured several unique new products.

Three displays seemed to capture my attention with new and improved product offerings.

A new generation of audio equipment shown by CRL was designed to take advantage of both newer technology and changing marketplace demands.

By incorporating the patented "Dyna-fex", a downward expansion method, a significant amount of noise reduction can be realized in the SGC-800, a gain controller unit.

The company has redesigned its FM peak controller, the SMP-850, and incorporated spacial enhancement.

This unit is based on an "intelligent" enhancement circuit which will sense a stereo separation level of six dB before any spacial modification is initiated, therefore insuring the integrity of monophonic program material.

Apparent audio loudness is increased with this concept.

The new stereo generator, the SG-800A, has two SCA input terminals to allow stations using older FM exciters to take advantage of multiple SCA channels.

An FMX retrofit will be available for the stereo generator when this system is adopted.

CRL also demonstrated its new AM

processing equipment. The company has incorporated new NRSC circuits (which are defeatable) in the SMP-900A AM stereo limiter and the monophonic companion, in the PMC-400A.

The AGC-400 gain control unit also incorporates the "Dyna-fex" noise control feature. Improved circuitry has reduced the distortion of the PMC-400 to 0.25%.

A new FM transmitter line was introduced by a company already known in the area of AM phasor and switching components.

Vector Technology is introducing four new transmitters using a slightly different approach to PA tube selection.

These transmitters use the grounded-grid design.

The company's 3 kW and 5 kW units currently utilize the 3CX3000A7 (which will be changed to a 3CX5000A7 in the near future) as well as a new solid-state RF driver system.

The new 12 kW FM transmitter uses a 3CX10000B7 which is identical to the A7 version except for a filament that runs at a considerably higher filament voltage with a much lower filament current.

The advantage is realized in lower filament operating costs.

(continued on page 12)

SBE Votes In a New President

St. Louis MO ... Jack McCain is the new president of the Society of Broadcast Engineers (SBE), according to the election results announced at the St. Louis equipment exhibit in mid-November.

McCain, who is VP/engineering for the Kansas State Network, was unopposed. He replaces Richard Rudman of KFVB, Los Angeles.

Three candidates for the SBE's three other top offices were unopposed. Taking over the VP position is Robert Van Buhler of WBAL, Baltimore. The new treasurer is Bill Harris of KMJL/KRZN, Denver, and the new secretary is Richard Farquhar, VP technical services for SOS Productions in Columbus, OH.

Elected as directors were Phil Aaland of KGUN, Terrance Baun of Multimedia Broadcasting, Dane Erickson of Hammett and Edison, David Harry of

Potomac Instruments, Larry White of KVOO/KUSO, and Tom Weems of Tektronix. Weems was the only incumbent seeking re-election.

Also at the show, the SBE announced that two bylaws proposal were also "decisively approved" by the membership.

One proposal, which called for changes in the terms of office, qualifications and duties of the SBE directors, as well as voting rights of officers, was approved by 90% of those who submitted ballots. It also will institute changes for nominations and audit procedures.

The second proposal, which was ap-

proved by 73% of the voters, will permit the board of directors "to set the dollar amounts of annual dues for various categories of membership," according to the SBE.

The results of the voting were announced at the SBE convention.

In other news, during a 9 November meeting in St. Louis, the SBE board of directors of the Harold Ennis Foundation voted to increase the ceiling of Alpha Epsilon Rho scholarships from \$1,000 to \$2,000.

For more information on SBE administrative matters, contact Robert Van Buhler at 301-467-3000.

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SBE CONVENTION REPORT

Among New Products Are Consoles and RF

(continued from page 11)

The 20 kW transmitter from Vector Technology uses a 3CX15000B7, which the company claims operates with a filament voltage of 15 V at 13.5 amps.

Socketing problems of the power amplifier are eliminated in these transmitters because the grounded grid connection is made through a special flange on the tube, while filament connections are made through screw-on stud type connections.

These transmitters are shipped with an exciter built overseas, while the company hopes to develop its own exciter design in the next year or so.

All of these transmitters are self-contained, and utilize an advanced 12 pulse power supply in the three phase models.

New on-air console

A company already well established in the areas of broadcast audio and RF design is Broadcast Electronics from Quincy, IL.

A new addition to its console line is the Mix Trak 90 series which boasts

either a 12 or an 18 channel mainframe.

This product is unique in that it can actually serve as a "mini automation" unit by providing a series of control lines in each program channel between the EOM circuits built into external tape equipment and the next machine's start circuit.

Each channel has tow inputs and four remote control functions. It is through these remote control lines that tape machines can be made to sequence to each other.

"RF hardened"

The company has tried to make these mainframes "RF hardened" through extensive use of a dual pi network RF bypass on every channel input.

All remote control lines are optically isolated from the outside world.

The microphone input amplifiers are DC coupled servo-amps while the program output amplifiers are unconditionally stable, true balanced and floating.

The program amps are designed specifically to drive Belden 8451 cable, which



SBE show attendees had a chance to talk one-on-one with technical staff of exhibiting companies.

is widely used in the broadcast industry.

Control attenuators (which are manufactured by Penny and Giles) do not directly carry audio, but rather DC control voltages for VCAs.

A rather unique feature is the use of voltage regulators on each audio chan-

nel amplifier to allow for superb channel isolation as well as the console's outstanding 85 dB SNR.

Dave Hebert is president of Dave Hebert Engineering. He can be reached at 509-545-9672.

SBE Convention Targets The Working Engineers

(continued from page 10)

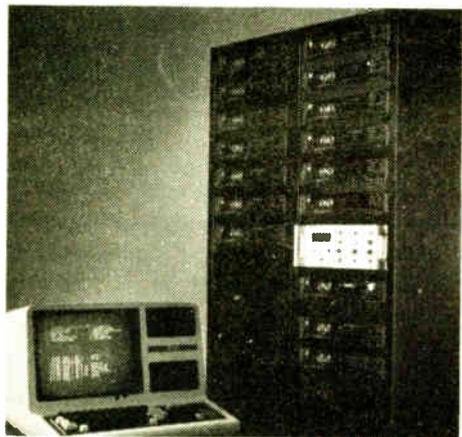
Overall though, the positives far outweighed the negatives, and those attending the Second Annual SBE National Convention are looking forward with anticipation to next year's gathering in Denver.

There is talk of arranging it over a weekend, so make your plans now and don't miss this engineers' delight.

The one slight surprise was the apparent lack of support for the SBE from many of the "big name" consultants that are usually seen at the NAB.

Perhaps they were busy that week. On the other hand, the SBE has encouraged participation by many engineers not seen as much before this.

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



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Working With Dummy Loads

by W.C. Alexander

Dallas TX . . . The dummy load, which has often been thought of as a "luxury" by broadcast managers and engineers alike, can be an important and sometimes essential troubleshooting tool.

If properly installed and maintained the dummy load will provide the transmitter plant with a fixed reference load, and by using this reference antenna and transmitter performance can be evaluated independently.

As any experienced engineer knows, an antenna presents a constantly changing load impedance to the transmitter.

The better, more broadband antennas are less susceptible to such changes, but all antennas do vary somewhat from their installation impedance.

Both AM and FM antennas, both directional and nondirectional, can be narrowband and present different impedances to the transmitter output at various points across the modulated spectrum.

But since antennas are constantly exposed to the elements, changes are to be expected with temperature, humidity, precipitation, ice buildup and so on.

Difficult diagnoses

Sooner or later almost every engineer will come across a problem that is difficult to isolate to either the transmitter, transmission line, or antenna.

Such problems will materialize as loading difficulties in the transmitter PA stage; excessively high or low screen current, plate current, or both; or in severe cases a transmitter that refuses to stay on the air because of various overloads.

In FM installations the station's reflectometer can provide clues to help diagnose the problem but reflectometers cannot always be believed, depending on their position in the line in relation to the load.

In AM systems, RF ammeters do nothing to indicate reflected power. An RF bridge, either of the operating impedance bridge (OIB) or the low level type, is needed to determine the actual resistance and reactance of the antenna.

Such instruments are expensive and not always on hand, especially at stations located in smaller markets.

The dummy load can be used in such instances to isolate the problem to either the transmitter or the antenna system.

FM types

Dummy loads for FM and TV come in three basic types: water loads, air loads (commonly called "dry" loads), and oil loads.

Water loads for FM are usually the smallest physically, yet they can dissipate tremendous amounts of power for their small size. They take up little space, and

can be mounted virtually anywhere.

Some water loads are self-contained and contain an on-board heat exchanger, pump and reservoir.

These type of water loads are expensive and relatively large, but they are well suited for high power applications in remote locations where no source of running tap water is available.

Most stations that use water loads simply connect them to the city water mains and dump the hot output water back into the sewer system.

This isn't very efficient as far as water usage is concerned, but considering the small amounts of time that such a load will actually be in use the savings in ex-

ternal heat exchanger, pump, reservoir and anti-freeze more than offset a ten dollar increase in the monthly water bill.

The disadvantage to this type of load is that it will self-destruct in seconds if power is applied without adequate water flow.

Therefore a flow interlock is necessary to keep the transmitter PA circuits from becoming energized with water flow below a specified rate.

Also, a control valve of some sort is needed to turn the water source on and off.

A mechanical valve is more than adequate, but most water load users install a solenoid valve of the type used in au-

tomatic sprinkler systems so that the water supply can be turned on and off with a pushbutton located in some convenient location near the transmitter/antenna switch controls.

Flow rates on the order of 6 to 10 GPM are nominally required.

Water-based precision

One big advantage of using a water load is that extremely precise power measurements can be made.

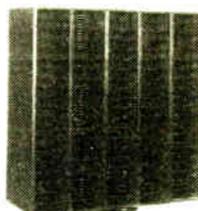
A calorimeter is nothing more than a water load with a thermometer on the input and output water lines and a calibrated flow meter.

(continued on page 14)

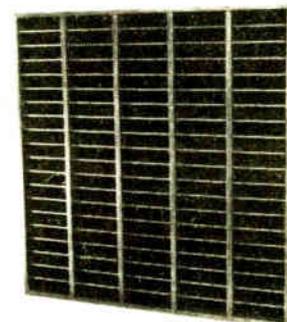


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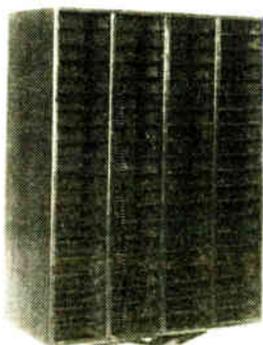


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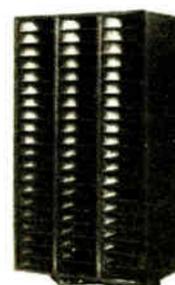
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A Device For Tricky Problems

(continued from page 13)

For a given flow rate, a specific rise in water temperature across the load corresponds to a specific power output.

Loads with calorimeters are available commercially, but they are often very expensive.

"Home brew" calorimeters are easy to make, and once calibrated, should give extremely accurate power readings for the life of the load components.

A word of caution here: systems that recirculate water through a heat exchanger often use ethylene glycol as a coolant/anti-freeze.

In this case power measurements become much more complicated, as the specific gravity of the solution becomes a factor in the calculations.

Air loads, oil loads

Air (or dry) loads are probably the least expensive type of VHF load. They usually consist of a number of non-inductive resistors wired in parallel to present the desired impedance to the transmitter.

Cooling is usually convective, although for the higher power loads forced air is added to the load to increase its heat dissipating capability.

Such loads are usually housed inside a shielded cabinet with a 3 1/8" EIA flange connection. They are usually much larger than non-self contained water

loads, but less maintenance is required.

Oil loads are somewhat smaller than air loads and larger than water loads.

Their power dissipation is limited, and all cooling is convective (although some manufacturers have added fans to their oil loads to increase their duty cycles).

One disadvantage of the oil load is that the coolant, usually transformer or mineral oil, is a changing volume inside a fixed volume container.

As power is dissipated by the load resistor, the temperature of the oil increases and its volume increases.

Relief valves are provided atop most oil loads, and some seepage is to be expected.

Dust tends to collect on the oily film, and it is not unlikely that the entire load can become completely clogged with lint and dirt in dusty locations and subsequently self-destruct.

When oil loads do fail, they sometimes do so catastrophically. The damage is not always limited to the load itself/sometimes it extends to all objects within several feet of the exploded oil load!

FM load operation

In FM systems, it is important that the antenna provide a matched load to the transmitter.

Matching techniques for FM antennas have been covered in previous articles and discussion of them is unneces-

sary here.

Suffice it to say that in most every FM antenna currently in production there is some provision for matching the antenna to the transmission line; and, presumably, the system was either matched upon installation or found to present an acceptable load (VSWR of 1.5:1 or less) to the transmitter.

Invariably there will be some difference, as far as transmitter operation is concerned, between a matched antenna system and the dummy load.

“ “

In FM systems it is important that the antenna provide a matched load to the transmitter.

Even in cases where the antenna presents a nonreactive impedance of 50 ohms to the transmitter, a 50 ohm dummy load will present a slightly different load to the transmitter and this will be apparent in the transmitter loading.

That there is a slight difference is of no importance. The way the transmitter operates into the dummy load is of great importance.

Once the dummy load is installed, the main transmitter should be operated into it and tuned for proper operation. All parameters should be read and noted for future reference.

The significant parameters are plate voltage, plate current, screen voltage and screen current.

In some transmitters load changes tend to reflect back into the driver stage, so driver parameters could be significant.

These values will provide a fixed reference to which the station engineer can compare future readings—independent of antenna/transmission line changes.

AM dummy loads

AM loads consist mostly of either non-inductive resistors in parallel or "toaster" elements wired in parallel.

Lower power loads (up to 2.5 kW) can use the non-inductive resistors, which resemble ordinary wirewound resistors. Simple convective cooling is normally used.

Loads of this type are easy to construct from raw parts in the field, but it is important to take 125% positive modulation into consideration when planning resistor power rating.

Non-inductive resistors are essential. Ordinary wirewound resistors will not work.

The "toaster" element loads consist of a number of non-inductive heating elements wired in parallel and cooled either convectively or with forced air.

A matching network, usually in the "L" configuration, is used to match the load resistance to the desired transmitter output resistance and to tune out any reactance that may be present.

This network, although normally adjusted at the factory for the customer specified resistance and reactance, normally will have to be retuned in the field, since shipping, installation and antenna switch wiring all will affect the impedance of the load.

An RF bridge is needed to make this one-time adjustment.

It is essential that the heating elements in such loads be kept clean and dust free. Small lint particles love to find homes in these open-air elements.

These elements, when in operation, normally glow red hot and anything caught in them is apt to burst into flames.

Other types

Some large water loads are also available for AM transmitters. Most of the above data on water loads applies to AM water loads as well.

Water loads with external heat exchangers are available into the megawatt range for SW transmitter applications.

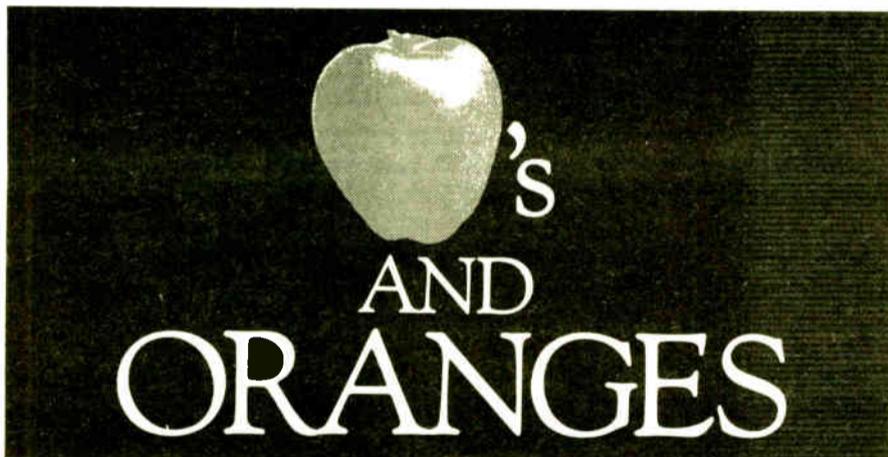
As with FM loads, some difference is to be expected between the antenna system and the dummy load, no matter how carefully the antenna tuning unit has been adjusted to provide the proper resistance and reactance values to the transmitter.

The important thing to remember is that a reference is where the antenna system resistance is apt to change seasonally.

Another word of caution: active bridge protection circuits, such as Magnaphase™ units, will sometimes be sensitive to the difference between the impedances of the antenna system and the load.

Such units can either be retuned temporarily for load operation or disabled while the load is in use.

W.C. Alexander is director of engineering for Crawford broadcasting, and a horror-fiction novelist. He can be reached at 214-445-1713.



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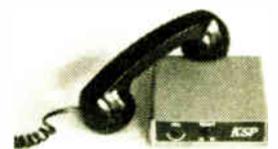
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DX-1 Quiets Mono Source Audio

by Tyree Ford

Baltimore MD . . . How often have you run into excessively noisy source audio that, had it been cleaned up, would have been great? While the possibilities are endless, most of them fall into three categories.

The first is newsroom noise. This is ambient and tape noise caused by recording news bites in the field on cassette recorders which are then dubbed to reel-to-reel for editing so they can be dubbed to cart for the newscast.

Don't forget the air-conditioner duct noise in the "news studio" which is really a converted closet which was never designed with an open mic in mind.

Next is remote noise—ambient and line noise caused by noisy environments and noisy audio links back to the studio, including noisy STLs. Your basic remote sports event, city council meeting or commercial remote fall into this category.

The third one is alien production noise—that "pre-produced" spot that came in sounding as if it had been passed through the field of a Tesla coil in hyperdrive.

This month we'll take a look at CRL's DX-1, a useful mono, one-rack space, single-ended noise reduction system.

If you're unfamiliar with the term single ended, it simply means that only one device is used. The audio passes through it and continues to the next

stage of your system.

This differs from systems like the Dolby noise reduction systems which use one box to encode the signal and another to decode the signal.

At the heart of the DX-1 is a circuit based on the Berwyn Noise filter.

It is a moving window which opens only wide enough to pass the signal while appearing closed to those frequencies above the signal.

Producer's File

In the case of voice-only recording this noise would mostly be up in the tape hiss and circuit noise part of the audio spectrum.

Because the DX-1 follows the dynamic filter section with a downward expander which "turns down" the output of the device below wherever you have set its threshold, you not only cleanup audio that is passed by the filter, you also lose unwanted lower ambient noise.

There are limits to the effectiveness of the DX-1.

If your news-person records an interview on the steps of City Hall and a fire truck wails by, the DX-1 will not remove the sound of the sirens.

In fact, the louder the ambient sound, the more difficult it becomes to filter out.

It must be remembered that any noise which occurs within the bandpass win-

dow will be part of the signal, although it will be masked by the primary audio.

Similar to DX-2

Like its stereo cousin the DX-2, the DX-1 is front panel switchable to operate at -10, 0, +4 or +8.

The two devices also share several other features.

There is a simple internal jumper system to allow for high or low Z input impedances and balanced or unbalanced operation.

Both also have a continuously variable threshold control which allows you to adjust the level at which expansion begins.

And there is the brilliance control which allows the addition of frequencies from 3K to 20K to be added back in to the filtered audio.

Since the source for the brilliance is

not filtered except through the DX-1's RFI input filter, you can only add so much high end before you end up with additional high frequency noise.

Operating the brilliance control between 0 and halfway gave acceptable results without the return of high frequency noise. Different source audio and your own ear will determine the best setting.

User controls

There are four additional controls on the DX-1 which differentiate it from the DX-2; Bandwidth, Range, Release and Input Gain.

Although automatic bandwidth limiting is what the DX-1 does in normal operation, the Bandwidth control allows you to manually adjust the bandwidth continuously from 20 kHz down to 3

(continued on page 17)

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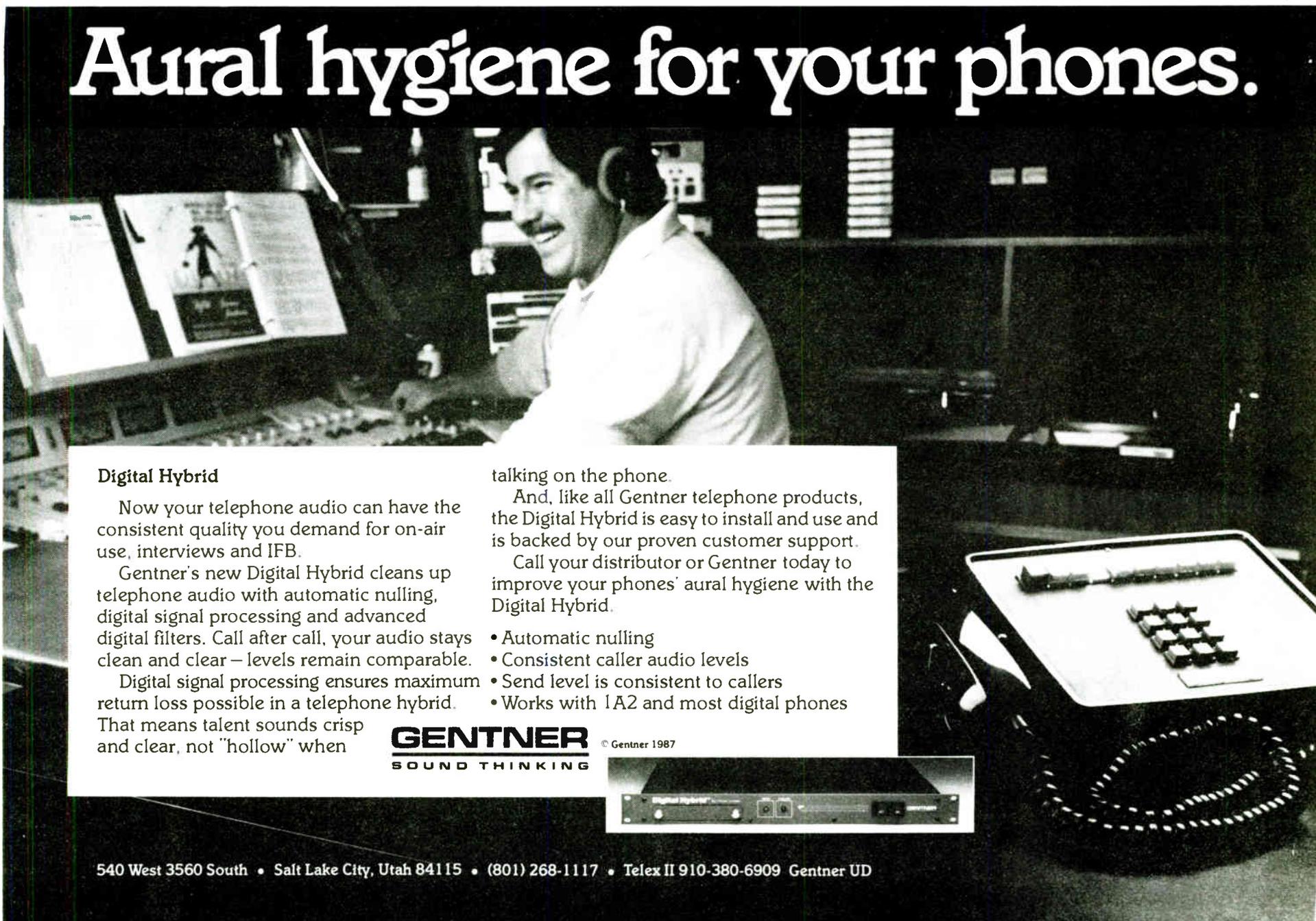
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Circle Reader Service 31 on Page 22

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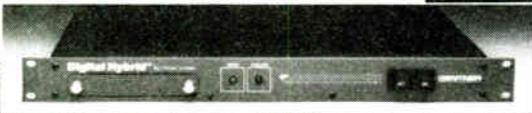
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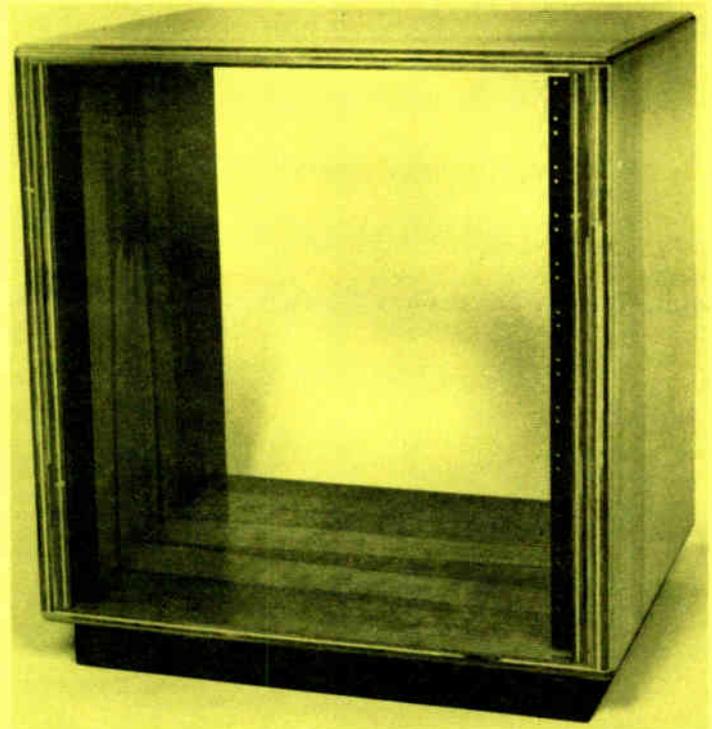
INR racks are available in all sizes from one to forty rack spaces, and come with drilled and tapped front rails. Shipment is usually two weeks or less from time of order.

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60KBINR3	3	5¼"	77.00	21.00	11.00	60KBINR23	23	40¼"	233.00	81.00	44.00
60KBINR4	4	7"	77.00	21.00	11.00	60KBINR24	24	42"	241.00	84.00	44.00
60KBINR5	5	8¾"	77.00	21.00	11.00	60KBINR25	25	43¾"	249.00	88.00	44.00
60KBINR6	6	10½"	77.00	21.00	11.00	60KBINR26	26	45½"	257.00	91.00	44.00
60KBINR7	7	12¼"	92.00	25.00	22.00	60KBINR27	27	47¼"	264.00	95.00	44.00
60KBINR8	8	14"	100.00	28.00	22.00	60KBINR28	28	49"	279.00	98.00	55.00
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60KBINR13	13	22¾"	140.00	46.00	22.00	60KBINR33	33	57¾"	319.00	116.00	55.00
60KBINR14	14	24½"	155.00	49.00	33.00	60KBINR34	34	59½"	327.00	119.00	55.00
60KBINR15	15	26¼"	163.00	53.00	33.00	60KBINR35	35	61¼"	342.00	123.00	66.00
60KBINR16	16	28"	170.00	56.00	33.00	60KBINR36	36	63"	350.00	126.00	66.00
60KBINR17	17	29¾"	178.00	60.00	33.00	60KBINR37	37	64¾"	358.00	130.00	66.00
60KBINR18	18	31½"	186.00	63.00	33.00	60KBINR38	38	66½"	365.00	133.00	66.00
60KBINR19	19	33¼"	194.00	67.00	33.00	60KBINR39	39	68¼"	373.00	137.00	66.00
60KBINR20	20	35"	202.00	70.00	33.00	60KBINR40	40	70"	381.00	140.00	66.00

Prices include crating. Shipping charges are additional. Prices and specifications subject to change without notice. Prices effective November 1, 1987.

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DX-1 Reduces Noise for Mono

(continued from page 15)

kHz, should you be dealing with sources operating at less than full bandwidth.

The Range control is a two-way switch which allows you to shift the expander threshold from between 0 and -30 to -20 and -50, a feature you may find handy in adjusting the expander to maximum quietness.

The Release functions, slow or fast, determine how quickly the expander follows the signal. For voice tracks, where nothing is going on between words, I found the fast setting best at removing unwanted noise.

The slow setting produced a slight rushing sound as the expansion circuitry took hold.

In cases where the audio is more continuous, like music, the more gentle slow

“ ”
In cases where the audio is more continuous, like music, the more gentle slow release is more appropriate.

release is more appropriate. The slight rushing noise would be masked by the music.

The Input Gain is a continuously variable control which allows inputs ranging from mic to line level. The Sennheiser 421 we attempted to drive the unit with provided unsatisfactory results.

Even with the gain cranked all the way up the signal was not hot enough. Better results were had with a EV 1751 condenser with its higher output.

The DX-1 responded best when driven by line level or the monitor output of a portable cassette machine. Ray Updike, CRL's marketing and sales manager agreed, saying the control was meant more as a gain/noise balancing feature

than a true mic preamp.

In two similar experiments we were able to remove significant amounts of noise.

The first experiment was to stand near an operating oil furnace while recording interview type material on a cassette recorder.

In the second experiment, the same machine was used in an area with a noisy air conditioning system.

The noise from the furnace contributed to the ambient noise level to such a great degree that filtering was difficult.

Because many of the frequencies generated by the furnace were low and mid-range, they were heard when the voice level raised the input level past the threshold of the expander.

Because the ambient level was so high, setting of the threshold was difficult. Of course, the DX-1 was not designed to function well in this set of circumstances.

Works as expected

The second experiment yielded much better results. The noisy air conditioning system (mostly wind noise and somewhat quieter than the furnace) was noticeably reduced.

Also gone was quite a bit of the tape hiss from the cassette machine. This test plus the live mic test proved that the DX-1 really does a good job when not pushed past the limits of its expected operation.

In the live mic test we ran a mic into a preamp and then into the DX-1. It was surprising how much circuit noise and low level room noise was removable.

We were able to set the expander threshold so that we could silently move paper around and make squeaky chair noises that never tripped the threshold.

The best results were obtained when the levels to the DX-1 were consistent enough to allow full use of the filter controls.

If, for example, you used the DX-1 to quiet a play-by-play remote broadcast, it

would be a good idea to precede the unit with a gain control device.

The extra control flexibility the DX-1 offers over the DX-2, while very effective, is not foolproof. The DX-1 can be misadjusted.

Since the input circuitry is very responsive to level changes, the use of grease pencil marks or adhesive dots to indicate appropriate switch and knob settings will not yield the best results.

The DX-1 should be considered a "hands on" device, which means some of your less technical people may not immediately feel comfortable with its use.

This is a great time to work on your communications skills. A lot of folks are easily snowed by a lot of knobs and

switches. Try sharing its operation with those operators who can quickly grasp its abilities, thereby creating a support group for the others.

The DX-1 manual is well written and includes PC board layout, parts list, block diagram, schematic diagram, preventive maintenance, troubleshooting, and testing set-up info.

It also includes a full theory section and operating instructions. Give me a call if you have any questions, or call Ray Updike at CRL 1-800-535-7648.

List price for the DX-1 is \$700. With some careful shopping you should be able to get the price down to the lower \$600's. Anything less than that is a steal!

Ty Ford, a radio audio production consultant, helps stations optimize their use of production and airstaff skills. He can be reached at 301-889-6201.

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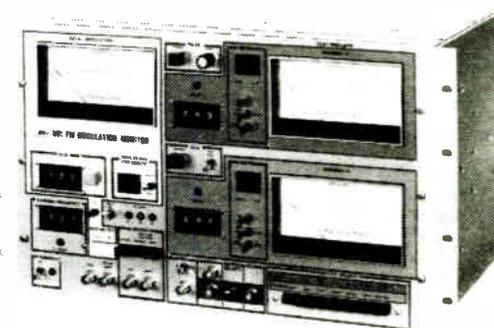
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Line Level Mic For Intercoms

by Frederick Baumgartner

Denver CO ... It is pretty easy to get audio for an intercom inside the studio.

With a little effort most mixers will give you a pre-fader mic at something close enough to line level to do the job. With a little care you can get the feed without messing up the on-air sound.

Places like newsrooms, shops and the PD's office are notorious for not having microphones available. Putting a mic in solves part of the problem but then you need an amp.

Logic says that the amp ought to be close to the microphone but running mic level cable around a broadcast station is a bit risky.

Without balanced microphones, preamps with pretty good common mode rejection (often more than you can get on the less expensive active input types) and good quality cable such as shielded twisted pair, the system tends to be better at receiving AM, FM and sync buzz.

The ideal trick then would be a line level microphone.

The broadcast quality versions are great for driving telephone lines in the field and dealing with very noisy electrical environments. This one is good enough for an intercom.

Parts count

As with most of these neat little circuits the parts count is kept to a minimum to provide easy, cheap, quick construction and reliability ... not broadcast quality.

But it works in a pinch and can go with

the AGC in RW 15 September.

Figure 1 starts with a electret condenser microphone often found built into things like cassette recorders and speaker phones. Lacking that, Radio Shack 270-092 is exactly right.

R1 biases the electret at 4 V. Different mics or supply voltages will change the required value, so check the voltage between the supply lead (often red) and the shield (not ground). Most need around 2 V and none more than 9.

R2, R3, C1 and C2 provide a circuit "center." Since the opamp is a bipolar device and I have decided that is too much trouble (besides there are more 24 V supplies around), we need a way to fool the opamp into thinking it can work.

The resistors form a voltage divider and the caps secure the "circuit center" to AC ground as far as the audio is concerned.

R4 couples the non-inverting input of the opamp to "circuit center." C3 blocks DC between the mic and the inverting input.

R5 sets the gain. With one standard "Fred at four feet" the 5 Meg will produce 0 dB into 600 ohms.

Gain adjustment

Seeking more gain by increasing R5 will increase instability with the amp "latching up" at some point. If you need less gain decrease R5; a 10 Meg pot is nice.

R6 is used to compensate for "offset." Offset is DC voltage at the output of the opamp.

Because of the very high gain in one stage and the simple way of developing

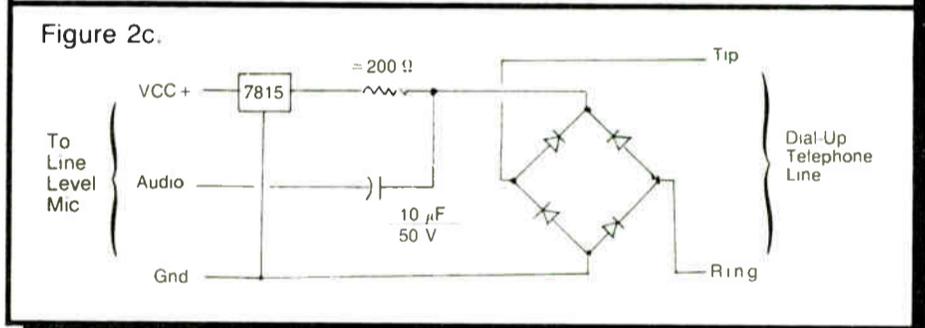
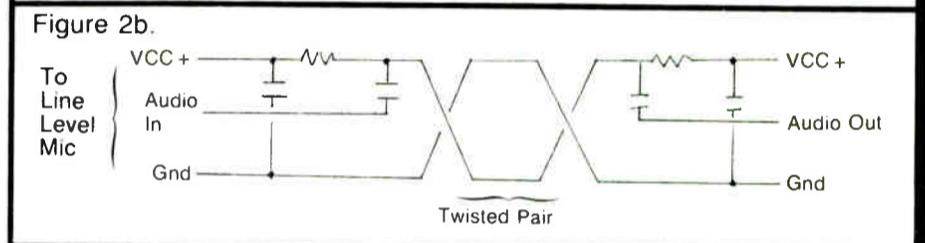
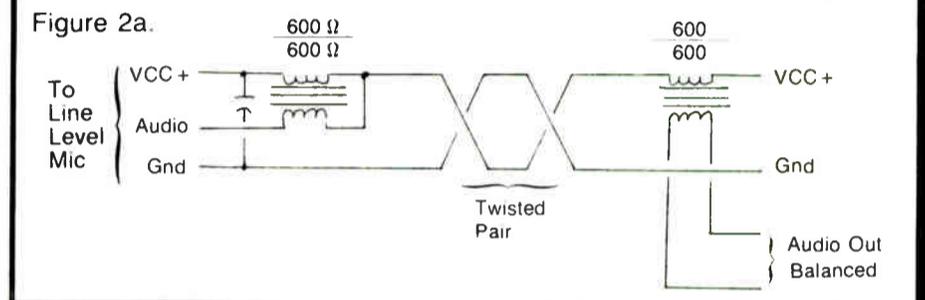
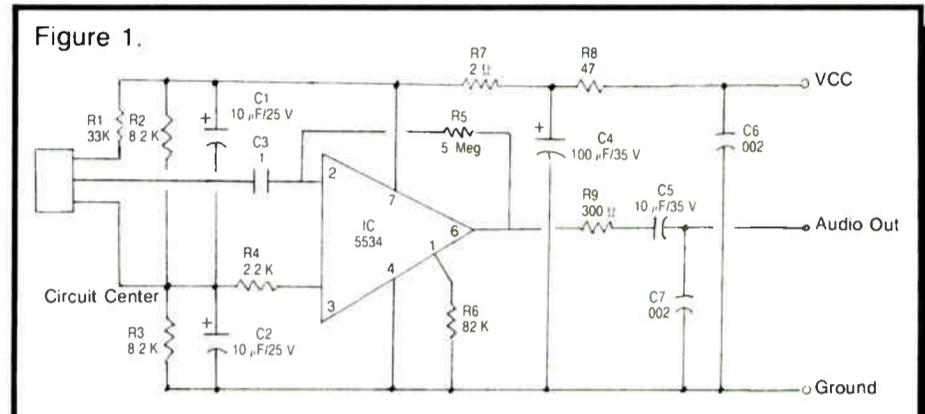
the circuit center, DC offset is likely, and the circuit is encouraged by design to swing to the positive side.

Use a voltmeter between pin 6 of the opamp and the circuit center and select

a value of R6 that will give you low DC offset. This will reduce distortion.

R7, R8 and C4 are a power supply filter. The project assumes a reasonably clean power supply to start with.

R9 protects the amp against shorts and C5 blocks the DC. C5 will normally have the positive side to the opamp output
(continued on page 21)



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BROADCAST COMPUTING

Listing 1. BASIC program for converting dBm to other unit.

```

10 PRINT " dBm      MW      RMS V      PEAK V      VOLTS      P-P HEADR"
20 PRINT
30 GOTO 40
40 X = 10
50 Y = 10 * 10 * 10 * 10 * 10 * 10 * 10
60 Z = 10 * 10 * 10 * 10 * 10 * 10 * 10
70 W = 10 * 10 * 10 * 10 * 10 * 10 * 10 * 10
80 PRINT USING "###.###"; X, Y, Z, W,
90 NEXT X

```

Listing 2. Trial run of program.

DBM	MW	RMS V	PEAK V	VOLTS	P-P HEADR
0.000	0.112	0.239	0.336	0.474	11.200
1.000	0.126	0.255	0.359	0.507	12.450
2.000	0.141	0.271	0.411	0.571	13.800
3.000	0.156	0.288	0.436	0.604	15.150
4.000	0.172	0.304	0.462	0.637	16.500
5.000	0.188	0.320	0.487	0.670	17.850
6.000	0.204	0.336	0.512	0.703	19.200
7.000	0.221	0.352	0.537	0.736	20.550
8.000	0.237	0.368	0.562	0.769	21.900
9.000	0.254	0.384	0.587	0.802	23.250
10.000	0.271	0.400	0.612	0.835	24.600
11.000	0.288	0.416	0.637	0.868	25.950
12.000	0.305	0.432	0.662	0.901	27.300
13.000	0.322	0.448	0.687	0.934	28.650
14.000	0.339	0.464	0.712	0.967	30.000
15.000	0.356	0.480	0.737	1.000	31.350
16.000	0.373	0.496	0.762	1.033	32.700
17.000	0.390	0.512	0.787	1.066	34.050
18.000	0.407	0.528	0.812	1.099	35.400
19.000	0.424	0.544	0.837	1.132	36.750
20.000	0.441	0.560	0.862	1.165	38.100
21.000	0.458	0.576	0.887	1.198	39.450
22.000	0.475	0.592	0.912	1.231	40.800
23.000	0.492	0.608	0.937	1.264	42.150
24.000	0.509	0.624	0.962	1.297	43.500
25.000	0.526	0.640	0.987	1.330	44.850
26.000	0.543	0.656	1.012	1.363	46.200
27.000	0.560	0.672	1.037	1.396	47.550
28.000	0.577	0.688	1.062	1.429	48.900
29.000	0.594	0.704	1.087	1.462	50.250
30.000	0.611	0.720	1.112	1.495	51.600
31.000	0.628	0.736	1.137	1.528	52.950
32.000	0.645	0.752	1.162	1.561	54.300
33.000	0.662	0.768	1.187	1.594	55.650
34.000	0.679	0.784	1.212	1.627	57.000
35.000	0.696	0.800	1.237	1.660	58.350
36.000	0.713	0.816	1.262	1.693	59.700
37.000	0.730	0.832	1.287	1.726	61.050
38.000	0.747	0.848	1.312	1.759	62.400
39.000	0.764	0.864	1.337	1.792	63.750
40.000	0.781	0.880	1.362	1.825	65.100

From Volts to dBm

by Peter Burk

Pepperell MA ... Have you ever needed to make audio measurements with a digital voltmeter?

We aren't going to suggest that you do your next audio proof this way, but it is sometimes the only tool available.

The most frustrating aspect of using a voltmeter is the fact that most are calibrated only in volts, not dBm.

Most of us know how to convert from one to the other but can't always do it without a calculator.

David Driessen of WGBA-TV contributed the program in Listing 1, which conveniently displays dBm, milliwatts, RMS and peak voltages and required headroom.

Power and voltage

The program will print a chart such as the one shown in Listing 2. For each level in dBm, power and voltage units are tabulated.

The last column lists the peak to peak voltage that an amplifier should be able to handle for 10 dB of headroom.

"An amplifier operating at +4 dBm should be capable of almost 11 V p-p be-

fore clipping to avoid distortion on program peaks," says Driessen.

We've tested the program on an IBM PC, but it should run on any machine.

Some modifications

To make a printed chart, change the PRINT statements to LPRINT or whatever is appropriate for your computer.

You may also wish to add INPUT statements at the beginning of the program to print charts with different limits.

Driessen suggests that if you need a chart for 150 ohms, substitute .15 for .6 two places in the calculations.

The RMS to peak conversions are all based on sine waves. Some but not all meters read true RMS, so check the specs.

In addition, expect most meters to roll off rather rapidly above one kHz. Don't even think about using a DVM for anything but rudimentary level checks.

RW welcomes your contributions to Broadcast Computing. Peter Burk is president of Advanced Micro-Dynamics. He can be reached at 617-433-8877. For questions about the program, contact David Driessen at 414-494-2626.



"Keeps Playing"

"I can't let another day go by..."

"...without telling you about my Harris SX-5A AM Transmitter," writes R. Dale Gehman, partner and chief engineer of WASG AM Stereo 55 in Atmore, Alabama.

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"But let me tell you what surprised me most: WASG is located in a lightning belt—more strikes than anywhere in America. Our 511-foot tower has been

popping with static many times, but your solid-state SX-5A just sits there and keeps on playing! We haven't been off the air once. THANKS!"

Harris' SX-5A is your best bet for a rugged, reliable and efficient 5 kilowatt AM transmitter, and it's available for single or triple phase hook-up. There also are 1 and 2.5 kW SX models. SunWatch™ automatic PSA/PSSA and C-QUAM® AM Stereo are options. Standard-setting Harris training and service top off the features.

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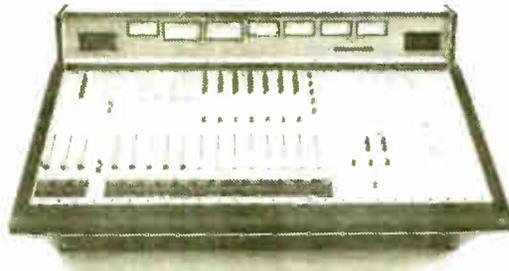


Digital storage

Schafer Digital's storage system—the System 80, includes eight VCRs and special Sony digital processors. It allows for random access by computer control and utilizes 16-bit quantization with 44.1 kHz sampling frequency equal to compact disc quality.

Cassettes may be recorded digitally or obtained from a syndicator.

For more information, contact **Paul Schafer** at 619-456-8000, or circle Reader Service 59.



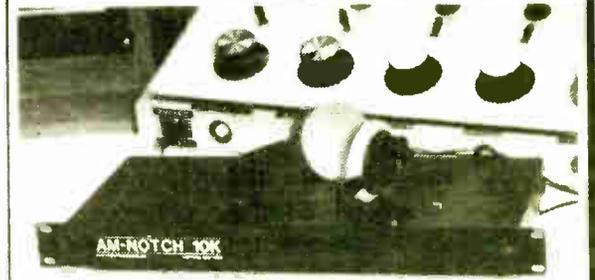
Compact console

JBL's Soundcraft SAC 2000 is a compact console suited for radio post production mixing and editing.

Opto-isolated Universal Logic Interfaces eliminate the problem of interfacing with cart machines, two-tracks and turntables which use different standards.

Cart machines are managed by an automatic sequencer which will "jump" a non-ready or dislodged cart and can always be overridden by the broadcaster.

For more information, call **Mark Gander** at 818-893-8411, or circle Reader Service 54.



AM notch filter

Electron Processing's AM Notch 10K is a precision 10 kHz notch filter providing up to 50 dB of rejection with flat frequency response to within 20 Hz of 10 kHz. The filter enables AM announcers with remote transmitters to monitor themselves without the tone caused by stations on adjacent frequencies.

The AM Notch 10K eliminates the subliminal effects of constant high frequency tones. A rear panel switch selects either a flat response or NRSC de-emphasis curve.

For more information, contact **John Martin** at 516-764-9798, or circle Reader Service 53.

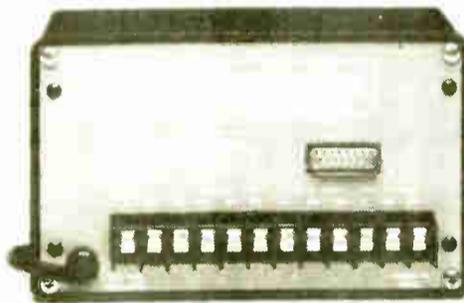


Recorder

Studer's new A807 VUK is a three speed, microprocessor-controlled audio recorder featuring a separate meter overbridge configuration and roll-around tiltable floor console.

The head block assembly has space for an optional fourth head in the 2-4 version. The transport functions are digitally controlled.

For more information, contact **David Bowman** at 615-254-5651, or circle Reader Service 56.



Logiconverter

Henry Engineering's Logiconverter is a remote control interface unit that creates compatible, isolated control circuits between a console and all outboard studio equipment.

It isolates the control circuitry, converts the control signals to those most appropriate for the device being controlled and provides a 'stop' output where none was available from the console.

Up to four devices can be controlled.

For more information, contact **Hank Landsberg** at 818-355-3656, or circle Reader Service 51.



Power protection

MCC Electronics' new SPC series of AC power line protectors are compact units (8 x 8 x 4) that offer increased energy handling capability—up to four times greater than comparably sized units. The units provide a total of up to 1200 joules/phase (W-sec) overall absorption capability for 120 VAC to 480 VAC single phase, wye and delta service panels.

For more information, contact **Christine Coyle** at 516-586-5125, or circle Reader Service 58.

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008	028	048	068	088
009	029	049	069	089
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011	031	051	071	091
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019	039	059	079	099
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BUYERS GUIDE

Cart Machines

CTM-10 Earns High Marks

by Douglas W. Fearn, CE
WKSZ-FM

Media PA ... I had a sense of déjà vu as I aligned a brand new Otari CTM-10 stereo cartridge machine. The features, the way the machine operated, the type and location of adjustments, the record electronics interconnect cables, are all highly reminiscent of the ITC/3M 99B series of machines.

This machine is loaded with features—overloaded, some might think, especially for an on-air machine. But the more I used the CTM-10, the more I be-

gan to appreciate almost every little LED, flashing light and tiny push button.

Otari's first effort at building a cartridge machine is impressive. This is a top-of-the-line unit that can compete in its market.

Most of the common functions are included. The unusual features are: Dolby HX-Pro; 3 $\frac{3}{4}$, 7 $\frac{1}{2}$, or 15 ips speeds; stereo matrix (L+R/L-R) operation; built-in timer; built-in variable speed ($\pm 6\%$); external capstan sync capability; splice finder; transformerless inputs and outputs; logging input for data on cue track; headphone jack; built-in test oscillator; repeat play lockout; front panel record head azimuth adjustment with phase indicator; LED meter for cue track level; and automatic monitor status switching.

The first thing I did when the machine arrived was to put it on the bench and align it to our standards. Before inserting a test cartridge, I checked the heads and metal capstan for residual magnetism with a magnetometer.

The playback head showed about 0.5 gauss, which reminded me never to assume anything about a machine right from the factory.

After demagnetizing the head and checking it again, I ran the MRL test tape, which we have loaded into an Aristocart shell to match the carts we use.

The playback head azimuth adjustment is touchy and the setting changes radically when the locking nut is tightened (careful, the azimuth adjustment was locked with paint).

It took about six times through the test

cart before I was satisfied. Once set, however, it varied no more than $\pm 15^\circ$ at 16 kHz as read on our Potomac AA-51.

I used those six passes through the alignment cart to also set the playback equalization. There are two high frequency adjustments. One is set at 10 kHz and the other at 16 kHz. The resulting high end response is exceptionally flat.

User Report

The adjustments interact quite a bit, though, so it takes awhile to optimize the response. After I set the left channel, the right was much easier since I had an idea of how much the 16 kHz adjustment would affect the 10 kHz and vice versa.

There is also a low frequency EQ adjustment, but Otari says to adjust this during the record alignment. I'm not sure I agree with that.

I think that such a procedure would be acceptable if there were only one master record machine at a station, and a master alignment cart was made for use in aligning all the playback machines. But at our station, there are four stereo record machines.

I prefer to set the playback low frequen-

cy EQ to the alignment tape, using the test tape's correction chart for fringing compensation. In this case it is academic; the CTM's low end response was quite acceptable just as it came from the factory.

Record adjustments were easy. This was the first opportunity to use the front panel record head phase adjustment, which is a screwdriver slot.

I set the record head azimuth using the LEDs provided for phase measurement. You simply adjust until the two front panel LEDs light equally, starting with a lower frequency and working up to the final adjustment at 16 kHz.

It is very precise. After setting it where I thought it looked best, I switched the AA-51 to "Phase" and was pleased to see that it was perfect.

I used the procedure in the instruction manual for bias adjustment, and then set it more precisely by listening to the modulation noise from the scope output of the distortion meter (fed to an amplifier and speaker) while recording a 50 Hz sine wave.

The two settings were close, but using the latter method improved the sound of the machine, I believe. Bias on the CTM-10 seems more critical than on other cartridge machines.

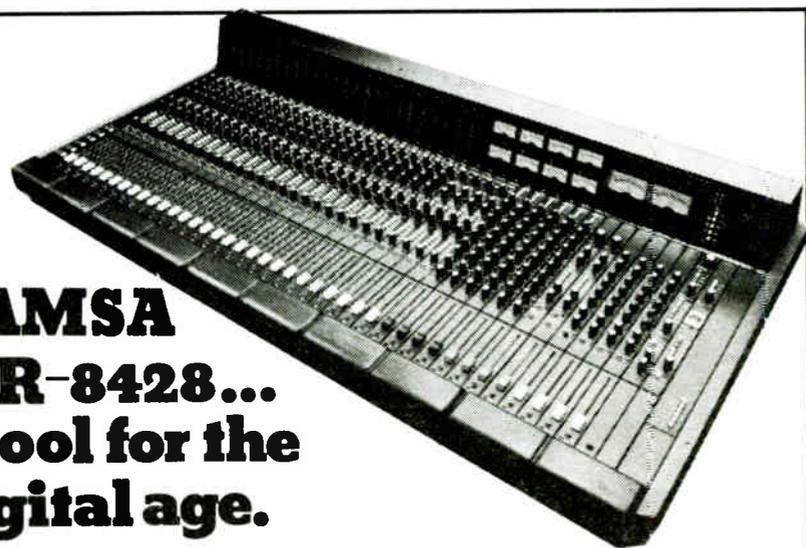
A few spot checks of harmonic and intermodulation distortion were made.

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Cart Machines Thrive

by Marlene Petska Lane

Falls Church VA ... The analog cart machine has endured as a radio station staple for longer than almost anyone could have predicted. But increasingly, there is talk of a digital replacement, and manufacturers have begun to sit up and take notice.

Many manufacturers, however, are not sure that a replacement has yet been defined.

"There is absolutely no digital device, either presently in production or on the horizon, which precisely emulates the ease of operation of a broadcast cart machine," says Art Constantine, VP of marketing for Fidelipac.

Tim Bealor, manager for audio products for Broadcast Electronics, agrees. "I don't think anyone knows what the true replacement will be or if there will be one," he says.

There is, however, considerable speculation on what such a replacement could be.

ITC has already made its first attempt with the new HCDA 3000 Digital Audio System, which employs S-DAT technology (a digital audio tape format which uses stationary heads). Other manufacturers have different ideas.

"My venture is that it will be digital and will get away from the actual mechanical aspects of handling," says

Dave Evers, Broadcast Electronics' new manager of digital products.

Broadcast Electronics has a digital product called the DV-2, which stores digital audio on a RAM chip.

"Any replacement for the functions of a cart machine has to give you the instant access of today's cart machine—and do it better and/or be more reliable and/or be easier to use," says Jack Williams, president of Pacific Recorders and Engineering.

Industry Roundup

But another contender for a cart machine replacement, soon to emerge on the market, appears to be R-DAT (a digital audio tape format employing a rotary drum with recording heads).

"R-DAT might have a real leg up in terms of it being available and universal—and relatively cheap," says Skip Pizzi, who is an audio engineer and training coordinator for National Public Radio, where he includes digital conversions as part of his training presentations.

"Although R-DAT provides slower access time," says Pizzi, "the start up time is adequate for my taste, and is still very fast relative to linear media."

(continued on page 30)

BUYERS GUIDE

Maxtrax Pairs with Micromax

by Barry Mishkind, VP & DE
KKPW/KFXX

Tucson AZ ... I saw the Micromax cart machines from Pacific Recorders & Engineering at the NAB in Dallas last year. The PR&E display was a bank of six players totally enclosed in a plexiglas box.

After running all day, the temperature rise in the box was a mere 10° or so. Not only that, attached to the display was a meter indicating that the total power drain for all six machines was a mere 42 W—just 7 W per machine—and they

were running!

All this interested me for three very important reasons. First, I have long dis-

User Report

liked the amount of heat generated by some cart machines—heat that, even with ventilating fans, becomes self-destructive.

Second, they were from the makers of the Tomcat, the highly regarded series

of cart machines which pioneered the Maxtrax™ head format. And last, these new Micromax units were priced at a level that forced me to take a closer look.

For a long time, I'd wanted to have an opportunity to install Tomcat machines. The reputation of Pacific Recorders and the idea of the Maxtrax wide track heads seemed to point to an excellent machine.

Friends that used Tomcats were nearly unanimous in praise. The trouble was the price tag for all that high tech. It was just too much for many smaller market stations to justify.

But with Micromax, at about \$1900, PR&E has made a great bridge to those smaller, but still quality conscious stations.

A first look at the insides reveals what might be several surprises for the engineer who has been inside a number of state-of-the-art machines.

First off, there is no large microprocessor. Also, the motor is connected to the capstan by a (gasp!) flywheel and belt!

And, the solenoid and chain have been replaced by a worm gear. The Micromax seems a major departure compared with many other machines currently on the market.

But there are good reasons for all these and other design choices that PR&E made when they brought out this machine.

After extensive discussions, we decided to completely equip our facility with Micromax cart machines. They have now been on line for more than a year.

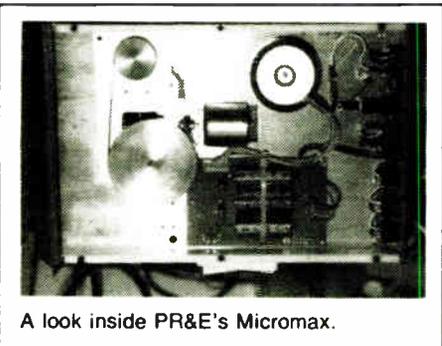
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Selectable Stereo/Matrix				
Three Tape Speeds (3.75, 7.5, 15 IPS)				
Maxtrax™ Heads	OPT.		OPT.	
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Cartridge Azimuth Error Correction System				
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Elapsed Time Counter				
Front Panel Headphone Amplifier Output				
Adjustable Phase Compensation				
Transformerless Balanced I/O				
Vari-Speed				

© Otari 1987 / Product information taken from sales literature available at the time of publication for stereo record/reproduce models

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A look inside PR&E's Micromax.

the first time with a cart in hand, it's immediately clear that this pretty little machine is different.

There is no need for a dymo label or magic marker scrawl to indicate the machine number. The power LED is actually a seven segment LED that can be quickly set to any number from 0 to 9.

And a blind man can figure out which are the start, stop and fast forward buttons, as they are of shaped rubber.

Inserting the cart, there is a secure feel as the heavy duty spring-loaded guides firmly bring the cart up to the tape guides. The heads are secured in heavy duty cast head mounts.

Alignment adjustments are quick and stable. In bench tests, I found cart placement was consistent, with test tapes coming up in phase time after time.

Then, when the cart is fully inserted, one of PR&E's innovative features jumps into action. Instead of a solenoid and chain, the Micromax uses a DC servo drive motor connected to a worm gear to position the pressure roller up close to the capstan.

Two very desirable results come from this. For the disc jockey, the proximity of the pressure roller means that the start time for the machine is less than 60 ms.

Our jocks love this because it means they can reliably lay the first beat of the new cart right over the last.

For the engineer, it means less heat and induced noise, as the motor draws no power when the tape is running, just when it is lifting and dropping the pinch roller. Rated stop time is less than 40 ms.

Drawbacks? Well, you can't just rip a cart out of the machine. It does take a fraction of a second for the pressure roller to drop when the cart is pulled.

We did have one jock who could catch the cart on the pressure roller consis-

(continued on next page)

CART CHART

Otari's CTM-10 has all the features you'd expect from a state-of-the-art cart machine, like cue level metering, logging mode, cue track record/erase, repeat play lockout, and many more—but check the chart for what it has that the others don't!

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BUYERS GUIDE

PR&E Bridges High Tech Gap

(continued from previous page)

tently, but he was so happy with the machine's quick starting that he quickly modified his tendency to rip the cart out.

The occasional slip up is usually prevented by a protective shield mounted under the pressure roller, to keep the cartridge plastic from cutting the roller.

The audio from the XLR connectors on the rear panel was clean, crisp and flat.

PR&E uses short head leads, no transformers and high performance ICs (NE5532) to produce a signal capable of a +24 dBm output that is ruler flat, with amplifier THD less than 0.01%, and noise better than -58 dB unweighted 20 Hz to 20 kHz. (Between 400 Hz and 2 kHz it reaches -70 dB).

Part of this comes from the Maxtrax head format which more than doubles the tape track width for the audio, while reducing the cue track somewhat.

Part also comes from a special high frequency equalizer stage which trims the preamp response for head wear and gap loss. Put it this way: this machine sounds superb!

Opening the spring release top on the desk mount, or sliding the rack mount unit out of the dual rack (the choice of mounting is the only option, everything else—including the high speed recue—is standard) reveals a clean, well laid out pair of PC boards.

All audio and control components are readily accessible from the top (the toroid-based power supply is under the deck).

The proper placement of the PC boards shows the thought given to the system: the audio board is located right behind the heads, the control board is next to the motors.

Internal connections in the Micromax are on quick release mini-molex style plugs.

However, about the only time you'll need to open the machine is for scheduled maintenance or for initial setup of the four pole dip switch that controls primary and secondary cue operation, replay inhibit, and a choice of having the capstan run constantly or just when a cart is inserted.

Full remote control, including status lights, are provided via a 16-pin AMP connector.

The audio section is essentially drawn from the Tomcat series.

Using active audio in a DC servo circuit to eliminate large capacitors in the audio chain, the electronics become close to transparent from the original source.

When playing CDs, for instance, it is hard to detect any coloration. The only minor effect is the slight residual tape hiss noticeable at very high monitor levels.

Now a word about the capstan motor and its linkage to the capstan. They are connected by a belt and pulley.

Again, as with the pressure roller motor drive, the Micromax utilizes an efficient DC servo motor with low power consumption.

Using a convex pulley to prevent belt slippage, the drive achieves wow and flutter below 0.08%. The self-aligning pressure roller design permits better

traction, with less tape skew.

One item "missing" from the Micromax is the ubiquitous microprocessor chip. As this machine is designed to do specific jobs well, such as play, stop, fast wind and check for replay inhibit, (what else do you do in a control room?) there is no need for complex microprocessors.

The Micromax does all its tricks from discreet CMOS logic chips, laid out in a direct manner. This seems to reduce problems and makes local troubleshoot-

ing much easier. In the event of a need for parts replacement, all parts are available from the local parts house.

All the same comments are true for the companion Micromax recorder. While it will not sense whether the coffee is ready nor automatically play the sign-on cart, it is a solid record unit designed to take full advantage of the Maxtrax format.

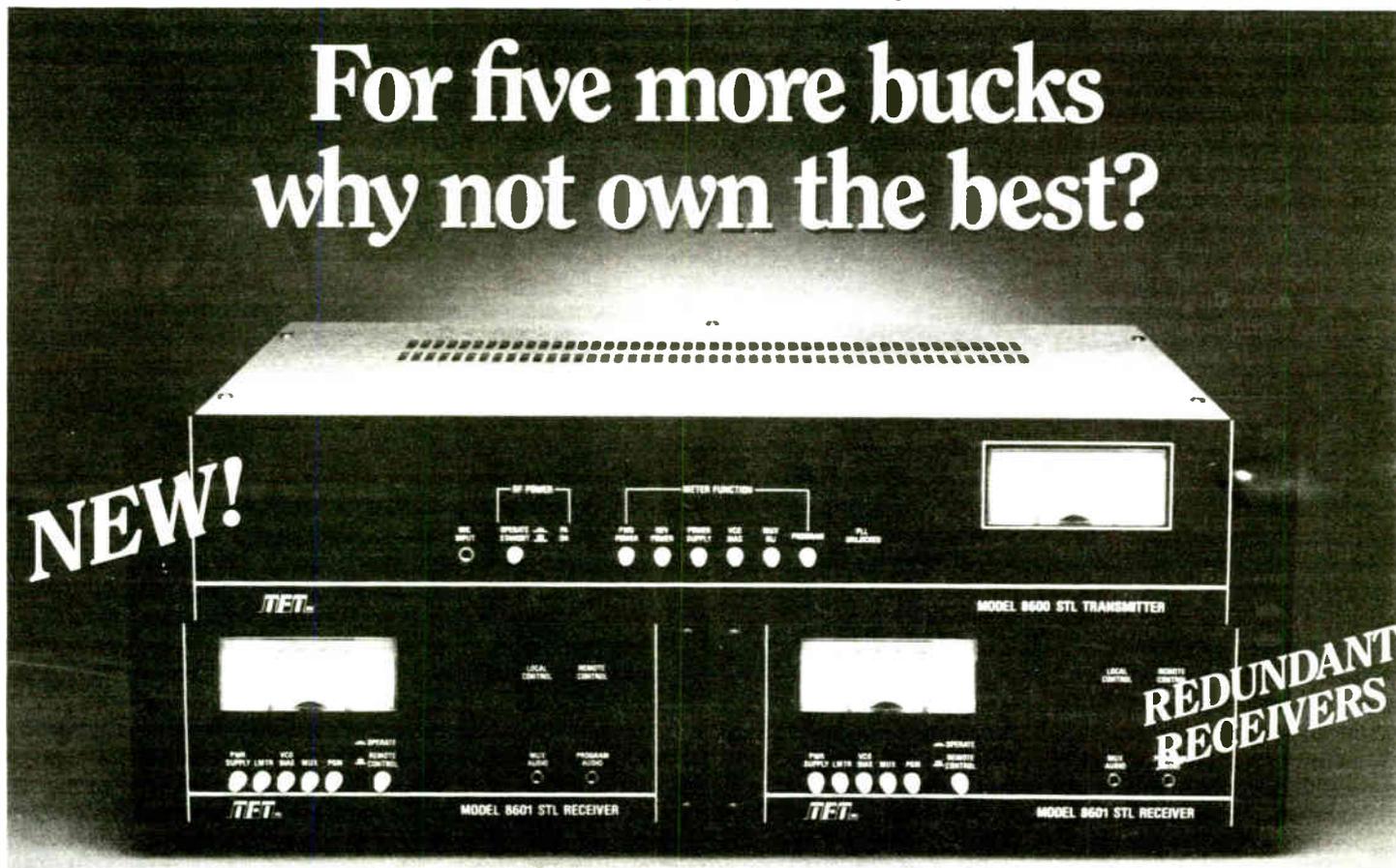
Again based on the Tomcat electronics without all the exotic features, the recorder is simply designed to be a high

quality cartridge recorder. The input circuitry has a phase compensation network that optimizes the audio and has solid specs.

The bottom line question: Would I buy more Micromax machines, knowing what I know now? You bet! And I've no hesitation in saying that your facility will benefit with these beauties in service.

Editor's note: Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant and contract engineer in Tucson.

For more information contact John Kenyon at PR&E: 619-438-3911. The author may be reached at 602-296-3797.



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Photo shows 8600 STL System (Model 8600 Transmitter) as a single link with redundant receivers (Model 8601 x 2). *Based on available price information 6/86



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BUYERS GUIDE

Fidelipac Cobalt Tape Endures

by Terry Hall, Prod Mgr
Radio Program Services

Colorado Springs CO ... I was first introduced to Fidelipac's new Cobalt DYN1000 cartridge tape at Radio '87 in Dallas. I have been waiting for this product since first seeing that smoky grey cart at NRBA 1984.

It's been worth the wait. We have made the new Fidelipac DYN1000 tape and cartridge the standard for our prerecorded music library services.

User Report

Radio Program Services produces custom libraries in CHR, AC, Country, Classic Rock, Oldies and Urban Contemporary formats from client music lists or standard company formats.

In producing a station's cart library, we start by recording sections of the music requested on open reel duplicators on 3600' rolls of DYN1000 tape.

Everything is dubbed in real time at elevated levels (250 nw) from digital masters (Sony PCM). The DYN1000 performs perfectly with no splash on occasional overdriven highs, and there's virtually no print-through at elevated levels.

The 3600' rolls contain about 20 selections that are cut and dropped into the Fidelipac cart shells.

The Dynamax cart shell is a new animal in itself. Made of high grade engineering plastics, the new shell boasts greater tolerance to heat while sitting idle in a cart deck.

A more precise tape path ultimately allows the cart machine guides to handle the tape for more phase accuracy.

What I find unique is the Teflon bearing system. What looks like 1/4" of plastic tubing replaces the metal bearing

coated with unidentifiable goo in the past to prevent plastic-to-plastic friction between the hub post and tape hub.

The hub is new as well. It is a sonically welded unit that eliminates tape binding as it comes off the hub, and long tapes (6.5+ min.) no longer have a chance of locking up in the center slant, as they did in previous designs.

If you have old Mastercarts, guess what? They'll accommodate the new hub and Teflon bearing when re-load time comes around.

Because of our interest in playing "destruction derby" with new products, we decided to find out how low the wear is with DYN1000 tape compared to other premium cart tapes.

We placed a Dynamax cart along with two others into a triple deck. Each was 3.5 minutes in length and each was recorded with a cue tone.

The result was that each cart would play in rotation while the other two set idle on hot decks. No cart failed after 1,000 plays.

The one showing the least wear was the Dynamax. It stayed within 5° phase to new carts and carts from other batches.

In an AC or Country library you may have up to 1,200 songs; 1,000 in oldies Rock 'n' Roll; 1,500 in Classic Rock. Assuming proper rotation, one given song will be played 75 to 90 times per year.

That means if all carts are handled normally, the playlife of a Dynamax exceeds five years. That usually outlasts the lifetime of most formats on a lot of stations these days!

To point out the survivability of the Fidelipac Cobalt cart, we will be making available used carts for demos for evaluation.

Using the above system to rapidly "age" carts, and having test carts placed with stations (in high rotation currents) gives us the "used" carts to compare

with the new.

To take things to another extreme, we placed a roll of DYN1000 tape in our mastering studio to compare it with our normal mastering tapes. Digital-to-analog recording properties of DYN1000 stand up to and meet our requirements.

If this tape were to be backcoated, we would not think twice about using it as studio mastering tape. Try this (in a non-critical situation) yourself and see how DYN1000 specs out for you.

Be sure to clean up the tape path after experimenting. This is cart tape and it is lubricated with the Whale Ambrigris and various other stuff (Fidelipac calls it "urethane tape binders").

If I worked at Fidelipac what could I find to change about the DYNAMAX? I cannot find anything that I'd change or upgrade.

PT 90 Corrects Phase

by Michael Maciejewski, Consultant
WEVS, Ed VerSchure Comm.

Saugatuck MI ... The Broadcast Electronics Phase Trak 90 has some unique innovations for a cart machine, namely built-in noise reduction, an FSK decoder and automatic playback phase correction (hence the "Phase Trak" name.)

User Report

Both the phase corrector and noise reduction are single-ended systems so no encoders or encoding is required when carts are recorded. The FSK decoder output is RS-232 compatible.

Three machines can be installed side by side in a 19" rack space. A rack shelf

My only complaint with Fidelipac has nothing to do with the cart, but with the shipping containers. I have yet to get a 100 bulk pack to arrive without one or two crushed carts in the box corners.

But that's our OEM problem, not one that would affect an end user!

If I were a program director at a station, or a GM picking up the tab, I'd put my money into a library recorded on Fidelipac Dynamax cobalt carts.

Digital is here and may one day replace the cart, but until a configuration comes along with the pricing and operator ease of use, we're going to stand behind the 30-year-old studio workhorse—and with the one cart we can't find something to gripe about.

Editor's note: Terry Hall is product manager and quality assurance director for Radio Program Services.

For more information call Art Constantine at Fidelipac: 609-235-3900. The author may be reached at 303-574-8628.

available for this has sliders for each machine to allow pull-out access for head alignment and adjustment of the equalization controls.

The electronics of the machines are in removable modules and use separate modules for the logic/control, audio amplifiers and power supply section.

The front face of the machine features blackout indicators for audio, secondary cue, tertiary cue, FSK data, variable speed and servo error. Also on the front of the machine is a bar graph display which indicates the amount of phase correction being applied to the cart playback.

How do they sound? The noise reduction is superb. The Phase Trak machines use the Dynafex system which improves the SNR by nearly 20 dB.

By being a single-ended system it will not only reduce the tape noise present, but it will reduce noise present in the source material being recorded.

This also holds true for the phase corrector. It, too, will correct phase errors in the source material recorded. With large amounts of gain reduction being used on air, there were no noticeable artifacts created from the noise reduction.

The only serviceability/design problem that I dislike about the Phase Trak machines is where the output level controls are located.

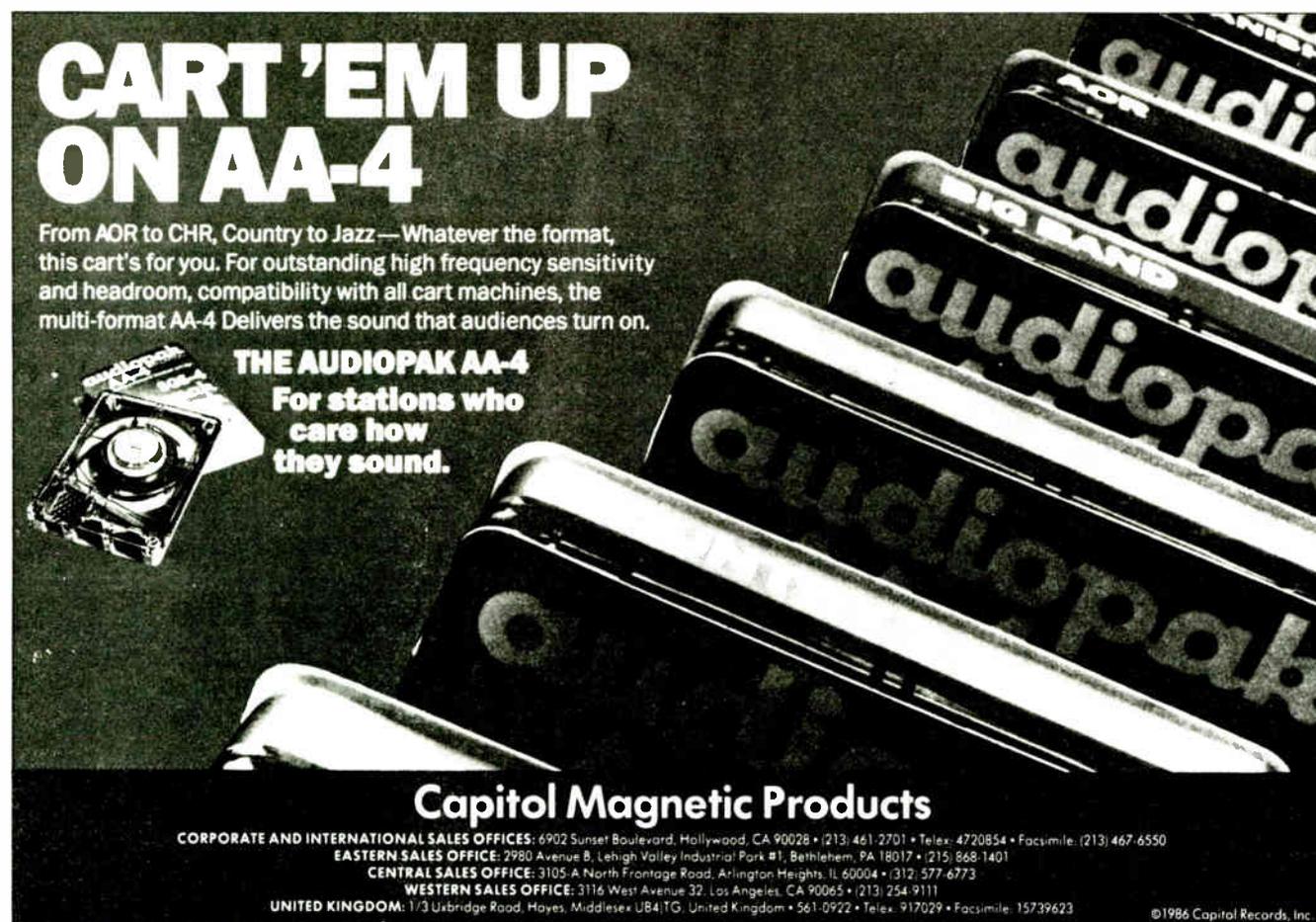
The controls are on the rear of the machines. If the machines are rack mounted in cabinetry, adjusting the levels when using your audio console metering becomes difficult.

However, there is a subminiature stereo headphone jack located adjacent to the output controls on the rear of the machine. It is possible to use a meter there to aid in adjusting the output levels.

Overall, the BE Phase Trak 90 cart machine, with its innovative features, brings cartridge playback to a new state of the art.

Editor's note: Michael Maciejewski is a NARTE-certified technician contracted by six stations in west Michigan for maintenance and servicing.

For more information contact Tim Bealor at BE: 217-224-9600. The author may be reached at 616-755-6163.



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BUYERS GUIDE

Omega Boasts High Speed Cue

by Mark Persons, Pres
MW Persons and Assoc., Inc

Brainerd MN ... In December, I reviewed the then new ITC Omega cart machine for RW. It was ITC's new economy line replacing the popular PDII series.

At that time I was impressed by its state-of-the-art design and quality. It was a world class machine.

Shortly afterward, I was involved in the design and installation of a new station in Florida. Fifteen ITC Omega machines were specified and installed at WDCQ, Fort Myers.

Twenty-one months of grueling, live, 24-hour-a-day operation have resulted in only two minor failures. Both were promptly taken care of under ITC's full two year warranty.

ITC recently re-engineered the Omega, adding new features including high speed cue. To do this, they installed the same motor that is currently used in the ITC Delta and Series 99 machines.

The motor is a servo whose reference frequency is divided down from a crystal. This makes for extremely accurate speed control regardless of power line voltage and frequency fluctuations.

Another feature that makes the ITC Omega a world class machine is the fact that it can run on 220 VAC and 50 Hz without changing the motor and power transformer.

Apparently black is back, because the front panel on the Omega has been changed from grey to black. I like the change and the appearance is good.

The front panel is actually an extremely durable plastic laminate over aluminum. There are large $\frac{3}{4} \times \frac{3}{4}$ " lighted push buttons on the front panel.

The stop button has a dimple for easy identification by an operator whose vision must be focused elsewhere. A new

"Cue" push button puts the machine into fast forward for rapid cueing.

I especially like the way ITC put a record level knob on the Omega. The knob goes behind the panel to grab the record level control, which is mounted on a bracket. This means that the knob can be removed and a $\frac{1}{2}$ " chrome hole plug put in its place.

User Report

Record level can be set by popping the hole plug out and turning the record level control's slotted shaft with a screwdriver.

I have long been an advocate of setting the record level controls with a tone to correspond with a console's VU meter and then preventing access to the control by the operator. The ITC Omega scores high marks here.

Another change is new rear terminal strips that now plug into the record and play circuit cards. This can make replacement of an ailing machine quick and easy.

The terminal strip is not quite as nice as a regular connector, but is a good functional alternative. We'll probably see more of these from other manufacturers.

Servicing PC cards is still fairly easy with ITC's unique tilt-up design. Removing three screws and putting one back in a different hole holds the circuit cards up for troubleshooting from both sides.

The power supply uses a toroidal transformer which is known for low flux leakage. In addition, there is a shield over the power supply area now. This is probably responsible for the very good noise performance the machine sports.

The ITC Omega logic is microprocessor-based which may make it a little more difficult to repair in the field.

power was being consumed. This increased to 53 W when a cart was inserted and running. Most of the heat then came from the pressure roller solenoid.

After an hour of continuously running a cart without a cue tone, the ITC Omega was warm to the touch, but cooler than any other machine I have worked with.

Apparently stations are stacking these machines one on top of another. This can be a slight problem as the top covers move about $\frac{1}{4}$ " forward and backward. To solve this, ITC has now put a locking screw on the cover to keep it in place.

ITC has produced an excellent book to go with the Omega cart machine. It has multi-color mechanical board layout drawings along with schematics with lots of notes to help you through the circuits.

They really go the extra mile to explain how to connect wiring in studios and illustrate correct and incorrect grounding schemes.

The ITC Omega may be an economy series cart machine, but it is a world class machine in construction and features. Omega is available as a monaural recorder, monaural playback and stereo playback.

Editor's note: Mark Persons is a frequent contributor to RW.

For more information contact Bill Parfitt at ITC: 309-828-1381. The author may be reached at 218-829-1326.

BUYERS BRIEF

ITC/3M's HCDA 3000 Digital Audio System is the first digital "cart machine."

It offers digital sound with the advantages of the cartridge machine format. It provides instant start, automatic cueing, and the ability to re-record and edit.

The HCDA 3000 is a true, 16-bit linear digital audio recording system allowing for up to 20 minutes of stereo recording per cartridge without companding.

"Carts" are really special mini-cassettes containing digital tape. They may be recorded at either 48 kHz or 44.1 kHz sampling rate. This rate is automatically detected during playback.

The system employs a unique form of S-DAT (stationary head) technology. While in operation, the tape runs from one end of the cartridge to the other, while the head (the only element which ever comes in contact with the tape) remains stationary.

However, when the end of the tape is reached, the head moves up vertically to the next track and the tape direction is reversed. This action is referred to as "serpentine" motion.

There are 32 tracks on the tape and tape speed is 52 ips.

The HCDA 3000 is available in three configurations: reproducer, which in-



cludes the tape drive and rack-mounted signal processor; recorder/reproducer, which additionally includes the record control; and the recorder/reproducer with an expanded control panel in place of the record control.

The signal processor contains the main electronics for accomplishing A-to-D and D-to-A conversion, tape encoding and decoding and error correction. It may be located remotely from the tape drive.

The cartridge and drive technology designed into the system is derived from the computer industry, while the magnetic tape comes from 3M research.

For more information, contact Bill Parfitt at ITC/3M: 309-828-1381, or circle Reader Service 60.



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BUYERS GUIDE

SR System Adds Life to Analog

by Jack Williams, Pres
Pacific Recorders & Engineering

Carlsbad CA ... Pacific Recorders recently introduced a compact broadcast version of Spectral Recording technology designed for application to modern tape cartridge equipment.

Spectral Recording, or SR, is a new professional studio mastering system from Dolby Laboratories. It provides two key advances in analog tape recording: a substantial extension of available headroom and the practical elimination of the influence of noise and non-linearity on the reproduced sound.

The SR system delivers this performance through being adaptive to the signal spectrum and by the consistent application of minimum processing to the signal.

When combined with a professional half-track reel-to-reel or Maxtrax™ format cartridge tape machine, SR provides performance equal to or better than 16-bit linear PCM digital audio recording.

Simply said, the Dolby Spectral Recording process addresses many of the classical limitations of analog magnetic recording.

It provides audio performance which competes favorably with the dynamic range and distortion of digital recording while retaining the sonic advantages of analog recording such as linear phase response and unfiltered bandwidth.

Spectral Recording consists of the en-

coding of the analog signal prior to recording and decoding it upon playback.

The SR process works both by optimizing the modulation capabilities of the magnetic recording medium and by applying corrective characteristics to eliminate or minimize tape saturation at the extreme ends of the audio spectrum.

Cart application

By mutual agreement, it was decided that Pacific Recorders & Engineering Corporation would design and develop a system to adapt the SR process to a broadcast cartridge application.

Technology Update

The goal of the design effort was to develop a more compact and affordable professional system than could be assembled using hardware, frames and cards designed for multitrack recording studios.

For example, the vertical rack space required to accommodate six stereo record and/or reproduce channels using recording studio hardware is 21", while the broadcast frame occupies only 7".

The system also incorporates features which are particularly important to broadcast cartridge applications, including automatic mode and monitor switching, extensive RFI protection, optional

redundant power supply and cartridge recognition logic control.

The rack mount frame contains the system power supply and the input, output and logic control connectors. The regulated supply uses a toroidal power transformer equipped with an electrostatic shield to prevent the coupling of common mode line noise and RFI.

The input, output and logic connectors are the same Molex series as used in Pacific Recorders consoles; the audio wiring sequence follows the normal console conventions.

Two interface modules

The frame will accommodate up to six sets of modules, each set representing a recorder or reproducer. Each set is comprised of an Interface Module and a stereo pair of SR Processing Modules.

There are two types of interface modules, one for use with a cartridge reproducer and the other for a recorder/reproducer.

The reproduce interface module is equipped with balanced stereo inputs to receive the output of the cartridge machine, stereo input and output level calibration controls, remote SR sense logic, reproduce level LED meter with meter switch and a set-up switch.

The recorder/reproducer module has the same facilities as well as record mode switch and record/play LED indicators. Each type of interface module controls

its set of SR processing modules as a stereo pair.

The SR Processing Module is manufactured by Dolby Laboratories and is a specialized version of the Cat. 280 module, which is a retrofit for the Cat. 22 Type A noise reduction module.

The SR Module used in the broadcast cartridge frame does not need the programming switch and uses the input and output amplifier circuitry contained in the Interface Module.

The SR Processing Module is equipped with a unique set-up signal, called Dolby Noise, and auto compare system for the rapid confirmation of level and frequency response in the tape equipment.

The use of Dolby Noise and the auto compare system gives maintenance personnel a quick check method of checking the recording and playback machines.

The application of Spectral Recording technology to modern professional grade cartridge machines provides exceptional audio quality, including a dynamic range of 88 to 92 dB with a 20 to 24 dB improvement in tape distortion, modulation noise and scrape flutter artifacts.

Editor's note: Dolby and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation. Maxtrax is a registered trademark of Pacific Recorders & Engineering Corporation.

For more information contact the author at PR&E: 619-438-3911 and Scott Schuman at Dolby Labs: 415-558-0200.

Harris Corrects Phase

by Ron McGrew, Eng Supvrs
WBNS RadioOhio, Inc.

Columbus OH ... Phase error and flutter on cartridge tapes can be troublesome problems. At WBNS-AM/FM in Columbus, however, we've virtually eliminated them with Harris Corporation's Phase Fixer™ audio time-base corrector.

User Report

We've put most of our AM library of 2500 cartridge tapes and all of our 500 commercial tapes for the FM station on the Phase Fixer system.

The Phase Fixer gives us clean sound on every tape, no matter how much repeat play and abuse they receive.

The Phase Fixer consists of an encoder

unit, which injects a low level, inaudible pilot signal into the audio recording of the tapes, and a decoder unit, which provides audio time-base correction to keep the left and right audio signals in time synchronization.

What most engineers don't realize is that it doesn't just gloss over the phase error problem, it actually corrects it.

The Harris Phase Fixer effectively eliminates phase error and flutter problems electronically. The encoder pilot signal consists of a 19,000 Hz sine wave, which is 60% double sideband amplitude modulated by a 296.875 Hz sine wave.

The pilot is injected into both audio channels at a level 27 dB below "0" VU. This level is so low it doesn't even show on the VU meter; it causes no degradation of real (decoded) SNR, distortion, frequency response or overload.

(continued on next page)

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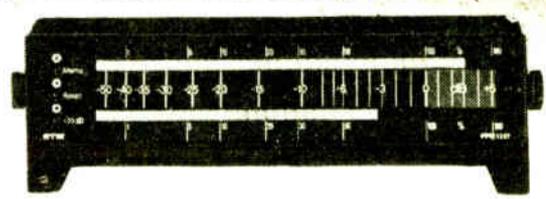
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BUYERS GUIDE

CTM-10 Ranked High by WKSZ

(continued from page 23)

There were no surprises here.

The unweighted SNR of the machine measured 51 dB, referenced to 0 VU output at a recording level of 160 nW/m. Crosstalk between left and right at 10 kHz was about -43 dB. Wow and flutter peaked at about 0.06% and muted noise (cart stopped) was less than -80 dB.

After all the measurements were made, I wanted to hear what the machine sounded like. I found a nice CD with good frequency response and significant separation.

I recorded a few minutes on the CTM-10.

The CTM-10 has neither an erase feature nor automatic azimuth. A cart was bulk erased, the record head azimuth was adjusted using the built-in features, and then the cart was removed, bulked again and reinserted for the splice finding function.

If your station has never had machines with these alignment features, the CTM-10 will seem wonderful.

I would be skeptical, however, about the possibility of consistent cart quality from operators given a CTM-10 after they are accustomed to fully automated cart preparation features.

With careful, well-instructed operators, the end result should be satisfactory. But it requires more conscious effort.

The CTM-10 uses an optical system to sense the higher reflectivity of the splicing tape. This worked flawlessly every time it was used.

The optical elements (LED and phototransistor) are mounted on the pinch roller shaft, close to the rotating roller.

I wonder what will happen when the rubber roller swells as it gets older. How long will those lenses stay clean when they are so close to the tape and roller? And what happens when alcohol or other cleaner gets on the lenses during cleaning? But perhaps there won't be problems.

After recording the selection, I ran the cart and the CD and switched between them. It sounded great, the audio only minimally degraded and slightly noisier than the CD.

One thing I did notice, however, was that the 1 kHz primary cue tone on the CTM-10 was heard when starting the cart on playback. It was low, but clearly audible at a fairly high monitor level. Later, I measured this crosstalk and estimate it

to be 1 or 2 dB above the noise level.

The tape timer display was much more useful than I initially thought it would be.

Normally the timer automatically resets each time the machine detects a primary cue tone. This can be changed to manual reset if a cumulative time is needed.

I saved the cart and made another, this one using the stereo matrix feature of the CTM-10. I aligned the record head as before, and then recorded the same music.

After 30 seconds, I purposely misaligned the record head a little at a time over the next two minutes.

On playback, there was no noticeable difference in quality between the matrix cart and the conventional cart—both sounded very good.

As the misalignment section started, the stereo image gradually became more monaural, but the frequency response

remained acceptable until the azimuth adjustment was so far off that the high frequencies were lost.

The matrix system appears to be far more tolerant of azimuth misalignment than the conventional L/R system.

The CTM-10 is a very good machine. It can hold its own with the best cartridge decks. It has a multitude of fine features. It is built well and has a rugged and professional feel to it.

The panel layout is logical and easy to comprehend. The instruction manual, even of the early unit I received, is well organized and complete.

Editor's note: Doug Fearn is a frequent contributor to RW.

For more information contact John Carey at Otari: 415-592-8311. The author may be reached at 215-565-8900.

Harris Fixes Phase, Flutter

(continued from previous page)

The decoder unit contains two voltage-controlled delay lines, which have an average delay of about 27 ms. The relative phase of the 297 Hz modulation of the pilot signals, from the left and right audio channels, is measured and a feedback signal is generated.

This is used to vary the delay of one of the two delay lines and correct the relative phase error to zero. This corrects—on a real-time basis—all stereo phase errors that have occurred between the output of the pilot encoder and the input of the decoder.

The benefits of the Phase Fixer are many. Existing cart record and playback equipment can be used without modification, and only one decoder unit is needed for an entire station. In addition, it can be used for carts, reel-to-reel and cassette machines, and for correcting the audio on video tapes.

Once the system is in place, you don't have to encode your entire library of carts at once.

Just encode carts as you have the time. As those carts play on the system it reacts to them. Carts that are not yet encoded go through as they would have anyway.

We have five encoders and two decoders (one for each station) in use now at WBNS RadioOhio. After using the Phase Fixer for two years, I must say

it continues to make our audio quality close to perfect. The Harris Phase Fixer is a winner of a product.

Editor's note: Ron McGrew came to WBNS nearly 19 years ago. He worked at WBNS TV for seven years and spent the other 12 years at WBNS RadioOhio, taking over the radio supervision in 1976.

For more information, contact Martha Rapp at Harris Broadcast: 217-222-8200. The author may be reached at 614-460-3891.

Response From the Manufacturer

We wish to make a few additions to Doug's comments as follows:

○ *Alignments for High Frequency EQ: The 10 kHz equalizer has a shelf characteristic which will cause the 16 kHz point to move so it should be set first, then 16 kHz adjusted to trim the last bit on the top end flat.*

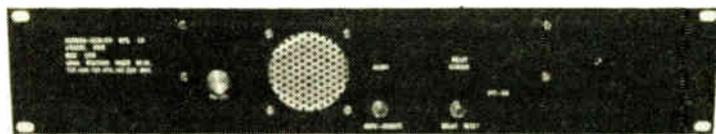
○ *Low Frequency Playback EQ: Some test tapes do not provide information on the amount of compensation necessary for the fringing effects. Because of this, the industry common practice is to record the low frequency signal and adjust the repro low frequency EQ using this track, which does not suffer the effects of fringing. Either method will yield good results.*

○ *Bias Setting Techniques: These may vary from user to user based on the parameter that is to be optimized. Factory recommended settings are established to provide a good level of performance across all of the recorder's parameters.*

The procedure described above will set the bias for minimum distortion where the output level (S/N) and high frequency sensitivity will fall where they may. The ideal bias point is largely up to the user.

*John Carey, Mktg Mgr
Otari Corporation*

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BUYERS GUIDE

Digital Replacement for Analog?

(continued from page 23)

Pizzi believes that if R-DAT is marketed properly and comes out in 1988 that "the cart will start to go pretty quickly. We should see cart machines heading towards the used market practically immediately," he says.

Cart machine manufacturers disagree. While R-DAT may have some place in broadcast, they say, its use will be limited.

"R-DAT is an excellent format but it still involves operators cueing and putting more than one cut on a cassette—and there is a lot of manual operation involved," says Bealor.

Bill Parfitt, ITC/3M's market development advanced administrator, referred to a paper presented by Sony engineer Roger Lagabec at the recent SBE show.

The text, he said, stated that "The basic R-DAT format was originally centered on consumer use, however it offers many possibilities and some limitation for use in professional applications."

Parfitt says Lagabec "alluded to broadcast as one of those industries where (R-DAT) wouldn't fit specifically."

The fact that R-DAT was never designed as a professional format is a distinct disadvantage, the manufacturers say.

"R-DAT was never designed to do (what a cart machine does); the professional (R-DAT) machine is designed to make tapes for the consumer and studio dubs for musicians and ad agencies," says Williams. "It is a digital replacement for the cassette machine," he adds.

Although these manufacturers don't

believe R-DAT will be the new digital format, most concede that there will eventually be (or at least admit the possibility that there may be) a digital replacement for analog cart machines.

"Digital will come and it will come in a hurry when the right combination of price and functionality is found," says John Carey, marketing manager of Otari Corporation.

"Just because such a digital device does not exist now is not to say that a 'digital cart machine' will not at some time in the future be offered," says Constantine.

All of them firmly believe that the cart machine will live for another five to 10, even 15 years. Even Parfitt, whose company is working hard to bring its digital machine to market believes any digital device will take some time to replace analog cart machines.

"We anticipate good things for analog for quite some time," says Parfitt. "Right now we view the HCDA 3000 as a supplement to our upper line products."

As digital technology matures, cart machine manufacturers with no digital replacement products as yet are creating or enhancing analog products to serve in the meantime.

"We made a significant commitment to analog with our Phase Trak 90," says Evers. "We figure that will hold us through the duration of the analog product lifetime," he adds.

PR&E has tremendously enhanced the analog cart machine with a Dolby SR outboard unit.

"The enhancement of tens of thou-

sands of cart machines (with Dolby SR) will give parity performance with digital while the new technology continues to emerge," says Williams.

Fidelipac has also indicated it will make similar enhancements, both in audio performance and cart machine control.

Although digital seems to have at-

tracted the attention of broadcasters, analog cart machine manufacturers don't appear, at this point, to be taking it too seriously as a contender for their now-solid position in radio.

Carey puts it into perspective.

"When I first joined Otari we had a product description for a cart machine and we didn't build it because the popular opinion in the industry was that there would be a replacement for the cart machine within 12 months," he says. "That was six years ago."

Carting on Fidelipac

by Alan P. McCarthy, DE
KUIC-FM

Vacaville-Fairfield CA ... The Fidelipac CTR 124 with Cartscan will easily intermix two different types of carts, which is something no other deck can do.

User Report

Two years ago when our programming department decided to change from records to carted music on the air, a big problem arose: how do we intermix on-air records, old carts and high output, low noise (HOLN) carts?

I did some research and tried out three different types of cart machines.

The deck that stood out from the crowd was the Fidelipac CTR 100 Series. We purchased the CTR 124 playback/record deck and two CTR 112s for carted music playback on air and three CTR 12s for spot playbacks.

The CTR 124 and CTR 112s can be set up for HOLN and regular tape levels, hot or regular tape, EQ and bias. They also have the Fidelipac Cartscan system.

The Cartscan system uses reflective foil tape on the right side of the cart which is read by an optical photocell on the right side of the machine.

With dip switches on the PC boards, I can normal the machine for the various modes I want, like mono left and right on the left channel for spots, or matrix for some of the moldy oldies we play.

The matrix takes the L+R information and puts that on the left channel. The L-R is put on the right channel. The result is a pleasing sound of stereo on the air.

I've found that with elevated levels and hot Cobalt tape, the SNR is far better than I ever expected.

A few of the features I like about the Fidelipac machines are the self aligning with ball bearing pinch roller, all three tones included with relays for secondary and tertiary tones, and Fidelipac service.

Fred Buehler is the service manager and has been helpful when I had a couple of interface and static start problems.

The interface problems with my board were fixed with a diode and the static start problems were fixed with .01 caps.

One thing I disliked about the decks was the head life on early production runs. I purchased a new type of head six months ago; the head life seems better.

I don't like the amount of heat the decks have on the deck plate, but I've had no failures due to heat.

Also, the cart hold down system used rubber "O" rings which easily crack and break and are very tough to replace.

Fidelipac has replaced the "O" rings with a wire spring steel clip. It works much better now. Retrofits are available free for the CTR 100 or 10 series.

If you've been looking for a new cart deck that will easily intermix two different types of carts, and has many good features and is reasonably priced, the Fidelipac CTR series of cart decks is worth a try.

Editor's note: Alan McCarthy has seven years of experience in radio. He has been CE of KUIC for five years and now is DE for the Quick-Crystal Broadcasting Group.

For more information contact Art Constantine at Fidelipac: 609-235-4900. The author may be reached at 707-446-0200.

New Phase Chaser

by Bill Laletin, Dir of Research
Howe Technologies

Boulder CO ... One of the most overlooked problems in the broadcast industry is the distortion caused by interchannel time delay errors.

Whenever an analog stereo recording is made or played back, there is the possibility that an unintentional time delay may be introduced between the two signals. The major causes of this are improper tape head azimuth alignment and gap scatter.

If random errors occur in the source material, no amount of calibration or fancy signal processing will guarantee mono compatibility in all cases.

A solution to this dilemma is provided by the Howe Technologies Model 2300A Phase Chaser: it can detect and correct time delay errors in real time, without any prior encoding or preparation of the program material.

A proprietary discriminator circuit (the Window of Zero Correction) allows the device to distinguish between pure time delay and intentional stereo phase differences so errors are corrected without affecting the original stereo image.

Stereo audio examined

The stereo image results from the presence of some dissimilar information on the two tracks. The image will be balanced if the left and right mono components of the signals line up properly

(continued on next page)

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Phase Chaser 2300A Debuts

(continued from previous page) in time so the average interchannel phase difference is zero.

As the degree of dissimilarity between the channels increases, so does the apparent width of the image, until at some critical point the two signals no longer perceptually fuse, but appear as spatially separated monaural sources.

The Phase Chaser design relies on two facts: One, that stereo audio has a significant mono component, and two, that the stereo image is on the average centered between the speakers.

Thus, any fixed displacement in time (that is, skew) between the mono components of the channels must be due to an unintentional interchannel time delay.

A determination of the skew between the mono components is all that is required to determine the proper time delay correction for the entire stereo signal.

Phase Chaser circuit topology

The time delay corrector consists of a cross-correlator, used as a phase error detector, a high gain op amp coupled to some decision making circuitry, and a voltage-controlled differential time delay network.

These elements are configured as a negative feedback servo amplifier operating in the time domain: It always tends toward an equilibrium point where the

average output of the error detector is zero.

When this condition is achieved, the interchannel time delay error must necessarily be zero as well.

A cross-correlator has two inputs and one output. For inputs of exactly the same frequency, the output will assume a steady state value proportional to the sine of the phase angle between the inputs; unrelated inputs will yield AC components at the sum and difference frequencies, but the average output (that is, the DC value) will be zero.

Technology Update

If the inputs are stereo audio signals, the output will be proportional to the sum of the instantaneous phase differences of the related signal components (uncorrelated signals produce zero average output, and so do not contribute to the sum).

If there is a fixed time delay between the inputs, the output will have a non-zero average value. This is used as the error signal in the servo loop.

Internal error signal

A precision op amp serves as the error amplifier that drives the actual correction circuitry. The output of this op

amp will assume whatever value is required to assure that both its inputs remain at the same potential.

Since the non-inverting input is connected directly to ground (i.e., to zero), the inverting input "wants to be ground" as well.

The inverting input is connected to the cross-correlator out, which will have an average value of zero only when there is no net time delay error between its input signals.

Now recall that the inputs to the cross-correlator are derived directly from the audio outputs of the Phase Chaser.

The servo loop operates to drive the internal error signal to zero by adjusting the differential time delay network to remove any time delay errors between the Phase Chaser audio outputs.

Bandwidth limited

In order to avoid applying correction where none is needed the inputs of the cross-correlator must be bandwidth limited to reject most of the fundamental frequencies which occur in audio material.

By using only frequencies between 1 kHz and 20 kHz—the harmonics—very satisfactory results are obtained without false operation occurring for such signals as bass drum beats and "phased" guitar.

To guarantee that the error detection operation is level independent, a pair of

wide dynamic range AGC amplifiers have been included just ahead of the bandpass filters.

The design described so far will perform as an extremely accurate phase corrector for complex audio signals.

Unfortunately, it will also cheerfully "correct" those interchannel phase differences which characterize stereo itself, and in effect, provide the sought-after mono compatibility by producing virtual mono at the output.

The key here is to provide some smart decision-making circuitry that can react very quickly to any change in the relative time delay between the channels, but can also reliably discriminate between simple time delay and normal stereo phase information so it doesn't "correct" the phase differences in the original stereo image.

These two apparently contradictory functions are provided by the Window of Zero Correction module in the 2300A Phase Chaser.

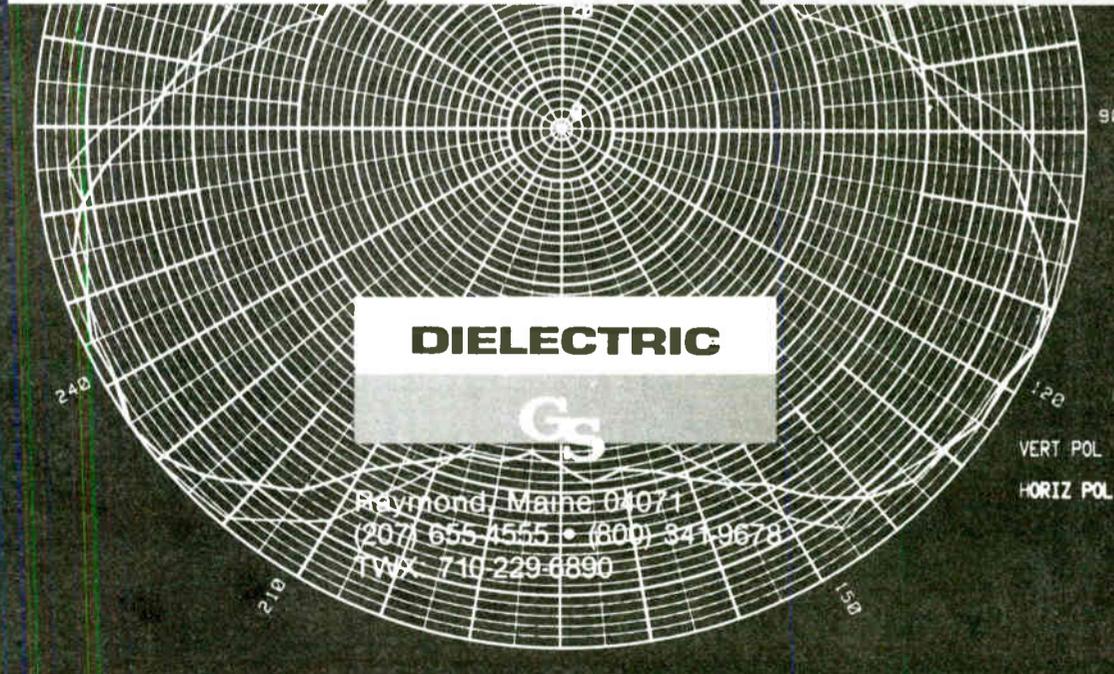
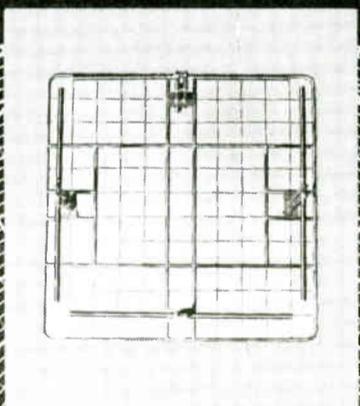
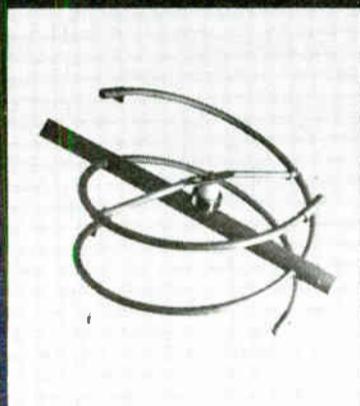
Without the Window module, any program-based time delay correction scheme will react either too slow or too fast to follow the shifts in program material. The Phase Chaser can avoid such mistakes.

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Editor's note: For more information contact the author at 303-444-4693.

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