

100-27-008 100-17 100-4
100-17 100-4
100-17 100-4

BULK RATE
US POSTAGE
PAID IN
DES PLAINES IL
PERMIT NO 321

Radio World®

Broadcast
Equipment
Exchange
see pages 33-38

PO Box 1214, Falls Church VA 22041
ADDRESS CORRECTION REQUESTED

April 1, 1988

Volume 12, Number 7

Comments Oppose Freeze

by Alan Carter

Washington DC ... A freeze on granting new AM stations and major changes to existing stations proposed by the National Association of Broadcasters has not been met with total approval.

Some broadcasters took advantage of a 1 March reply comment deadline to oppose the freeze that the NAB called on the Federal Communications Commission to implement.

The NAB made the proposal in comments filed in February on the FCC's comprehensive review of AM assignment criteria, Docket 87-267.

In the reply comments, broadcasters also opposed a proposal by Crawford Broadcasting and Saga Communications that the skywave service of clear channel stations be eliminated.

NAB Science and Technology VP Michael Rau had not seen the reply comments but said he expected the opposition to the freeze. "I think in an AM industry as large and diverse as ours, it is impossible to get unanimity," he said.

No freeze

Money Radio, a limited partnership that owns KMNY, Pomona, CA, "strongly" opposed the freeze and predicted such a move would be counterproductive.

"Time and again, the suspected or actual onset of a freeze has caused a deluge of applications by parties hoping to slip in under the wire," Money noted. The Commission's staff then becomes overloaded, the broadcaster added, and it can take years to restore order.

Money also claimed a freeze would create problems for existing licensees who desire or need to make facilities modifications. "The Commission's existing protection requirements will prevent the widespread creation of new interference that the general freeze's proponents fear," Money stated.

Money said previous freezes, such as on the filing of new AM daytime-only stations to prevent deterioration of the level of spectral efficiency, were justified.

But under the NAB's proposal, the station owner stated that a freeze "would prevent increases in spectral efficiency that would not cause interference as defined by the Commission's rules."

If the FCC approves a freeze, Money recommended the action not apply to facilities improvements that comply with the existing protection rules.

More opposition

Another broadcaster, GSM Media Corp., owner of daytime-only WRGM, Ontario, OH, called a freeze "absurd."

"Today, more than ever," GSM wrote, "existing AM stations need every opportunity to expedite improvements in their

technical operations and thereby improve audience service."

An indefinite freeze would "throw additional dirt on the coffin of the AM industry," the broadcaster noted.

Even though it opposed a permanent freeze, GSM said a temporary move in that direction may be justified.

But station owners were not the only segment of the industry to file opposition to a freeze.

The Association of Federal Communications Consulting Engineers (AFCEE) stated that a freeze, at this stage of the Notice of Inquiry, would be inappropriate.

AFCEE stated that the review process would be lengthy and "imposition of an AM freeze now could deny new service to the public, and delay needed im-

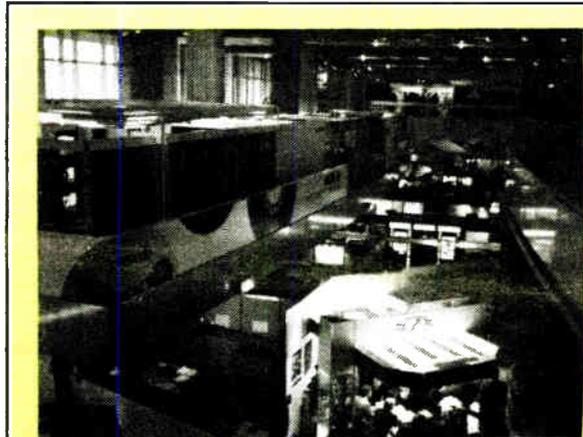
provements in existing facilities, for a matter of years to come."

The Association for Broadcast Engineering Standards (ABES) recommended the FCC continue to enforce the 'go/no-go' acceptance standards, rather than adopting a freeze.

ABES said the go/no-go standards "will have the effect of channeling the small amount of growth still available in the system into comparatively underserved areas."

Clear Channel

On the proposals by Crawford and Saga to eliminate skywave protection for clear channel broadcasters, opposition came from Palmer Communications and Clear Channel Broadcasting Service (CCBS).



The 84th
AES show
brought new
audio gear to
Paris.

For story and photos
see page 9.

NJ Class A's Fail to Sway NAB

Washington DC ... Class A FM New Jersey broadcasters could not convince the National Association of Broadcasters Radio Executive Committee to support their proposal for a blanket power hike.

The Radio Executive Committee supported the full board's decision to back individual power hike requests by Class A FMers, rather than an across-the-board power increase.

The executive committee met 1 March with New Jersey Class A FMers who have filed a petition before the FCC asking for a blanket power increase from 3 to 6 kW for Class A FMers.

A representative of Class B broadcasters, who fear additional interference if the power hike is granted, also met with radio executives.

The Radio Executive Committee "reaffirmed our board's position," said Michael Rau, NAB's vice president of science and technology. He did not elaborate on specific discussions between the two groups. Talks centered around points in the New Jersey petition before the FCC, he said, and a number of questions radio executives had.

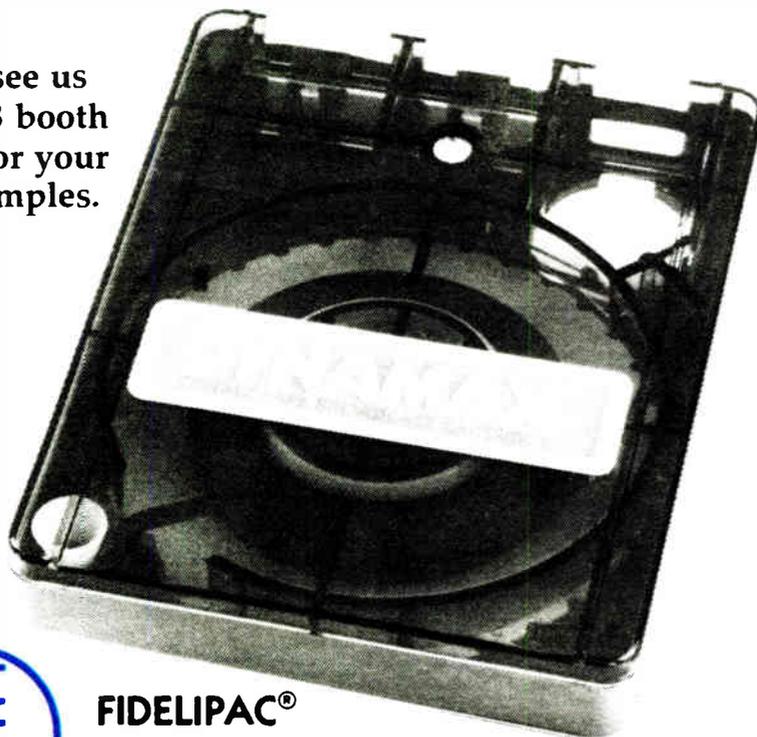
Going ahead

Bob McAllan, president of Press Broadcasting and one of the Class A owners in the New Jersey Group, admitted that the meeting did not result in the groups solving their differences.

But he said, "It never hurts for
(continued on page 11)

DYNAMAX DELIVERS

Come see us
at NAB booth
515 for your
free samples.



FIDELIPAC®
BROADCAST TAPE PRODUCTS

Circle Reader Service 20 on Page 28

World Radio History

REGULATORY NEWS

RF Limits Planned for Boosters

by Alex Zavistovich

Washington DC ... In response to a Federal Communications Commission move to have FM boosters included in RF evaluations, the National Association of Broadcasters has filed comments supportive of the Commission's action, while cautioning that the regulation should not spill over into FM translators.

However, the NAB also used the comments to chide both the FCC and the Environmental Protection Agency for not addressing the matter of federal preemptive radiofrequency (RF) exposure standards.

For some time, FM boosters—which extend a station's service by transmitting at lower power the same programming as their full service station—had been limited to a 10 W power output. Because of the low power, the boosters had been categorically excluded from environmental evaluation of RF emissions.

However, in July 1987, in response to a petition filed by Minnesota-based Brill Media Co., the FCC adopted what it called "substantial increases" in output of FM boosters.

Booster power now is restricted only in that it can not extend service beyond the primary stations 1 mV/m predicted contour, nor increase interference to co-channel or adjacent channel stations. The increase in power increases the amount of RF energy emitted by the boosters.

In December the FCC held that although such stations would probably not cause excessive environmental exposures to RF radiation, it was "no longer justifiable" to categorically exclude the boosters from measurement.

In its 8 February filing, the NAB applauded RF evaluation of FM boosters as part of the Commission's regulatory program.

"NAB supports fully the Commission's

proposals to apply its RF radiation regulatory program to FM booster facilities," the association wrote, urging the FCC to "afford FM broadcasters several months notice prior to the revised rule's effective date."

However, the NAB also said that FM translators, unlike boosters, should not be subject to the same RF environmental evaluations.

"The FCC has made no change in the rules specifying maximum power output of FM translator stations," the NAB said, pointing out that such facilities "still are limited to output powers of either 1 W or 10 W," based on their location.

While the NAB on the one hand supported the Commission action, it also criticized the FCC and the EPA for not coming to any decision regarding a federal standard on RF radiation exposure levels.

Currently the FCC uses as a general standard for environmental impact of RF radiation a protection guide established by the American National Standards Institute.

A defined federal standard, the NAB has argued, would preempt more stringent local standards such as those in Massachusetts and Oregon; the latter state's Multnomah County ordinance, for example, requires a cap of 200 $\mu\text{W}/\text{cm}^2$.

The NAB used the booster filing to point out that it has urged the FCC to formally adopt the ANSI RF standard to prevent local government intervention.

"... Federal standards for nonionizing energy exposure not only will afford appropriate protection for the public and station workers but will provide either guidance or ... a disincentive for state and local authorities that otherwise might choose to address this regulatory area in an inappropriate manner," the NAB said.

The association noted that the EPA has

"failed to enact its own 'expert' agency standard" for RF energy, and commented that the FCC "has not squarely addressed the matter of federal preemption."

Federal preemption is a matter "long overdue" to be addressed by the Commission, according to NAB Deputy General Counsel Barry Umansky.

The issue has been "pending for some time," said Umansky, commenting that the NAB has been lobbying the FCC for some action for a number of years.

"It's important to settle on a standard, not just for the integrity of the FCC's own processes, but for broadcasters who are taking the time and expense to try to comply with RF emission limits only to find they are unqualified at the local level," he explained.

The FCC's RF evaluation docket is GEN 87-551. For additional information, contact the news media information office at 202-632-5050. Contact Barry Umansky at the NAB: 202-429-5456.

INDEX

AES Paris Show	9
A Digital Studio to Transmitter Link by Tim McCartney	14
Covering the Campaign Live by John Shepler	18
Listening to the CBS Copycode by Alex Zavistovich	20
Using a Computer for Business by Jeffrey Baker	23
Maintaining Your Station Log by Harold Hallikainen	25
The Future of Digital Processing by Jim Somich	28
Microwaves Aid Synchronous AM by Fred Baumgartner	30

FCC
Clips

Public File Inspection

The Federal Communications Commission has reduced the period that broadcast licensees must keep applications, ownership reports and various supporting documents comprising their public files.

These documents must be kept one license term—seven years for radio and five years for TV—or until the licensee's renewal application has been approved, whichever is later.

Previously, the Commission required stations to retain applications in the public inspection files for seven years from the date of application or until final FCC action on the second renewal application, whichever was later.

When this provision was adopted, license terms for TV and radio stations were three years, resulting in the retention of material covering at least six years of station activity.

The Commission said this would significantly reduce the paperwork associated with maintaining public inspection files, while still providing the public with access to enough information about the licensee to evaluate its performance.

Minority, Female Preference

The FCC reactivated and reaffirmed decisions in three cases previously remanded to the Commission and held in abeyance pending completion of a Notice of Inquiry into race and gender preference.

The Commission reaffirmed grants to Dale Bell for a new FM station at St. Simons Island, GA; to Rainbow Broadcasting Co. for a new UHF TV station on Channel 65 in Orlando, FL; and assignment of license for UHF Channel 18 in Hartford, CT, from Faith Center, Inc., to Astroline Communications Co. Limited Partnership.

In January, the FCC reinstated its comparative licensing and distress sale policies under pressure from Congress. Lawmakers forced the issue when, in appropriations legislation, they directed the Commission to terminate its inquiry into comparative licensing, distress sale and tax certificate policies based on racial, ethnic or gender preferences.

For more information, contact the FCC's news media information office at 202-632-5050.

Public File Rule

The FCC has conformed the public file rule for commercial and noncommercial educational licensees, now requiring both to maintain a quarterly list of programs that represent their station's most significant treatment of issues of community concern.

While commercial licensees presently use the most significant treatment standard in maintaining their public file, noncommercial licensees have been previously required to maintain a quarterly list of five to 10 issues of importance.

For more information, contact Vicki Assevero at the FCC, 202-632-7792.

Vanguard Series™

Stereo Broadcast Consoles

Performance, Value and Reliability through Innovative Technology

- Full Featured On-Air Performance
- Reliable VCA Faders and Electronic Switching
- Serviceable Plug-in Circuit Boards
- Quick Punch Block Installation
- RF Protection that Works!



BC12DSL 12 Mixers • 24 Inputs Dual Stereo Outputs	BC8DSR/L 8 Mixers • 12 Inputs Dual Stereo Outputs
\$4995	\$3195

Call or write NOW for free detailed color brochure.

AUDIO TECHNOLOGIES, INC.
328 Maple Avenue, Horsham, PA 19044 • (215) 443-0330



Ideas Sought For New AM Band

by Alex Zavistovich

Washington DC ... The FCC wants to know whether the spectrum from 1605 to 1705 kHz, which the Commission wants for AM broadcasters, should be allocated using "national licensing," whereby a single licensee would develop a channel nationwide.

This departure from current FCC allocation practices is one aspect of a Commission inquiry into use of the extended band by AM broadcasting service. Announced 25 February, the inquiry is the fourth such launched by the FCC on this issue.

But the inquiry does not only focus on new users. The Commission also anticipates receiving information on technical criteria including the class of station which should operate in the band, minimum and maximum power, protected contours, ground and skywave propagation, coverage and daytime skywave propagation.

With this, the Commission also wants to show receiver manufacturers it's serious about the expanded band, in the hopes the signal will spur them to design receivers incorporating the new bandwidth before broadcasters begin signing on, some time in mid-1990.

Through the 1970's, the spectrum from 1605 to 1705 kHz was reserved for non-broadcast applications, such as radiolocation. Then, in 1979, the World Administrative Radio Conference discussed phasing out those uses, according to John Boursy, an engineer with the FCC's Mass Media Bureau.

New technology for nonbroadcast pur-

poses opened up possibilities for use of the previously occupied band by AM stations, beginning in mid-1990, Boursy said.

With the latest inquiry the FCC is also hoping to "get (its) own house in order," said Boursy. He explained that because in the US the band is "essentially empty," it would allow the Commission to investigate alternate methods of allocating spectrum.

“ We thought it was a good time to revisit the way we allot spectrum ... ”

"We thought it was a good time to revisit the way we allot spectrum, to see whether there was a better method," Boursy commented. He noted that such an investigation could not be undertaken if the band was already occupied.

A key subject of the fourth notice of inquiry, therefore, is the Commission's regulatory stance and an exploration of national licensing of facilities in the band.

However, careful examination of regulatory options must be made, the FCC said, because the frequencies are in a band for which receivers are not yet available.

Under the Commission's notion of national licensing, one licensee would develop a channel nationwide, possibly operating the stations itself or leasing the frequency to other broadcasters.

Advantages in economies of scale, programming diversity, networking and rapid introduction of the service were cited by the Commission regarding such a practice.

Another allocation plan is assignment. Under the assignment plan, each station is entered into the plan with a specific location and power; this is different from allotment, in which certain frequencies are available anywhere within a specified area.

Besides regulation of the band, the FCC acknowledged its need to "explore the full range" of other technical questions pertaining to implementation of the new frequencies.

In addition to the national licensing issue, the inquiry will take up questions of eligibility for the band—in particular whether special preference should be considered for public broadcasters, minorities or AM daytimers which want to switch to fulltime operations.

Comments are also being requested by the FCC for technical criteria for implementation of the band. Power levels, propagation (both skywave and groundwave) and protected contours are all areas the Commission hopes to

have addressed.

The Commission has been moving on the extended AM band issue and hopes to have some subjects addressed by the second session of the expanded band conference of the International Telecommunications Union (ITU) Region 2 Administrative Radio Conference (RARC). That conference is slated for 28 May to 11 June in Rio de Janeiro, Brazil.

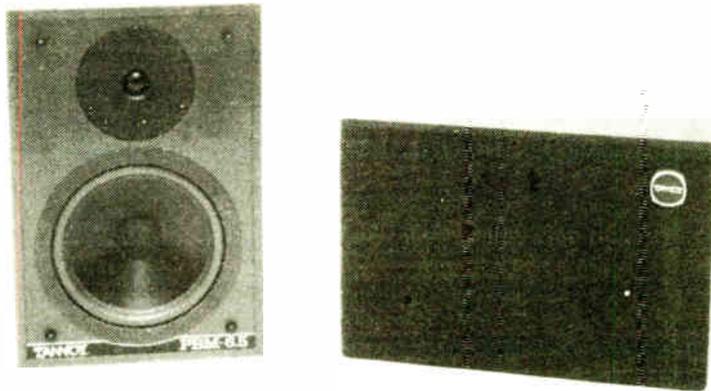
Since initiating the inquiry in 1984, the FCC has put out two reports addressing technical criteria for broadcasting and ways to plan the band; a third report will include Commission suggestions for a US proposal for the second RARC session.

The Commission acknowledged it could have waited to address the extended band allocations and technical questions until after the conclusion of the second RARC session in June. However, by tackling the issues now instead of waiting, the FCC said it expects to "foster the earliest introduction of broadcasting in the expanded band."

Beyond that, the FCC hopes to show manufacturers that it is serious about use of the band. With the notice, the Commission expects to "send a clear signal to receiver manufacturers" so that they may get a head start on design and manufacture of new receivers.

Eb Tingley, of the Electronic Industries Association (EIA), which represents equipment manufacturers' concerns, would not comment on how his association or the industry at large would re-

(continued on page 10)



Now Hear This . . .

Never before has such a small speaker sounded so accurate. Tannoy's PBM-6.5 measures only 12" x 8" x 8 1/2". Its 6 1/2" woofer and 3/4" dome tweeter combine to provide a smooth, wide range sound superior to many larger monitors.

Tannoy, Great Britain's premier speaker manufacturer, and Bradley now offer the remarkable PBM-6.5 for less than \$300 per pair. Listen to the PBM-6.5 . . . and hear what you've been missing.

Call Toll Free 800-732-7665



BRADLEY BROADCAST SALES

Where Service and Engineering Make the Difference

8101 Cessna Avenue • Gaithersburg, Maryland 20879-4177
MD & DC: 301-948-0650 • FAX: 301-330-7198 • TELEX: 269-245



The New Series 2100C A Great Cart Machine Just Got Better!

The quality and value leader is now even better. The new Series 2100C features the innovative Phase Lok V precision head block, an improved cartridge guidance system, a more powerful solenoid and advanced electronics with specifications that meet or exceed 1975 NAB standards.

Now more than ever before, compare prices...compare features. You'll agree that the new Series 2100C gives you more value per dollar than any other cart machine.

Playback: Mono \$1,425 Stereo \$1,525
Record/Play: Mono \$2,095 Stereo \$2,395

Prices USA only. 115V, 60 Hz, FOB factory exclusive of sales or use tax.



The new 2100C incorporates the advanced Phase Lok V head block.

BE BROADCAST ELECTRONICS INC.

4100 N 24th ST., PO. BOX 3606, QUINCY, IL 62305, (217) 224-9600, TELEX 250142, FAX (217) 224-9607

Sound of the Future in Gay Paree

by Judith Gross

Falls Church VA . . . It was more than thrilling to ride to the top of the world's most recognized (if not the tallest) radio tower at the Paris AES show.

I mean, really, doesn't the Eiffel Tower look like it was *made* to broadcast to the world?

The European show is a lot more subdued than our own version held each fall—there were more suits and ties, not as many sequined and leather jackets or green-spiked hair. And these were recording freaks?

What was really great was getting a sneak preview of some of the new gear set for the NAB show. There are a few surprises waiting in the wings, check out the coverage in this issue and see if you don't agree.

☆☆☆

Meanwhile back in the US of A, it looks as if the Copycode issue may finally have been put to rest, with the strong evidence from the NBS report that it is audible.

Now maybe R-DAT machines will begin showing up in the stores, as they have in Europe, and stations which are anxious to try the new technology won't have to bootleg a player from the "black market."

But it's not completely over. The record industry is threatening to sue any company which wants to sell R-DAT machines without copy protection until the issue is completely resolved.

Marantz has announced it will sell R-DAT players this spring. Interestingly, Delco has also announced plans for a car R-DAT player, to be ready this summer.

Hmmm . . . wonder how Delco can have R-DAT ready for this summer but won't have NRSC radios on the market until next year?

And then there are other copy-protection technologies around. One

called "Stop Cop" is reportedly being developed by Leonard Kahn.

Kahn, by the way, has now had the US Patent Office turn away his latest complaint against Motorola, the one which has to do with the Motorola patent which Sony wanted to be licensed under to make multisystem radios.

It was able to decode ISB AM stereo (i.e. the Kahn system), so Motorola decided it didn't want to compete with itself by having a radio that would decode C-QUAM and another system. Motorola told Sony it wouldn't be licensed under the patents.

Does this amount to alleged "conspiracy" on Motorola's part? Well, the FCC didn't think so, they turned down



Kahn's request to look into the matter.

And the US Patent Office has now re-affirmed all of Motorola's claims. So once again we go around and around on this issue.

Common sense dictates that if there were any real interest in the manufacture of multisystem radios they would have been here by now.

Whatever happened to the Sanyo chip that was supposed to bring multisystem radios into the market? There was no patent dispute on that one. Wasn't it "just around the corner" many, many months (perhaps a couple of years) and many, many corners ago?

How many corners do we have to turn before it becomes clear that if AM is ever to be a competitor in the world of stereo audio stations are going to have to get

behind the dominant system?

Isn't it time we all stopped playing these games with AM's future? Anyone in this country has the power to tie up the legal machinery and the various bureaucratic processes with endless complaints, paperwork, appeals, etc.

But when the dust settles and the complaints have been denied (as they invariably have been . . . over and over) we're right back where we started, only it's getting later and later.

The "Big Lie," by the way, may be effective PR for awhile but it does wear thin.

There's a lot of misinformation being tossed around these days, so for any "Eagles" who might be reading this, and who are mulling over the whole stereo situation and what you're being told about everything (including this newspaper's policies) call me and I'll gladly talk it over. (Or corner me at NAB if you're going.)

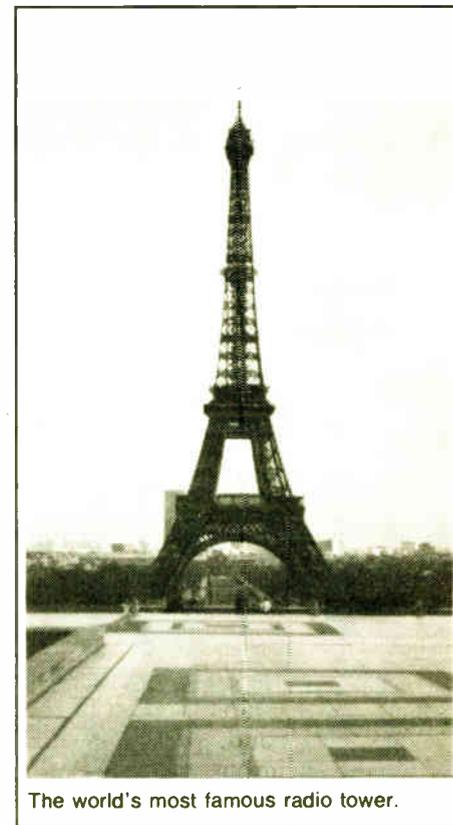
☆☆☆

Congrats to Stan Salek, who has been with CRL and worked hard to help make the NRSC a success. He's the new staff engineer at NAB, filling in the vacancy left when Mike Rau moved up to VP of S&T.

Meanwhile, CRL will be sending another mailing to AM stations on the NRSC standard. The first few, you remember, got over 1200 responses, with the majority saying they either had or would convert.

Hey, here's an idea for the expanded AM band. The FCC, as you know, is asking for input on how to use the new spectrum. How about a rule saying that every station that signs onto the new band has to broadcast in stereo?

While we're at it, how about any new AM station has to broadcast in stereo to get a license? That's a variation on the NAB's freeze idea. Freeze mono, but let stereo thrive. Well, it's one way to force



The world's most famous radio tower.

the issue.

Things might appear to be a bit confusing with CCA and CSI, but let's see if we can clear up some of the muddle.

CCA bought CSI Electronics, the bankrupt transmitter manufacturer. CCA is based in Atlanta.

CSI Marketing, meanwhile, based in Lakeland, Florida is still in business, selling equipment manufactured elsewhere.

Still confused? Well, for CCA info call Ron Baker at 404-964-3764. For info on CSI Marketing call Bernie Gelman at 813-646-4101.

Hope that's crystal clear.

☆☆☆

Late news about the NAB show has a surprise from Sharp, of all companies. Along with others who are showing an R-DAT player comes word that Sharp will have a pro player at the NAB show as well.

CQ . . . CQ . . . Calling all Hams. In addition to the Ham Radio reception the NAB holds (scheduled for Monday, 11 April and partly sponsored by RW) we have good news from KPBS-FM's Chris Durso (AA4CD). He and Mike Barnett of KNX-FM (Mike is N6JVH) are bringing a portable UHF repeater to Las Vegas for the show.

The input frequency is 444.5; output is 449.5, and PL is 136.5 (4Z).

The repeater is going to be situated at the Hilton, and Chris wants all Hams to feel free to use it for central communications.

Now all the Hams with hand-helds will know where to tune to find their buddies.

Finally, it is with great sadness that we report that there will be no slinkies at the Orban booth this year.

Seems the blue and purple models the company gave away last year were so popular that they caused near-riots on the exhibit floor.

Orban would rather have you look at the types of toys that engineers love to play with, the Optimods and such.

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.

With our Automatic Remote Control System your transmitter — and your personnel — will operate with increased efficiency

Have you ever wondered if your night operator will remember . . . to switch patterns at sunrise? . . . to periodically check critical levels? . . . the correct transmitter restart sequence? You'll never have to worry if Potomac Instruments' RC16+ is on the job. Because it'll do all these tasks for you. Plus a lot more. Automatically.

With its microprocessor based control logic, the basic RC16+ provides 16 telemetry channels with automatic out-of-tolerance alarms and remote raise/lower controls;

plus 16 status channels. The automatic functions — pattern shift, transmitter restart, power control — are pre-programmed in accordance with station license requirements and controlled with an accurate master clock.

The RC16+ is also expandable. In 16 channel increments, up to a total of 64 channels. With the remote video display option your chief engineer can get a detailed readout of all measured parameters. It's updated every 30 seconds and connects to any standard telephone. The optional plug-in automatic logger provides a permanent record of all transmitter activity. Log intervals, sequence, and alarm flags are user-selectable.

And, best of all, the RC16+ is cost effective. No other unit on the market offers these features and capabilities at this low price.

Basic System	\$4,995.00
Additional 16 Channels	1,865.00
Plug-In Automatic Logger	2,499.00
Remote Video Display Unit	650.00



POTOMAC INSTRUMENTS

932 PHILADELPHIA AVE. SILVER SPRING, MD 20910
(301) 589-2662

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).

Competition from translators

Dear RW:

I wonder just what broadcasters in Tucson and other "translator abuse" areas are doing wrong in meeting their local markets' needs so that 1 W translators in southern California and 10 W stations in Tucson are able to compete so well for their audiences?

Granted, a 10 W translator can compete fairly well with some Class A stations within about a 10 by 20 mile oval, but outside that area the translator's signal falls off fairly rapidly.

On the other hand, the 1 W translators I have been involved with in northern California are certainly not in the same league as most Class A stations and I really don't see how southern California broadcasters can complain.

Since rents in our area run from a low of \$300 to about \$475 per month for any decent site, not including maintenance or equipment upgrades, I don't quite understand why some seem to think that \$200 to \$500 per month is making anyone in the translator business rich.

In our case the translator service organization is non-profit (as is the primary station). Just keeping up the site rent payments is often difficult. We'd be hard pressed to do this for profit!

As for charges of interference to regular broadcast stations, by FCC rules if a translator actually interferes with a normal broadcast station it *must* go off the air!

This has happened on several occasions in this area. Long established

translators were forced off the air by stations in moderately sized markets who somehow gained questionable waivers in order to extend their coverage into adjacent major markets.

It is interesting to note that these stations now aim their service at the adjacent markets with only token attention to the needs of their licensed markets.

The translators which were affected, on the other hand, had provided a service which remains unfulfilled in their service areas even today.

The key issue is service. With only one or two exceptions, all of the dozen or so translators in the central coast and San Francisco Bay Areas provide translation of stations whose programming is not available on any other outlet in the regions being served.

If this is competition, let the local stations provide equivalent programming. We'd gladly trade our three "barely-better-than-no-station-at-all" 1 W translators for the same programming from a full powered, locally owned station.

The reality is that none of the local outlets have shown any inclination toward providing such programming. I really don't think they have earned the right to complain about unfair competition when they aren't even trying to compete.

I certainly would agree that protection from unfair competition from translators is justifiable, but I'm not all that convinced that this is truly the key to the translator controversy!

James Eagleson
Watsonville CA

The FCC has picked a good time to launch its inquiry into uses of the expanded 1605-1705 kHz AM band.

With sign-on some two years away, and with the Commission's recent focus on AM technical standards, the current NOI is both timely and welcome.

The expanded band offers opportunities for new stations and it also provides a chance to experiment with new kinds of service.

Lots of questions surround the new band. Should daytimers be given first choice on channels? Should there be minority or other special preferences?

Then there's the FCC's idea for "national licensing"—giving one licensee a channel to develop nationwide.

On the one hand it might prevent some of the problems which exist on the current AM band. But the idea runs counter to recent trends toward decentralization in radio.

National channels would help fill the new band quickly. But it seems unlikely that there will be a shortage of demand for the spectrum, so the speed with which stations sign on may only be limited by the FCC's licensing process.

The FCC will be monitoring reaction to its idea closely. But however it proceeds it should take pains to avoid the problems which have burdened the docket 80-90 allotments on the FM band.

The timing of the inquiry also benefits from the information the Commission is amassing on technical standards for AM allotments.

With the first round of comments in on Docket 87-267, and the next round due in June, the pros and cons of existing policies are becoming clear.

The FCC should look closely at issues such as minimum and maximum power, ground propagation and skywave protection.

From this should emerge a better method of allocating spectrum which can be used in the future. So technical problems which now plague AM can be avoided in the new band.

The Commission's notice sends a clear signal to receiver manufacturers that it's serious about the band and it's keeping an open mind.

It's a chance to work together with those who will make the new radios so that one side of the industry doesn't propose something that won't have the other side's support.

All industry factions should take advantage of the FCC's request for comments about the extended band. Allotments of the existing AM band have been criticized in hindsight.

This time can be different, but the time to get in on the dialog is now.
—RW

Planning For New AM Band

Drawbacks to Minority Policy

by Keith Glen Littlejohn

Jerome AZ ... Regarding the story "FCC Reinstates Minority Policy" (15 February *Radio World*): your tax dollars at work.

Apparently someone felt that there weren't "enough" women or "minority" owned broadcast stations, and that the only way to solve that problem was to change the rules for "qualified" would-be broadcasters. Everyone knows how well that works.

I've seen fewer women and minorities in broadcast engineering than I did in the computer technology field—do we need new rules for some folks? Let's give full GROL privileges to any restricted-holder not bearing a male, middle-European name, regardless of actual qualifications or skills.

This would have the desired result. Suddenly, there would be as many—if not more—minority GROL-holders than today, and it would get a number of Congress critters re-elected, which is the real reason to do such a thing, after all.

Of course, those female/minority GROL-holders who earned their way into the industry will be lumped into the same class as the "Insta-GROLs", so let's have a new endorsement, a "this-one-

knows-what-she's-doing" certification, to separate current GROL-holders from the thundering-herd-to-be.

Bias or lack of ability?

With no slight intended to any of the involved interest groups, I have to wonder why women and minority groups

Guest Editorial

seem unable to perform up to current industry standards—or more precisely, why your lobbyists and representatives think so.

You want to buy a radio station? Fill out the forms and jump on the wheel. You want to play Tarzan on the antenna array, half a mile above the valley floor? Welcome to the club!

Just don't bother me with things that don't matter, like which clothing department you shop in. I'm more interested in whether you know which end of the soldering iron you don't hold!

Maybe there aren't a lot of minority-owned radio stations. Is that due to an inability to qualify for ownership among the Hispanic population? Not hardly!

If you can offer something the commu-

nity needs, the community can help you get on the air (stations with a zero share don't last too long) to fill that need.

Competence first

But how would any of you reading this magazine like to work for a station that is only on the air due to the "protected" status of the minority owner—rather than the ability of the owner to operate the station?

I realize that there has been discrimination in the past, and that there is still discrimination out there. There is also a Flat Earth Society, and I even know one fellow who doesn't believe in color television because he doesn't understand how it can possibly work.

All three of those attitudes belong in the past, and we ought to be putting them there ... not propagating discrimination in the name of equality.

How can we be a "colorblind society" if color remains a basis for reward?

As the man said, "It's not enough to 'not mind', you have to *not care!*"

Keith Glen Littlejohn is CE of KSMK in Cottonwood, Arizona. He is also a computer consultant and involved with land mobile and with alternate energy. He can be reached at 602-634-2404.

Radio World

Vol 12, No 7 April 1, 1988

Publisher: Stevan B. Dana

Editor: Judith Gross

Buyers Guide: Marlene P. Lane

News Dept.: Alan Carter, Mgr.

David Hughes

Production Editor Alex Zavistovich

Circulation Mgr.: Marion Alsup

Advertising Coord.: Simone Leaser

Production Dept: Jean Barnes, Mgr.

Gina R. Rosario,

Jeanne Pearson/

Graphic Artists

Radio World (ISSN: 0274-8541) is published twice a month by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone: 703-998-7600. Copyright 1988 by Industrial Marketing Advisory Services, Inc. All rights reserved.

Advertising Sales Representatives

East Coast Ernest Robitel 516-671-2502

Midwest Steve Dana 800-336-3045

West Coast Patricia B. Macsata 415-786-2198

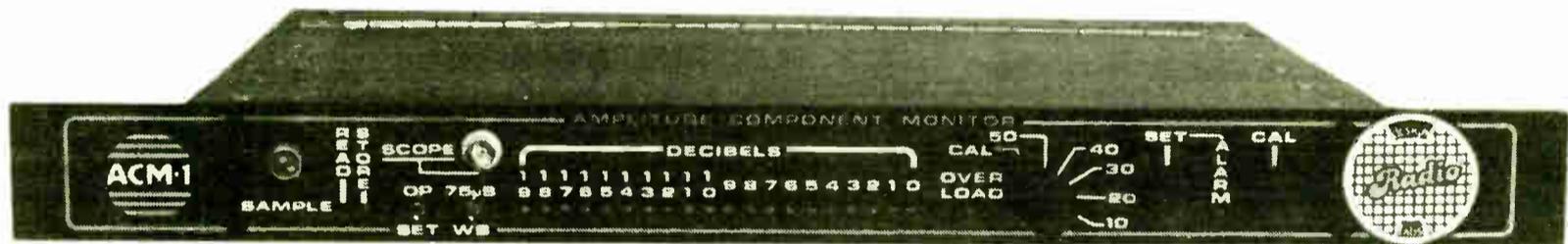
Free subscriptions are available to professional broadcasting and audiovisual equipment users. For address changes, send current and new address to RW a month in advance at the above address. Unsolicited manuscripts are welcomed for review; send to the attention of the appropriate editor.

ALLIED

The **FULL SERVICE** Broadcast People



A **NEW** PRODUCT
Especially for our industry



ACM-1 AMPLITUDE COMPONENT MONITOR

The Instrument No FM or TV Station can Afford to be Without!

What is an AMPLITUDE COMPONENT MONITOR? The ACM-1 is a precise AM noise meter which connects to the RF sample on an FM transmitter or television aural carrier. A digital string display with 20dB of range exhibits AM noise for precise transmitter tuning. It interfaces with any remote control to sample and then read back a stable indication of AM noise. An adjustable alarm threshold can signal the station operator when AM noise has increased beyond a level you determine will cause reception problems. The nature of AM noise measured can be examined by the engineer with the oscilloscope output. Audio and data outputs are provided.

Why is it said of the ACM-1 that this is the first product no FM station can afford to be without since the advent of audio processing? For many years, FM broadcasters have turned to audio processing for better signals... a tailored sound for programmers... improved signal to noise ratio for engineers. In short, a good foundation for bigger audiences and more sales. Your signal path, however, does not end at the output terminals of your processing system! The STL, transmitter, transmission line, antenna, various impedance matches, atmospherics and terrain all play a part in the consistency of your FM signal. Now television operators, with the marketing requirements for stereo and improved audio quality, are discovering the same important reasons to provide the finest audio and separation possible.

The ACM-1 is designed to be a constant watchdog of the integrity of your potential RF signal. Natural shifts in transmitter tuning, tube aging, interstage coupling mismatches and antenna problems

will all increase the AM noise in your FM transmitter. And it often goes undetected. (Except, perhaps, by station salespeople or management who notice variations in the signal, but are told the station is putting out "full power".) In fact, proper ongoing detection of AM noise is a BIG problem. Most stations' modulation monitors are at the studios where AM noise *cannot* be read! Even current modulation monitors which are located at the transmitter site may not give an accurate indication of precise AM noise null, since the detectors used are located at the end of a coaxial cable rather than at the transmitter output. And, until now, product technology has not offered a way to read the AM noise at the studio, or to alert the engineer that the AM noise is reaching a level which will audibly affect the station signal. The ACM-1 does all this and more...

It provides:

- a precision tuning instrument for the engineer.
- assurance of transmitted signal integrity for management and sales.
- a constant readout for the programming staff that their "sound" remains consistent through the antenna.

Engineering consultants in the field have long proclaimed the need to maintain consistent minimum AM noise. And we are now hearing a lot more talk among station engineers about controlling AM noise. After several years of planning and research, this is indeed music to our ears.

Keep the Sound Consistent... with ACM-1!

\$1495 + F&H

ATLANTA, GEORGIA
404-964-1464

LOS ANGELES, CALIFORNIA
818-843-5052

CHICAGO, ILLINOIS
312-470-0303

RICHMOND HILL, ONTARIO, CANADA 416-731-3697

RICHMOND, INDIANA
317-962-8596

DALLAS, TEXAS
214-423-8667

SEATTLE, WASHINGTON
206-838-2705

USED EQUIPMENT DIVISION
317-962-1471

BROADCAST SYSTEMS DIVISION
714-752-6664

SATELLITE EQUIPMENT DIVISION
317-962-8596

NIGHTS/WEEKENDS EMERGENCY
317-962-8961

ALLIED
Broadcast Equipment

P.O. BOX 1487 • RICHMOND, IN 47375

Join Our FAX Network • Prompt Response on Your RFQs
FAX 317-962-8961

Log In... Bulletin Board Modem... 317-935-0531

Kahn Patent Complaint Denied

by Alex Zavistovich

Washington DC ... A patent dispute between Kahn Communications President Leonard Kahn and Motorola may be nearing an end, as the US Patent Office has notified the parties of the termination of its inquiry and cited its preliminary findings.

Radio World has learned the notice, which was sent 3 March, contains a decision favorable to Motorola. However, spokespersons for the Patent Office cautioned that the finding is not final until a certificate to that effect has been issued.

The dispute is at the heart of an allegation made by Kahn that Motorola has been "frustrating the growth of AM" by preventing the sale of radios which can decode both Motorola and Kahn AM stereo systems.

Request filed

On 15 September 1987 Kahn requested a reexamination of patent 4,184,046 which had been issued to Motorola for a chip capable of decoding independent sideband (ISB) transmissions.

Kahn claimed a patent issued to him for his AM stereo system predated the Motorola patent.

Earlier, Sony had developed a multi-

system AM stereo radio which Motorola claimed used that patent, along with another, to decode the Kahn signal—which is an ISB system. The second patent was not questioned in Kahn's complaint.

Motorola however sent a letter to Sony Corporation requesting Sony "cease selling AM stereo radio receivers in the United States that use these patents."

A Motorola source explained that the reason for the letter was that the company, in effect, didn't wish to "compete with" itself, since the Sony radios would also decode the C-QUAM system.

Kahn was granted the reexamination and in December protested to the FCC that Motorola was using an "improperly procured patent" to threaten receiver manufacturers out of selling multimode AM stereo receivers in the US. The FCC took no action on Kahn's protest, however.

Then on 3 March, Motorola received a "Notice of Intent to Issue a Reexamination Certificate" from the US Patent Office, according to the firm's General Patent Counsel Jim Gillman. The notice declared that the reexamination had been terminated and a certificate was to be issued "in due course."

However, the certificate will indicate

that no change in specifications or drawings related to the Motorola patent are required, and that all claims of the Motorola patent are confirmed.

Patent office acknowledged

At the Patent Office, spokesperson Oscar Mastin acknowledged that a notice went out to Motorola on 3 March. However, he stressed that "the decision is not final until a certificate of reexamination is printed and issued." That may not be completed "for eight weeks," Mastin said in mid-March.

Kahn Communications President Leonard Kahn refused to comment to RW on the matter.

There is also some possibility that the matter may be contested by Kahn, according to Edward Onders, associate general counsel of Hazeltine Corp., a former competitor in the AM stereo race now aligned with Kahn Communications.

Onders cautioned that the notice received by Motorola may not mean the end of the case, because Kahn believes it to be "defective in some respects."

No details of the defects in the notice were available from Onders.

For information, contact Oscar Mastin at 703-557-3341, Edward Onders at 516-261-7000, or Jim Gillman at 312-576-5304.

OUR FM MONITOR DESERVES A SECOND GLANCE.

BUT IT DOESN'T NEED IT.

Engineers look twice when they first see our 691 Stereo and SCA Monitor. But when they start to use it, they find the 691's meters are easily tracked in a single glance. Like everything else about the 691, its measurement displays are very well thought out.

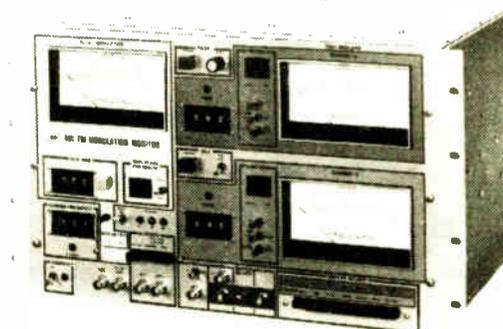
A color-coded system ties together the associated displays, switches, and jacks for a particular function or test. Select your test by pushing a color-coded button and simply read the results on *all* of the indicators. It's as easy as it sounds.

Other benefits of the 691 include over 40 proof-of-performance and signal quality measurements. Add a scope and use the 691 as a spectrum analyzer ... or get a vector display of L/R phasing. Perform a Bessel-Null calibration in minutes. Measure clipped composite accurately and quickly.

The 691 can now be optionally ordered to measure two SCAs. There are many other features ... write or call for complete information.



QEI CORPORATION
One Airport Drive □ Box D
Williamstown, NJ 08094
Phone 609-728-2020
Toll Free 800-334-9154



Circle Reader Service 30 on Page 28

ABSOLUTE BROADCAST AUTOMATION SYSTEM 100

Real Time Automator

Attention potential automation buyers:

If you are in the market for radio station automation, don't go to Las Vegas to find it!

Consider for example, our automation for satellite programmed radio stations. The system is a random access, cassette tape based, program automation and comes complete with the following equipment:

Hardware: (2) Tandy Model 4 Microcomputers; (1) Okidata Dot Matrix Printer; (6) Nakamichi Analog Cassette Decks (MR-1), for Commercial and Liner Storage; (1) Nakamichi MR-1™ Analog Cassette Deck for recording; (1) System 100 Production Processor; (1) 77-inch Equipment Rack including: a) Prewired with all sources in place; b) Card Cage Space for 14 Sources; c) All Electronics Necessary for Operation; (7) Analog Cassette Source Cards; (1) Satellite Source Card; (1) Cartridge Machine Source Card; (1) Satellite Function Decoder; (1) System 100 Operating Package including: a) Installation and Operating Manuals; b) Technical Manuals; c) Free Phone Consultations for 90 Days; d) 1 Year Warranty on all ABA Hardware and Software; e) Manufacturers Warranty on all Sources;

Software: (1) System 100 Software Package Includes: a) Program Automation and Recording Software; b) Traffic Software; c) System Diagnostics Software; d) System Set-up and Test Software;

Optional Software: a) Fully Integrated Radio Station Business Software Package; b) Music Library Management and Recording Software.

Now, Consider Our Price: Everything Listed Above, Except Optional Software, Is Only \$15,500.

For more information about our Satellite System or our Music Automation contact

ABSOLUTE BROADCAST AUTOMATION
(301) 359-3033

or Northeast Broadcast Labs NY (518) 793-2181 PA (215) 322-2227
or John Harper Broadcast Associates SC (803) 366-8830

BSW



DYNAMAX COBALT™ Broadcast Cartridge

By Fidelipac

Dynamax Cobalt outperforms all other broadcast tape cartridges in the following critical areas:

Greater high frequency headroom

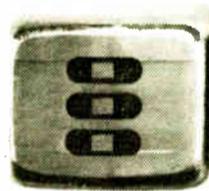
Extended high frequency response

Lower flutter and distortion components

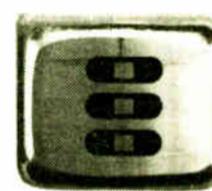
Longer service life without user adjustments

Maximum undistorted output level at 10 kHz

AFTER 2000 HOURS OF OPERATION



STANDARD TAPE



COBALT TAPE

Reduced head and capstan wear

Fidelipac pays special attention to the problem of tape abrasion, so you don't have to. Dynamax Cobalt contains a combination of lubricants which actually reduce head and capstan wear in comparison to ordinary tape.

Pacific Time
6:00 am to 6:00 pm

Mountain Time
7:00 am to 7:00 pm

Central Time
8:00 am to 8:00 pm

Eastern Time
9:00 am to 9:00 pm

NATIONAL TOLL FREE ORDER NUMBER

1-800-426-8434

OR FAX 206-565-8114



BSW • 7012 - 27th Street West • Tacoma, WA 98466

Paris AES Gives Sneak Preview

by Judith Gross

Paris, France . . . Again this year the European AES offered a first look at products slated for debut at the April NAB convention.

Last year ITC/3M took the opportunity to get some early reaction to its digital cart machine.

There was not any product introduction quite as dramatic this year, but the 84th AES, held the first week of March in Paris, did have its share of new broadcast gear.

The European AES show, unlike its fall counterpart in the US, is heavily focused on the broadcast as well as the recording industry.

This year's show saw the largest representation of American companies—60 US manufacturers showed up—according to one AES official in Paris.

Overall the exhibit showcase, with more than 250 companies displaying their products, was a balance between broadcast audio and professional studio recording equipment.

Without the legal complexities to hold it up, R-DAT has made its way into the European consumer market.

Sony is already selling its consumer machine in Europe, and the company showed its professional model, the PCM 2500 in a demo room at the show.

Tascam showed its new R-1 professional R-DAT recorder/reproducer. It's a prototype which the company plans to introduce at the NAB show.

Fostex, meanwhile, showed a prototype R-DAT professional digital master recorder which it had brought to the October AES in New York. It's actually designed more for audio for video, with SMPTE/EBU timecode and syncing capability.

Two companies showed products for measuring R-DAT performance. Audio Precision has enhanced its System One to test not only CD players but R-DAT machines. And Kenwood, which has marketed test products for CD players, also showed test instruments for R-DAT.

And at least one company at the Paris show was offering R-DAT tape and cassettes. DIC Digital showed pancake reels and cassettes in 46, 60, 90 and 120 minute formats.

Studer was one of the first companies to respond to radio stations' demand for professional CD players with its A725 introduced several years ago.

Now Studer has a brand new CD player, the A730, and it's obvious from the design that the collaboration with Philips has been a close one.

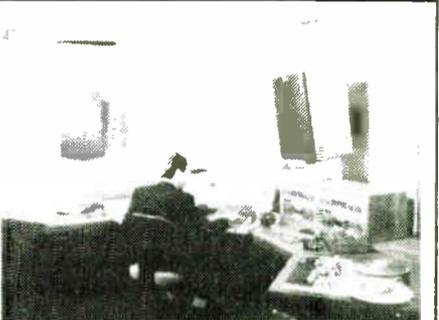
The A725 used a front loading pull-out drawer which resembled a cassette player.

A CD player first marketed by Philips (before the joint venture with Studer) was a top-loading model with flywheel cueing.

The combined efforts of the two companies has yielded a "hybrid" of the two, a top-loading, flywheel-cueing model. It has broadcast features such as variable speed and remote play capability, and an LED display.

Since radio engineers have been eagerly providing input on their likes and dislikes to Studer on its previous design, this first of the next generation of pro CD players should be as much of an attention-getter in Las Vegas as it was in Paris.

Another recent entry into the pro CD



The convention spanned two floors (upper left) and featured Southern Broadcasting System's DAMS hard disk audio storage system (upper right); Harrison System's new Air 790 console (above left); Orban's stereo spatial image enhancer and other products (above middle); a complete studio set-up by Studer with products not usually seen in the US (above right); Studer's new A730 pro CD player (left) and Fidelipac's tape, cartridge and cart machines (right).



market is Shure. The company showed its PDP 1000 CD player at the AES, along with its line of microphones.

But not all developments in audio sources are in the digital domain. There were several new reel-to-reel recorders on display. While most of them were multitrack and aimed primarily at the studio recording market, there was at least one new machine targeted at broadcasters.

Otari showed the new MX 50 reel-to-reel which will be at the NAB show and is ready for purchase. It incorporates several enhancements over Otari's other broadcast decks.

One feature of particular interest allows those editing tape to review it in fast forward, but at a lower pitch which is easier on the ears than the usual "chipmunk" voice.

On the digital side, multitrack machines are still finding greater acceptance in large recording studios than they probably ever will in radio stations, mostly due to their cost.

But now a group of industry players has joined together to at least resolve the standards controversy which has caused some uncertainty in that market.

Two console manufacturers, Neve and Solid State Logic, and two manufacturers of digital reel-to-reel machines—Sony, which supports the DASH format and Mitsubishi, a supporter of the incompatible PD (ProDigi) format—have formed a working group to develop a digital audio interface.

The result is an AES/EBU twin-channel format which was demonstrated in a special booth at the show.

While not of critical concern to most radio stations, the demonstration proved that standards controversies can be resolved when there is enough interest and initiative on the part of the manufacturers.

Digital audio storage and playback on hard disk has been out of the price range of most radio stations. Several companies over the past few years have in-

roduced products but failed to set the industry on fire.

But now, aimed at the radio market comes Southern Broadcasting Systems Ltd.'s DAMS system—for Digital Audio Mass Storage. The system was shown in the Media Touch booth at the show, as it will be at the NAB show as well.

The Australian company has developed a system which uses Winchester disks to store digital audio. The system has full memory redundancy—there are twice the number of drives to the system as are needed for the desired amount of storage.

So if the system crashes, the back-up automatically comes on line.

According to the company, storage capacity is about 100 minutes of stereo, full-fidelity audio per drive.

The DAMS system can operate stand-alone with a simple custom controller which imitates the user interface of a cart machine.

It can also interface to automation systems, such as the Media Touch Touchstone system.

Media Touch, meanwhile, is getting ready to debut its new studio-in-a-truck. The mobile studio will feature a complete Touchstone System interfaced to a variety of audio gear.

In addition to providing a complete demonstration of Touchstone's capabilities, the company plans to take it on the road to help market the system.

Introductions in processing gear were the surprise development of the AES show.

Eventide showed its new Ultra-Harmonizer, the H3000. The version in Paris was aimed at the recording industry, but the company intends to have new broadcast software in time for the NAB, with such features as time compression and presets.

Aphex introduced the model 612 expander/gate/ducker. It uses downward expansion with a variable ratio, and with a high ratio it acts as a gate.

Shure introduced the FP51 gated com-

pressor mixer, a version of its portable mixer with a high quality gated memory compressor incorporated.

Digital processing is considered by many to be the next step in audio. A company called Harmonia Mundi Acustica introduced the BW 102 digital audio processor, with total processing in the digital domain.

The company is located in West Germany, but its products are distributed in the US through Gotham Audio.

Orban Associates also exhibited at the Paris AES. The company showed several products slated for introduction at the NAB, including its stereo spatial enhancer, a new programmable mic processor, and its new Optimod for shortwave.

There were a few other product debuts by US-based companies at the show.

Harrison Systems showed the new Air 790 console in a demo suite. It is also slated for NAB introduction.

Dorrough also had its recently developed console as well as its loudness meters.

In studio equipment, JBL featured its new line of studio monitors, while Beyer, Electro-Voice and HM Electronics featured their latest in microphones.

In the test and measurement category, TFT had a prototype of its model 860 Audio Analyzer. It's a microprocessor controlled distortion analyzer with AC level voltmeter and ratio meter.

In Paris, the model 860 was operating with a companion signal generator. In Las Vegas, it will be part of TFT's BTSC monitor, but it's slated to become a stand-alone unit later this year.

Two cart and tape manufacturers also exhibited at the AES show. Fidelipac featured its Dynamax cobalt tape carts and had a cart vs. CD listening test.

And ITC/3M showed its line of professional cart machines, but did not have the digital HCDA 3000 at its booth. The company said, however that the digital cart machine will be at the NAB show in Las Vegas.



The NRSC subgroup ponders the RF mask proposal at its February meeting.

RF Mask Plan Ready

by Alan Carter

Washington DC ... A subgroup of the National Radio Systems Committee has outlined revisions of an RF emission mask proposal to present to the full committee meeting this month in Las Vegas just prior to the NAB Convention.

The AM Technical Subgroup met here 25 February at which time discussions focused on issues including transmitter power differences, PDM transmitters and an effective date that the mask would take effect.

The full committee is expected to vote

or initiate a vote on a voluntary RF emission mask, which could go into use 1 June, at its meeting 7 April.

The proposed RF mask is designed to address emission, specifically those of older transmitters that may cause a station's signal to exceed the NRSC standard at the point of transmission.

Under the proposed RF mask, the signal of stations with powers of 5000 W or greater complying with the standard should be 25 dB down from 10 to 20 kHz, 35 dB down from 20 to 30 kHz, 35 dB plus 1 dB/kHz down from 30 to 75 kHz and 80 dB down above 75 kHz.

Members of the subgroup decided to recommend that an RF mask should accommodate varying power levels of AM transmitters.

Discussion focused on the idea that lower powered transmitters are less likely to cause objectional interference. Further, the subgroup said it may be difficult, for example, to measure -80 dB below a transmitter with an output power of 50 W or less.

The subgroup voted to recommend that a proposal from CRL on this issue be adopted. In comments filed, CRL stated that the required attenuation of the carrier should be 43+logPc (dB) from the slope intercept point, and -80 dB for powers greater than or equal to 5000 W and -55 dB for power levels less than or equal to 50 W.

The maximum attenuation described by the RF mask shall be 43+logPw, according to the subgroup's recommendation.

The subgroup also proposed to modify the RF mask to retain the existing mask slope of 1 dB/kHz. According to the specs from 60 to 75 kHz, the attenuation shall be -65 dB; at frequencies above 75 kHz, the mask is -80 dB or 43+10logPw, whichever is the lesser attenuation, and the maximum attenuation described by the RF mask shall be 43+10logPw.

The deadline for filing comments on the RF mask was 11 March. No objections to it have been received, only suggestions for revisions that the sub-group considered and accepted.

NRSC subgroup chairman John Marino of NewCity Communications said he believes people understand the need for a RF mask. "I think everybody realizes the need for it because the band is so crowded that everybody needs to stay within their window," he commented.

For more information contact John Marino at 203-333-4800, or NRSC coordinator Michael Rau at the NAB, 202-429-5346.

New Band

(continued from page 3)

spond to the FCC's interest in the expanded AM band.

However, he noted that if the FCC wants to expedite building of expanded-band receivers by offshore manufacturers, the inquiry "is probably a good way to do it."

At press time, deadlines for comments and replies on the docket, GEN 84-467, had not been established. Boursy commented that he expected the reply deadline to fall after the RARC conference ends in June.

For more information, contact John Boursy at the FCC: 202-634-6315.

"Absolutely the most affordable fully professional recorder on the market."



years ago—more technology to help you do your job better and faster.

Agile and Easy to Use

The Studer A807 is a fast, full-featured machine for making quick work of your production tasks.

Features include: • tape shuttle wheel • reverse play • right hand edit • tape dump • varispeed • multifunction tape timer and autolocator with programmable "soft keys" • digital setting of audio alignment parameters for 3 tape speeds and 2 tape types • phantom powered mic inputs on portable version • RS 232 port • optional 1/4 track playback head • a variety of portable and console configurations, including a 4 channel 1/2" version.

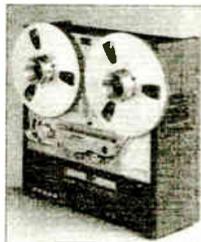
Studer Audio Performance and Reliability

Advanced phase compensated audio-electronics and Dolby HX Pro™ ensure that this compact Studer delivers full-sized Studer sonics.

A massive, die-cast chassis and headblock, rugged AC spooling motors and new brushless DC capstan motor, remind you that the A807 is built with the same quality and precision that have been synonymous with the Studer name for four decades.

So—if "affordable" is not the first word that comes to mind when you think of Studer—think again.

Ask us about the A807. The most affordable*fully professional recorder on the market.



Portable version of the A807 with wood side panels



Timer-autolocator control panel

Available from Studer Revox Full-Line Dealers. Or contact us directly: Los Angeles (818) 780-4234 / New York (212) 255-4462 / Chicago (312) 526-1660 / San Francisco (415) 930-9866 / Nashville (615) 254-5651

STUDER REVOX

STUDER REVOX AMERICA INC.
1425 Elm Hill Pike • Nashville, TN 37210

A bold statement. But no exaggeration. Here's why ... No 2-track machine available today—at any price—offers the same level of advanced technology, plus Studer audio performance and renowned Studer quality. Only the A807.

With the A807, Studer defines a new price point. If you don't believe us, check out the competition ... It won't take you long, because there isn't any.

Broadcast, post production, or studio—in whatever audio environment you operate—make it your business to check out the Studer A807. Start with price ...

High Tech, Low Price

Anyone who thinks "Studer" always means "expensive," please take note. With the A807, your dollars actually buy more now than they did five

Presidential Visit Set for Vegas

by Alan Carter

Washington DC ... President Reagan has "tentatively" scheduled an appearance at the National Association of Broadcasters convention that will be held 8-12 April in Las Vegas.

If plans go as scheduled, Reagan will address the convention on Sunday

Class A's & NAB Meet

(continued from page 1)

reasonable men and women to sit down and discuss the issues." The issue now will be solved at the FCC. "We tried the best we could," McAllan added.

Radio Board Chairman Jerry Lyman, president, RKO Radio, said NAB officials "didn't see any reason" to take a different position after hearing from the Class A group.

A difference of opinion exists on what interference would be created from the power hike, Lyman noted. NAB has taken the position that "we're not supporting any interference of any kind."

The comment period on the New Jersey petition was to end 14 March.

The Class B representative, Milford Smith, vice president of radio engineering for Greater Media, declined to comment on advice of his company's lawyers, pending the 14 March filing.

NAB position

The NAB Board of Directors endorsed a plan that would allow upgrades based on individual applications to the FCC, provided that the Class A station meets

“*The issue now will be solved at the FCC. 'We tried the best we could.'*”

certain mileage separation minimums. The NAB holds the position that its plan would allow about 60 percent of Class A's to upgrade and offer more protection to the more powerful Class B's and Class C's, than would the New Jersey plan.

The New Jersey group modified its original filing with "additional engineering information" after a NAB FM Transmission Subcommittee failed to reach a final compromise with the Class A hike proponents.

At that time McAllan maintained the revisions did not result from a failure to reach a compromise with the NAB subcommittee.

He said the revision was to take into account the vagueness of FCC rules and the reality of the protection situation. New Jersey broadcasters determined that protection ratios for Class B's and C's were not the same, McAllan said.

For more information on the New Jersey group's activities, contact Ken Keane at 202-861-7800, or Bob McAllan at 201-774-7700. For information on the NAB's position, contact Michael Rau at 202-429-5346.

morning 10 April, according to NAB spokesperson Bob Hallahan. NAB also is slated to present the President a "special award," but Hallahan did not have any further details.

Word of Reagan's speech came at the NAB's State Leadership Conference from former FCC Mass Media Bureau chief Jim McKinney, now deputy assistant to the President and director of the White House military office.

To accommodate Reagan's appearance, NAB will reschedule Sunday morning sessions, according to Hallahan. Those plans were not confirmed—the definite schedule will be listed in the NAB daily convention newspaper.

This would be Reagan's first appearance before NAB since becoming President. He addressed a radio session in

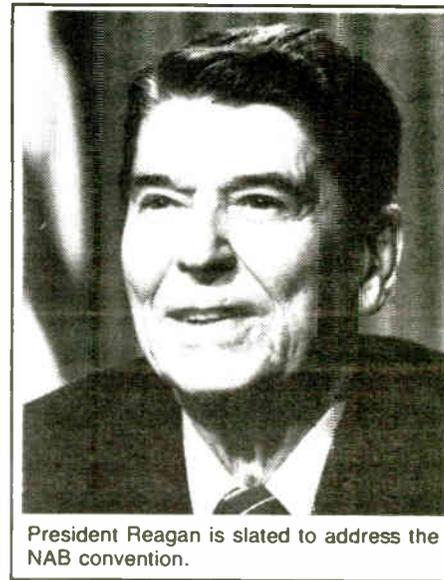
1978 before announcing his candidacy in the 1980 election.

Every chief executive since President Eisenhower has appeared before an NAB convention, Hallahan said.

In an additional change to the previously announced convention schedule, NBC-News President Larry Grossman will speak at the Sunday TV luncheon; Tom Brokaw had been scheduled.

More than 40,000 are expected to attend the convention and engineering conference, which is going to Las Vegas after two years in Dallas. The show will feature more than 670 exhibitors occupying more than 380,000 square feet of floor space at the Las Vegas Convention Center. Overflow exhibits will be set up at the Hilton Center.

The engineering section of the annual



President Reagan is slated to address the NAB convention.

convention will consist of 27 technical sessions and more than 150 papers.

For details on the convention, contact Bob Hallahan at 202-429-5350.

WE DIDN'T HAVE TO ...

Frankly, we didn't have to do it. The original digital telephone system, our Telos 10 - with hundreds of units performing daily for America's finest broadcasters - continues to set the telephone interface performance standard. But we just couldn't wait.

After extensive research we announce our new *second generation* Telos 100 system, applying the latest digital signal processing technology to your phone-to-air problems.

The first member of our new family is the Telos 100 high-performance hybrid. It's a "single-line" unit perfect for newsrooms, production studios, or as a member of a complete system.

Our newborn uses a full 16 bits and sophisticated processing software to make trans-hybrid loss, noise, and distortion superb. On most lines, it delivers trans-hybrid loss of 42 dB - about 20 dB better than the competition. It sends to the caller the full legal maximum - 9 dBm.

The Telos 100's smart gain-control functions are implemented in the digital domain under software control - another digital first for the broadcast industry.

Telos Systems gave birth to the digital hybrid concept. We know digital and we understand phones and broadcast. That's why our systems are the acknowledged quality solution to getting great "real-people" talk on the air.

Isn't it time for you to experience the pleasure of great phones?

telos 100

TELOS SYSTEMS
216-241-7225

Sold by
BRADLEY BROADCAST
800-732-7665 / 301-948-9650

You can stop worrying about who's setting the AM Stereo standard.

We Are. With C-QUAM® AM Stereo!

Some people will think we're pretty bold making that claim. You bet we are! Because we're confident. And here's why, when you modernize with C-QUAM AM Stereo, you can be confident too.

- **MORE STATIONS...**Nearly 9 times more C-QUAM stations worldwide than any other AM Stereo system -- over 600! And still growing.
- **MORE RECEIVERS...**C-QUAM is already in more than 65 models marketed by over 30 manufacturers; approximately 15 Million IC's shipped to date! Plus, our new IC's will put C-QUAM in virtually any type receiver.
- **MORE IC'S/NEW FEATURES...**Automatic band width control, notch filtering, low or medium voltage operation...Our new C-QUAM IC's offer enhanced AM Stereo performance! In fact, the MCI3024 contains all active devices for receiver and stereo decoding functions from antenna to left and right low level audio output.
- **MORE COUNTRIES...**4 Nations already have named C-QUAM their official AM Stereo standard; many more are currently testing C-QUAM AM Stereo broadcast gear!
- **TOTAL COMMITMENT...**IC technology, broadcast equipment, receiver design, international seminars, technical/marketing support -- from studio to listener, Motorola is totally committed to AM Stereo!

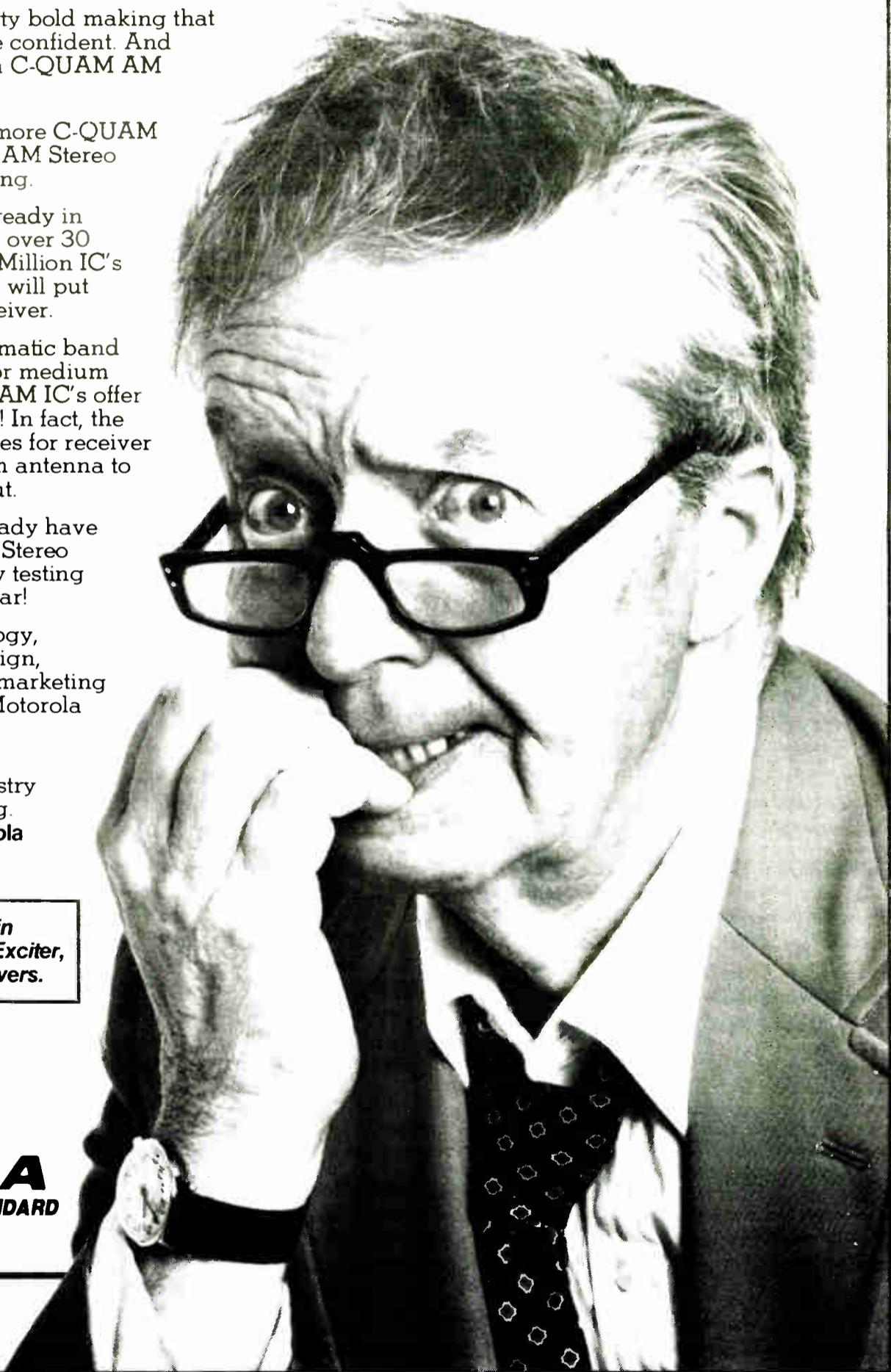
Now if this isn't "Setting the Industry Standard," what is? So stop worrying. Call Steve Kravitz (collect) on the Motorola C-QUAM Hotline -- 312/576-0554.

Visit Motorola Booth #117 at NAB '88 in Las Vegas! See our new Model 1400 Exciter, 1410 Monitor and new C-QUAM receivers.



MOTOROLA
C-QUAM® SETTING THE INDUSTRY STANDARD

C-QUAM® IS A REGISTERED TRADEMARK OF MOTOROLA, INC.



Copycode Dismissed by NBS

by Alex Zavistovich

Washington DC ... Copycode—which would encode a notch at 3840 Hz in digital audio recordings to prevent piracy by digital audio tape (DAT) machines—does not work, according to a recently released study by the National Bureau of Standards.

The NBS study was released on 1 March. In it, the bureau concluded the system "does not achieve its purpose" of preventing DAT machines from taping, because of excessive numbers of false negative readings and false positive triggerings.

Other conclusions in the study determined, by statistical testing, that the system diminished the recorded quality of material encoded with Copycode.

What's more, NBS suggested that an electronics technician with the proper circuit schematics could bypass the system in at least five ways, for approximately \$100.

The Copycode system

The Copycode, developed by engineers at CBS Records, was designed to foil unauthorized digital duplication of digitally recorded music, a facet of the copyright infringement concerns with which the recording industry is engaged.

When a decoding unit in a DAT machine scans a notch at 3840 Hz encoded into the audio material, the record function of the DAT is overridden for 25 seconds. Copycode proponents maintained the notch is not audible on the source material.

Opponents of the copycode strongly disagreed, and presented demonstrations this past summer to Congress of a facsimile of the notch and its purported harmful effect on the quality of the recorded sound. CBS and other anti-copying adherents rejected the results as not indicative of true Copycode performance.

Nonetheless, inclusion of the Copycode technology was stipulated in legislation before Congress; the sale of DAT recorders would be blocked according to the bill, unless the machines were fitted with Copycode gear.

The House bill—HR-1384—was passed 3 August in the House subcommittee on commerce, chaired by Representative James Florio (D-NJ). However, it included a stipulation that the anti-taping requirement would be lifted if the sound quality of prerecorded material is found to be degraded by the notch.

Some months earlier, prompted by the inconclusive demonstrations presented to Congress, the House Committee on the Judiciary had asked the NBS to determine whether there were any problems inherent in the Copycode system.

Funding for the tests came from both sides of the issue—the Recording Industry Association of America (RIAA) in support of Copycode and the Home Recording Rights Coalition (HRR) in opposition.

Results of the NBS evaluation were primarily negative—the Copycode system did not adequately achieve its intended purpose of preventing digital copying, the Bureau contended.

In its findings, NBS determined that

the Copycode was a dynamic system, with encoding stopping and starting depending on the components of the signal not only at 3840 Hz, but at 2715 Hz as well.

Because the encoder switched on and off depending on these signal components, many false negative readings were made, the report concluded, with the decoder occasionally missing an encoded signal.

More importantly, NBS held, the decoder often "failed to accept unencoded input signals of several varieties." On 16 out of 502 tracks on CDs used to test the system, false positives were detected by the decoder which subsequently shut down the DAT recorder.

NBS noted especially that "organ and violin recordings consistently produced false positive detection."

The recorded quality of musical instruments, as well as the human voice, also was determined to be noticeably affected by Copycode encoding, according to a subjective listening study conducted by the NBS.

The listening survey had two tests—to determine simply whether encoded material sounded the same or different as unencoded material in a blind test and, in a second test, to determine which of two signals carried the encoding (see related story, this issue).

In general, NBS stated that "ability to hear effects of the encoder varies substantially among individual subjects and, especially, among musical selections."

However, in one test, 69 of 84 listeners scored higher than 50 percent correct identification, which NBS claimed was "a result that would occur by chance with a probability of only 3 in a trillion."

Easily bypassed

The investigators were also able to design five methods by which the Copycode system could be "circumvented or defeated by external signal conditioning methods." The circuit components as well as power supplies for each of the methods are available off-the-shelf for approximately \$100, the NBS said.

An "electronics technician, familiar with reading circuit schematics," would be able to construct the defeat circuits, NBS estimated.

Following release of the results, RIAA President Jay Berman was reported to have admitted Copycode was "no longer politically viable" to use in DAT players. However, he cautioned that the RIAA was prepared to sue any equipment manufacturer who tries to import the devices "before this issue is resolved."

In particular, Berman has been reported as prepared to sue Marantz Company Inc., which is slated to make its DT 84 digital audio tape recorder available to the public later this year.

(continued on page 19)

ALLIED

The FULL SERVICE Broadcast People

1. Complete RF Systems
2. Complete Studio Systems
3. Complete Radio Stations

Atlanta, Georgia 404-964-1464
Chicago, Illinois 312-470-0303
Los Angeles, California 818-443-5052
Dallas, Texas 214-423-8667
Richmond Hill, Ontario, Canada 416-731-3697
Richmond, Indiana 317-962-8596
Seattle, Washington 206-838-2705
P.O. BOX 1487 • RICHMOND, IN 47375
Join Our FAX Network FAX 317-962-8961

Ears Ahead!

Harris' new DX-10 Digital Solid State 10 kW Transmitter delivers AM sound equal to FM

Your listeners will love the vastly improved sound. New listeners will tune in. Competitors will wonder what you're using. And you will be amazed at the reduction in power costs. All because you installed the first and only solid state digital AM transmitter which operates at typical overall efficiency of 86%. The Harris DX-10.

low THD and IMD. Plus, the DX-10 is an operator's dream, with Harris' ColorStat™ signal flow diagnostic diagram and other exclusive extras to keep you on the air.

Superb audio performance? You bet — no measurable tilt, ringing or overshoot. Signal clarity? Definitely—

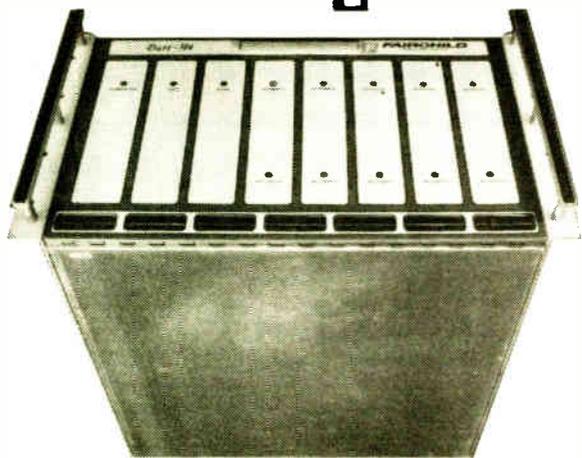
Install the DX-10. Be "ears ahead" immediately and be years ahead because you've gone digital. Call now for the DX-10 brochure, 1-800-4-HARRIS, Ext. 3005. Or write: Harris Radio Sales, P.O. Box 4290, Quincy, IL 62305-4290.

HARRIS

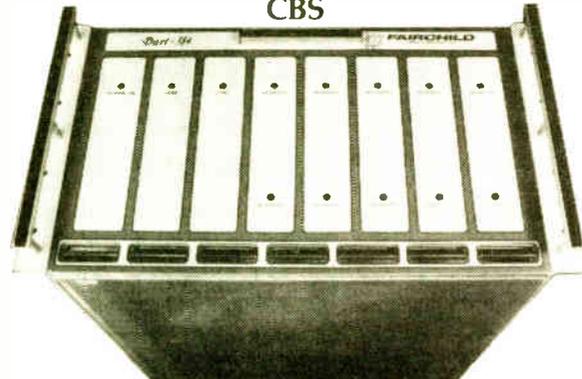
ALLIED

The FULL SERVICE Broadcast People

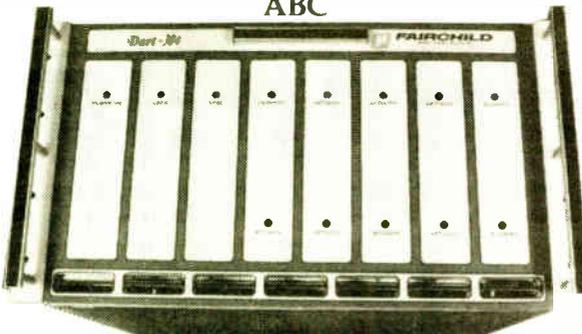
FAIRCHILD The Digital One



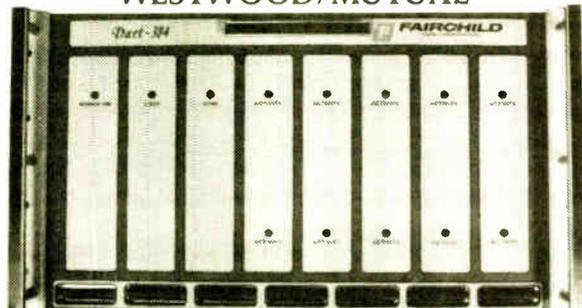
CBS



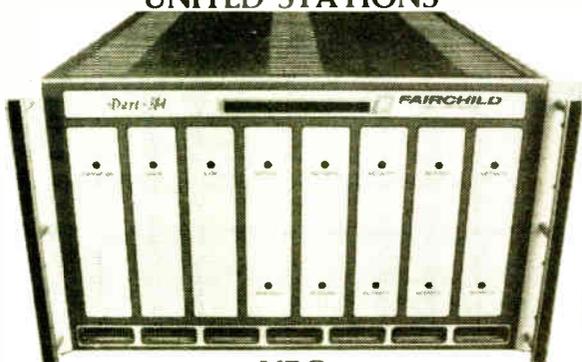
ABC



WESTWOOD/MUTUAL



UNITED STATIONS



NBC

BOOTH 557
NAB
BROADCASTERS

The FAIRCHILD DART 384 brings all the digital networks down to earth FOR LESS

The Digital One

Call the Experts
317-962-8596

ALLIED
Satellite Equipment

All trademarks registered

April 1, 1988

A Digital Studio to Transmitter Link

by Tim McCartney

Boise ID ... It's a long run up and down the frequency spectrum, back and forth between analog and digital domains and over a 10.5 mile distance of city and mountains. But the KBSU digital STL works perfectly!

In preparation for a transmitter site move KBSU began development of a digital STL system at minimum cost.

Inspired by the digital STL exhibits at the 1987 NAB show, Dr. James Paluzzi, GM of KBSU at Boise State University, designed the system. It takes advantage of the down-time of existing video STL systems.

The completed link is one of the first in the country, and is certainly the one with the greatest number of hops.

Stereo audio arrives to the exciter inputs with the same level of quality as the feed-point back at the studio. Distortion and noise readings are lost amid the residual noise of the measuring instru-

ments. Frequency response is virtually unchanged.

The heart of the system consists of two Sony Pulse Code Modulators (PCM) Model 501ES and various video linking systems.

Figure 1 provides an overview of these conversions.

At the studio analog is converted to digital by the PCM; its baseband video output then feeds the input of a video STL.

Several video relay points later the video with digital information is converted to a precise replica of the analog audio back at the studio.

Figures 2-5 demonstrate a more complete look.

In Figure 2 the studio console outputs feed a processor with outputs simultaneously routed to the current transmitter via telephone lines and to the future transmitter site.

Once converted to digital, the PCM uses baseband video to transport digi-

(continued on next page)

Figure 1. Analog, Digital, Video Conversions

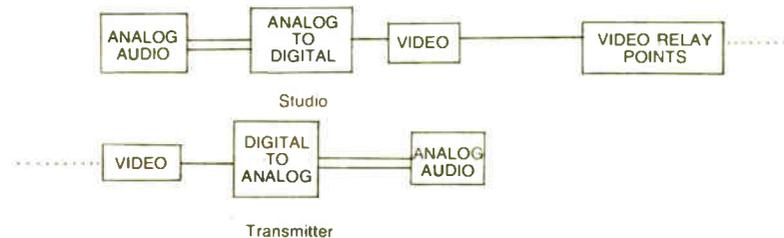
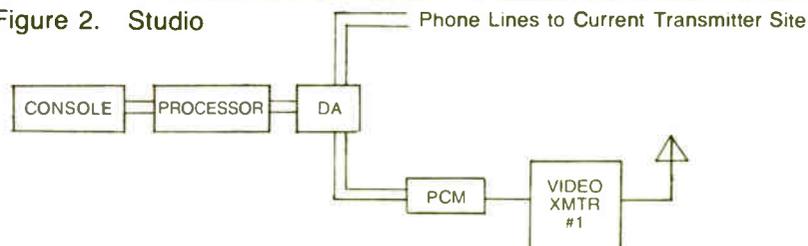


Figure 2. Studio



Subscription/Reader Service Forms

Radio World

April 1, 1988 Issue Use until July 1, 1988

FREE Subscription/Renewal Form

I would like to receive or continue receiving Radio World
FREE each month. YES NO

Signature _____ Date _____

Please print and include all information

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ ZIP _____

Business Telephone () _____

Please circle only one entry for each category:

I. Type of Firm

- | | |
|------------------------------|---------------------------------|
| A. Commercial AM station | F. Recording studio |
| B. Commercial FM station | G. TV station/teleprod facility |
| C. Educational FM station | H. Consultant/ind engineer |
| D. Combination AM/FM station | I. Mfg, distributor or dealer |
| E. Network/group owner | J. Other _____ |

II. Job Function

- | | |
|-----------------------|---------------------------|
| A. Ownership | D. Programming/production |
| B. General management | E. News operations |
| C. Engineering | F. Other (specify) _____ |

III. Purchasing Authority

1. Recommend 2. Specify 3. Approve

Reader Service

Please first fill out contact information at left. Then check each advertisement for corresponding number and circle below. NOTE: Circle no more than 10 numbers, otherwise card will not be processed.

001	021	041	061	081
002	022	042	062	082
003	023	043	063	083
004	024	044	064	084
005	025	045	065	085
006	026	046	066	086
007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
016	036	056	076	096
017	037	057	077	097
018	038	058	078	098
019	039	059	079	099
020	040	060	080	100

Sales Call Service

Please have a salesperson contact me about these items (list numbers):

Clip & Mail to: Radio World, PO Box 1214, Falls Church VA 22041

A Digital STL Setup

(continued from previous page) sized stereo audio. This PCM output feeds a 23 GHz video STL link to Receiver 1 atop a building on campus as shown in Figure 3.

Receiver 2 is located atop Deer Point Mountain as seen in Figure 4. The final hop to Receiver 3 at the KBSU transmitter building is just a few hundred yards away, as in Figure 5.

The signal is first downconverted to VHF channel 8, then brought to baseband video by a VHF-TV receiver. The PCM then changes digital information to stereo analog audio. Next, it's on to final processing, preemphasis, stereo generator, exciter, transmitter and antenna.

Yes, there are problems—the kind that will test one's technical prowess, analytical ability, common sense and patience.

The first problem is that PCMs use unbalanced, high-impedance audio inputs and outputs. While such mismatches can be satisfactorily resolved at the studio, the high RF environment at the transmitter site poses a new series of potential problems.

And that leads us to the second problem: RF. Boise's popular RF site is Deer Point Mountain at an altitude of 7000' complete with four VHF's and ten FM's.

In this locale, forget using radios because their front ends overload. As for TV screens, several images are more likely than the one which is expected.

In my inspections on the mountain, audio is to be found only for remote pickup use and is both heavily filtered and shielded. Otherwise, composite signals are the rule. So, the odds against the KBSU project seemed formidable.

RF experts offered advice about shielding. Yes, what KBSU designed is feasible. But the question is just how much RF shielding will be necessary, something elaborate or just a well-grounded equipment rack?

Questions centered around whether or not the RF is having an impact on the STL system's PCM or video, power line interference or the monitoring equipment used to make these judgments.

In KBSU's installation, two consumer-grade VCRs failed to successfully convert VHF video to baseband video. The RF prevented the VCRs control circuitry from functioning.

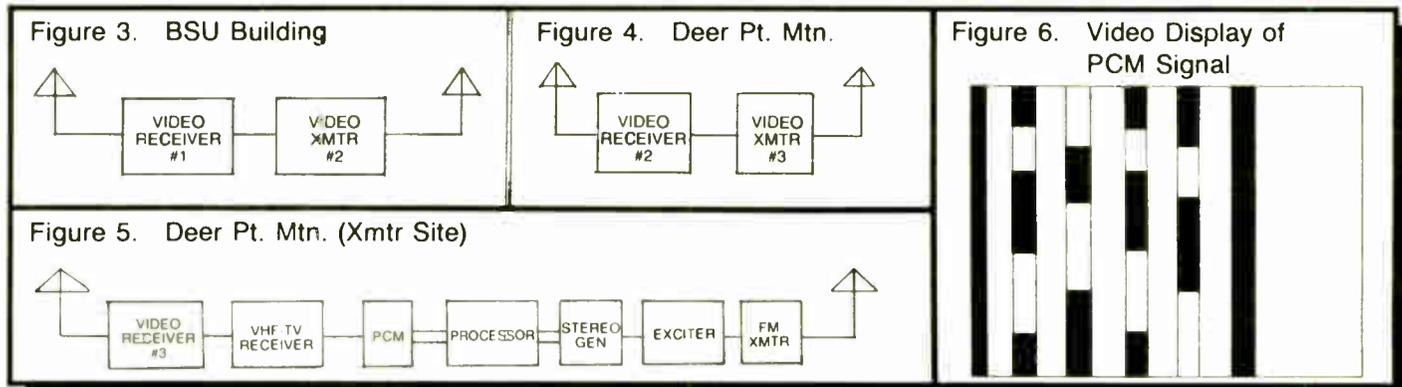
Then a TV monitor was used. This offered the additional advantage of being able to view the digital signal on the screen.

Its appearance, as sketched in Figure 6, is a series of five or six vertical black bars which vary at an audio rate. However, the monitor tuner was unable to hone in precisely enough to the incoming video channel due to the high RF.

Thus the outgoing baseband video was either of insufficient amplitude or distorted enough to destroy the digital signal. We still don't know which one was the culprit.

A new consumer item proved to be the answer: a TV receiver less the monitor portion. Unlike the monitor used earlier,

Tim McCartney is director of engineering and operations at KBSU, Boise State University. He is an SBE broadcast engineer, a former GM and has a masters degree in human resources development. He can be reached at 208-385-3760.



this unit had modern tuning circuitry and baseband video output, all protected by a steel chassis.

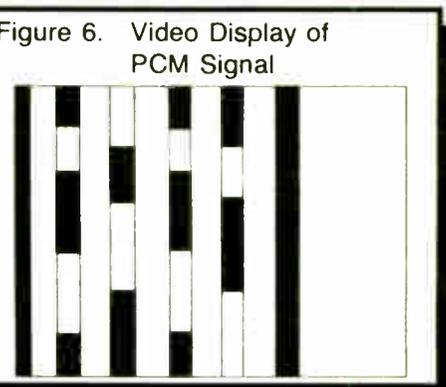
Sure enough the receiver provided a signal to the PCM which could be flawlessly converted to stereo analog audio.

All along we were concerned about the PCM's performance in high RF

fields. But thanks partly to its steel chassis there was no problem.

Our doubts about unbalanced audio from the PCM in the heavy RF environment also proved unfounded.

Digital audio is usually like a pass/fail course. You either do or you don't. You either reach nirvana with a perfect sig-



nal or sit out in the cold with nothing at all.

So one spends a lot of time believing that "Camelot" is just around the corner. A thousand ideas later and finally, success.

Strike one up in our ongoing quest for greater potential!

RADIO

CLASSICS

What makes a *Radio Classic*? Timeless design, flawless performance, outstanding value, and above all — bullet-proof reliability. Because, in radio, we don't coddle our classics.

The RCA 77DX is one such product. It set new standards in microphone performance. Even now, decades later, its quality still endures. Arrakis Systems' SC audio consoles are *Radio Classics* too. Introduced in 1980, the SC series set new standards in design, performance and value. Today, Arrakis SC consoles are the choice of more radio stations worldwide than any competitive unit in their class. Shown below is the 2000SC, an outstanding value at \$4695. Like all Arrakis audio consoles, the 2000SC is ultra-reliable. And it will continue to deliver outstanding performance as the years go by. After all, that's what it takes to be a *Radio Classic*.

arrakis
SYSTEMS, INC.

RCA 77DX MICROPHONE

Call (303) 224-2248

ARRAKIS 2000 SC AUDIO CONSOLE

2000SC FEATURES:

- 12 Stereo Channels, 24 Inputs Total.
- Program, Audition, and Mono Mixdown Balanced Outputs.
- Telephone Mix-minus Buss.
- Full Monitoring Facilities.
- Remote Equipment Start.

For features,
performance,
price and
reliability,

2000SC RELIABILITY:

- DC Controlled — No Audio On Pots Or Switches.
- Rugged Motherboard Construction
- Penny & Giles Slide Faders.
- ITT Shadow Switches.
- Only 3 IC types employed, all plug-in.

NOBODY BUILDS CONSOLES LIKE ARRAKIS.

Arrakis Systems Inc. 2609 Riverbend Court Fort Collins, CO 80525

High Power FM Power

Before you purchase a high power FM transmitter, ASK:

Q. Which manufacturer has offered leadership in high power FM since 1961?

A. **ONLY HARRIS.** Since we introduced our first high power FM transmitter in 1961, we've been the *only* constant force in the business. Some companies have come. Others have changed hands. And a few have gone completely.

As the high power FM industry's most solid player, Harris will give you the industry's strongest safety net. You can count on us for top confidence that service and parts will be available *tomorrow* for the product you invest in *today*.

Q. Which manufacturer combines a continuing record for innovation in FM with a broad range of high power FM transmitters?

A. **ONLY HARRIS.** From the first solid-state FM exciter to our revolutionary IPA, functional innovation is more than a Harris tradition. It's a principle we've applied to an extensive range of compact high power FM transmitters. We have *new* 20, 25, 30 and 35 kilowatt models. And they're available in dual configurations for FM super powers!

At every power level you'll get a competitively-priced transmitter engineered for years of top performance, low-cost ownership, and easy operation and maintenance.

Q. Which manufacturer has provided 24-hour technical service since 1975?

A. **ONLY HARRIS.** Because we were the first company to understand your need for service on *more* than a 9 to 5, Monday through Friday basis.

Total approaches to RF system problems are always available from our specially-trained RF systems service engineers — even if your system went on the air before they were born! Your engineers can get answers to over 90 percent of their technical questions by phone. And the service is free to our customers!

You can also phone us 24-hours-a-day for parts — even for products we no longer manufacture!

If you use our toll free parts priority hotline — 1-800-422-2218 — we'll even pay for the call!

We take our service commitment seriously. Because we know that if you're off the air, everything stops. Except the expenses.

Q. Which manufacturer offers formal technical training?

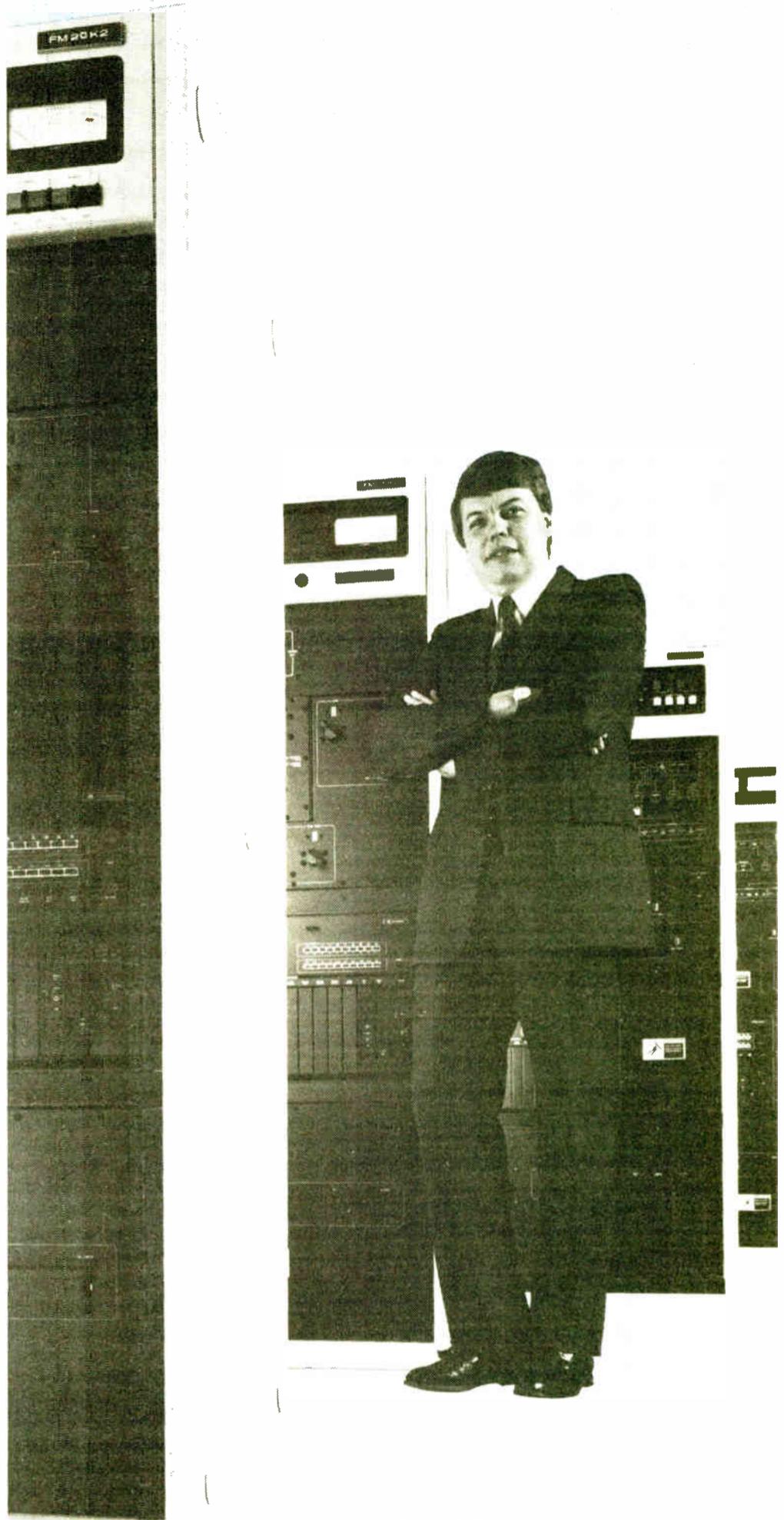
A. **ONLY HARRIS.** We know station engineers retire . . . that new engineers come on board . . . that engineers move from studio to RF systems maintenance. And we know that those who keep your equipment on the air need to be in the know.

That's why we offer more than 50 regularly-scheduled technical training programs every year at the industry's *only* Broadcast Technology Training Center. While some of our courses focus on major Harris products, we also offer comprehensive, general courses on complex RF systems for *all* broadcasters.

Q. Which manufacturer has *more* high power FM transmitters on the air nationwide than both the second and third-rated manufacturers combined?

A. **ONLY HARRIS.**

For complete information about our high power transmitters or to arrange a visit from one of our radio district sales managers, write to me at Harris Broadcast Division, P.O. Box 4290, Quincy, IL 62305-4290, or phone Harris TOLL FREE: 1-800-4-HARRIS, Extension 3012.



Ronald C. Frillman
Manager — Domestic Radio Sales
Harris Corporation, Broadcast Division

*Learn all about Harris' capabilities!
Visit us at NAB Booth 503.*

 **HARRIS**

Broadcasters Hold NRSC Test

by Alex Zavistovich

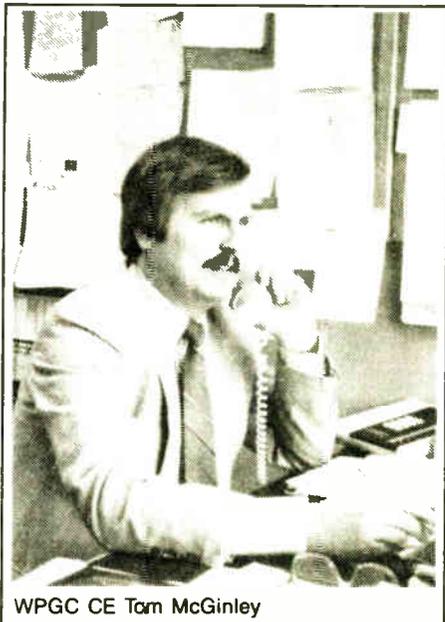
Greenbelt MD ... Two Maryland radio stations are testing the National Radio Systems Committee (NRSC) transmission standard's effect on second adjacent channel interference for a presentation at the NAB's convention later this month.

In early March a study was ready to be launched by WPGC-AM, Morning-side, and WINX-AM, Rockville, two broadcasters in the Maryland suburbs of Washington, DC. WPGC broadcasts at 1580 kHz, with 50 kW; WINX broadcasts at 1600 kHz with 1 kW.

The towns in which the stations are located are approximately 15 miles apart.

Unusual situation

"It's somewhat unusual to have two stations two channels apart serving the same basic area," said WPGC CE Tom McGinley. With each station acting as the other's second adjacent, interference problems exist for both stations, particularly in Northwest DC and the immediate outlying areas of Bethesda and Rockville.



WPGC CE Tom McGinley

At the suggestion of the NAB, McGinley noted, the two stations are using the NRSC 75 μ s preemphasis and 10 kHz stopband filtering in a test which would record improvements over second adjacent interference in each stations' coverage areas.

The NAB will supply the stations with R-DAT equipment, an RF analyzer and other measuring gear to conduct the listening test, McGinley said. WPGC and WINX have worked with coverage maps, he continued, to select "likely points" from which to test.

In particular, the stations looked for areas where the signal strength of the stations would be 20 dB different, 10 dB different or the same. Measurements would then be taken from that point of the interference experienced by both stations, and any relative improvement when the NRSC processing is switched on would be noted.

Test coverage area

The test coverage area strays only a short way into Washington, explained McGinley, noting that the service contour of WINX "is smaller than WPGC's, and doesn't penetrate as much." The main problems exist just north of the city, he said.

In some cases, the problems can be severe. McGinley commented that in areas of Rockville WPGC's signal is subject to "hash" resulting from the second adja-

cent interference problems. Similar interference is experienced by WINX, which has suffered some loss of service in the Maryland suburb.

McGinley stressed the stations' concerns to protect their 2 and 25 mV contours, which he admitted was somewhat difficult with WPGC and WINX, stations he described as "shoehorned in pretty tightly." The NRSC preemphasis and bandwidth limitations are "particularly appropriate" in their situation, he commented.

Results presented at NAB

The results of the testing will be discussed by WPGC and WINX representatives in a joint paper scheduled for the NAB convention in Las Vegas, McGinley added. The presentation was, as of early March, scheduled for the morning of 8 April, as part of the NAB's AM improvement session.

NRSC AM Technical Subgroup co-Chairman John Marino said the presentation will be significant because it would "actually show a practical application of the NRSC standard in the broadcast environment."

In the past, Marino suggested, "broadcast engineers may have seen the standard as being all theoretical." He said the paper would help dispel those misapprehensions.

Although the testing was not completed at press time, McGinley said that positive results would only confirm the support he already has for the standard.

"(The NRSC standard) is a step in the right direction of giving AM some relief," he said. "It's not a panacea, but it will help in second and third adjacency problems where the selectivity is less great."

McGinley also commented that the processing makes transmissions "sound cleaner" because of the reduction of "IMD and other distortion grunge" afforded by the system.

For more information, contact Tom McGinley at WPGC: 301-441-3500. Contact John Marino at 203-333-4800.

NAB Names New S&T Engineer

by Alan Carter

Washington DC ... The NAB has named a new staff engineer to its Science and Technology department.

Stan Salek, an engineering manager with Circuit Research Labs in Tempe, AZ, has been named to the position that became vacant when Michael Rau was promoted to VP and acting head of the department.

Salek, who assumes his duties 7 April, will become staff coordinator for the National Radio Systems Committee taking over from Rau. As a radio engineer for NAB, Salek also will work on radio allocation issues and FMX.

As with all engineers joining NAB, Rau said Salek will start in a staff position. His hiring, from more than 50 who applied and interviews with 12 applicants, brings the S&T engineering staff level back to its previous complement of six engineers.

Rau said he plans to ask for a budget increase for fiscal 1988-89 to hire more engineers.

Rau praised Salek's work as a radio engineer. "I think those talents will be well used at NAB," he commented. "The first criteria in selecting an engineer was excellence."

Salek and CRL have actively participated in development of the NRSC standard.

Salek said with his design back-

ground, the position with NAB will give him "an opportunity to work on industry issues that I have been interested in."

Salek has been with CRL since 1984. Prior to that, he was a design engineer with Broadcast Electronics from January 1983. There he designed FM transmitter components and AM generating equipment. He holds a patent on an AM modulating technique.

He worked for Motorola Inc. from June 1981 until joining Broadcast Electronics. At Motorola, he was a design engineer working with communications systems.

Contact the NAB Science & Technology department at 202-429-5346.



Stan Salek will become the new NAB staff engineer.

Your Problem Solvers

from **ATI**

- Mike
- Line
- Phono
- Mixing
- Matching
- Metering
- Monitoring
- Processing
- Distribution
- Rack Mounting

AUDIO TECHNOLOGIES, INC.

328 W. Maple Ave., Horsham, PA 19044 • (215) 443-0330 • FAX (215) 443-0394

Bext, Inc.

High performance at affordable prices.

- 15, 20, 30, 80 W exciters and translators/boosters.
- 100, 250, 400, 500, 1000 and 2000 W amplifiers.
- All front panel programmable, broadband.
- 2 and 20 W STLs.
- 24 Hr. technical support on call.
- Credit/Leasing options available.

Bext, Inc. 619-239-8462
739 Fifth Ave. San Diego, CA 92101
TLX 229882 FAX: 619-239-8474

Covering the Campaign, Live

by John "Q" Shepler

Part II of II

Rockford IL ... The Senator's plane glided over the fence at the end of the runway to a smooth touchdown. The distinctive whine of the jet engines would make a perfect background to start the live campaign coverage.

Wiley Cohen smoothly segued from his supreme news command post at the station to reporter Christine Cacciatore in the RPU-equipped station wagon at the airport.

CE Norm Ungar bit the corner of his lip. This was the point of no return. The next couple of days would be a near-continuous news broadcast from many locations, scripted almost as they went along. His equipment had to work perfectly—or at least appear to on the air.

"The band is starting to play now as the door to Senator Corquebaro's plane opens," Christine announced, "The Senator has appeared and is waving to the crowd."

Wiley pushed the telephone talkback button on his console and called to Buzz Sawyer through the studio mic. Norm had bridged the output of the main mic preamp and routed it to the telephone hybrid unit via a PTT/Off/On lever switch.

This was great for remotes because the announcer at the remote end could hear studio cues even if the remote was beyond the station's coverage area.

There was no answer from the terminal where a major news conference was scheduled in a matter of minutes. Wiley wiggled the lever half a dozen times. Could it be on the fritz now, at the worst possible time?

"OK, Wiley, I'm here," Buzz finally responded, noticeably out of breath. "We lost power. The PA and mixer are both on batteries now, so it won't really matter. But 95X can't run its transmitter. They'll probably ask you for a feed."

Norm nodded affirmatively. He had a distribution amp patched from the board

to the telephone system. They could feed up to four telephone lines with program audio.

Superior pick-up

Buzz was soon crushed among the horde of reporters as the news conference went on the air. A couple of the smaller stations were trying to pick up the questions and answers using only the built-in electret mics on their cassette recorders.

Buzz was sure he had the only decent pickup among the local stations. Except, of course, for Francine Foxx, president of the college station and Buzz's girlfriend.

Q-Tips

Her recorder was plugged into a line output on his mixer. Buzz had Norm make up the special cable just in case such an opportunity should arise.

Meanwhile Christine had pulled the news car around the pile-up of media vehicles and parked just past the airport entrance.

She left the motor running and made a few notes while listening to the last questions of the news conference. Nothing really noteworthy had been said.

Christine looked over her shoulder. Just as she expected, the Senator's limo pulled away from the terminal while reporters grabbed their equipment and raced to the parking lot.

As the limo left the airport, Christine slipped easily into the motorcade and reported in.

"Now we join Christine Cacciatore live from the Senator's motorcade," Wiley beamed. He was scooping the competition for sure.

On to headquarters

Buzz took his time packing up. There were only the two of them left in the terminal. "See you at the dinner tonight, Francie?," he asked, trying to maintain

some degree of cool.

"Of course you will. I hope he says something important this time. We're going to put together a half-hour special tomorrow."

"Well, your connection will be right here," he said casually, waving the mixer in one hand in hopes of looking like a network reporter with lots of equipment.

Just then the mixer slipped from his hand, through a railing, and crashed step by step down a flight of stairs.

Francine looked almost as horrified as Buzz. His short career flashed in front of his eyes as he could hear Wiley giving him the exit speech. "Geez," he cried. "That's our only mixer for tonight."

Disaster averted

Meanwhile, the motorcade arrived at party headquarters with Senator Corquebaro being led in surrounded by cameras and microphones.

Christine parked around back and came in through a side door just as the festivities were starting. She powered up the remote equipment and grabbed the wireless mic.

"OK, Wiley. I'm ready at headquarters."

While Christine moved through the crowd conducting interviews with only a clip-on receiver and wireless mic, Buzz was racing toward the station. He had already decided that going AWOL was not the answer.

"Psssst," Buzz called to Norm, hoping that Wiley wouldn't see him. "Come here," he whispered.

Norm gave a pretty serious look to the smashed mixer that Buzz was hiding under his jacket. He motioned to the shop.

The meter bezel was cracked in a dozen places and two knobs were missing. Buzz sheepishly took the pieces out of his pocket.

The circuit board seemed to be intact, although jarred loose. A couple of wires had broken free, but Norm had those soldered back on in no time.

With a sigh, he flipped the power switch on and plugged in a mic and

headphones. Murphy had been kind. The mixer was still functional.

More troubles

Just then, the paging speaker in the shop came to life. "News studio here, buddy, we got trouble!"

Buzz schlepped out the back door with the damaged mixer as Norm made tracks for the front of the station.

Wiley was pacing in the studio with his hands on his hips. "We lost the line." "What?"

"Traffic accident. Truck skidded into a utility pole about a quarter mile from the place. We're dead on the speech unless you've got any ideas, Norm."

"How about the car?"

Wiley lit up. "Yes, yes, yes."

Christine beat them to the punch, as she keyed the two-way mic. "Come in studio, we lost our phones here."

The three of them quickly discussed the situation and decided that they would use the car to relay their audio from party headquarters.

Spontaneous solution

Christine could string the 500' mic cable from the car's mixer through a back door and to their equipment location inside.

Buzz was already on his way with the other mixing console and could help connect the new setup. The signal was less than they would like, but Norm would fix that with a portable Yagi antenna. It would work if they hustled.

Wiley padded for time which, fortunately, was his strong suit.

By the time Norm arrived, Christine was back doing on-air interviews and Buzz was guarding the car. During the next break, Norm rigged the new antenna and topped off the car's gas tank from the can in his jeep.

They would need power for a couple of hours—too much for the battery alone. With this impromptu setup, they sounded every bit as professional as any news operation could. Norm headed back to the station.

The dinner speech broadcast seemed pretty routine after what the news team had just been through. Christine provided the commentary while Buzz rode gain and made eyes at Francine.

As Senator Corquebaro waved from the front doorway, they broke down the setup and scurried back to the station.

The main event

The long day had one more event scheduled before they could call it a wrap. Wiley straightened his tie. He was sure now: this was the biggest day of his life.

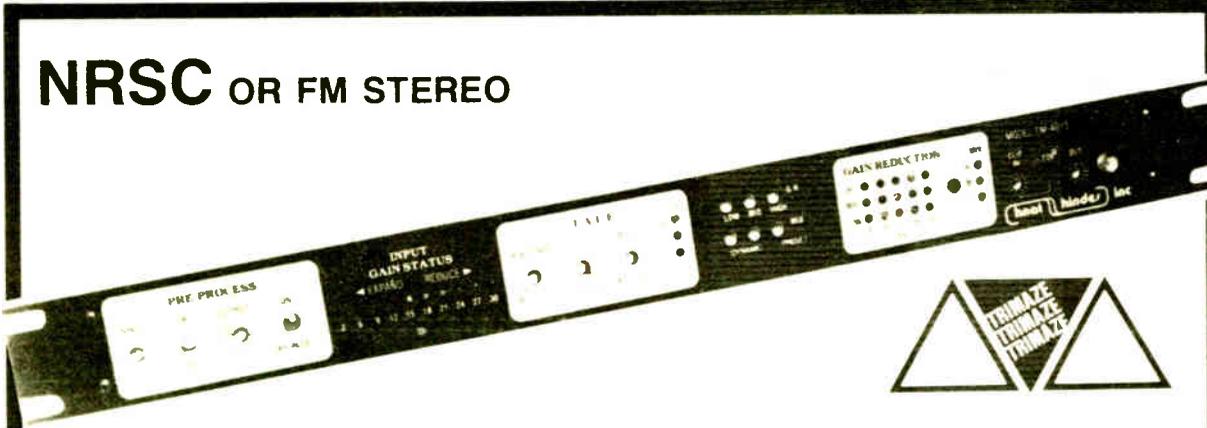
Norm tugged on the mult box cable one last time. He really didn't expect it to come loose, but tugging made the connection seem tighter, somehow.

A few minutes later the entourage arrived. The Senator and his aides made a bee-line for the newsroom with a string of TV people following.

Wiley arranged the guests around the conference table and made sure everyone who wanted an earphone had one. The phone audio would also be on speaker so only Wiley really needed the air monitor.

Norm, meanwhile, kept a close eye on the camera crews who were matter-of-
(continued on next page)

NRSC OR FM STEREO



THE MOST POWERFUL TOOL IN AM AND FM AUDIO PROCESSING

The TRI-MAZE is a complete stand alone audio processor requiring nothing more than pure source material for total performance.

FM — Designed to feed the multiplex input of all existing stereo generators, as opposed to working around the problems of existing processors.

AM — Complete NRSC compliance, total processing for a LOT less than 5Gs.

SOME OUTSTANDING FEATURES INCLUDE:

ZERO HYSTERESIS POST FILTER CLIPPING for up to 2dB of increased loudness without composite clipping.

TIME DOMAIN CONTOURED INTEGRATED RELEASE TIMES, that specifically treat time intervals associated with frequencies in the three bands of processing providing the ultimate in transparency.

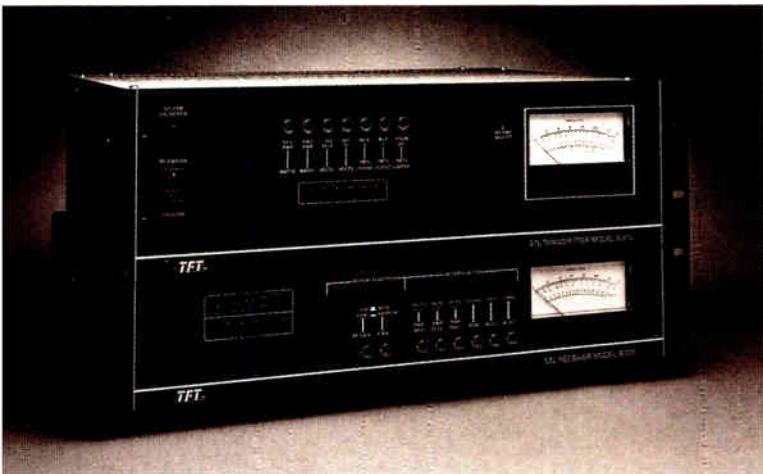
PEAK MIX DOWN METERING makes set up as simple as your home stereo.

If you're looking for a rich, smooth, big dimension sound for thousands less, TRI-MAZE ...
CONTACT YOUR DISTRIBUTOR OR CALL DIRECT



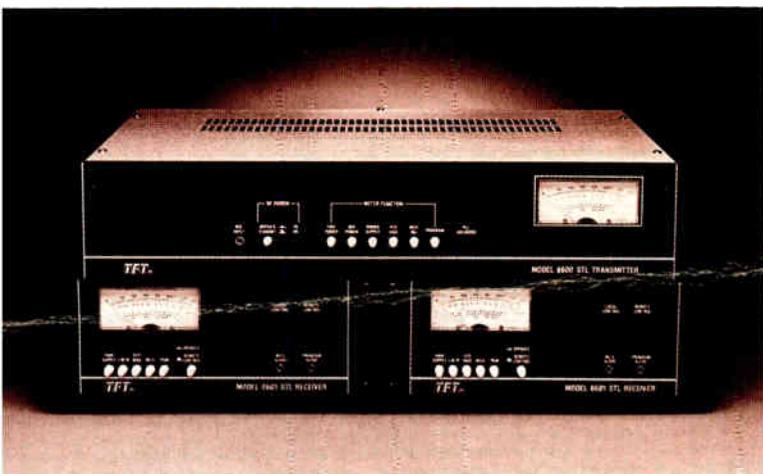
1-203-935-9066
1-203-935-9242

FOR EVERY APPLICATION, THE BEST STL'S YOU CAN BUY.



MODEL 7700B STL

The 7700B is the 8300's economical counterpart. Available in composite, mono, or dual mono configurations without degradation of separation, signal-to-noise ratio, or added distortion. As with the 8300 Series, an FM Stereo Decoder is optional and provides L & R channel outputs for local monitoring, or AM stereo applications. **\$6,995***



MODEL 8300 COMPOSITE STL

When it comes to transporting the cleanest, most transparent audio via microwave, the 8300 Composite STL is ahead of the rest . . . even in dense RF environments. If multi-hop links are involved, the 8300 features exclusive IF repeater circuitry to ensure audio quality at the origin is accurately relayed and maintained through 3, 4 (or more!) hops to the transmitter. **\$8,950***



MODEL 8600 DISCRETE STL

The Model 8600 STL is a discrete 950 MHz system. Designed for either single or dual monaural operation, it is the ideal choice for congested areas or STL drop-ins. It features a built-in subcarrier generator and demodulator for voice or data, spurious-free power amp, mic and headphone jacks and the capability to properly match phase and gain between dual links for either AM stereo or FM stereo applications. Also available on FCC Part 94 frequencies (private fixed microwave). **\$3,195***

In addition to the above systems, we have:

- I.F. Repeaters
- Hot-Standby with Automatic Changeover Units
- TSL 450 MHz Return Links with multi-user Time Division Data Multiplex
- RPU's
- STL Accessories

*Suggested List Prices. 3/88

I'm interested TFT. Please send me the following:

- Free 30 page Engineering Guide,
A PRIMER: AURAL MICROWAVE LINKS.
- Please call me—your expertise in STL Path Analysis would be greatly appreciated.
- Full technical literature and price details on all your STLs.
- Send me information on your RPU line.
- Send me information on your TSL with multi-user capability.
- I'm interested in your legendary monitors too.

Name _____

Position/Title _____

Station _____

Address _____

City _____ State _____ Zip _____

Telephone (Optional) _____



YOU CAN RELY ON STL'S FROM TFT.

HIGHEST RELIABILITY.

TFT's patented STL design* achieves high performance and the highest reliability with much fewer components (doing lot's of very clever things). The low component count means a higher MTBF. Our extensive nine-step Quality Control and lengthy, 144 hour burn-in at elevated temperatures is an additional guarantee you're getting the most reliable STL's made.

And, we back-up this boast with a two year warranty.

COMPREHENSIVE SELECTION.

TFT has the broadest selection of high-performance aural STL systems, including the Model 8300 & 7700B Composites, discrete versions, the economical Model 8600, exclusive IF repeaters and all the accessory gear you need for a complete, state-of-the-art aural microwave system.

If we don't have it, you don't need it!

ON-CALL SUPPORT, 24 HOURS-A-DAY.

Behind all our STL's is a responsive support and service team you may never need. But, if you ever do need help, rest assured that we have technically knowledgeable people to assist you.

Around-the-clock. Seven days a week.

PERFORMANCE & FEATURES

Our higher reliability, comprehensive selection and responsive support and service team wouldn't mean much if our STL's didn't give you the performance you demand.

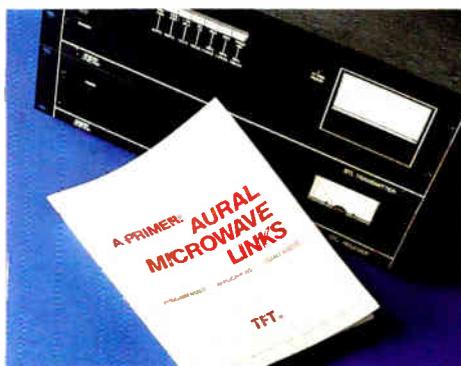
Our list of performance and convenience features is unrivaled.

DEDICATED DEALERS

TFT dealers take pride in selling our products because we support them just like we support you. Each year, TFT dealers attend our Technical & Sales Training Seminar to satisfy their desire to provide you with accurate and useful information.

Contact your favorite TFT dealer today.

* U.S. Patent No. 4,710,970



To make your own STL Path Analysis, ask for our free 30 page Engineering Guide.

TFT INC

3090 Oakmead Village Drive
P.O. Box 58088
Santa Clara, California 95052-8088
☎ (408) 727-7272
TWX: 910-338-0584
FAX: (408) 727-5942

© 1988 TFT, Inc.



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 694 SANTA CLARA, CA

POSTAGE WILL BE PAID BY ADDRESSEE

TFT INC

Attention: Marketing Administrator
3090 Oakmead Village Drive
P.O. Box 58088
Santa Clara, California 95052-9954

World Radio History



Direct from the Senator's Tour

(continued from previous page)
factly plugging into his homemade mult box.

"Please, don't let there be hum," he prayed, too late to do anything about it if there was a grounding problem.

Tinfoil solution

One of the local TV guys was swearing under his breath. "Hey, this audio is full of buzz."

The other crews quickly confirmed that their signals were good and shrugged to the hapless technician. Norm grabbed the man's mic cable and plugged it into a different output. No luck.

"Try some tinfoil," another technician called. He had run into the problem before. The culprit was the station's RF overwhelming the camera's audio circuit.

It seemed that you could reduce the effect drastically by simply wrapping the plastic camera case with household aluminum foil.

Norm breathed a sigh of relief when he found a half-used box of foil in the kitchen. The talk show was rolling while Norm wrapped furiously and the camera man strained to check his audio.

It worked! Now everybody had a good signal and they were only five minutes into the broadcast.

Norm took the remaining scraps of foil back to the kitchen and dropped a cou-

ple of quarters in the pop machine. He deserved to sip it slowly.

Everything was running smoothly at last. As the last caller was connected, he trudged back to the studio to watch the finale.

Senator Corquebaro smiled at Norm through the studio window. Did he really appreciate the engineering effort that made him, as well as the station, shine today? Norm finally decided that wasn't it. He had that same toothy grin for everybody.

The news theme faded up and the "On-Air" light went off. In less than a minute the whole contingent had started to pack up.

Norm caught a glance of his homebrew mult box as the crews yanked their cables free. It had done its job well. In fact, all of the equipment had performed remarkably well.

The Senator shook Wiley's hand with both of his own. "You're a good man, Cohen. Could make a fine press secretary someday, if you're so inclined." He

smiled that toothy grin even wider.

Christine turned to avoid breaking up during Wiley's big moment. Norm had to look away, too. The studio was getting knee-deep in more than microphone cables.

Today's events would make great conversation for months. But, they had to postpone that enjoyment for at least another day. At 6 AM tomorrow the polls would open and another exciting election day's coverage would begin.

John Shepler is an engineering manager, broadcast consultant, writer and regular RW columnist. He can be reached at 815-654-0145.9

Why record on Cart Disks?

"Because the audio quality is what I expect from digital. Also, it's practical and affordable for our radio stations."

- Andy Laird

Vice President

Director of Engineering, Radio Group
Heritage Media Corporation

**The CompuSonics DSP 1500:
reproduces, records, edits.**

Copycode is Rejected

(continued from page 13)

The company had first announced its intention to sell DAT machines domestically in 1987, during the height of the Copycode audibility controversy.

On the other side of the fence, the Home Recording Rights Coalition heralded the NBS study as a "victory for consumers," anticipating the study will help defeat legislation which had sought to use Copycode in DAT machines, and which has delayed the introduction of consumer machines into the US.

HRRC Chairman Thomas Friel asserted that "Consumers are looking forward to DAT, an exciting new format. The recording industry, in asking for Copycode legislation, had its credibility at stake. Now that Copycode is finally and fully discredited, we don't think anyone in Congress could reasonably ask that DAT be delayed any further."

Friel added that the HRRC would resist any more requests to finance further investigations of anti-taping systems.

And yet, anti-copying technology has not breathed its last. The CBS system was not the only one in development. Kahn Communications President Leonard Kahn has applied to the US Patent Office for three patents on copy protection devices.

Although Kahn refused to speak to RW regarding the technology, reportedly termed "Stop-Cop," the protection system is said to insert an "inaudible" signal into recorded material which would produce a tone over the digital recording.

For additional information on the NBS study, contact NBS at: 301-975-6620. Contact HRRC at 202-457-4919 or RIAA at 202-775-0101.

CompuSonics
First in audio computers since 1983
2345 Yale St., Palo Alto, CA 94306
415-494-1184

See Us at NAB Booth Hilton 5521

Circle Reader Service 22 on Page 28

Editor's note: On 1 March, the National Bureau of Standards released its evaluation of the Copycode, an anti-copying device which was proposed to be installed in R-DAT machines to prevent digital-to-digital piracy (see related story, this issue).

The Copycode system requires the placement of a "notch" in digital recordings at 3840 Hz, which would be read by a decoder in the R-DAT device and prevent copying.

In preparing its report, the NBS conducted subjective listening tests to determine whether people could hear the effect of the notch. RW reporter Alex Zavistovich participated in the study and in this concluding segment he compares his responses with those of others who took the tests.

by Alex Zavistovich

Part II of II

Gaithersburg MD ... What do you do when you want to make sure you don't miss hearing something? How do you train to improve your perception?

When in late January I wrangled a spot among the test subjects who were to participate in a National Bureau of Standards study of the effects of Copycode encoding on source material, I was eager to have the chance to hear whether the system sounded as bad as its opponents claimed.

I was expecting something really strong—great gaps in the upper frequencies, or something; I don't really know. However, after speaking to some people who had taken the test before me, I realized the effect would probably be more subtle than that. I wanted to make sure I got every nuance in the encoded music.

So in the week prior to the test I tried

Listening to the CBS Copycode:

to prepare myself, particularly by trying to attune my ear to the 3840 Hz frequency affected by the Copycode notch.

In training

If you are familiar with the piano keyboard, 3840 Hz is represented by the highest B or B-flat—within the last few keys. There aren't a lot of instruments with that kind of true range, and fewer still are musical arrangements which use that pure tone very frequently.

For most of that week I listened to the high B on a synthesizer, trying to get a mental fix on its position in the audio spectrum, thinking of other instruments that it might affect (bells, chimes, and piccolo occurred to me right off the bat).

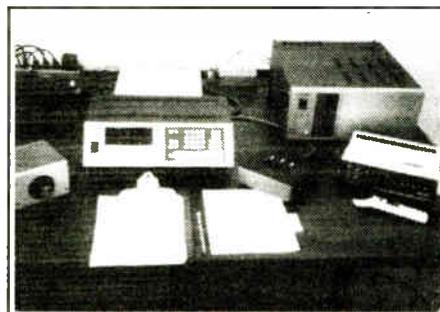
Also, without trying to be overly influenced by what I had heard from others who had taken the test, I remembered the "lack of presence" they described, the ambience loss which might result from a dropout in overtones and harmonics in that frequency.

I also remembered previous reporting, in which the Home Recording Rights Coalition (HRRRC) had conducted demonstrations before Congress with a facsimile of the Copycode, maintaining that the device also affected the timbre of particular instruments—especially the piano, in which they maintained a significant change in the clarity and the purity of the upper register tones had been created.

Incidentally, both CBS and the Recording Industry Association of America, which were working together for the incorporation of the Copycode scanner into DAT products, have dismissed those earlier tests. The device used in the

demonstrations was a facsimile of the code, not the actual device; therefore, they maintain, nothing was proven.

When I arrived at NBS, Dave Evans, the test administrator, sat me in front of a Sony digital autolocator, a set of Stax headphones, and a switcher box. He then explained the parallel listening test of the NBS' subjective study of Copycode.



Set-up for Copycode listening test at NBS.

Ten musical selections were transferred digitally from CD to digital format, then copied onto six other tracks: two nonencoded as a reference, and the remainder making up two groups (A and B), two tracks each. Either A or B would be encoded—never both—and the job was to pick the encoded signal.

To toughen things up a bit more, the Copycode would not be engaged in the encoded selection for the entire length of the selection, only for a portion, so you really had to listen to the reference track and tracks A and B completely.

The autolocator would allow me to review any portion of any selection as often as I liked until I was certain of which signal was encoded.

The ten selections, approximately 30 seconds long, were primarily classical pieces, with the exceptions of the climax from a Barbra Streisand vocal piece, a quiet passage from the score of West Side Story, and the introduction from an uptempo jazz-fusion number by Pat Metheny.

When I asked why more contemporary or harder-edged, "rock" numbers had been excluded, NBS' Evans explained that the selections were inspired by suggestions made by principals on both sides of the issue, and represented, in NBS' opinion, music in which the affect might be more noticeable.

He diplomatically added that the audio processing so pervasive on rock material would make determining where the Copycode was activated more difficult.

Moment of truth

I had always somewhat arrogantly considered myself more discriminating than even my other audiophile friends, because I am a musician—I know what instruments are supposed to sound like.

I began the test confident that no encoded material would get past my trained ears.

And yet, I listened to some selections to the point of exhaustion, without hearing any appreciable difference between the reference track and selection A or B.

Now, in one case—a passage from Prokofiev's *Alexander Nevsky*—the change due to Copycoding was definite. As the piece builds towards its climax, every instrument is playing to crescendo, includ-

(continued on next page)

DIGITAL QUALITY

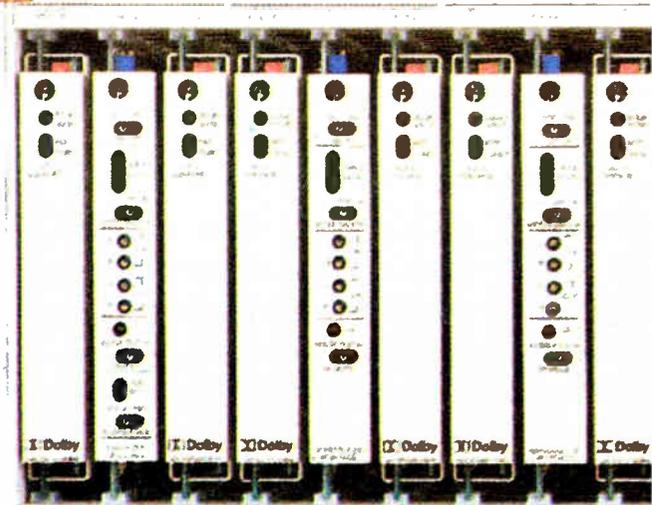
From Here 92 dB in less time

Program material, spots or promotions are on the air in an instant.

Our new Dolby® Spectral Recording (SR) system will get your cart machines up to speed and let you pull ahead in the race for audio quality. When used with our Tomcat™ and Micromax™ cart machines, with Maxtrax® head format, you get an impressive 92dB of clean dynamic range. And, NAB format machines get results that are almost as astounding.

We've integrated Dolby's revolutionary SR modules into a system that works equally well with cart or reel-to-reel machines, including an interface module designed to automatically follow machine recorder/reproducer logic.

You get the convenience of a cart machine, with its well proven advantages, while retaining the quality of your finest compact disks and



PACIFIC RECORDERS & ENGINEERING CORPORATION

© 1988-PR&E

An Audible Difference in Sound

(continued from previous page) ing what I heard to be a triangle.

That triangle must be right around 3840 Hz, because it sounded as though it was on its own fader, and someone behind the console was arbitrarily taking it out, entirely, from time to time. It was pretty annoying.

As for the rest of the cases, I just couldn't tell for certain. There were times when I thought I detected a loss of overall depth or size, and occasionally I believed I may have heard a shift in the mix of some instruments. But to call it subtle was an understatement.

I mean, if you were listening on your car stereo, forget it—the road noise would be much worse, and would almost certainly mask any change the notch might produce.

After three hours of listening, I had an enormous headache and was only certain of having correctly identified one encoded track out of ten.

I drove back to work from NBS thinking pretty hard about the notch, and re-evaluating just how critical my listening skills actually were.

Comparing notes

And yet others who took the same test I did were much more confident. National Public Radio (NPR) Director of Training Skip Pizzi outlined three separate problem areas: gaps in the ambience (as I had noted), reduction in timbral brilliance in voice and percussion, and some negative effect in the fundamentals of higher notes.

David Moulton, chairman of the Music Production and Engineering Depart-

ment at Boston's Berklee College of Music, also noticed ambience problems. However, he went on to say he could detect a "pitch shift" in a gong, which he attributed to the removal of the harmonic at 3840 Hz.

To some extent, I think, these men have a leg up on even the staunchest consumer audiophile—they may be hearing something they've been trained to pick up, some curious engineering abnormalities that many consumers might not hear, because the average listener may never have been exposed to it.

But even so, if it's audible, it's audible.

“*... who's to say the average listener won't learn to hear it?*”

It's *not* inaudible, no matter how small a group of people might hear it, or how specialized their hearing may be.

Reactions to the code

A number of people I spoke with had some interesting opinions about the Copycode. Berklee's Moulton suggested that the 3840 Hz notch is not the only trigger for activation of the device—he speculated that some other frequency must be present.

Such a feature would be desirable, Moulton speculated, to reduce the risk

of "false positives"—some quirk in the music which would cause the DAT machine to fail to record because of a mistake in detection.

Still, he said such a safeguard was in itself damning of the technology. Moulton maintained that the Copycode, as he experienced it "is not the device to use to protect musical copyrights."

"The failure rate of such a device would have to approach the random failure rate of a recorder; that is, only one false positive in every million attempts," he said. "It should be inaudible to the people making the records, as well as the people listening to them," he added.

Interestingly, when NBS's report on the Copycode technology came out, many of Moulton's assumptions about the system were born out.

NPR's Pizzi also was skeptical about the Copycode, citing a "philosophical" engineering problem.

"(Engineers) want improved fidelity in the areas of frequency response, dynamic range, and phase, and great strides have been made in those areas. To introduce a terrible anomaly on purpose—how are you going to state your frequency response?" he asked.

Pizzi also articulated a concern expressed by a number of participants in the test, one that I noticed myself, to a degree—a "learning curve" in detection of the notch.

"Auditory acuity in this case seems to be an evolutionary process," Pizzi said. "Collective listening patterns may change. The Copycode doesn't necessarily destroy the validity of the music, but who's to say the average listener won't

learn to hear it?"

Having heard all the arguments and struggled with the test, my own thoughts about Copycode still no doubt reflect the perspective of a musician and composer.

Although the effect of the device is generally so subtle as to be nearly inaudible, it is, in some cases, annoyingly noticeable, and clearly not what the songwriter had intended.

Even after my own experience with the tests, I still can't believe that the majority of musicians would be so preoccupied with protecting the copyrights to a song that they would allow their music to be released to the public in effect, damaged.

Now that the NBS has concluded that one *can* hear the difference between encoded and nonencoded music the Copycode might be a moot point, but there's a lot to think about when you talk about adding something to all music that was not meant to be there.

The ethical question goes beyond even the legitimate concerns of copyright infringement and digital piracy. It's like a surgeon purposely putting a scar on his wife's face so that other men won't flirt with her.

Sure, that might be a deterrent, but should it be done, even if the scar is small? Even if it is so small some people might not notice? Isn't there something less drastic he may have overlooked?

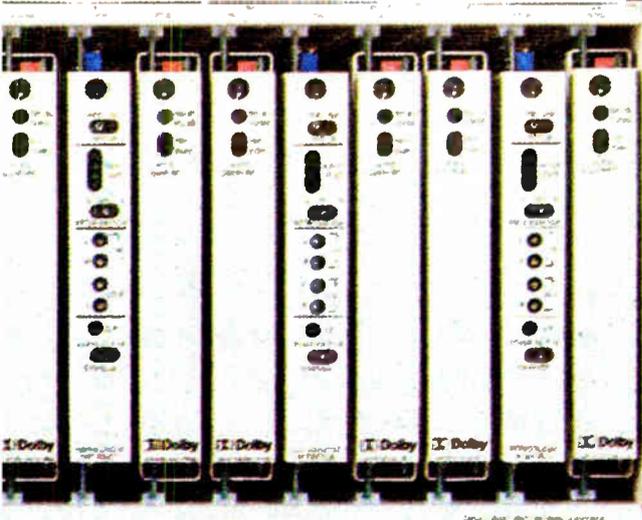
If only one person had heard the difference in Copycoded music, it would still be audible. At this juncture, it seems many have heard it.

So, as in the case of the misguided surgeon, maybe the listening public and those concerned with the technical quality of recorded music have the right to ask concerning Copycode: isn't there something a little less drastic that might be tried first?

TY À LA CART.

e To Hear: han 100 mSec.

You get performance equal to or better than 16 bit PCM linear digital audio recording.



in-house production efforts. In fact, our Dolby SR System provides sonic performance equal to or better than 16 bit PCM linear digital audio recording. You get wide dynamic range and low distortion performance without dither noise or quantization distortion. And, the soft saturation characteristic of audio tape is preserved, avoiding the breakup and clip sound when a digital signal is overmodulated.

With Dolby SR in the rack, your listeners are in the fast lane to better audio quality. And, you're in the driver's seat in the ratings game. If Dolby SR sounds like the technology you've been waiting for, give us a call. We can show you how to get 92dB of dynamic range from "here" to "hear" in less than 100 milliseconds.

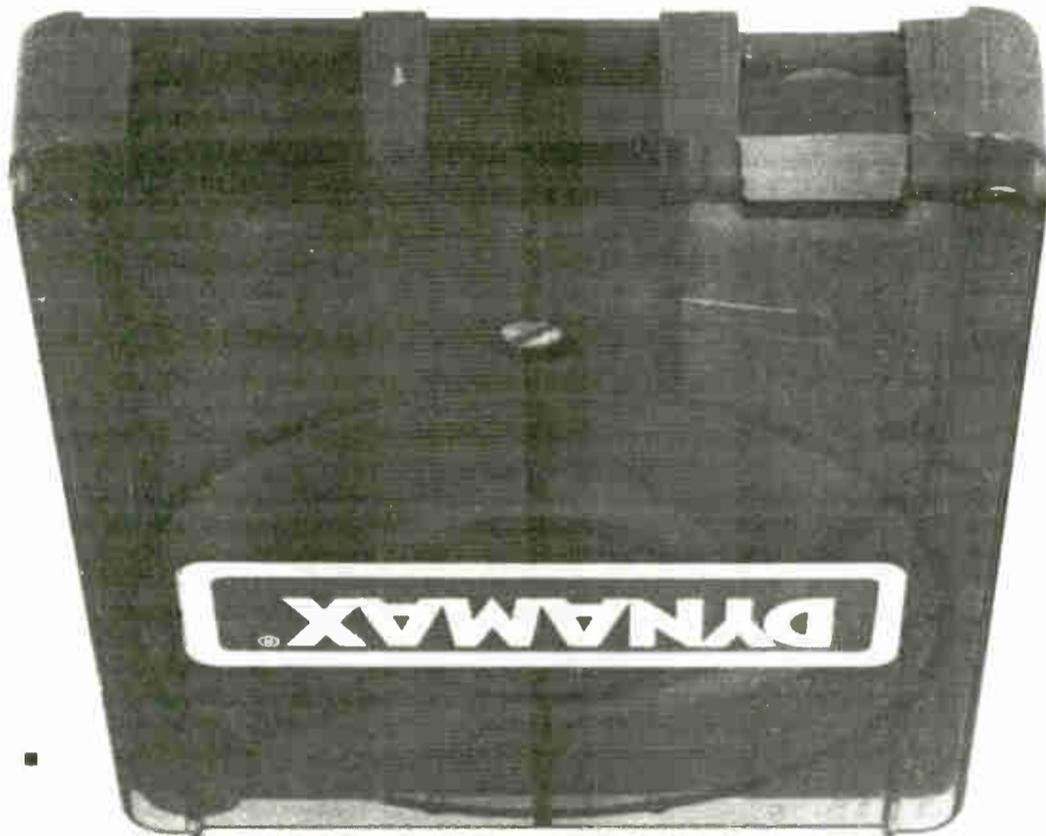
Dolby and the double-D symbol are registered trademarks of Dolby Laboratories Licensing Corporation. Maxtrax is a registered trademark of Pacific Recorders & Engineering Corporation.

2070 Las Palmas Drive, Carlsbad, CA 92009 (619) 438-3911 FAX (619) 438-9277

ALLIED

The *FULL SERVICE* Broadcast People

WHEN
YOU'RE
READY
FOR
REAL...



TEST
US
FOR
THE
BEST

DYNAMAX[®]

Cobalt Tape Cartridges by Fidelipac[®]

Recommended Test Procedures

1. Carefully clean & degauss cartridge machine heads & drive surfaces.
2. Set recorder head azimuth, bias & equalization to optimize the performance of the cartridge under test.
3. Compare various lengths of the same cartridge type for stereo phase, level uniformity, noise & distortion performance.
4. Starting with Step No. 1 above, test other brands of cartridges.
5. Compare results.



FREE OFFER

A sample kit of Dynamax Cobalt Cartridges consisting of 1 each of 70 seconds, 1 each of 3.5 minutes, 1 each of 5.5 minutes is available for the asking. Your request should be submitted on your station letterhead, signed by the Chief Engineer, the General Manager, or Program/Production Director. Send request to:
DYNAMAX
P.O. Box 1487
Richmond, IN 47375

ATLANTA, GEORGIA
404-964-1464

LOS ANGELES, CALIFORNIA
818-843-5052

CHICAGO, ILLINOIS
312-470-0303

RICHMOND HILL, ONTARIO, CANADA 416-731-3697

RICHMOND, INDIANA
317-962-8596

DALLAS, TEXAS
214-423-8667

SEATTLE, WASHINGTON
206-838-2705

USED EQUIPMENT DIVISION
317-962-1471

BROADCAST SYSTEMS DIVISION
714-752-6664

SATELLITE EQUIPMENT DIVISION
317-962-8596

NIGHTS/WEEKENDS EMERGENCY
317-962-8961

ALLIED

Broadcast Equipment

P.O. BOX 1487 • RICHMOND, IN 47375

Join Our FAX Network • Prompt Response on Your RFQs
FAX 317-962-8961

Log In... Bulletin Board Modem... 317-935-0531

CONTRACT ENGINEERING

Using a Computer for Business

by Jeffrey Baker

Fairport NY . . . As a contract engineer you want to spend the maximum possible amount of your time doing billable work and the least time handling the routine operations of running a business.

Those routine tasks are important for the success of your business but they don't bring in any dollars directly. Doing them with a computer saves time and has the desirable side effect of forcing some organization upon you.

The money invested in a good business computer system will save you the value of many lost billable hours and at least some of the cost of services you might need to hire, such as bookkeepers, typists and clerks.

In some cases, a well designed computer program can save the cost of professional fees of lawyers and accountants as well.

What you need

While you may make do with a VIC 20, an Atari, or an Apple II, I suggest that you get a machine designed with business use in mind.

This may be a Macintosh, or Amiga, but I recommend an IBM-PC or compatible. There is a vast amount of general business software available for these, as well as many engineering programs.

And you can write your own programs (if you can find the time) in almost any program language.

But perhaps most important is that the PC has become the standard for broadcast station software and probably in the future, for station automation.

As a result, you had better become familiar with the PC-DOS/MS-DOS operating system so you can talk intelligently with your clients about it. As their technical consultant, you will be expected to know something about their computers.

By the way, if you are a loyal Commodore or Atari fan, those companies make PC-compatibles too.

There are many choices of MS-DOS/PC-DOS computers from IBM, other major US and foreign manufacturers, and dozens of computer retailers and small home garage shops which assemble components under their own brand names.

As a technically inclined person, you can probably handle problems that occur with undocumented clones, but why waste the time?

Buy a machine from a company that has been in business for a while and offers good support and service.

An "AT" class machine will give you more speed, especially if it is one of the new "zero wait state" 10 or 12 MHz models.

But that is not essential unless you use complicated spreadsheets, antenna analysis programs and the like, or compile long programs from source code.

If you are serious about your business you will want a hard disk. Shuffling floppies holding large quantities of business records is no fun at all. And hard disks save time, which is your primary goal.

You will need at least one floppy drive to load software onto the hard disk and

for making backups.

You will need a reasonably high speed dot matrix printer, preferably with near letter quality mode. This will allow you to crank out bills, data and routine correspondence, all on the same machine.

However, for the best presentation quality, you will also want a real letter quality printer. This may simply be a typewriter with a serial interface.

They are slow, but impressively neat.

The typewriter can also be used for a quick envelope or label as well.

Obviously a monitor is in order, and you have a choice of color or monochrome.

Choose a good quality color monitor if you can afford it, but if the choice is between poor resolution color and high resolution monochrome, choose the latter.

The appropriate monitor driver card

must usually be purchased, but sometimes driver circuitry for color, monochrome or both is included with the basic system.

If you plan to use a Computer Aided Design System to do schematics or plant layouts, then you will want the more expensive Enhanced Graphics Adapter and EGA monitor or possibly the newer VGA system.

More than anything else, you will probably be using the computer to write reports and handle correspondence. Thus you will need a word processing

(continued on page 29)

The Dial Access/Voice Response keeps your MRC-1600 within reach.

With an MRC-1600 and the Dial Access/Voice Response option, you can monitor and control your transmission facility through any DTMF telephone.

When you're away from the studio during an emergency that can't be resolved by the duty operator, you're not away from the ability to correct the situation. The Dial Access/Voice Response always keeps your MRC-1600 within reach.

Changes in status or telemetry data that induce an alarm will trigger the DAVR to notify up to nine predetermined phone numbers. After password

acceptance, a digitally-synthesized voice reports all unacknowledged alarms. The 32 Command outputs, 16 Status and 16 Telemetry inputs found in a standard MRC-1600 Remote Control System can be accessed from the DTMF keypad.

A unique control lockout feature allows the duty operator at the Control Terminal to seize control from unauthorized entry. An RS-232 port provides standard serial interface for PC or modem control.

Available as a factory installed option in MRC-1600 units or as a field retrofit kit.

Call for demonstration 1-800-338-4219



- Accessible through any DTMF phone
- Digitally-synthesized voice reporting
- Passwords prohibit unauthorized control
- Dial access control lockout
 - Automatic alarm reporting
 - RS-232 interface
 - Unlimited vocabulary

Moseley

Moseley
Associates
Incorporated

111 Castilian Drive
Santa Barbara, CA
93117-3093

a
Flow General
Company

Phone 805 968 9621
Telex 658448
FAX 805 685 9638

Circle Reader Service 12 on Page 28

Save this Ad!

It may save your Station.

Ask us about our rectifier stacks for your RCA transmitters

INTRODUCING THE
RICHARDSON RESCUE
TEAM

1 SPEED
OVER
90%
Same Day Shipment

Richardson gives
you fast shipment

2 COURTESY



We make that extra
effort when you
have an emergency.

3 DEPENDABILITY



All our products carry
full manufacturer
warranties.

4 CONVENIENCE

#1-800-

Phone or write for our full
catalogue. In the meantime,
use the attached line card for
quick reference.



Richardson Electronics, Ltd.

BROADCAST COMPONENT SPECIALISTS

Products/Major Manufacturers

BROADCAST POWER TUBES BY:

Amperex	Cetron
EIMAC	G.E.
ITT	Machlett
Mullard	National
RCA	Siemens
Thomson-CSF	Varian
Westinghouse	

CAMERA TUBES BY:

Amperex	Hitachi
G.E.	National
Panasonic	RCA
Toshiba	

RF TRANSISTORS BY:

Acrian	Amperex/Philips
CTC	Motorola
TRW	Thomson-Mostek

UHF TV LINEAR AMPLIFIERS BY:

Acrian

SOLID STATE TUBE REPLACEMENTS BY:

National

CATHODE RAY TUBES BY:

Clinton National

FM AMPLIFIERS BY:

EIMAC

KLYSTRONS BY:

ITT Varian

VACUUM CAPACITORS BY:

Jennings

RECTIFIER STACKS BY:

Amperex National

RF POWER AMPLIFIERS BY:

(For STL and Remote Pickup links)

RF Gain

SOCKET AND ACCESSORIES BY:

EIMAC E.F. Johnson
National

CALL US FOR SERVICE, QUALITY & OFF-THE-SHELF DELIVERY

SALES OFFICES

EASTERN/BROADCAST DIVISION

Ceco Communications, Inc.
Brooklyn, NY 11235
Phone: 800/221-0860
718/646-6300

WESTERN DIVISION

Richardson Electronics, Ltd.
Woodland Hills, CA 91364
Phone: 800/348-5580
818/347-5580

CENTRAL/CORPORATE OFFICE

Richardson Electronics, Ltd.
LaFox, IL 60147
Phone: 800/323-1770
312/232-6400

CANADIAN OFFICE

Richardson Electronics Canada Ltd.
Brampton, Ontario L6T 4E3
Phone: 800/387-2280
416/458-5333

Maintaining Your Station Log

by Harold Hallikainen

San Luis Obispo CA . . . It's finally time to turn our attention to the transmitter log. Keeping logs is one of those areas which seems to generate some misconceptions, especially in this era of deregulation.

The Commission did require stations to keep three logs: the program log, the operating (transmitter) log and the maintenance log.

Each of these were available to the FCC during an inspection, and a "composite week" of operating logs and program logs were submitted to the Commission as part of license renewal.

This was to demonstrate station compliance with the technical terms of the license and with the "programming promises" made in the last license application.

The logging requirements have been relaxed substantially but technical requirements for operating the station have not. The logs provided evidence of the station's compliance with the requirements.

The operating and maintenance logs have been combined into a single log called the "station log."

The program log is not legally required, though some form of program log would be useful in demonstrating "programming promises" and in keeping accurate records of commercial announcements to insure the station bills for time accurately.

Let's review the log requirements section by section.

The log is to be kept by employees competent to do so, who have actual knowledge of the facts required [73.1800(a)].

Note that this section requires the log to be kept by "employees" as opposed to "contract operators."

A distinction between employees and contract operators is made in the Chief Operator requirements [73.1870(b)(1)] and [73.1870(b)(2)], perhaps implying that, to the Commission, there is a difference between an employee and a contractor.

Insight on Rules

The IRS has generally made the distinction between an employee and a contractor. Ten or so years ago I had proposed a "transmitter operating service" to the Commission.

At that time they indicated that a contractor could not be used as a transmitter operator. The station licensee had to have "hire and fire" power over the operators.

However, at the 1986 NAB New Technologies panel session, John Reiser of the FCC said, "The Commission is not going to get into the issue of compensation or how the person is compensated."

He went on to say that no matter what job the person held, "the station management must have the right to supervise that operator and his training and work and duties and so on, as if he were solely working for the station."

"If he's sharing duties with other

things, that's OK, he can be assigned to other duties, but there must be a supervisory responsibility."

If you have non-employees operating the station from non-traditional control points, make sure that they are fully instructed in the operation of the station, and that you get the logs.

Log signatures

The Commission used to require an "audit trail" of operator signatures. The operator was to sign when going on duty, then sign again when going off duty (logging the time of each).

But the current station log recording procedures are "exception reporting" instead of "sampling." In other words, log entries are required only when something is wrong.

Further, log signatures are required only when a log entry is made, attesting to the fact that the log entry is an accurate representation of station operation.

Since it may be days between successive log entries, there is no record as to what licensed operator was responsible for the station operation at any particular time (the lack of an audit trail).

For this reason, many stations are still using the old signature procedures, satisfying the current log signature re-

quirements and providing evidence of compliance with the operator requirements.

Neatness counts

The logs must be clear enough to "stand on their own." That is, the writing should be legible; the pages are to be dated and numbered; all abbreviations must be explained elsewhere on the log.

Time entries should be in "local time" with an indication as to whether the times are non-advanced (standard) or advanced (daylight savings).

The Commission does not want faked logs. Any corrections made after the operator has signed it (attesting to the accuracy of the log before this correction) must be made by striking out the erroneous portion and making a corrective explanation.

The correction is to be made by the person who made the mistake (the person who kept the log), the chief operator, the station manager or officer of the licensee.

The erroneous portion is not to be erased or obliterated. No portion of a log is to be erased or obliterated during the log retention period of two years [73.1800(e), 73.1840(a)].

(continued on page 27)

ALLIED

The FULL SERVICE Broadcast People

It's an Air Monitor
It's an EBS Receiver
It's a Problem Solver



The Dayton Radio Plus main channel receiver is a dip-switch frequency agile receiver with Hi-Z IHF level out AND variable 1.5 watt, 4 ohm output. 12 volt DC powering (AC adaptor included) permits use in mobile vans. (FM 88.1-107.9 MHz).

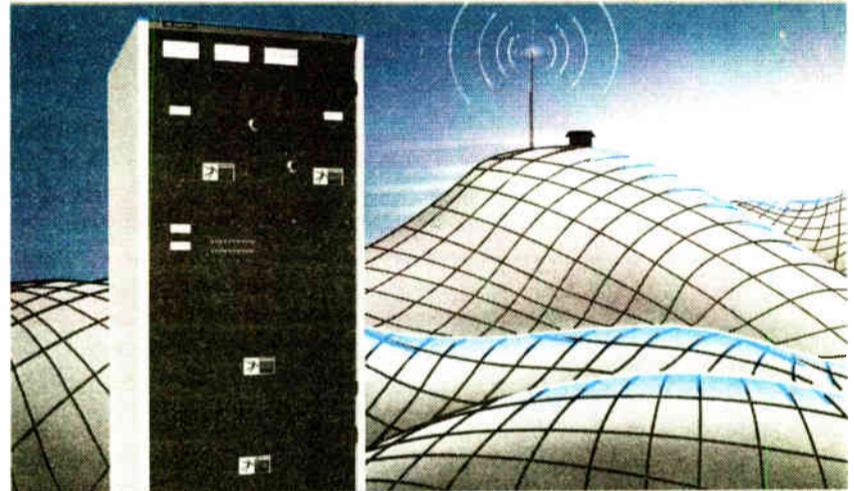
Model AF160 \$118^{ea} U.S. +F&H

BOOTH 557
NAB
BROADCASTERS

ALLIED
Broadcast Equipment
P.O. BOX 1487 • RICHMOND, IN 47375

Atlanta, Georgia 404-964-1464
Chicago, Illinois 312-470-0303
Los Angeles, California 818-833-5052
Dallas, Texas 214-423-8667
Richmond Hill, Ontario, Canada 416-731-3697
Richmond, Indiana 317-962-8596
Seattle, Washington 206-838-2705

Join Our FAX Network
FAX 317-962-8961



"Airborne!"

"Harris' 3.5 kW FM Transmitter would be an excellent choice for any station!"

When it's time to recommend a medium power transmitter to FM stations in his area, radio engineering consultant Larry Estlack of Lansing, MI opts for the Harris FM-3.5K. "This transmitter would be an excellent choice for any station."

FlexPatch™, a feature which gives a certain amount of built-in redundancy, rates particularly high: "Many Class A stations don't have the money for two transmitters," Larry says. "With FlexPatch, impedance matched stages allow patching of the exciter to the PA in case of IPA failure. And the FM-3.5K still delivers 1200 watts of power! It's a wonder that this hasn't been part of quality transmitter design before."

"Single phase power is a real cost and headache saver, especially in remote transmitter installations. And automatic VSWR foldback is an excellent peace-of-mind feature that could save feedline, transmitter or antenna."

"The FM-3.5K installs easily, has extensive status indicators and is remote-control ready. It's one of the finest transmitters in this power range I have seen," he adds.

Find out more about the Harris FM-3.5K. Call now for your free brochure: 1-800-4-HARRIS, Extension 3007. Or write to Harris Broadcast Division, Radio Sales, P.O. Box 4290, Quincy, Illinois 62305-4290.



A Moment's Paws Over Missing Lynx

by Jack Cheese

Pasadena CA . . . One of the most common headaches experienced by the typical broadcast engineer is that of interface.

It's not uncommon to find out (usually at the last minute) that two supposedly compatible pieces of equipment aren't really compatible at all.

Either the connectors don't match, or the audio levels are different, or the remote control logic won't work. As the saying goes, "it's always something."

It's bad enough with two pieces of electronic equipment, but you really have a problem when hardware and mammals can't be interconnected.

One situation that seems to surface now and then is the difficulty interfacing a common balanced 600 ohm audio circuit with a standard-issue housecat.

The problems are numerous.

A typical stereo input and output pair, such as that on a mixing console, has four audio paths, left in and out, and right in and out.

The cat also has four paths (paws, actually), but the similarity ends there. The studio wiring will almost always be LO-Z, operate at +4 dBm and be balanced.

The cat, on the otherhand, will be

high-strung, operate slightly above ground and be unbalanced, despite its ability to land upright when dropped from an inverted position. The interface difficulties are obvious.

Queso Engineering is pleased to announce a new product to solve this dilemma: The Catbox.

The Catbox is the ultimate studio-to-feline interface device for connecting almost any breed of cat to broadcast studio gear.

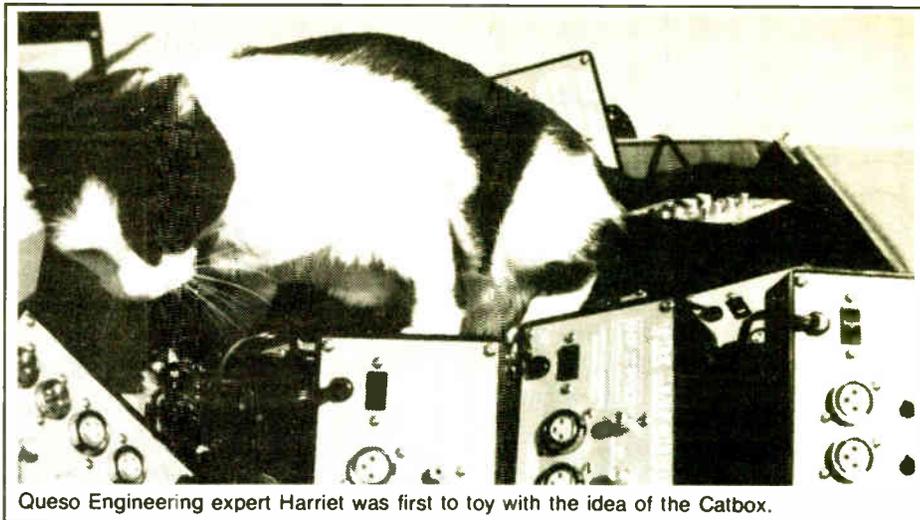
The unit employs several unique circuits to create a perfect match between your console and tabby.

One is an amplifier that uses a cat's whisker detector in the feedback loop. This eliminates half of the input signal by forcing it to ground.

Hence, a balanced input produces an unbalanced output which is just a few ohms above ground. This is a perfect match for the cat, which is also just above ground by about a foot (actually four of them).

Another circuit uses a special high-voltage opamp that is capable of operating on 120-volt rails.

An input signal of +4 dBm will be amplified by 40 dB, resulting in an output level of nearly 110 volts.



Queso Engineering expert Harriet was first to toy with the idea of the Catbox.

This is the secret of connecting a LO-Z circuit to a high-strung cat. In fact, the 110 V Catbox output is what causes the cat to be high-strung in the first place.

There are several adjustments on the Catbox to accommodate various breeds. Some settings can be critical, due to the "finicky factor" observed in some purebred versions.

Problematic hairball build-up can be detected and eliminated through a special anti-static circuit.

The deluxe model of The Catbox also includes an anti-howl circuit that eliminates the low-pitched "yowll" triggered by a nearby cat that is "overheated" (also called "in heat").

When the studio-cat senses another of opposite polarity (or sex), the Catbox responds quickly by inverting its polar-

ity, and causing a state of confused identity.

Thus we have catatonic cancellation, which is just as effective as having the cat "fixed."

The Catbox is the ideal solution for feline interface frustration. It's easy to use, inexpensive, and smells better than most canned catfood.

You can set it up, start it, and leave it out all night.

In a market where each station has to claw its way to the top of the litter, this unique device will catapult your ratings and make your GM purr.

Jack Cheese is the engineering wizardry behind KCHZ Powercheese Radio, and he surfaces every April Fool's day on the pages of Radio World.

LAZER™ From TEXAR.

The Monopoly Is Over.

Until now, when you wanted to buy an FM limiter/stereo generator, there was only one choice. We even contributed to the situation with the TEXAR RCF-1, which allowed you to plug additional power into a box we didn't make. At the St. Louis SBE convention, we demonstrated the TEXAR RCF-2, which had even more power. Now the power and technology of the RCF-2 are available in a totally-TEXAR product . . . LAZER™

LAZER has the clean power to go toe-to-toe with any system made and a digitally-synthesized stereo generator with laboratory-like specs. Delivery begins in 3rd quarter, but you can hear it now in Booth 5415 (Hilton Annex) at the Las Vegas NAB Convention.

TEXAR FOUR FM

616 Beatty Rd. • Monroeville, PA U.S.A. 15146-1502 • 412-856-4276 • Telex 910-240-9185 • Fax 412-856-4656

Keeping Station Logs in Order

(continued from page 25)

Further, since machines do not make mistakes, no automatically kept log can be altered [73.1800(d)]. On failure of automatic logging devices, stations must resort to manual logging.

For most stations, there is no specified schedule or specified parameters that require logging.

It is up to the station licensee to determine a schedule and parameter list to insure compliance with the terms of license.

Many stations are using the Commission's previous logging requirements.

These requirements were log entries at least every three hours of sufficient data to determine the transmitter operating power.

If using the direct method, this would be final amplifier voltage and current. If using the indirect power determination method it is output power meter, antenna base current or common point current.

Stations that are determining power by the direct method often log the final amplifier voltage and current as a "backup" means of demonstrating the power was as authorized.

Methods for directionals

Directional stations generally also log the tower sample currents, current ra-

tios, or deviation from licensed ratios, along with the sample phase or deviation from licensed phase.

Note that directional stations not having an approved sampling system (as defined by 73.68) are required to log these indications (output power and antenna monitor readings) at least every three hours.

“ “ *The logging requirements have been relaxed substantially but technical requirements for operating the station have not.* ” ”

Contrary to the US Constitution Fifth Amendment, you must log "self-incriminating" evidence.

Rule 73.1820(a) requires log entries of any parameters that require adjustment prior to adjustment and after adjustment.

If the parameter was beyond a prescribed tolerance, a notation of the corrective action taken is required. Again, the Commission is interested in the station log as an accurate record of actual station operation.

The actual time of any reading must

be logged.

Rule 73.1820(a) further requires that any parameters that are affected by modulation must be read without modulation. The "degree of effect" of the modulation is not specified.

AM stations may have a difficult time with this requirement since the final amplifier voltage and current and the RF

output current are often affected by modulation. If you can determine the maximum metering error due to modulation and operate the transmitter in a "tightened window" to allow for this error, you can probably insure your operating power is within licensed limits without dropping your modulation all the time. I wonder if an FCC inspector is going to sit outside your station listening for a modulation pause, then check your logs to insure you read meters during the pause (if any), assuming an AM station

where meters are affected by modulation.

Rule 73.1820(a)(1) requires that the entries required by 17.49 be made.

This section requires only that the date, time and description of any tower light problems be logged, along with the date, time and description of any tower light repairs.

Note, however, that 17.47 requires a daily observation of the tower lights, or an indicator that will properly register any failure in the tower lights.

While the results of this inspection need not be logged unless it shows that there is a problem with the tower lights, logging the inspection demonstrates compliance with this section of the rules (leaving an audit trail).

This section also requires an inspection of all the tower light control devices (photosensors, flashers, etc.) indicators (your remote sample) and any alarm devices at least every three months.

Logging of this inspection is not required, but would be a good idea.

We're out of space, once again, so we'll continue with the station log next month. I'll look forward to hearing your comments on this series, or other subjects.

Til next month, keep it legal!

Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200.

TEXAR PHOENIX™

High Fidelity Comes To AM!

Only one audio processor combines four-band, digital control with the NRSC standard. The TEXAR PHOENIX™ packs a clean, powerful wallop in one very small package. For monaural AM, you can't buy more processing power for less money anywhere. Comparing in performance and features with units costing nearly twice as much, the TEXAR PHOENIX™ features variable asymmetry, a voice phase-rotator to insure maximum modulation, and a low-frequency tilt-corrector that can compensate for some weaknesses in plate-modulated transmitters.

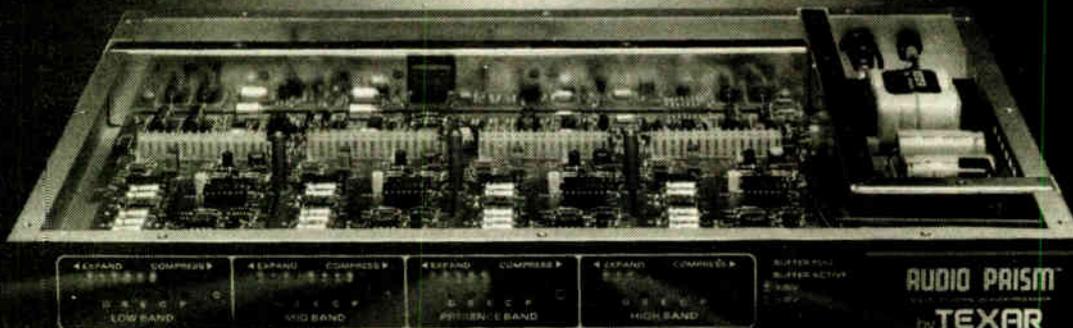
The PHOENIX™ also includes features you don't get with the competition, like the clean, powerful sound of digital control and individual gating of bands, so record fades don't "swish up". But high technology doesn't mean complicated installation. A simple AC voltmeter (like a Simpson 260 or a Potomac Instruments AA-51) is the only test equipment required for set-up. Simply set six voltage readings to equal the recommended values for your situation. The Users' Manual's table of time-proven set-up values insures you get immediate results. The PHOENIX™'s oper-

architecture design means repairs or upgrades are only a card-swap away. (PC boards in some other processors are soldered in.)

Compare features. Compare performance. Compare ease of customer use. We think you'll choose the TEXAR PHOENIX™. At \$4,000.00, the PHOENIX™ would be a

good deal. At \$2,745.00, it's a steal! Financing is available.

You can listen to the PHOENIX™ in **Booth 5415 (Hilton Annex) of the Las Vegas NAB Convention**. See Barry Honel in the booth, or see your favorite equipment distributor to arrange for a 10-day demo to insure that the PHOENIX™ is right for your needs.



TEXAR *For AM*

616 Beatty Rd. • Monroeville, PA U.S.A. 15146-1502 • 412-856-4276 • Telex 910-240-9185 • Fax 412-856-4656

The Future of Digital Processing

by Jim Somich

New York NY . . . Audio processing as we know it today has its roots in the introduction of the CBS Audimax I in the mid 1950s.

Interestingly, the development of the Audimax was undertaken to improve upon the gain-riding techniques of control room operators, not to increase loudness.

Needless to say, any form of dynamic range compression increases apparent loudness. With the Audimax however, it was now possible to compress more than ever before without severe side-effects.

The next significant advance in audio processing was the multiband concept introduced commercially by Dorrough in the early seventies.

Now the standard, multiband was scoffed at by almost the entire manufacturing community until it was proven in actual field use.

The introduction of the legal composite clipper by Eric Small was the last significant addition to the loudness wars.

You bought the magic box and hit that immovable brick wall of clipping to the point of aural pain!

Of course your competition had the same idea and everyone wound up right back where they started . . . except that

everyone sounded a lot worse than in the good ole days.

There were dozens of processors introduced during this period, but with the exception of the Optimod—which was revolutionary in its own way—they were all rehashes and improvements on the existing concept.

Orban, by integrating the processor and stereo generator, made his contribution to the "wars" by eliminating low pass filter overshoot in the stereo generator.

In effect all of these processors create a "closed-loop" or a servo system that controls output level based on device output.

Each design had its own set of parameters such as attack and release time, compression ratio, compression, clipping etc., and good engineers were not shy about modifying circuits if some adjustments were not provided or the range was not sufficient.

This combination of "hot-rodged" processors and composite clipping finally succeeded in producing a "wall of sound" effect that is often more to be endured than enjoyed.

Few would disagree with the statement that we have pushed analog about as far as it can be reasonably (or unreasonably?) pushed.

Obviously, the next frontier is audio

processing in the digital domain . . . using the number-crunching ability of a high speed CPU to shape your audio in ways yet to be dreamed of.

Some current processors (i.e. the Texar Prism) use digital control circuitry, but no processor designed for broadcast use actually manipulates audio in the digital domain.

There is only one reason why you cannot buy a true digital processor today and that is *cost*.

When conceptualizing in the digital area, it is necessary to adopt a whole new way of looking at things. Audio is the analog of sound waves; it is inherently a purely analog form.

Any introduction of digital technology is foreign to audio. Therefore it becomes extremely complex to manipulate this analog audio in the digital domain and exceed the performance possible with pure analog processing.

If it were not for the analog gremlins of noise and distortion, we would probably continue to perfect our current technology.

Computers however, because of their digital architecture, are little concerned with the artifacts that degrade audio when handled in analog.

If it were necessary to design from scratch a digital computer that could process audio better than today's best analog processors, the cost would be staggering.

The high speed manipulation of audio in the digital domain to a predetermined program is within the grasp of today's technology but the cost factors are prohibitive. Does this mean that digital audio processing is impractical or that it will never be used?

On the contrary, I believe that within five years we will all be processing digitally. The only question is: what miracle will produce the competitively-priced digital loudness box?

Preliminary research by my company into the realm of digital audio processing has produced results that are very encouraging.

On the lab breadboard, where cost is no object and practicality not a factor, it has been found that digital processing can produce a cleaner sound with the

same degree of processing as analog in comparison with the best analog boxes currently available.

Common sense would tell us that this is a correct assumption. Analog processing, as sophisticated as it has become, is still a relatively crude operation.

Multiband has made it less crude, but analog still relies on developing a control voltage with a relatively long time constant to act on the audio signal through a variable gain device.

The audio signal by its very nature is a very short-time constant signal.

In digital processing it is a whole new game. We can now develop processors that can attack on a specific digital word, hold level when desired at any programmable point and release it on command at a rate that is written as 0s and 1s in a computer program.

And all this is a virtually distortion-free process.

Given a reasonable sampling rate of the incoming audio, a decent quantization figure and other enhancements such as the dithering of low level signals, the digital processor becomes a truly transparent device, giving you exactly what you command with no artifacts.

The technology that will make broadcast digital processing a reality is the development of VLSI (very large scale integration) circuits for allied and parallel technologies.

Broadcast markets are not large enough to justify the cost of VLSI development.

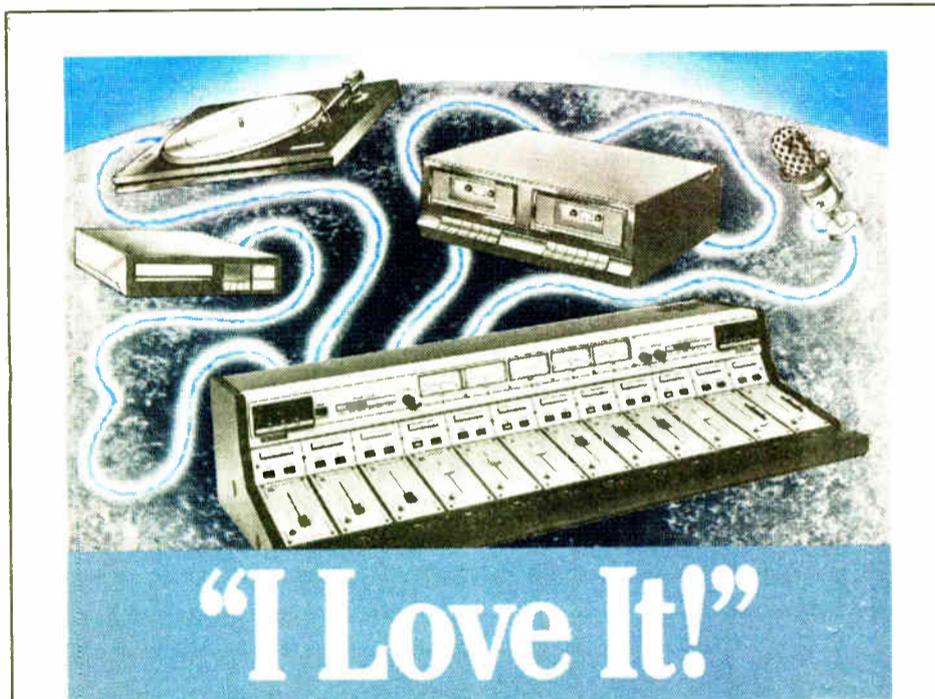
But there are new developments. The proliferation of CD players on the consumer market and the widespread development of Digital Audio Tape (DAT) systems are two.

Along with interest in digital mixing and mastering in the recording industry these new factors have led to a major interest by large VLSI manufacturers to produce chips that will accomplish remarkable things with audio.

It might be interesting to take a look at a typical digital audio processor as it might exist in prototype form and compare it to current technology. Figure 1 is a simplified block diagram of this hypothetical box.

Input program audio passes through a low-pass filter to bandwidth limit in correspondence with the sampling rate of the system.

(continued on page 32)



"The Harris Gold Medalist is a lot of equipment for the money..."

"We have three Harris Gold Medalist Control Consoles — one here and two at our sister station — and we've had zero problems with all three boards," says Don McDonald, Contract Engineer of KJJR-AM/KBBZ-FM in Kalispell, Montana.

"I love it! The thing I like most about the Gold Medalist is its extremely low distortion and noise characteristics. In all cases, this unit has exceeded factory specs. After only 30 minutes of being on the air with a Gold Medalist, we had people calling and asking why we sounded so good.

"Our jocks love it! It's very functional and easy to use. We have guys here who've been in the business for 15 years, and some for only six months. They just

step in and start using it. I recommend the Gold Medalist to anybody in on-air or production work. It's a lot of equipment for the money."

Harris' Gold Medalist Stereo Console frees your air talent to be as talented as possible. It makes switching easy, fading smooth and on-air performance reliable. The Gold Medalist is a 12 Channel Enhanced Dual Stereo Console with top-of-the-line features and performance. And it's more affordable than you might think.

Call today for your Gold Medalist brochure. 1-800-4-HARRIS, Ext. 3008. Or write: Harris Broadcast Division, Radio Sales, P.O. Box 4290, Quincy, IL 62305-4290.

 **HARRIS**

Subscription/Reader Service Forms																																																																																																					
 April 1, 1988 Issue Use until July 1, 1988 FREE Subscription/Renewal Form																																																																																																					
I would like to receive or continue receiving Radio World FREE each month. <input type="checkbox"/> YES <input type="checkbox"/> NO																																																																																																					
Signature _____ Date _____																																																																																																					
Please print and include all information: Name _____ Title _____																																																																																																					
Company/Station _____																																																																																																					
Address _____																																																																																																					
City _____ State _____ ZIP _____																																																																																																					
Business Telephone () _____																																																																																																					
Please circle only one entry for each category:																																																																																																					
I. Type of Firm																																																																																																					
A. Commercial AM station	F. Recording studio																																																																																																				
B. Commercial FM station	G. TV station/teleprod facility																																																																																																				
C. Educational FM station	H. Consultant/ind engineer																																																																																																				
D. Combination AM/FM station	I. Mfg, distributor or dealer																																																																																																				
E. Network/group owner	J. Other _____																																																																																																				
II. Job Function																																																																																																					
A. Ownership	D. Programming/production																																																																																																				
B. General management	E. News operations																																																																																																				
C. Engineering	F. Other (specify) _____																																																																																																				
III. Purchasing Authority																																																																																																					
1. Recommend 2. Specify 3. Approve																																																																																																					
Reader Service Please first fill out contact information at left. Then check each advertisement for corresponding number and circle below. NOTE: Circle no more than 10 numbers, otherwise card will not be processed.																																																																																																					
<table border="0"> <tr><td>001</td><td>021</td><td>041</td><td>061</td><td>081</td></tr> <tr><td>002</td><td>022</td><td>042</td><td>062</td><td>082</td></tr> <tr><td>003</td><td>023</td><td>043</td><td>063</td><td>083</td></tr> <tr><td>004</td><td>024</td><td>044</td><td>064</td><td>084</td></tr> <tr><td>005</td><td>025</td><td>045</td><td>065</td><td>085</td></tr> <tr><td>006</td><td>026</td><td>046</td><td>066</td><td>086</td></tr> <tr><td>007</td><td>027</td><td>047</td><td>067</td><td>087</td></tr> <tr><td>008</td><td>028</td><td>048</td><td>068</td><td>088</td></tr> <tr><td>009</td><td>029</td><td>049</td><td>069</td><td>089</td></tr> <tr><td>010</td><td>030</td><td>050</td><td>070</td><td>090</td></tr> <tr><td>011</td><td>031</td><td>051</td><td>071</td><td>091</td></tr> <tr><td>012</td><td>032</td><td>052</td><td>072</td><td>092</td></tr> <tr><td>013</td><td>033</td><td>053</td><td>073</td><td>093</td></tr> <tr><td>014</td><td>034</td><td>054</td><td>074</td><td>094</td></tr> <tr><td>015</td><td>035</td><td>055</td><td>075</td><td>095</td></tr> <tr><td>016</td><td>036</td><td>056</td><td>076</td><td>096</td></tr> <tr><td>017</td><td>037</td><td>057</td><td>077</td><td>097</td></tr> <tr><td>018</td><td>038</td><td>058</td><td>078</td><td>098</td></tr> <tr><td>019</td><td>039</td><td>059</td><td>079</td><td>099</td></tr> <tr><td>020</td><td>040</td><td>060</td><td>080</td><td>100</td></tr> </table>		001	021	041	061	081	002	022	042	062	082	003	023	043	063	083	004	024	044	064	084	005	025	045	065	085	006	026	046	066	086	007	027	047	067	087	008	028	048	068	088	009	029	049	069	089	010	030	050	070	090	011	031	051	071	091	012	032	052	072	092	013	033	053	073	093	014	034	054	074	094	015	035	055	075	095	016	036	056	076	096	017	037	057	077	097	018	038	058	078	098	019	039	059	079	099	020	040	060	080	100
001	021	041	061	081																																																																																																	
002	022	042	062	082																																																																																																	
003	023	043	063	083																																																																																																	
004	024	044	064	084																																																																																																	
005	025	045	065	085																																																																																																	
006	026	046	066	086																																																																																																	
007	027	047	067	087																																																																																																	
008	028	048	068	088																																																																																																	
009	029	049	069	089																																																																																																	
010	030	050	070	090																																																																																																	
011	031	051	071	091																																																																																																	
012	032	052	072	092																																																																																																	
013	033	053	073	093																																																																																																	
014	034	054	074	094																																																																																																	
015	035	055	075	095																																																																																																	
016	036	056	076	096																																																																																																	
017	037	057	077	097																																																																																																	
018	038	058	078	098																																																																																																	
019	039	059	079	099																																																																																																	
020	040	060	080	100																																																																																																	
Sales Call Service Please have a salesperson contact me about these items (list numbers):																																																																																																					

PCs for Business Use

(continued from page 23)

program. There are many.

Wordstar has become somewhat of a standard but it is dated and uses cryptic, non-mnemonic commands.

One which I have found easy to use (this article is written with it) is the Leading Edge Word Processor. With dictionary and merge-print feature (for customized letters and mailing labels), it is available at discount for less than \$50.

You will want an accounting program if contracting is really your full time business. PC Magazine listed Dac Easy Accounting as an editor's choice.

This program is inexpensive (under \$100) and has an impressive number of features. It is also relatively easy to use, if you know something about accounting. If not, you'd better read up on general accounting principles before trying to use this program.

Further complexities

Although the Dac Easy manual contains a brief accounting primer, it is not adequate for understanding how to set up your accounts and use the system's reports.

A good part of the manual is merely a rehash of the information contained in the program's menus and help screens without any amplification.

And another part is a sales pitch for the company's custom forms. The program can print all reports, invoices and statements on plain paper, however, which can result in a large cost saving for you.

Unless you are of a super analytical frame of mind, you will probably not need a spreadsheet in a small business if you use a good general accounting program.

But you may want to become familiar with them because your clients may be using them, and helping with their computer problems may become a part of your service.

Unfortunately, many of the attempts to assemble collections of software for engineering applications in broadcasting have not met with the greatest success.

Although many broadcast engineers are hacking away at useful programs, very few get wide distribution.

At least part of the problem is the variety of computers in use having incompatible operating systems (or no operating systems as such) and differing versions of BASIC or other languages.

The SBE collected some BASIC listings a few years ago, but according to Gerry Dalton, who has acted as computer coordinator for the society, they are no longer available.

There are commercial time sharing services such as Dataworld and Broadcast Data Services which allow access to mainframe or mini computers running such programs as FM databases, AM directional antenna analysis and calculation of FM and TV contours, but they can be fairly expensive and in some cases impose minimum monthly fees.

Others have offered software for specific applications at prices which may be high for the typical contract engineer.

And a pay-for-service engineering bulletin board seemed to die as quickly as it started up.

But currently, Allied Broadcast runs a Bulletin Board for broadcast engineers, offering a free exchange of software and solutions to technical problems. The

number is 317-935-0531.

I have outlined some conventional uses for a computer which I hope will be useful, but here is an unusual one which could make you seem like a troubleshooting wizard.

Unusual applications

How many times have you tried for hours to find an intermittent problem using an oscilloscope, only to have the errant waveform flash by so fast, you couldn't identify the problem?

You know that the station manager will object to being charged for ten hours to complete what seems to be a simple task.

Well, if you had a digital storage scope,

you could trap that waveform and find out what is going on.

Now, a storage scope is a great device but it can cost thousands of dollars. Long term storage may be unreliable, so you can't always take the image back to the lab for analysis.

Scope interface

But what if you had a portable computer? It can store data on floppy disks or even a hard disk.

If it could accept input from a scope, you'd have it made. Well, look at the Heath IC-4802. It turns an IBM compatible computer into a 50 MHz digital storage scope.

You can get not only the waveform itself, but also "automatic readouts of voltage, time or frequency at any point on a waveform." If you don't want to build a kit, it is available assem-

bled as SC-4802.

A somewhat more expensive version can be used with either a computer or an ordinary 5 MHz scope.

Through other suppliers, an extensive line of data acquisition equipment is available which can be used with your computer to analyze all sorts of information from transmitters, power systems and communications paths.

These tools give you an edge in solving difficult problems. They are not yet for everyone, but if you can afford them and are willing to spend the time to learn to use them, they may pay off well.

Jeffrey Baker is with Heritage Media Inc. and principal of Technical/Design Services, a contract engineering service. He is a certified Sr. Broadcast Engineer and a doctoral student at Nova University, and can be reached at 716-227-9510.

BSW

THE SENSATIONAL

RADIX

2



When you've seen one distribution amp, you've seen 'em all. Not so...The Radix DA1600 offers **removeable** connectors on the back, so the DA never has to be pulled from the rack. Excellent specifications, outstanding quality. 2 inputs - 8 outputs. Only \$349.95.

4



Interfacing audio to the telephone is absolutely painless with the TLM500. Simply unplug the handset on any phone, plug in the TLM...Now you have a mini console to send or receive audio. Works great in the studio and because it can operate on batteries, it is a natural for field work. Yours for only \$179.95.

1



The Radix ST500 is a two timer....that's right, just as quick as pushing 2 buttons you can program a preset time to count down from, or by pushing 1 button the ST500 will work as a count up timer. Fully remote controllable and great looking. Buy one for each studio. Two timers in one and only \$179.95.

3



Nothing is more boring than a phono preamp. The Radix TP500 is **really** boring because after you install it....you'll never see it again. Sorry, no excitement such as RF leakage, bad power supplies, hum, noise, and crosstalk....What you do get is trouble free, great audio. And only \$229.95.

BSW • 7012 - 27th Street W • Tacoma, WA 98466
1-800-426-8434 Fax # 206-565-8114

Microwaves Aid Synchronous AM

by Fred Baumgartner

Denver CO...Historically there has been a relatively small number of synchronous AM radio retransmitters in operation even as experimental stations.

For the most part, synchronous retransmitters have been fairly high power and located a fair distance from the master transmitter,

It is also true that most synchronous projects have had mixed results. Locking the transmitters seems to be the major hurdle.

In the areas where a mix of the master and retransmitter is equal or both have some significant component, an unlocked retransmitter produces a beat

note.

Even if the frequency is locked fairly well, shifts in relative phase even over long periods of time cause the peaks and nulls of the interference pattern to shift, making the station unreliable.

Even assuming that the phase relationships can be held fairly close, the absolute tracking required by some popular stereo systems is in question. The lock in phase required for stereo transmission rules out most current technology.

In addition, most synchronous work to date has been done to add additional communities to coverage area.

I would suggest that a more cost effective use of synchronous AM retransmitters is to improve selected areas of exist-

ing natural station coverage rather than seeking to add other large communities.

The technology is more suited to three categories.

First there is null fill. Most stations that operate at night do so with directional arrays. These arrays produce nulls that often leave the station unlistenable within sight of the towers.

As communities grow, the odds of larger portions of the TSA living in the nulls becomes more likely.

Further a number of nulls are produced and tolerated in an effort to keep the cost of the antenna system down, since to reduce the unwanted "symmetrical" null would require more towers.

The second use of synchronous can be

for PSA enhancement.

Most stations that operate in this mode do so with power levels that leave out significant population centers (often rural) that are covered in daytime operation.

A typical operation will find three or four communities within 15 miles of the station location with population in excess of a couple thousand.

The third use is overcoming local terrain limitation. There are a large number of places where mountains, tall buildings, tunnels or very poor ground conductivity preclude coverage.

The concept is to use multiple low power retransmitters to selectively fill in populated nulls and adjacent communities.

Suitable system

Our system marries solid state low power linear AM transmitters and low cost short haul microwave links.

Both technologies are mature and with a little effort can be made very cost effective.

Figure 1 is a block diagram of the system. The master transmitter is tapped at the same point as the modulation monitor.

By definition this point represents a sample of the transmitted station in its most accurate form.

This is used to directly modulate the FM microwave carrier.

This point often causes confusion. What the microwave carries is not demodulated audio or plain unmodulated reference carrier or combinations of the two.

What enters the microwave system and exits is a low voltage version of what is actually being transmitted by the transmitter, including all of the nuances of its envelope and phase modulation characteristics, intended or not.

For microwave systems normally used to carry video with components from 60 Hz to 6 MHz this is not at all difficult.

At the retransmit point the low voltage baseband AM signal carried by the microwave is then amplified to the 10 to 50 watt area and matched to the antenna.

Testing the system

On 5 March 1988, Joel Humke of Westek Communications, Bill Harris of KRZN/KMJI, John Hellyer of HSE Communications and I tested the concept.

At noon a 7 GHz microwave transmitter (HSE provided a Microwave Radio Corporation Super Seven-MX) was placed on the roof of the KRZN transmitter building.

The feed to the modulation monitor was tapped and better than 30 dB of homebrew switchable pad installed to reduce the AM signal to one volt peak-to-peak.

Joel used a mirror at the retransmit site to flash its location, making pointing the transmitter easy.

The retransmit site was chosen because it offered line of sight for the 4.2 mile microwave shot and was located in the deep 81° null.

The null is deep enough that a station in Salina, Kansas is heard much better than KRZN and the interference-free contour extends only 1 mile down the radial.

At the retransmit site, the MRC Two-Plus-Seven MR receiver was aimed and a scope confirmed the 1 V peak-to-peak AM signal.

Plugging it into a field intensity meter confirmed the excellent sound quality and the lack of any artifacts other than the KRZN signal at 1150 KHz.

(continued on next page)

WATTS UP?

3.5KW — 5KW — 10KW

When-and-if you're ready to UP your transmitting power, will your FM transmitter be ready too? If it's one of the QEI "New Reliables" FMQ series, the answer is YES!

Our new 3.5KW, 5KW and 10KW transmitters were designed to give you a clear upgrade path to higher power. In just a few hours, your 3.5KW or 5KW QEI FM transmitter can be upgraded to a factory-equivalent 5KW or 10KW unit, right in the field. QEI's unique modular solid state drivers and interchangeable P.A. assembly make these power upgrades easy...and very economical.

If you're shopping for a 10KW unit in the first place, the QEI FMQ-10000 has lots to recommend it. No other FM transmitter packs this much power, reliability and performance into a single 24" wide rack cabinet. And the FMQ-10000 is designed to operate on single-phase power, so there's no need to pay for installing new three-phase electric service.

What's more, for upgrades to power levels beyond 10KW, each of these FMQ series

transmitters can serve as the driver section for QEI's 20, 30 or 60KW transmitters, again resulting in major cost savings.

Every QEI "New Reliables" FM transmitter is built to deliver ultra-dependability and performance. So—whether your station is thinking of upping its power down the road, or if the power you start with is the power you stay with—you'll be glad you chose QEI. Call us toll-free at (800) 334-9154 for the full story.



The New Reliables

One Airport Drive, P.O. Box D
Williamstown, NJ. 08094 (609) 728-2020

AM Retransmission

(continued from previous page)

A homebrew broadband voltage gain amplifier feeding a homebrew power gain block built around a Linear Technology LT1010 lifts the 1 V peak-to-peak at 75 ohms to about one watt at 50 ohms.

This provided enough input to drive a LA-25 amplifier provided by LPB.

LPB makes these for use in carrier current and low power applications. The LA-25 provides up to 25 W out and is a very clean block of power gain.

My homebrew 160 meter pi-network antenna tuner was just shy enough "L" to bring the 180' long wire (127 -j262 ohms) in line.

Joel's coffeecup was converted into an additional coil as well as Bill's clip leads (he was the only one who remembered to bring a complete set of tools). Finally, 49 -j23 ohms was declared close enough and the wait for the experimental period began.

Results

It was decided that from 1/2 to 1/4 miles the retransmitter was the dominant signal on 1150.

Beyond this range the skywave and the signal from the main transmitter took over.

While a distinct interference pattern between the main transmitter and the slave could be found, at no point was the audio degraded.

Cycling the retransmitter on and off proved that within the range of the retransmitter the signal improved a great deal.

Outside of the range of the retransmitter, there was no significant effect. In the interference zone nothing was lost or gained on balance.

A series of field measurements and subjective data were recorded.

The tests were conducted with 7 GHz common carrier microwave, and in the experimental period in a mode far less than non-D full power.

Practical implementation

While the experiment proves the workability of the system (though KRZN was not stereo), the equipment used was overkill.

In retrospect, 23 GHz technology seems far more appropriate than the 7 GHz video.

Reducing bandwidth, power, removing the video circuitry, the subcarriers and the bells and whistles like LCD signal strength meter would leave us a bare-bones microwave system with pretty good range and reliability.

In the case of 23 GHz rain fades the AM band is almost useless.

Clearly antenna efficiency could be improved. Attention to establishing a real ground and placing the long wire in the clear and higher (ours was 8' up and 2' below the CATV) would go a long way.

Helical verticals are a consideration though more expensive. Loading water-towers and other existing vertical structures makes sense too.

Combining the microwave receiver, AM linear amplifier and tuning network in one pole-mounted waterproof box also makes sense and would reduce costs.

There is nothing in the FCC rules and

regulations that covers these situations.

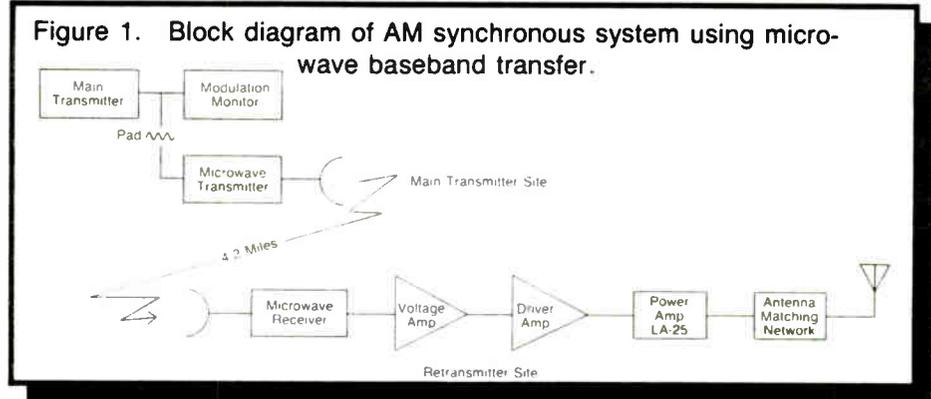
The key item to consider is interference caused to existing services, but two pieces of data are more or less missing to make empirical judgements.

First, if a long wire is used there are few good models of what practical sky-wave radiation would be.

Second there is even far less data on the effect of multiple close-spaced synchronous transmitters on skywave.

In practice they will rarely add to sky-wave effects. In fact, a model can be drawn to suggest that the overall effect might be a reduction of skywave effects.

Generally, I would suggest using a



retransmitter up to predicted daytime coverage area or 15 miles, whichever is larger.

I would also recommend the use of up to 1% of main transmitter power level for stations operating in that mode.

In using retransmitters, a maximum of 10 watts beyond 15 miles from main transmitter is needed, as well as a maximum vertical antenna of 75' or a quarter wave long wire at less than 60' above ground.



Introducing the new Orban Programmable Mic Processor

- 3-band parametric equalizer with "constant-Q" design and full notch filtering capability
- Smooth, transparent compressor with adjustable release time
- Noise gate (attenuates control room noise by up to 25dB) and compressor gate (prevents noise rush-ups during pauses)
- De-esser controls excessive sibilance

And it's programmable.

- 32 memory registers store complete control setups for instantaneous recall
- Effects send and return (with programmable return gain) simplifies integration of external reverb or other processors
- Built-in connectors for remote control, MIDI, and future serial interfaces
- Optional second-channel slave for dual-mono or stereo operation (Model 787A/SL)
- Standard line-level input; optional Jensen transformer mic preamp with 48V phantom powering
- Security lockout code prevents unauthorized tampering with presets

Orban's powerful, new 787A Programmable Mic Processor provides an efficient way to optimize the sound of your DJ and newsroom mics and then recreate these setups every day for maximum punch on the air.

The 787A combines clean-sounding, Orban-quality analog processing with the control and programmability made possible by contemporary digital technology.

Complete settings can be stored in any of 32 different memory registers for instantaneous recall at the beginning of each airshift, or in a different studio at some later date. The 787A is also the perfect tool for processing commonly-used talent in video and film post-production work.

Call or write today to find out more about Orban's powerful new Programmable Mic Processor, an efficient and consistent way to optimize your mic channel and talent for maximum impact on the air.



Orban Associates Inc.

645 Bryant St., San Francisco, CA 94107 (415) 957-1067 Telex: 17-1480 FAX: (415) 957-1070

Circle Reader Service 33 on Page 28

Fred Baumgartner is Engineering Manager of KHOW/KSY. He has been CE of WIBA, Madison and ACE at KWGN-TV and can be reached at 303-694-6300

Digital Processing

(continued from page 28)

The A/D converter samples the audio and outputs a digital word at the clock rate. In a 16-bit system this number can be from 1 to 65,535 corresponding to a theoretical dynamic range of over 96 dB!

This might seem like more than enough for broadcast applications until you factor in the headroom required for distortion-free operation.

Today, many designers compromise by placing an analog compander system into a digital product. This is one way to overcome the headroom required.

In a purely digital circuit the operating point will have to be around 20 dB below the clip point.

Now our 96 dB has been reduced to 76 dB, and that is theoretical. In practice, with today's typical chips, it would be reduced to about 65 dB and this is just barely acceptable in a pro-audio device.

While 65 dB of dynamic range might be marketable in a first-generation processor, 24-bit technology will be necessary for great specs.

The addition of eight more bits will increase the theoretical dynamic range to over 144 dB. Now that is more like it!

The chips to do this are being produced today, but the price is still not in line with the design objectives of a practical digital audio processor at a competitive price.

In this particular design, a ROM

would hold the programming that would manipulate the digitized audio according to a pre-programmed scheme.

In other words, the computer (and that is really what it is) would manipulate the audio in step with a program that could be user-written, supplied by the manufacturer or purchased from a software writer.

Such parameters as attack and release time constants, compression ratio and threshold would be, in effect, hard-wired into the processor.

Of course a selection of ROMs could be provided to allow push button selection of programming.

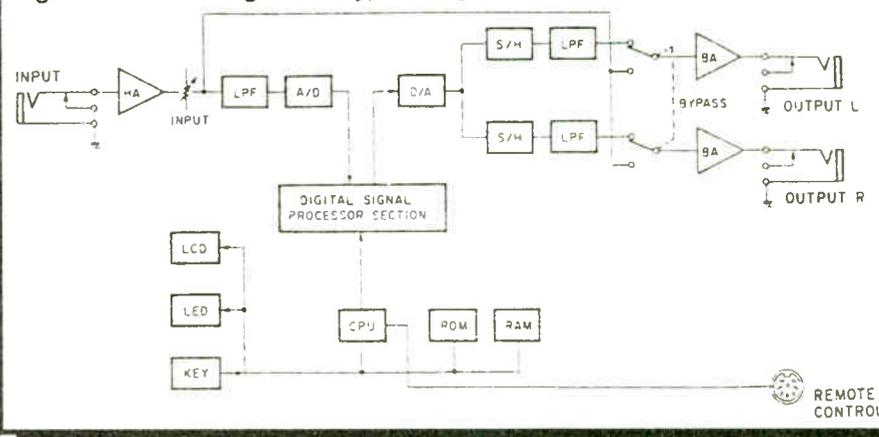
This very circuit, in a bit more complicated form, has produced excellent results in prototype.

When driven by a highspeed CPU, excellent performance has been obtained with minimal side effects.

And while I am sure that multiband digital audio processors will eventually appear, there is good reason to believe at this time that the advantages of the multiband approach are greatly reduced when processing audio in digital.

The actual control is so precise that the chance for intermodulation between frequencies is much lower. Because of cost/value restrictions, the first digital processors are sure to be single band units that will still outperform multiband processors.

Figure 1. Block diagram of typical digital audio processor.



Just to stretch your mind a bit, consider further another approach to digital audio processing that "cheats."

It is processing in the purely digital domain as controlled by an analog signal shaped in a conventional side chain.

Tests have shown that most of the advantages of digital processing can be achieved with a hybrid system without much of the cost.

In practice a sample of the audio after reversion to analog is processed into a control signal quite similar to that used in analog processors.

This signal is then quantified into a digital data stream and used to control the audio through a multiplier circuits. Such multiplier chips are currently available at reasonable prices as they are used in digital equalizers.

With either approach, pure digital or hybrid, the modified digital signal is reconverted to analog through a D/A converter, low-pass filtered and output as standard analog audio.

In those installations that use digital STL systems it would be possible to feed the data stream through the video STL and decode it at the transmitter, improving performance even further.

Obviously any totally digital audio processor would succeed or fail in the marketplace on its own merits, regardless of being digital or analog.

Most of the deep dark secrets of the ultimate digital audio processor will be buried deep into the inviolate VLSIs and ROMs.

The processor sections will be serviced only by the manufacturer, probably on an exchange basis.

The first practical digital processor must also address the real-world requirements of adjustable programming, operator feedback of function, preemphasis

control, gating and other functions.

As with any new technology, the first digital processor will be expensive and relatively inflexible. It will sell only if it can deliver improved performance over analog at a reasonable cost.

By using some existing technology, it should be possible to put a digital processing channel on the market this year for about \$10,000 for mono, \$20,000 for stereo.

The possibilities of clobbering your competition completely might make 20 grand look like small potatoes to a manager out to win.

Utilizing the coding technology developed by Sony in the PCM-1630 processor or, for less money yet, the processor section of the Sony PCM-2500 DAT, it should be possible to introduce a ROM based true full digital audio processor this year in a price range that is realistic.

It is beyond my wildest dreams to believe that the introduction of total digital audio processing will clean up the audio in today's contemporary FM or AM stations.

But there is no doubt that it will allow more loudness, punch, clarity and power on the dial than was heretofore possible with analog techniques.

Audio may be a purely analog form, but in the areas of storage (CDs and DAT) and manipulation (digital audio processing) digital is vastly superior. The accuracy of a digital computer working on your audio can make you the most competitive sounding station in your market.

Jim Somich has been in broadcasting for over 20 years and has served as CE for a number of stations. Currently he is CE at New York's Z-100 (WHTZ-FM) and president of Major Market Engineering. He can be reached at 201-867-5000.



Here is audio engineering at its affordable best. The Series 'S' Console can be tailored for any size budget and broadcast requirement to provide precise audio mixing, monitoring and control. The very latest in analog and digital electronics is coupled with full electronic audio switching to assure the highest quality.

As complete or as basic your budget allows, the Series 'S' offers McCurdy's unsurpassed audio quality and ultra-reliability.

- Available in 12, 18 and 26 input configurations
- Stereo Program and Audition buses
- Telephone and Cue buses
- Active balanced inputs and outputs
- Low maintenance solid state audio switching
- Full function digital logic control and interface
- VCA controlled monitor facilities
- Penny & Giles conductive plastic faders

RAM BROADCAST SYSTEMS

Specialists in Broadcast Systems Design and Engineering, Prewired Systems and Equipment Sales

For more information contact your nearest Ram office:

Chicago 312-358-3330 Colorado 303-247-2450 Los Angeles 714-884-8119 New York 516-832-8080 Tennessee 615-689-3030 Washington, D.C. 703-860-5823

THE FOLDED UNIPOLE

Custom-Made Kits by Cortana Corporation

THE ULTIMATE ANTENNA FOR AM BROADCAST!

Ideal for synchronous AM transmitters and traveler's information service.

- BROAD BANDWIDTH** for better mono or stereo sound and effective range increase;
- GROUNDING ANTENNA** helps eliminate lightning and static electricity problems;
- ELIMINATES ISOCOUPERS** - VHF and UHF antennas on a unipole fed without discontinuity in transmission lines;
- ELIMINATES LIGHTING CHOKES**, transformers, base insulators, static drain chokes, and spark gaps;
- EFFECTIVE AS A DETUNING SKIRT;**
- FULLY ACCEPTABLE BY FCC** - The Folded Unipole is easy to assemble and apply!

Also available from Cortana:
Radial Chaser™ Inspection Tool
Stati-Cat™ Lightning Preventor
Write or call for free brochure.

Cortana
Corporation

Copperweld™ Dist.
4001 LaPlata Hwy.
Farmington NM 87401
(505) 325-5336
Mastercard/Visa

Broadcast Equipment Exchange®

"Broadcast Equipment Exchange" accepts no responsibility for the condition of the equipment listed or for the specifics of transactions made between buyers and sellers.

AMPLIFIERS

Want to Sell

UREI 1122 phono preamp, works & looks brand new, BC. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

Carver M1.0 + .200 W/chan, 1 mon old, 4 yr warranty, \$525 C Bradley, WRBK, 517 W 9th, Metropolis IL 62960. 618-524-3698.

Gates Solid Statesman II preamp, operating cond, w/manual, \$50 plus shpg. G Heidenfeldt, 2800 W Lake, Wilson NY 14172. 716-751-6187.

Altec 436E tube compressor amp, \$50. G Ernst, BaySide Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

Want to Buy

Audio amps, mono or stereo 300+ W, working or not. T Scott, Daley & Assoc. 311 S Gloster, Tupelo MS 38801. 601-841-1506.

Crown, BGW for sound reinforcement, 300 W or above. S Wallace, WWSN, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

ANTENNAS & TOWERS

Want to Sell

Harmonic filter, 101.1 TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Shively 6810 8 bay, 106.1 MHz, excel cond, 4 yrs old, \$9000 plus shpg/ndng. C Steely, KOAI, 8236 Douglas, Dallas TX 75225. 214-891-3400.

Celwave CFM-HP antenna elements, \$175 ea. Celwave radomes for CFM-HP antenna D Dybas, WTUV, 2400 E Devon, Des Plaines IL 60018. 312-297-8430.

Utility Tower 304', w/18" face, solid legs, w/A3 lighting & guy cables, on ground, BO. F Shields, KERV, POB 2187, Kernville TX 78028. 512-895-1230.

Phelps-Dodge HP 12 12-bay antenna, 101.1 MHz; 300' 3" jacketed line. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

RCA TFU-240M UHF TV antenna on chnl 41, \$1500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

ERI SML 14C, 91.1 MHz, 3-1/8" center fed, low wind load, \$5000/BO plus ship. J Skinner, KANZ, 1 Bdct Plaza, Perceville KS 67868. 316-335-5120.

Prodline 3-1/8" Xmission line, 760' plus, on-air now, \$4000/BO. J Skinner, KANZ, 1 Bdct Plaza, Perceville KS 67868. 316-335-5120.

CO-EL CO-5FM, 8 bay horizontal, gain 4.7, mounted on 200' tower, \$3000; ERI 425 isocoupler, \$1500; Andrew HJ7-50A air line, approx 600', \$1500; Andrew LDF5-50, approx 400', \$425; Andrew 1930-B auto compressor-dehydrator, \$400. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

Andrew GP8F-890 950 MHz STL antenna, \$1700; Mark 2 GHz microwave dish w/radomes, BO; Cablewave HCC-300-155 80' coax w/EIA flange or will sell separate, BO. K Schipper, KOKS, 919 Sherman Blvd Ste 205, Westminster CO 80030. 303-427-7700.

Jampro JLC-7 FM antenna, Jampro 7 bay for 12" face of leg mt, 106.3 MHz, \$5000; Prodelin 195' of 1-5/8" coax, air dielectric w/EIA conn each end, \$1400. B Dickerson, WPXE, POB 520, Starke FL 32091. 904-964-5001.

Phelps Dodge ECP xmitg antenna for 94.3 MHz, w/assembly diagram, \$1000. T Dufresne, Foster Comm, 1 City Hall Plaza, San Angelo TX 76903. 915-653-3387.

Hellix, 300' of 1-5/8", \$5/ft. T Dufresne, Foster Comm, 1 City Hall Plaza, San Angelo TX 76903. 915-653-3387.

AUDIO PRODUCTION OTHER

Want to Sell

AKG BX20E mint cond plus spares, BO. K Heyne, 415-664-0163.

ESE ES 510L 60 min timer, looks like new & works perfect, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

ITC 750 stereo R-R PB only, \$400/BO. J Saaco, WDAV, POB 1540, Davidson NC 28036. 704-892-8900.

IGM PAL encoder, E Kazmark, KAZZ, POB 1369, Deer Park WA 99006. 509-276-8816.

Schafer 800S, w/(4) Ampex 440 R-R decks, (2) McCarta cart machines, now in use, \$5000/BO. C Steinbacher, WWPA, 230 Market St, Williamsport PA 17701. 717-323-7119.

Custom automation system suitable for cable orig, photos & info on request. R Tanner, Van Wert Cable, POB 126, Van Wert OH 45891. 419-238-4793.

Harris 900 automation system, w/Go-Carts & racks, M Crump, WCMS, 900 Commonwealth Pl, Virginia Beach VA 23464. 804-424-1050.

BE tone gen/detector, \$400. B Elliot, Bdct Systems, 200 West Road Ste 13, Elington CT 06029. 203-871-2976.

Automation startup system, just out of service, Control Design programmer, power pack, prog clock, tone sensor, five SMC Carousels, reasonable. D Anderson, WCSY, 510 Williams, South Haven MI 49090. 616-637-1138.

Schafer 800T 3 random access Carousels, (6) Ampex 440 R-R, stereo, recently rebuilt, many spare parts, \$6000. B Elliott, WKRL, 2 Corporate Dr, Clearwater FL 34622. 813-579-9790.

Harris system 90 brain (2) IGM Instacart 48 bay mono; (4) Ampex AG355-2 stereo PB only decks; Ampex AG350-2 stereo R/P; mounted in (4) Harris 6-1/2" racks, make offer on system or individual items, buyer pays shipping. J Saaco, WDAV, POB 1540, Davidson NC 28036. 704-892-8900.

Colorado Magnetics Transtar NS-200 network switcher, 2.5 yrs old, \$425. Bob or Jeff, KJ108, POB 1203, Grand Forks ND 58206. 701-746-1417.

Century video cue command decoder for ABC Talkradio; Epson MX-70 dot matrix printer; voice cue card for S-A digital audio earth terminal, gd cond, sold as package for \$500, or sold separately. M Martin, KWNO, Box 466, Winona MN 55987. 507-452-4722.

Harris 9001 w/2 terminals, 4 Otari ARS1000, excel cond, \$12,000/BO. D Hayworth, KFGO, 1020 S 25th St, Fargo ND 58108. 701-237-5346.

SMC 250-2 stereo Carousel wired for RS; (2) Scully 270-2 stereo rack mount 14" R-R reproducers; Harris 25 Hz stereo rack mount filter, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

NEW

ENHANCE THE QUALITY OF YOUR AM AUDIO

EXCEEDS ALL NRSC SPECS



Energy-Onix
(518) 828-1690

NRSC AM PROTECTOR

- Contains switchable pre-emphasis circuit, built in NRSC filter & switchable monitor de-emphasis.
- Can be used with multiband and single band limiters such as CBS Volumax
- NRSC Filter on PC Board and Stand Alone Monitor De-emphasis available separately

\$595

41 North 7th St., Hudson, NY 12534

Galvanized steel towers, (5) 196' 18" face, guys & insulators, BO; (5) ceramic base insulators; (4) antenna tuning units; (2) 500' sections of 7/8" hardline coax; (2) 300' sections of 1-5/8" hardline coax; phasor; Gorman Redlich antenna phase monitor, all less than 2 yrs old, BO. M Pulley, KYOO, 304 E Jackson, Bolivar MO 65613. 417-326-5257.

FM isocoupler, 3-1/8" milled flange, out of service, gd cond, \$2000. R Dufault, WEBB, 3000 Druid Park Dr, Baltimore MD 21215. 301-367-9322.

Harris/ERI FMD-3B directional FM, 3 bays, 50 kW, tuned to 100.7 MHz, used 10 mos, separate HV elements arranged in 3 stick candelabra, pole mountable. J Seaman, WWSA, POB 752, Harrisonburg VA 22801. 703-434-0331.

Eagle Hill PSA/PSS adapter, now in service, avail immed, BO. M Murray, WAMJ, 1129 N Hickory Rd, South Bend IN 46615. 219-234-1580.

Fisher AM towers, (3) 330', 24" face, insulated, guyed, w/lighting & all hardware, vgc. BO & take them down. B Glasser, WHBC, POB 9917, Canton OH 44702. 216-456-7166.

Comark 3" xtmtn line, 4 pole, \$1500. J Whitney, WPXY, 55 St Paul St, Rochester NY 14604. 716-325-5300.

Want to Buy

Guyed tower, 500' & 4 bay FM antenna for 95.3 MHz. J Stitt, WIOX, 7075 Industrial Rd, Florence KY 41042. 606-727-0800.

Austin transformer, used/operational, M Edwards, Pride Group, POB 2576, Montauk NY 11954. 212-713-5558.

Jampro 4 bay for class A 3 kW 100.9 MHz or nearby; also need isocoupler & 370' 1-5/8" transmission line. S Roach, KARY, POB 1310, Prosser WA 99350. 509-882-3500.

CP 2-bay low power FM antenna tuned to 104.9 MHz. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Mounting hardware, (brackets) for RCA BFA-8B FM antenna. B Howard, KOTR, POB 902777, Cambria CA 90809. 805-929-5021.

Tower beacons, used 300mm, price depends on cond of glass & casting. J Muehlfelt, Bdct Comm, POE 131, Verona WI 53593. 608-845-6755.

Orban 622B parametric EQ, excel cond, \$350; UREI 535 full octave stereo EQ, \$200; Harris FM 25K driver modules, tested, gd cond, also other xmtg parts avail, \$300 ea. R Dieterich, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Audio & Design Scamp mini rack, w/F300S gate, S01 compressors, S04 parametric, S23 auto panner, TT patchbay, power supply, power supply module, Anvil mini case, \$1600/BO. R McMillen, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Eventide H910 Harmonizer, 2 outputs, works perfectly, \$999 firm. J McMillen, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Fairchild 644B EQ module (2), BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

CBS processors; McMartin TBM 3500 modulation monitor; Harris FM limiter; Gates FM limiter; RCA 35 W 2-way units, (4), VHF. E Kazmark, KAZZ, POB 1369, Deer Park WA 99006. 509-276-8816.

Orban 245E stereo synth, gd cond, \$225; Lauderdale Lab EQ10 graphic EQ, \$50; Edcor HA400 headphone amp, gd cond, \$89; ORK Ultima II TT preamps, working order (2), stereo, \$25 ea. C Butler, Butler Bdctg, 1775 Bartlett Ave, Orange Pk FL 32073. 904-264-8169.

Fairchild 658 reverb unit, w/remote amp/controller, excel cond, \$60/BO. A Tucker, Foothill Prod, 70 W 83 St, NY NY 10024. 212-877-0973.

Lauderdale Labs Splicemaster III, like new, \$150. B Dickerson, WPXE, POB 520, Starke FL 32091. 904-964-5001.

Fairchild 644B EQ modules (2), BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

Want to Buy

Tone gen, 25 Hz. B Orderek, KTER, POB 190, Terrell TX 75160. 214-563-2646.

Pultec EQ's. We will pay \$1,000 for almost any Pultec program EQ models EQP1/EQP1A/EQP1A3. Also wanted: EQH2/EQH3/MEQ5/MAVE/CMB1/ITI & Sontec EQ's, any tube or ribbon mics & limiting amps. Call or write to: Dan Alexander Audio, 2944 San Pablo Ave, Berkeley CA 94702. 415-644-2363.

dbx 700 digital encoder. A Murfin, KRAB, 2212 S Jackson St, Seattle WA 98144. 206-325-5110.

AUTOMATION EQUIP.

Want to Sell

Gates SP-10-2 automation brain, cannibalized, gd for parts, \$200 for all; Tonmeister, TRE-3N tone decoder for NBC Network, excel, \$195. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Sono-Mag ESP-1 & DS-20A switcher, all working, \$4000/BO. P Wolf, 241 NE 10th, Cape Coral FL 33909. 813-574-5548.

IGM 364 automatic logger, mechanical printer, for parts. L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

Schafer 903, 20 sources, 1064 events w/(3) Otari ARS-1000 reels, (2) IGM 48-PBM mono Instacarts, Extel logger, Schafer video terminal & cart encoding center, \$15,000. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

IGM time announce control for 2 single play cart decks, gd cond w/manual. D Garder, KDUZ, POB 10, Hutchinson MN 55350. 612-587-2140.

SAVE 30% ON

IGM INSTACART STEREO HEADS

List price: \$115.00
Sale price: \$80.00

BRAND NEW ORIGINAL EQUIPMENT HEADS

CHECK WITH ORDER
WE PAY FREIGHT

CONTROL TECHNOLOGY INC.

2950 SW 2nd Ave.
Ft Lauderdale, FL 33115

(1-800-327-4121)
OUTSIDE FLORIDA
(1-305-761-1106)
IN FLORIDA

ACTION-GRAM

EQUIPMENT LISTINGS:

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply call 1-800-426-8434 to place your listings courtesy of Broadcast Supply West. Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Listings are available on an \$18/25 word basis. Call 800-336-3045 for details and complete display rates.

EMPLOYMENT SECTION:

Help Wanted

Any company or station can run "Help Wanted" ads at the flat rate of \$18 per listing per month (25 words max). Payment must accompany insert, there will be no invoicing. Blind box numbers will be provided at an extra charge of \$2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

Positions Wanted

Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$2 fee (which must be paid with the listing (there will be NO invoicing). Responses will be forwarded to the listee, unopened.

Check as appropriate: Help Wanted With Box Number
 Positions Wanted Without Box Number

Text (25 words maximum): _____

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ Zip _____

Telephone _____

BROADCAST EQUIPMENT EXCHANGE
PO BOX 1214
FALLS CHURCH VA 22041

The BIG MIC SALE

BIGGER, BETTER, CHEAPER





- AKG
- Audio-Technica
- Beyer Dynamic
- Crown
- Countryman
- Electro-Voice
- HME
- Nady
- Ramsa
- Saramon
- Sennheiser
- Shure
- Sony
- Stewart
- Teac
- Telex
- Tram
- Tom
- Vega
- Williams

**PRICES SO LOW
WE PROMISED NOT
TO PRINT THEM!**

BACK by Popular Demand

**TOLL FREE in 50 States
(800)356-5844**

AMPLIFIERS • CASSETTES • HEADPHONES • INTERCOMS • LIGHTING • MICS • MIXERS • PARTS
SIGNAL PROCESSING • SPEAKERS • TAPE • TAPE RECORDERS • TEST EQUIPMENT • TURNTABLES

Full Compass Systems

6729 SEYBOLD RD. MADISON WI 53719-1393

In Wisconsin:
(800)362-5445
Consultation:
608)271-1100



Broadcast Equipment Exchange

AUTO EQUIP . . . WTS

PR&E DT-2 digital uptimer in factory case. BO. B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Want to Buy

Roland Compu-Editor CPE 800 w/VCA800 module, M Anderson, Jerec Records, 1469 3rd Ave, New Brighton PA 15066. 412-847-0111.

Control Design or ABC 24 Hz R-R EOM detectors & companion generator. D Williams, KLCB, POB 730, Libby MT 59923. 406-293-6234.

CAMERAS (VIDEO)

Want to Sell

Sharp XC 700, 3 tube Saticon camera w/CCU, Fujinon 9-108, 2x lens, battery & charger, hard case, studio & ENG configurations; Panasonic AK 760, 3 tube Plumbicon camera w/Canon 9-118, 2x green line lens, ENG VF, studio tripod controls battery & charger, hard case, \$2000. R Krage, Box 397, Roosevelt NJ 08555. 609-448-4739.

GX-S700U color video cameras, KM 1200U SFX gen, power supplies, batteries & cables, \$3500/BO. V Storer, Storer Studio Photo, 1305 Sunset Dr, Norwalk IA 50211. 515-981-4217.

Panasonic WV6000 420 line Saticon, 2 yrs old w/PS & carry case, \$1600; Panasonic WV3700, old two tube color camera, needs work, \$100. R Tanner, 419-238-4793.

Panasonic 3990B, \$1500; Norelco PCP-90 plumbicon color, \$500; Houston Fearless studio pedestals, \$350; RCA PK-701 color std camera, \$995; Norelco PC-70 color, as is, \$400; C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

Norelco PC70 (11), some need Plumbicons. BO. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

RCA TK-44 (2) w/Canon lens & mounts, 100' camera cable, BO; (2) RCA film projectors, pre TP-66, BO. Jim or Fred, WJIO-TV, 419-228-8835.

JVC KY210 camera, 10:2 Fujinon lens, case, AC adapter, \$2995; JVC KY1900 camera, 10:1 lens, case, battery, AC adapter, \$1995; Harris 690 TVC frame sync, corrects 3/4", 1/2" & 1", 9 bit proc, latest factory upgrades, excel, \$4895 D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Want to Buy

RCA metal tripod TD-11-A; RCA Inpod dolly TD-15-A; RCA Lo Hat MI-26190-1; RCA studio camera dolly TD-5-A; RCA studio camera pedestal TD-1-A; RCA lens turret for TK-11-A camera. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

Panasonic WV3806B remote control for 3990 camera & (2) 19A50 camera cables. J Major, Marguette Public Schools, 1203 W Fair, Marguette MI 49855. 906-225-4273.

View finder for Sony DXC 1210; AC power supply & charger for Sony DXC 1600. C Lund, Cycle Snd & Video, 167 Madison St, Waterbury CT 06706. 203-756-7761.

Sony DXC 3000 video camera, must be in perfect shape. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

CART MACHINES

Want to Sell

Spotmaster TIA winder w/timer, gd cond, \$325. R Miller, WIMS, 685 E 1675 No, Michigan City IN 46360. 219-874-9467.

Tapemaster, Spotmaster machines repaired, bought & sold. Advent Duplication, 9723 Riggs Rd., Adelphi MD 20783. 301-439-7222.

Hall Electronics Quality Used Equipment 30 Day Guarantee!

BE-3400 mono play (as new) \$395.00
Audi-Cord 'E Series' Stereo R/PS895.00
ITC PD-II mono R/P \$595.00
BE-4000 stereo play w/tones \$395.00
Harris stereo R/P w/tones \$595.00
We Buy Used Equipment-Send for Free Flyer
P.O. Box 7732
Charlottesville, VA 22906
PHONE: (804) 973-8697

Ramko elect cart winder w/timer, vgc, \$250. P Talerico, WWAX, POB 750, Olyphant PA 18447. 717-489-0005.

ITC Delta stereo PB (3), \$1000 ea. T Gaiser, KUZZ, 3223 Sillect, Bakersfield CA 93308. 805-326-1011 X644.

Gates RA5A random Carousel selector, gd for parts, \$100. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

ITC RP, beautiful cond, mono, \$850; ITC RP, not so beautiful, gd cond, \$750. F Lauerman, WMMAM, POB 609, Roosevelt Rd, Marinette WI 54143. 715-735-6631.

Cuemaster stereo cart players, (2) pb cards prone to failures, but spare cards included; (2) BE 8 cart sequencers w/spare parts, unknown cond, many spares, send sealed bids by 4/15/88. M Starling, KPBS, SDSU, San Diego CA 92182

Hall Electronics Quality Used Equipment Aligned & Guaranteed

ITC ESL-IV splice finder/eraser \$495.00
ITC SP-WP series
3 deck mono w/tones \$1,495.00
AUDI-CORD 'E' series stereo \$895.00
UMC SF-1 cart splice finder \$175.00
Patch bays std 1/4" tip-ring-sleeve \$25.00
We Buy Used Equipment-Send for Free Flyer
P.O. Box 7732
Charlottesville, VA 22906
PHONE: (804) 973-8697

Harris Criterion 90 R/P mono, cue tones, like new cond, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

ITC WRA record amp. P James, Allstar Bdcg, POB 7007, Defiance OH 43512. 419-782-8591.

RCA RT-125 mono PB, \$350/BO; RCA RT-126 mono recorder, \$500/BO. J Swett, 4025 Lugano, Flagstaff AZ 86001. 602-526-1975.

Ampro CT-4500B stereo R/P, gd cond, 4400; (2) Gates Criterion 80 mono R/P, gd cond, \$200 ea; ITC 3-deck mono, gd cond, \$500. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

ITC Delta I & IV, \$1500 & \$2000. P Hawkins, New Life Prod, POB 19073, Louisville KY 40219. 502-968-9316.

RCA RT-27 mono (6), all tones, +4 dB audio, (5) completely refurbished & one needs work, (2) BA-27 record amps for 2 of the decks, \$750/all or cash/trade for RCA 77DX/44BX mics. F Vobbe, 706 MacKenzie, Lima OH 45805.

ITC Delta, 3 deck stereo, play only, perfect cond, BO. R Swatte, KZZU, South 5505 Regal St, Spokane WA 99223. 509-478-5555.

Tapemaster 700-RP, excel cond, w/extra motor, \$325/BO. J Klauck, WSAM, 200 Bloomfield, W Hartford CT 06117. 203-726-9083.

BE 5500B stereo audio cart machine, 2.5 yrs old, new motor 7 shaft recently installed, \$2200. Bob or Jeff, KJ108, POB 1203, Grand Forks ND 58206. 701-746-1417.

Audicord E-21, gd cond, \$550. CE, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Sparta MC-104 4 deck mono play only, \$400. J Phillips, All Star Bdcg, 414 Washington, Defiance OH 43512. 419-782-8591.

Tapemaster 700RP stereo R/P, gd cond, \$600. K Peckham, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

ITC RP Series, mono R/P, BO; IGM 12A, stereo (2) PB, BO. M Hensley, 1655 Olive, Evansville IN 47714. 812-424-8284.

ITC stereo RP-4, SP-3, mono PDII Series 99 stereo PBs, ESL-IV splice finder, PR&E Tomcat PBs (3) & R/P, many spare parts, heads, boards for ITC cart machines, 750 Series R-R's, BO. B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Want to Buy

ITC WRA or RA record amp for cart machine (2). D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525

BE 3000 & 2100 cart machines wanted. Exporter needs 90 used machines, working cond, not more than 6 yrs old, reasonable price avail. Send particulars to: RW, POB 1214, Falls Church VA 22041. Attn: Box 1-1.

ITC R/P mono machine in gd cond. J Bean, KSIV, 1750 S Brentwood, St Louis MO 63144. 314-961-1320.

Mic preamp for BE 1070 RP mono cart machine. R Armstrong, WVMR, Rte 28, Dunmore WV 24934. 304-799-6004.

SMC, any cond, prefer rack mount, buy or trade. B Van Prooyen, 2111 Shangria Dr SE, Grand Rapids MI 49508. 616-532-1168.

Gates Criterion, 150 Hz record & playback boards & cans, also Microset head mounting assemblies. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 516-891-1544.

ITC mono PB, fair price for excel machine. B Anthony, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

Cart machines or Carousels. K Thompson, WWIC, 815 W Willow, Scottborough AL 35768. 205-574-2198.

ITC stereo cart PB only machines. P Martin, WZUU, 4359 S Howell Ste 106, Milwaukee WI 53207. 414-482-2638

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Ampex 600 FT, excel cond, \$200/BO; Ampex AG500-2 in remote case w/mic preamps, 7.5-3.75 ips, \$500/BO. M Saady, First City Recording, 141-60 84th Rd, Briarwood NY 11435. 718-846-2062.

Ampex 440C (2) in cabinets, \$2800 ea. United Research, 681 Fifth Ave, NNYN 10022. 212-751-4661.

Scully 280, (2) 4 chnl in Rusiang cabinets, 1/2" tape, \$1100 ea. M Edwards, Pnde Group, POB 2576, Montauk NY 11954. 212-713-5558.

MCI recorder parts, for JH-110 A & B: heads, motors, PC boards, pinch rollers, etc. at 1/2 price. Call 818-355-3656 for inventory list.

Ampex 440, scrape flutter idlers, perfectly reconditioned, \$25 plus your old idler. C Close, 1502 Chappel Ct, Northbrook IL 60062.

MCI JH16 2" 16 trk, gd cond, \$9500; Tascam 80-8 w/DS dbx, new record head, \$1700. B McPeck, Mirror Image, 619 S Main St, Gainesville FL 32601. 904-376-8742.

Ampex MM1000 16 trk, w/full remote, auto locator, test tape, cables, VSO, like new, \$6500. D Vost, 1913 Oaklawn, Cleveland OH 44134. 216-741-1400.

CLEAN PATCH BAYS NO DOWN TIME



VERTIGO BURNISHERS AND INJECTORS RESTORE ORIGINAL PERFORMANCE TO YOUR PATCH BAYS \$29.95 Ea. Please write for additional information and order form today.
VERTIGO RECORDING SERVICES
12115 Magnolia Blvd. #116
North Hollywood, CA 91607 818-907-5161

Otari MX5050B 2 trk master recorder, 1-1/2 yrs old, very little use, \$1800. T Carroll, Linear Acoustic, LPO Box 932 CN 5064, New Brunswick NJ 08903. 201-932-1248.

Ampex 350 3 trk console, \$800; Ampex 4 trk w/set-sync, \$950; Ampex 2 trk, \$750, take all 3 for \$2350. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Tandberg TCD-320 cassette deck, excel cond, 3 motors, dual capstans, \$350. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

Ampex extender card for ATR-100 series recorder circuit boards, \$150; MCI JH24 series multitracks, used spare cards, bias \$118, repro \$115, output \$85, record/cue \$320. R McMillen, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Scully 270 stereo (3), excel cond, \$600 ea or all for \$1650; Scully 270 mono (2), \$600 ea or both for \$1000; Crown tube FT, fair cond, \$150. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Ampex 440's, (4) 1/4" 2 trk; Multisync MDA1B for Ampex 440; (3) rack mounted Revox A77 R/Ps, 1/4" 2 trk; portable Revox A77 recorder, 1/4" 2 trk; rack mount Revox A700, 1/4" 2 trk, send sealed bids by 4/15/88. M Starling, KPBS, SDSU, San Diego CA 92182.

Scully 280 stereo 2-trk rec/reproducer, new heads, gd cond, w/manual, \$400/BO. L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

Ampex 440B, 7.5-15 ips from home studio, clean, \$1295, also roll around cabinet, \$295 D Elliot, Creative Services, 10909 Riverside Dr, N Hollywood CA 91602. 818-762-3554.

Revox A77 2 trk, 7.5-15, low time on recent heads, w/remote, \$595. B Borrelli, Media Group, 462 Merrimack St, Methuen MA 01844. 617-688-5573.

Ampex AG440B 2 trk in console (2), \$1000 ea. T Gaiser, KUZZ, 3223 Sillect, Bakersfield CA 93308. 805-326-1011 X644.

Otari ARS1000DC (2), \$1000; & ITC 750 w/sensor, \$700. C Harrison, KGOT, 5601 Cashia, Boise ID 83705. 208-344-3511.

ITC 750 record elec, \$400. D Talmage, Future Snd Studios, POB 8042, Marion OH 43302. 614-383-2566.

ITC 750 R-R recorders (3). D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Ampex ATR-700 FT w/stereo capabilities in excel cond; Ampex AG-440C-FT w/2-trk head cable box & remote control in vgc, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

Ampex 440 PB (3), \$450. R Humphrey, WLTJ, 1051 Brinton Rd, Pittsburgh PA 15221. 412-244-7600.

Ampex AG-350-1 mono play (4) w/(2) Inovonics 377 dual-chan repro elect, fair cond, books, \$425/all; Ampex AG350-1 mono R/P (2), \$200 ea. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

Teac A7030 1/2 or 1/4 trk, needs work or use for parts, \$300/BO. S Bidde, Hot Spots, 727 Fletcher Rd SE, Palm Bay FL 32909. 305-729-8576.

Ampex 300C, \$100; Ampex 300, \$100; Ampex AA620, 3 part portable, \$700. C Stillman, Bdcg Foundation of America, Hill Rd, Califon NJ 07830. 201-832-5269.

Ampex AG-440, 1" 8 trk, fair cond, w/roll about stand, \$1000; Ampex AG-440, 1/4" 2 trk, gd cond, w/roll about stand, \$1000. K Har-nack, WE21, 6080 Mt Moriah Rd, Memphis TN 38115. 901-365-2032.

Wollensak portables (2), works fine, no cards, \$55 ea incl ship. P Salois, KPCR, Hwy 54 East, Bowling Green MO 63334. 314-324-2283.

Inovonics 375 recorder elects, \$150/BO. J Swett, 4025 Lugano, Flagstaff AZ 86001. 602-526-1975.

Revox PR99 low miles, excel cond, \$1200/BO. J Chidester, KSPN, POB 1224, Aspen CO 81612. 303-925-5776.

JVC KD3030, recently factory overhauled, needs work on pause circuit, \$150/BO. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 518-891-1544.

Crown SX811 mono FT w/remote for rack mount. D Geocaris, Concept Prod, 7878 Big Sky Dr, Madison WI 53719. 608-833-8273.

Otari MX5050-8 1/2" 8 trk, gd cond, \$2800; Teac X7R 2 trk, like new, \$300. D Huettner, Dynamic, 358 Bell, Neenah WI 54956. 414-722-7228.

Sony TC-K6 cassette, solenoid assist, mint cond, \$150; Ampex 1450 reel deck, as is, \$35. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

REVOX FACTORY AUTHORIZED REPAIR SERVICE

Swiss trained in servicing all A77, B77, A700, PR99, A67, B67, A810 tape recorders. Typical 46-72 hour service. 90 day warranty. Huge parts inventory, factory boxes, new and used machines for sale.

VISA & MASTERCARD ACCEPTED
Call Studio-Sonics for all your audio equipment needs.

STUDIO-SONICS CORP.
1165 Tower Road
Schaumburg, IL 60195
(312) 843-7406

Ampex ATR100 2 trk w/stand & remote, call for details, \$4000. D Glasser, Air Show Inc, 5727 N 25th Rd, Arlington VA 22207. 703-237-8312.

Tascam 80-8 1981 8 trk, very low hrs, w/lor w/lor NR, BO. M Baykian, Granny's Kitchen, 6689 Orchard Lake Rd, Ste 151, W Bloomfield MI 48322. 313-737-0751.

Ampex AG500 vgc, \$350; Ampex PR-10 stereo, vgc, \$200; Ampex 440E mono & rack mount, vgc, \$950; Tape-A-Thon 900 stereo recorder w/travel case & rack mount, vgc mech cond, has hum in one chnl, \$300. L Bergman, Universal Snds, POB 18716, Spokane WA 99308. 509-328-0766.

Ampex 2 trk head stack nest for AG-440 reel machine, needs R&PB heads, \$75. N Beatty, 3438 N Galeston Ave, Indianapolis IN 46236.

Pioneer CT-F900, 3 head, solenoid transport, micro proc control, front panel bias & output pots, needs new belts, w/service manual & original box, must sell, \$125/BO. A Tucker, Foothill Prod, 70 W 83 St, NY NY 10024. 212-877-0973.

Liberty C W-20 tape winder, \$175. Electro-Sound ES 100 cartridge & cassette winder w/tape time, \$300. D Lundy, Lundy Recdg, POB 408, Heidrick KY 40949. 606-546-6650.

Ampex ATR 700, 2 trk stereo, BO. R Swatte, KZZU, South 5505 Regal St, Spokane WA 99223. 509-448-5555.

NORTRONICS Replacement Tape Heads

Test Tapes, Degaussers, Gauges
Cleaners, Swabs, Lapping Films
Splice Bars/Tabs, Demagnetizers

SEQUOIA ELECTRONICS

209 Lester Lane
Los Gatos, CA 95032
(408) 356-3232

Ampex 300-8 8 trk 1", vintage tube machine, excel cond, BO; Ampex 351 tube electr (8), excel cond, BO. R Kaufman, Kaufman Recdg Sids, POB 46227, Garland TX 75046. 214-271-7625.

Otari CB116 auto locator, \$475. S Sullivan, WGGG, 900 NW 8th Ave, Gainesville FL 32601. 904-376-1230.

Revox A-77 circuit cards, all types, BO; Harris/Gates Criterion 8C record amps, stereo, circuit cards & rack mount adapters, all new, BO. B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Ampex 440B w/ruby guides; PR&E motor drive amp & geomor roll about console, BO. B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Ampex and Scully Spare Parts, Accessories, Motor Remanufacturing.

VIF INTERNATIONAL
PO Box 1555
Mtn. View
CA 94042

Direct order line
(800) 848-4428
in CA Dial (408) 739-9740
Telex 62922869 ESL UD

Uher 4000 Report-S, comp overhauled w/service manual, \$350 plus shpg. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

Pioneer RTU11 1/2 or 4 trk w/2 head stacks, remote control, factory road case, \$850. G Ernst, Bayside Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

Ampex 850 2 trk R/P w/transport (2) w/inovonics, \$450 ea; Ampex AG 440B R/P, Inovonics record amp 2 trk w/transport, \$800. J Whitney, WPXY, 55 St Paul St, Rochester NY 14604. 716-325-5300.

Ampex 351 tube-type elect (3), \$400 ea. T Dufresne, Foster Comm, 1 City Hall Plaza, San Angelo TX 76903. 915-653-3387.

Ampex AG445 PB decks (3), in custom roll-around cabinets w/storage below, meter bridge mounted above deck w/manual, \$1200. B Hoffman, WRTN, 7711 Carondelet Ste 304, St Louis MO 63105. 314-727-2160.

Revox PR99, not much use, heads gd, PB only, w/25 Hz sensors & NAB hub adaptors, 3.75-7.5 ips, \$900/BO. D Talbot, WGUS, POB 1475, Augusta GA 30913. 803-279-1380.

Ampex 351 elect (8), all in gd working order, BO. R Kaufman, POB 46227, Garland TX 75046. 214-271-7625.



Rw

Broadcast Equipment Exchange

CASSETTES ... WTB

Want to Buy

Ampex 351 or AG440. P Hons, Mainline Comm, 100 Poplar St, Portage PA 15946. 814-736-3883

MCI/Sony capstan & reel motors, any cond., reedg heads, most mfgs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-826-0601. in FL 305-659-4805.

Ampex AG440, 351 or other 3 motor deck, R/P. P Hons, Mainline Comm, 100 Poplar St, Portage PA 15946. 814-736-3883.

Low cost 8 trk, for use in studio. W Dougherty Jr, WLD Recording, Rt 1 Box 70, Mill Spring MO 63952. 314-998-2377.

Presto PT-900 or RC-7 portable recorder & corresponding elects. B Leslie, Pro Recording Svcs, 13709 Mapleleaf Dr, Garfield Heights OH 44125. 216-662-1435.

Ampex 350 console for 350 machine. B Sauber, WFFRA, POB 908, Franklin PA 16323. 814-432-2181.

MCI JH110-2, need repro-record & bias boards, power supply chimney, phase lock loop board, analog torqueboard, control logic board; MCI JH110A-2 elect tray & all above for JH110A-2. C Hertzberg, Kinura Records, Box 660236, Miami Springs FL 33166. 305-887-5329.

CONSOLES

Want to Sell

CCA dual 80 chan, gd cond, \$700; BE 4-150M (2), light service, \$500 ea. T Shinn, WKSF, POB 6447, Asheville NC 28806. 704-257-2700.

Gates Gateway & Gates 31 consoles. D Tabor, WLCK, POB 158, Scottsville KY 42164. 502-237-3149.

BE 105350 10 chnl, dual stereo console, w/slide faders, less than 1 yr old, gd cond, \$3750. L Blakeney, WBBN, Rt 2 Box 273B, Taylorsville MS 39168. 601-729-8100.

Adct Audio System IV, 8 chnl stereo. R Lane, KTYD, 5360 Hollister, Santa Barbara CA 93111. 805-967-4511.

Cetec 2000 Series, 5 chan, everything works, BO. R Ballard, Gospel Upebeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

Bi Amp 16 chnl stereo mixing console mol 1682, \$500. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515

Neve 5402 12 x 2 stereo mixer; Altec 250A, very clean, send sealed bids by 4/15/88. M Stirling, KPBS, SDSU, San Diego CA 92182.

Cetec 2000, 5 in 2 out; Quantum 8P 8 in 4 out; Quantum QM 22/8 8 in 4 out. R Kragen, Box 397, Roosevelt NJ 08555. 609-448-4739.

Gates Yard power supply & monitor amp, excel cond, w/tubes, \$75; Gates Yard input matching transformer bank in rack panel, \$75; GE BC-1A power supply, gd cond, needs minor work, \$30; Gates Yard misc parts, some new, some used. G Heidenfelt, 2880 W Lake, Wilson NY 14172. 716-751-6187.

McMartin 802 8 chan mono, working when removed from service, \$800. D White, WYBR, POB 7180, Rockford IL 61126. 815-874-7861.

RCA BC-4A 4 chan mono tube, gd cond, \$200; Bogen LOM mixer, fair cond, \$50; Bogen MXM mixer, 4 chan, mono, fair cond, \$50. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Wheatstone SP5 prod console, lots of modules, 2 yrs old, \$12,000. S McCloskey, WBHH, 916 Bay St, Beauford SC 29902. 803-524-9120.

CCA 10-chan stereo console; Micro-Trak 4-chan console. T J Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Gatesway audio console. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Gemini MX4440 disco mixer, 5 chan, stereo, excel cond, \$100. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

Hall Electronics Quality Used Equipment Aligned & Guaranteed

BE 5BEM200 5 pot, dual mono w/Daven attenuators \$795.00
Comprehensive MX-1002 3 input mic mixer. Like new \$135.00
CCA Futura 10 slide pot stereo (As-Is) \$395.00
We Buy Used Equipment-Send for Free Flyer
**P.O. Box 7732
Charlottesville, VA 22906
PHONE: (804) 973-8697**

Tascam Mdl 3, 8 in 4 out, approx 8 yrs old, gd cond, \$600; Shintron 340 4 chan audio mixer similar to Shure Vumeter, line out, \$150. R Tanner, 419-238-4793.

ORX 8S solid state w/manual, spare modules & parts, \$900/BO; Wilkinson PAC-S3 solid state, \$500/BO. L Sprivey, WLLS, Hwy 231 S, Hartford KY 42347. 502-298-3268.

Auditronics 110, 14 input by 4 or 2 out for prod or on-air, recently refurbished, \$7000. J Georgiads, WRRO, 124 N Park Ave, Warren OH 44481. 216-373-1440.

Ampex MX35's (3), \$250 ea/all \$725; Sigma mixers (3), \$100 ea/all \$270; Altec portable mixers (2) 1567A, \$250 ea/both \$475; Harmon Kardon mixers (2) mdl DPR7, \$85 ea; (2) Echo bleeds passive off mic input lines to Fisher echo or any, \$25 ea/all \$65. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Atus AM 500 stereo mixing console, new, 8 stereo inputs, 2 mic inputs, EQ & much more, \$225. J Klauck, WSAM, 200 Bloomfield, W Hartford CT 06117. 203-726-9083.

Autogram IC10 stereo, rotary pots, new, BO. R Kaufman, Kaufman Recdg Sds, POB 462247, Garland TX 75046. 214-271-7625.

Interface 300 recording & mixing console, 24 x 16 frame w/20 in 8 out, also talk back & set-up tone, vgc, \$2200. D Lundy, Lundy Recdg, POB 408, Heidrick KY 40949. 606-546-6650.

BE 4M50 4 chnl std mixer in excel cond, \$500; also 5 chnl mono board looks like BE board, vgc, changeable circuit boards, \$350. L Bergman, Universal Snds, POB 18716, Spokane WA 99208. 509-328-0766.

Biamp 1282, 12 chan stereo prod board, separate 3 band EQ, reverb effects & pan buss/chan, slide pots, \$550. C Stevenson, WFEC, 507 S Main, Williston FL 32696. 904-528-4622.

Sound Workshop 1280, 12XX8 x 2 mixing console, \$1000. K Harnack, WEZ1, 6080 Mt Moriah Rd, Memphis TN 38115. 901-365-2032.

ADM ST-160 MKII on air/prod console, timer, talk-back, 4 trk mix, 2 EQ mod, 2 mic/10 SLI mods, rack power supply, manuals, vgc. J Book, WOC, 3535 E Kimberly Rd, Davenport IA 52807. 319-344-7000

Harris Stereo Executive, 10 chan, gd shape, \$2150. B Evans, WQXE, POB 517, Elizabethtown KY 42701. 502-737-8000.

Tapco 8201B portable 8 chnl stereo mixer w/48v phantom pwr, manual/schematic, needs work, \$250. J Saaco, WDAV, POB 1540, Davidson NC 28036. 704-892-8900.

Yamaha PM1000, 16XX4 mixing console, gd cond, \$1000/BO. D Geocaris, Concept Prod, 7878 Big Sky Dr, Madison WI 53719. 608-838-8273.

Gates Stereo 80, 8 chan stereo w/manual, \$1000/BO. D Fiewall, WIREM, POB 160, Monticello NY 14760. 707-536-3528.

Cetec Centurian I 12 chan mono w/power supply, \$500/BO. B Simonson, Bct Technical Support, 290 N Ruth #4, St Paul MN 55119. 612-731-1741.

Shure M67, gd cond w/battery supply & manual, \$200 plus shpg. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

Tascam 5B, 8 mic/line inputs, 4 out, eff, monitor, talkback, pan pots, EQ each input, vgc, \$800. E Helvey, Successtrax, POB 1357, Winchester VA 22601. 703-877-1191.

Autogram IC 10 stereo, new, few hrs, BO. R Kaufman, POB 462247, Garland TX 75046. 214-271-7625.

Want to Buy

Gateway II, for parts, modules & power transformers. B Zellmer, KROZ, POB 2224, Greeley CO 80632. 303-351-8354.

Manual for Sparta AS400 console. M Numerick, WJCO, 1293 Floyd, Jackson MI 49203. 517-784-1510.

Collins 212P-2. R Davis, KJHK, Univ of KS, Flint Hall, Lawrence KS 66045. 913-864-4746.

Autogram IC10 8 to 12 chan stereo or equiv, min 20 inputs. J Gerber, WGLO, 816 Ludington St, Esacanaba MI 49829. 906-789-9700.

DISCO & SOUND EQUIP

Want to Sell

JBL 4406 studio monitors, like new, \$200. G Ernst, Bayside Sound, POB 166, Lincoln City OR 97367. 503-996-6020.

Altec-Lansing 9844A monitor speaker, BO; Altec-Lansing Valencia 1792, BO; Altec-Lansing 604D, BO. J Phillips, All Am Bctdg, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

AVR GROUP

The Widest Selection of Used Gear
Neumann • Pultec • UREI • Teletronics
PCM 501 --- DAT
Oran MX5050B—\$1.2K; Oran MK III—\$3.3K;
Studer A-80-24—\$20.5K; Tascam 48 (mint)
\$2.9K; Neve 8036 16x8—\$22K; Neve 8048
32x16 w/Neacm II—\$98K; Tascam 15 24x8
\$2.5K; Pultec MEO5—\$700; Pultec EOP1A3
Call: Dolby 361A—\$850; Teletronics LA2
\$1.3K; Lang PEQ—\$600; Neumann U-87
\$1K; RCA 77DX—\$600; Dolby A Cat.2—\$350
Kepeex—\$125; dbx 150—\$100;
UREI 1176LN—\$425

We Buy and Trade!!
All used gear warranted and calibrated to factory specifications or your \$\$\$ back.
Call for discount prices on new items!
(617) 332-1441
Attention! Hnat Hindes (the finest in broadcast equipment) available NOW!!

Altec Lansing Voice of the Theater studio monitors (2), BO. J Howell, Howells Audio, POB 6184, Kingman AZ 86401. 602-753-2054

dbx RM155, gd cond, \$750. D Huettner, Dynamic, 358 Bell, Neenah WI 54956. 414-722-7228

JBL & EV raw speakers (8), 12" & 15", new. P James, Allstar Bctdg, POB 7007, Defiance OH 43512. 419-782-8591.

EV Sentry 100A (2), \$275/BO; EV EVM15B Series II (2), \$225/BO. R Cobb, POB 5332, Sun City Center FL 33570. 813-634-1940.

JBL 4301B, excel cond, \$100; JBL 2345 w/15" W & horn in excel cond, \$250. L Bergman, Universal Snds, POB 18716, Spokane WA 99308. 509-328-0766.

Fairchild 658-A echo chamber, \$75. D Lundy, Lundy Recdg, Box 408, Heidrick KY 40949. 606-546-6650.

Want to Buy

JBL 4443, 4415, 4413 monitors. D Glenn, WBZE, Box 3B Montgomery Ln, Waldorf MD 20601. 813-634-1940.

EV 100A Sentry speaker system. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

LIMITERS

Want to Sell

Aphex Compellor, like new, \$800. J Breiter, WRON, 136 W South Boundary, Perrysburg OH 43051. 419-874-1548.

Fairchild Conax 600 mono, \$200; Gates Sta-level M5167 limiter, \$175. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Stereo Volumax model 411; Ampex 601-2 portable stereo, 1/4" recorder, send sealed bids by 4/15/88. M Stirling, KPBS, SDSU, San Diego CA 92182.

Orban 424A stereo limiter, perfect cond, \$700/BO; UREI LA-4 (2) stereo sets, gd cond, \$600/BO pr. R Dietterich, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

UREI LA3A (2), \$300 pr. S Fox, KKKI, 1603 Barcelona St, Livermore CA 94550. 415-838-3063.

CRL APP-400, \$350/BO. P Wolf, WRCC, 2600 Pine Island, Cape Coral FL 33909. 813-574-5548.

CBS 411-Volumax, tested, fully operational, excel cond w/manual, \$300 plus shpg. G Heidenfelt, 2880 W Lake, Wilson NY 14172. 716-751-6187.

CRL SEP400A, (2), \$900 for both. P Parks, KHYS, 7700 Gulfway Dr, Pt Arthur TX 77642. 409-963-1276.

Pacific Recorders Multimax tri-band AGC (2); CBS Audiomax AGC; CBS Volumax limiter; Harris MSP-90 w/AM limiter module; Gates Solid Statesman FM limiter; (2) Gates Sta-level AGC; Intersound PRV-1 reverb/EQ. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Symetrix 501 compressor w/limiter, mint cond, \$200; Fostex 3070 stereo gated compressor, \$225. G Ernst, Bayside Sound, POB 166, Lincoln City OR 97367. 503-996-6020.

Volumax, factory rebuilt. T J Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

BE FM601 stereo AGC/limiter, gd cond, \$400. J Gaboury, KECC, 699 Ave B, Yuma AZ 85364. 602-782-4321.

Moseley TPL 280 solid state mono audio limiter, clean & complete, \$100. H Ruh, WOVF, 540 Oakton, Des Plaines IL 60018. 312-803-8443.

CRL PMC300A, \$650; CRL SEP400A, \$650, or both for \$1200. A Katz, Arthur Eng, 6630 Falstaff Rd, Woodbury MN 55125. 612-731-1147.

Optimod 9000A, nearly new, 6 band EQ w/smart clipper & polarity follower, \$2200/BO. D Bybee, KDLX, POB 819, St George UT 84770. 801-673-1450.

Gates Sta-Level, cond unknown, \$25. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

CRL FM4G, 1 yr old, excel cond, currently on standby, \$5800/BO. J Loughridge, WPLZ, 3267 S Crater Rd, Petersburg VA 23805. 804-748-4199.

CBS Labs 4440 Audimax, fair cond, \$250/BO; CBS Labs 450 Dynamic presence EQ, fair cond, \$250/BO. J Swett, 4025 Lugo, Flagstaff AZ 86001. 602-526-1975.

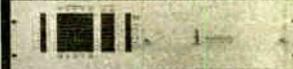
Mari CLA 40-H compressor/limiters (2), BO. J Saaco, WDAV, POB 1540, Davidson NC 28036. 704-892-8900.

Orban 424A comp/limiter stereo de-esser, \$695. D Jackson, WGCH, 1490 Dayton Ave, Greenwich CT 06830. 203-869-1490.

ATI Emphasizer audio processor, \$850. M Tail, Tail Recdg, 1347 S Capital St SW, Wash DC 20003. 202-488-3905.

Harris 994-7059-002 AM limiter, asymmetrical capable, gd cond, w/manual. D Garder, KDUZ, POB 10, Hutchinson MN 55350. 612-587-2140.

GIVE IT A CALL



This stereo processor can be pre-programmed with 5 different presets to "call up" for format changes, etc. Unit has slow-AGC, 5-band compressor, and either an AM or FM peak limiter. Computer/modern control option available.
Inovonics
4081 458-0552

Gates Solid Statesman AGC single band, \$100. B Hoffman, WRTH, 7711 Carondelet Ste 304, St Louis MO 63105. 314-727-2160.

dbx 142 (2) rack mount NR systems, new, BO; CBS Labs 4110, 4111, 4450A, (2) CBS Labs dynamic presence EQ's; stereo audio DA; 410/411, 4110 & 4450A stereo processors; UREI BL-40 AM compressor/limiter, BO. B Royster, KOM Bctdg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Hall Electronics Quality Used Equipment 30 Day Guarantee!

OPTIMOD 8000A w/complete updating & proof by Optimod at time of sale \$1,975.00
BELAR AMM-3 AM mod mon \$795.00
PRO-BASE for SP-15 or SP-25 (new)\$75.00
AMPEX AG-440B stereo w/new heads \$895.00
We Buy Used Equipment-Send for Free Flyer
**P.O. Box 7732
Charlottesville, VA 22906
PHONE: (804) 973-8697**

Gates Solid Statesman single band, \$100. B Hoffman, WRTH, 7711 Carondelet Ste 304, St Louis MO 63105. 314-727-2160.

Volumax 411 FM stereo limiter, \$300. B Hoffman, WRTH, 7711 Carondelet Ste 304, St Louis MO 63105. 314-727-2160.

Valley People stereo Dynamite, \$275. G Ernst, Bayside Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

dbx 163 compressor, \$75. G Ernst, Bayside Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

Harris ME-1 AM mod; CRL SPP800 split band compressor; Orban 418A stereo limiter; Orban 622B stereo parametric EQ; PR&E AM&FM Multimiters & Multimax's, BO. B Royster, KOM Bctdg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Distributor Directory

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

One Source for best prices CALL: SPENCER BROADCAST 1-800-221-6941
P.O. Box 5215 Glendale, AZ 85312

MAIL LABELS AM-FM-TV STATIONS
• guaranteed accuracy
• fast service
• select by area, market size, power, etc.
800-338-3264
In Florida: 813-682-2270
BROADCAST MAILING SERVICE

THE SOURCE
CALL US FOR ALL YOUR EQUIPMENT NEEDS
Toll free: 800-223-8202
In Florida: 305-651-5752
ELECTREX COMPANY

SANGAMO-ACUSHNET MICA CAPACITORS
PLASTIC CORP.—NON-PCB OIL FILLED CAPACITORS
RF-ANTENNA AMMETERS
RCA-RAYTHEON-AEL TRANSMITTER PARTS
TRANSFORMERS & CHOKES 250 WATT THRU 50 KW
COMMERCIAL RADIO COMPANY
BOX 43, CAVENDISH VT 05142
802-226-7582

Kidd COMMUNICATIONS
CALL US FOR...
Audio Processing, Digital Effects
Antennas, FM-UHF-VHF
Cart Machines, Consoles
Turntables/Disc Players
AM/FM/TV Xmters/Translators
CALL US TODAY!
916-961-KIDD (5433)
4096 Bridge St, Ste 4
Fair Oaks, CA 95628

CART'EM UP ON AUDIOPAK AA-4
Call for best price Sales—Service
Broadcast Cartridge Service
(714) 898-7224

STAR SYSTEMS
Audio Solutions
Otari, 3M, Tascam ATR, Nakamichi Pro, Yamaha, Orban, Valley People, Studer/Revox, Fidelipac And much much more!
Call for a current quote
(617) 794-9399
462 Merrimack Street
Methuen, MA 01844

CORNELL-DUBILIER MICA CAPACITORS
FROM STOCK
JENNINGS VACUUM CAPACITORS
FROM STOCK
JENNINGS VACUUM RELAYS
SURCOM ASSOCIATES, INC.
2215 Faraday Ave., Suite A
Carlsbad, California 92008
(619) 438-4420

HAVE A USED TRANSMITTER? CALL
(305) 887-1223
WE LIKE TO KNOW
Lita Broadcasting Distributor
MIAMI, FLA.

FREE Catalogue! FREE Sample!
High performance cartridge tapes & cart reloading - all types.
MARATHON PRODUCTS
(617) 853-0988
334 West Boylston Street
West Boylston, MA 01583

Can't Find It? Call 1-800-426-8434 For Immediate Action! Want To Sell It?



Broadcast Equipment Exchange

CASSETTES . . . WTS

CBS Labs Audimax 4440A, gd cond, \$400 plus shpg. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

Want to Buy

Allison Research Gainbrain 700. K Smith, Smith Eng Svs, RR 3 Box 483A, Gorham ME 04038. 207-929-6129.

Optimod 8000. P Martin, WZUU, 4359 S Howell Ste 106, Milwaukee WI 53207. 414-482-2638.

MICROPHONES

Want to Sell

Neumann tube mics, pristine collection of M49's, SM2, & KM 54's, 90 matched pairs. K Heyne, 415-664-0163.

AKG D19E, BO; Shure 54SL, BO. P Sibley, Sibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

EV RE-20 w/EV 309 shock mount & both in excel cond, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

CBS (Radio) Network ID plate for RCA 44B/BX mic; RCA 44BC ribbon mic for trade for pre-1940 condenser mic or RCA BK-10A (uniaxial). J Steele, Philocom, 160 W 77th St, NY NY 10024. 212-206-5240.

AKG D330BT, excel vocal mike, LF & HF filter switches, gd shape, \$100; EV CS15 condenser w/cardiod capsule, gd for boom mike or snake, acoustic guitar etc, \$125. R McMillen, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Neumann U67 matched pair w/consecutive serial numbers, \$4000. G Geocaris, Concept Prod, 7878 Big Sky Dr, Madison WI 53719. 608-833-8273.

EV RE16 (4), like new, \$150 ea; EV DL42 (2) shotguns, excel cond, \$175 ea; EV 635, \$50 ea. C Butler, Butler Bdct Svs, 1775 Bartlett Ave, Orange Pk FL 32073. 904-264-8169.

AKG V19E; Shure 54SL, BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

RCA KU3A (2) w/yokes & wooden case & (3) BK5B's ribbon mics, all re-ribboned from RCA, excel cond, \$1000/pr of KU3A's & \$300 ea for BK5B's. P Chance, Univ of UT, Salt Lake City UT 84132. 801-581-8943.

EV RE-15 excel cond, \$100. L Bergman, Universal Snds, POB 18716, Spokane WA 99308. 509-328-0766.

Want to Buy

RCA BK-6A levallier; RCA BK-10 uniaxial, any cond; RCA 91-A announce (desk) stand for RCA 44 mic; Yoke (fork) shock mount assembly for RCA 44 mic. J Steele, Philocom, 160 W 77th St, NY NY 10024. 212-206-5240.

RCA studio boom, length approx 10', mfg by Mole-Richardson, 1940 era; RCA floor & desk mic stands. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

AKG C24 stereo mic, any cond. Mr. Hertzburg, Kinura Records, Box 660236, Miami Springs FL 33166. 305-887-5329.

Sennheiser MD421U, gd cond. P Martin, WZUU, 4359 S Howell Ste 106, Milwaukee WI 53207. 414-482-2638.

RCA 77DX, pay up to \$375 for gd cond unit. B Gowa, KTIM, 1623 5th Ave Ste D, San Rafael CA 94901. 415-456-1510.

MISCELLANEOUS

Want to Sell

RCA 43 printer for teletype w/1571 weather writer board, 3 yrs old, like new, \$750. L Stone, KLID, POB 458, Poplar Bluff MO 63901. 314-785-9637.

Isolator, 5 kW, solid copper, BO. F Shields, KERV, POB 2187, Kerrville TX 78028. 512-895-1230.

NEW BOOK

Promotions, Ideas, New Sales Techniques, What To Do, What Not To Do

A Must for Success
Make all the money you want: Send \$14.95 cash, check or money order to:

Book
PO Box 100
Brunswick, GA 31520

Sonex 4' x 4' x 3', new in box, \$200/carton. L Mueller, WSTF, 2500 Maitland Ctr Pkwy, Maitland FL 32751. 305-660-0664.

Giant 30' inflatable cowboy, 8 yrs old, \$2000 w/compressor. C Hodgson, KKLZ, 925 E Desert Inn Rd, Las Vegas NV 89109. 702-727-9600.

Tandberg TCD 330 cassette deck; Waveform 452A tone osc; (2) Shure M63 audio masters; (2) Shure M62V audio level controllers; Shure M675 audio prod master; (2) Ampex A692 amps/speakers, send sealed bids by 4/15/88. M Stirling, KPBS, SDSU, San Diego CA 92182.

Bird 3127 FM power monitor & alarm, gd cond, \$500/BO; Sola 63-13-150, gd cond, \$150/BO; Elgin ERC, send, receive & answer to or from phone line, \$75/BO. P Wolf, WRCC, 2600 Pine Island, Cape Coral FL 33909. 813-574-5548.

NW-1 remote meter panel; Delta remote base meter; (4) Luxo mic booms; (4) E/V mic shock mounts. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Patch bays, (2) row of 12 ea 19" rack mount, very new w/cords, \$100 ea; Daven panel (8) pots for volume controls, excel, no noise, \$100. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Aquarius 16K memory w/expander w/printer data recorder, games & manuals, like new in original box, \$125 plus frt. M Kantor, WPOB, 50 Knickerbocker Rd, Plainview NY 11803. 516-822-6915.

Fifty Years of catalogs, flyers, manuals, Al-lied, Lafayette, GR, HP, Tek, Radio Masters encyclopedias for Radio-TV-Sound. 30 page list for 39" SASE. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458.

Extel teleprinter set up for slow speed weather wire, working cond, \$300. M Martin, KWNO, POB 466, Winona MN 55987. 507-452-4722.

Jennings N-16-C-65863-2275 10,000 V caps, vgc, \$75 ea; Mylar caps, various values 200-600 V, large quantities avail, 3-30" ea. N Carlson, Mobile Snd Group, Box 148794, Chicago IL 60614. 312-871-7459.

Custom made 19" equip rack, table model, black in vgc, \$75. L Bergman, Universal Snds, POB 18716, Spokane WA 99208. 509-328-0766.

Tandy 600 portable, like new, sell or trade for X700RP Tapecaster cart recorder, \$400. G Arroyo, WONQ, 2483 John Young Pkwy #R, Orlando FL 32804. 305-290-2020.

Catalogs/magazines, 50 yrs worth, IRE/IEEE, GR, HP, Tektronix, Sears Roebucks, Allied, Lafayette, etc, SASE for list. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

Canon old style XLR-3 females; Canon P-3s, male & female, chassis females & pieces, \$100/\$6 ea/\$10 pr. Good Sound, 171 Drexel Ave, Lansdowne PA 19050. 215-626-9322.

Tandy Radio Shack Mod III computers, several, some w/80 trk disk drives, gd cond, \$350 ea. E Helvey, Successtrax, POB 1357, Winchester VA 22601. 703-877-1191.

Tandy Radio Shack Mod 4P port computers (2), w/40 trk disk drives, vgc, \$400 ea; modified for ext dual 80 trk disk drives w/drives, vgc, \$500; w/CPM software. E Helvey, Successtrax, POB 1357, Winchester VA 22601. 703-877-1191.

Want to Buy

RCA BTF20E1 manual; any early 1960's radio transmitting equipment catalogs. W Irwin, WHIS, 900 Bluefield Ave, Bluefield WV 24701. 304-327-7114.

Rack cabinet, 19" w/doors. J Sherwood, KC Amateur Radio Club, POB 6551, Shawnee Mission KS 66206. 913-676-3020.

RCA or Dumont TV equip inc manuals & catalogs. A Weiner, Weiner Assoc, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554.

Radio Antenna Engineer textbook by Ed Laporte, pub by McGraw Hill, \$50 for good copy, \$75 if mint. J Glass, WNIU, N IL Univ, Dekalb IL 60115. 815-753-0212.

MONITORS

Want to Sell

Belar SCM1 SCA monitor, BO; McMartin TR55D, SCA tuners, BO. R Kinsley, Box 271, RD 3, Vergennes VT 05491. 802-759-2575.

JBL 4311 studio monitors, excel cond, no grills, \$500/pair. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

Want to Buy

Mod monitor, prefer 1972 or newer, any cond, will buy or trade. B Van Prooyen, 2111 Shangrila Dr SE, Grand Rapids MI 49508. 616-532-1168.

McMartin TPM2500C FM monitors & remote unit 37R, \$2200 & \$3700. R Davis, KJHK, Univ of KS, Flint Hall, Lawrence KS 66045. 913-864-4746.

MOVIE PROD. EQUIP.

Want to Sell

Arriflex BL camera, battery & all accessories, magazines, etc. F Singuschkin, Seraphin Comm, 1568 Eustis St, St Paul MN 55108. 612-645-9173.

Employment

To place ads in this section, use the Action-Gram form. To respond to box numbers, write Radio World, Box 1214, Falls Church VA 22041, Attn: _____

POSITIONS WANTED

CE, NBN, HBO MDS, 2 college radio stations, excel personality looking for FT, PT or contract work. M Rakoff, 114-41 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

Just sold station owned 20 years. Want work as manager, sales or related field. Will travel. Now in Texas. Send inquiries to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-1-88.

CE, radio, now! Former radio CE, top 5 market, FCC general, ham, non-drinker. M Gottesman, 3377 Solano Ave #312, Napa CA 94558. 415-221-2000.

CE w/over 2 yrs exper looking for FT position. Exp in AM/FM, FCC genrl, AS degree. J Grimes, Box 336 RD2, New Cumberland WV 26047. 304-387-4424.

CHR/UC announcer seeking FT employment in AM/FM markets, will relocate, FCC permit, \$4/hr paying internship considered, resumes available. J Torres, Columbia Sch of Bdcgt, 4326 Ivy St, E Chicago IN 46312. 219-397-4156.

Station/Ops Mgr, major market exper in programming, sales, budgeting, client relations, etc, looking for similar position in station or group, results oriented, turnarounds considered. Box 81, Westhampton NY 11977.

On the ball 8 yr vet, currently working as PD, strong in formatives, looking for PD or jock job in East. D Silverstein, 703-955-4688.

Interim GM position sought (1-6 mos.) by Alan Swan, 18 W Spring Garden St, Palmyra NJ 08065. 609-829-1770.

CE Radio now! Former CE, Boston, Houston, Miami, Ft Lauderdale, FCC Genrl, ASEE, non-drinker, ham. M Gottesman, 3377 Solano Ave #312, Napa CA 94558. 415-221-2000.

Engineer, 11 yrs exper, large mkts, high power, AM directionals, AM stereo, superior sound, presently DE of small group. Looking NYC, Boston, Philly, Baltimore. Jim, 1449-I Devon Ln, Harrisonburg VA 22801. 703-434-5926.

Short-term, 2-12 mons, interim GM seeks position. A Swan, Box 3, Palmyra NJ 08065. 609-829-1770.

I have designed, built & maintained many radio stations, including Radio New York Intl, what can I do for you? A Weiner, Engr, 178 Lawrence Park Terr, Bronxville NY 10708. 914-337-4554.

HELP WANTED

Radio Eng/Tech to join team of New Orleans based professionals. J Binsfeld, Bdct Technical Inc., POB 13475, New Orleans LA 70185. 504-866-3846.

Top LA prod. studio wants adv. prod. eng., experienced, creative, fast, equip knowledge & ad people. Sweetening exp helpful. Send tape & resume. Salary negotiable. All inquiries confidential. Send to Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-3-88.

WLIO TV has opening for a technician. Persons should have skills in audio/video systems, TTL/CMOS, microwave, satellite systems, & some UHF xmtr. Contact with detailed resume Fred Vobbe, CE, WLIO, 1424 Rice Ave, Lima OH 45805. No phone calls please. EOE.

The Daytona Group, a rapidly expanding, dynamic, radio chain is looking for several overachievers to head up new engineering departments. Successful candidates must have at least three years engineering exper, communicate well & love radio. Send resume to Kyle E Magrill, 770 W Granada Blvd, Ste 206, Ormond Beach FL 32074.

Bdct Eng, 1.3 kW NCE FM & cable access television studio. Letter, resume, three recent references. Jeff Harman, Dir of Bdcgt, Muskingum College, New Concord OH 43762. EOE.

CE wanted in Northern California's top FM, on the leading edge of technology. Building new plant this year. Send detailed resume & salary requirements to Gordon Zlot, KZST, Box 55, Santa Rosa CA 95402. EOE M/F.

CE wanted at KJEL, Lebanon, MO. 5000 watts AM, 100,000 watts FM. To \$25,000 for qualified. Contact Jerrell Shepherd, KWIX, Box 430, Moberly MO 65270.

Consultants

R.L. HOOVER

Consulting Telecommunications Engineer

11704 Seven Locks Road
Potomac MD 20854
301-983-0054

Member AFCCE

SPENCER BROADCAST

The Radio Station Specialists

Chuck Spencer
Phoenix, AZ
602-242-2211

R.J. GRANDMAISON, P.E.

CONSULTING ENGINEER

Applications and Rulemakings
11213 Split Rail Lane
Fairfax Station, VA 22039
(703) 764-0513
Member AFCCE

FM Study Program

FM Searches Within
The Budget Of
Anyone Who Owns
An IBM-PC
L.R.C.
602/293-2374

Robert M. Lund

Broadcast Consultants
Auburn, Massachusetts
Applications -
Field Engineering
617/832-2611

EVANS ASSOCIATES

Consulting Communications Engineers

FCC Applications, Design
& Field Engineering
Broadcast Engineering Software
216 N. Green Bay Rd.
Thiensville, WI 53092
(414) 242-6000
Member AFCE

W. LEE SIMMONS & ASSOC., INC.

BROADCAST TELECOMMUNICATIONS CONSULTANTS
5 Gracefield Road
Hilton Head Is., SC 29928
(803) 785-4445

Moffett, Larson & Johnson, Inc.

Consulting Telecommunications Engineers
Two Skyline Place
5203 Leesburg Pike #800
Falls Church VA 22041
703-824-5660
800-523-3117
Member AFCCE

MIRKWOOD ENGINEERING

Rural & Remote Site
Field Engineering
50 Park Ave.
Claremont, NH 03743
603/542-6784

DAVE HEBERT & ASSOCIATES

"Services for the Broadcaster"
Specializing in AM-FM Transmitters
Field Engineering, Audio Quality
and Minor Tower Work
P.O. Box 2442
Pasco, WA 99302
(509) 545-9672
SBE Certified—Senior Broadcast Engineer

Contact Radio World Newspaper

P.O. Box 1214,
Falls Church VA 22041
for availabilities.
Phone
800-336-3045

MAGRILL ENGINEERING

(904) 591-3005
APPLICATIONS—CONSTRUCTION
UTILITY PROBLEMS SOLVED
FAIRFIELD, FLORIDA

Can't Find It?

Call 1-800-426-8434 For Immediate Action!

Want To Sell It?



Broadcast Equipment Exchange

MOVIE . . . WTS

Singer autoloed 16mm & B&H 1400 Series sound projectors; Fairchild, rear screen, 8mm salesman's projector, \$60 ea; Teletype 33, ASR, w/purch & reader, \$125 ea. DMT A/V, Box 9064-FW, Newark NJ 07104. 201-484-5291.

Motorola Mostar 800 MHz trunk system, 2 base units, 2 mobiles & 2 300T portables, BO. CE, WWMY, 7819 Natl Srvs Rd #402, Greensboro NC 27409. 919-668-0811.

Want to Buy

Fischer FM100 FM tuner. K Smith, Smith Eng Srvs, RR 3 Box 483A, Gorham ME 04038. 207-929-6129.

Moseley SCG8 SCA gen, BO. R Kinsley, Box 271, RD3, Vergennes VT 05491. 802-759-2575.

S-A digital satellite receiver, fully operational w/cue & audio cards, \$4000/BO. D Flewelling, WREM, POB 160, Monticello ME 04760. 207-538-9538.

Wegener, set up to receive Transtar, w/down converter demod, time zone switch, network release, etc, 9 mos old, \$4500. M St Cyr, Goodrich Bldg, 2517 E Mt Hope, Lansing MI 48910. 517-487-5946.

Want to Buy

Looking for small, good recrdg studio: sale/lease—Chicago area. C Fuller, 312-579-9578.

Rather than sell below mkt prices, let our turnaround team eval & re-organize your station, services pay for themselves in 6 months, contact: Consultants, POB 81, Westhampton NY 11977.

McMartin BFM-1521R & BFM 1514R, matching set, stereo gen amp, FM stereo limiter, Maxi 1, \$250 pr. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Moseley SCD-2P & SCG-4T SCA gen & det set 185 kHz, \$600. B Sadlier, WFSI, 918 Chesapeake Ave, Annapolis MD 21403. 301-269-6500.

Want to Buy

Standby gen, 15 kW single phase 220V LP gas w/automatic switching. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-696-4441.

Vital production switcher, VIX 115 AZ w/dual chan Squeeze Zoom, \$15,000. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

Fidelipac 300 carts, (3) boxes of various lengths, at least 250+ carts, BO plus ship. F Vobbe, 706 MacKenzie, Lima OH 45805.

Fidelipac 300 aud carts, var lengths, new, \$2.50+. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

Aristocart & Capital A2's, (350), w/plastic wall mounting shelves for 200 carts, \$250 for lot or 75+ ea. K Peckham, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

Transtar, compl oldies lib, over 1200 carts, \$2100/BO. M St Cyr, Goodrich Bldg, 2517 E Mt Hope, Lansing MI 48910. 517-487-5986.

RCA 16" music transcription library, BO. R Bellevia, WSB, 4949 W Belmont, Chicago IL 60641. 312-282-9722.

RECEIVERS & TRANSCEIVERS

Want to Sell

Sensui-G7700 stereo rcver 120 w/chan, excel cond, digital tuner w/all kinds of inputs, \$300. B Feinberg, Total Tape Publ Co. 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

CONSULTANTS NEED TV • FM • Field Strength

FCC NPRM Docket 88-56 changes rules. 50/50, 50/10 charts become a FORTRAN computer program (TVFMFS). Buy this program now. Ready to run on any IBM-PC compatible. ALSO Included, RULES & BEAR, FCC distance and bearing calculator: \$95.00

**Jeremy Lansman
Spectrum Resources
POB 240-467
Anchorage AK 99524
(907) 349-5837**

SCPC receiver. T.J Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

McMartin TRE6B SCA receivers (10), \$55 ea plus shpg P Lierman, Chriscomm Services, 701 Spur Round SE, Rio Rancho NM 87124. 505-891-0764.

GE VHF custom exec base radio w/5 PY & PE portables w/CTSS (PL) tone, (2) drop-in chargers & rack charger, \$700/all plus ship. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

REMOTE & MICROWAVE EQUIP.

Want to Sell

S-A 6602 satellite video rcvr, excel cond, frag agile 3.7-4.2 GHz, front panel C/N meter & IF mon, lcl or rem cont, \$1600. P Smith, 1147 Palore, St Paul NM 55105. 612-698-6369.

Transtar ssat receiver for oldies format. N Al-lebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

TFT 8300 STL xmtr only, 947.5 MHz, new cond, \$3700. L Mueller, WSTF, 2500 Maitland Ctr Pkwy, Maitland FL 32751. 305-660-0664.

TFT 7601 10 chan RC for telco, STL or SCA, gd cond, \$1000. R Simmons, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

Moseley TRC15 AM RC system for use w/STL, studio & xmtr units & insertion units, manuals, gd cond, \$2500. B Gordon, KIPA, 688 Kinooie St, Hilo HI 96720. 808-935-6858.

Moseley PCL 505/C composite STL sys, pres on 95.1500 MHz, \$3000. G Savore, WFRD, Dartmouth College, Hanover NH 03755. 603-646-3313.

Potomac RC16+ 16 channel remote control, \$3500. H Reinders, WOGO, 5558 Hallie Rd, Chippewa Falls WI 54729. 715-723-1037.

Marti STL-8 dual-chan sys on 950.0 MHz; RCA PBR-30 RC sys w/SCD-2 subcarrier detector; RCA PBR-15A RC sys, send sealed bids by 4/15/88. M Starling, KPBS, SDSU, San Diego CA 92182.

Symetrix 104 tel interface (2), \$950 ea. John, WTDY, POB 2058, Madison WI 53701. 808-271-1484.

Want to Buy

Marti RTC15 RCU for parts, need all 3 pieces. M Edwards, Pride Group, POB 2576, Montauk NY 11954. 212-713-5558.

Telephone interface, Gentner, Symetrix or similar in working cond. M Schaaphok, Protestant Radio & TV Cir. 1727 Clifton Rd NE, Atlanta GA 30329. 404-634-3324.

RCA early portable microwave units. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

Moseley PCL/606-C composite stereo system, gd cond, will consider others. K Lincoln, WIZN, Stevens House, Vergennes VT 05491. 802-877-6800.

STATIONS

Want to Sell

Pueblo CO, KAYK-AM for sale, off air, take over payments, inspected April 14. G Erway, Erway Bldg, 1505 Crestview, Ordell OK. 405-832-5432.

FM CP'S Wanted

Clients seek CP's any size market. Small, medium, large. Will consider FM upgrades, too!

Send inquiries to: Radio World POB 1214, Falls Church, VA 22041 Attn: Box 4-2

LPTV-CP South CA coastal city, large market, \$50,000. G Erway, 805-688-0249.

STEREO GENERATORS

Want to Sell

Harris 994-6533-001, gd cond for TE-3 exciter, \$300/BO. P Wolf, WRCC, 2600 Pine Island, Cape Coral FL 33909. 813-574-5548.

**A & D
CARTRIDGE REBUILDING SERVICE**

3380 Blakely Ave. • Eau Claire, WI 54701 • Ph.(715) 835-7347 • Ph.(715) 835-8676

We clean, load & pack.

Service within 10 work days! Work Guaranteed!

Add 50¢ per Scotch Cart. We charge ONLY for tops, bases, and pressure pads: NOT for minor parts

Send This Order Form - 10% OFF Your Order

Call Letters _____ Total Carts Shipped _____

Street _____

City _____ State _____ Zip _____

Telephone _____ Return Attn. _____

BE FS30, excel cond, \$1000/BO. J George, WMFX, POB 210271, Columbia SC 29221. 803-772-4980.

CCA SG-1D stereo gen. T.J Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Sparta 682, needs work, w/Audiolab Elec lowpass filters, \$125. S Fox, KKIQ, 1603 Barcelona St, Livermore CA 94450. 415-838-3063.

Harris TE3 stereo gen, gd cond, \$750/BO. CE, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

SWITCHERS (VIDEO)

Want to Sell

ISI 904, 10 input, (2) ME's, DSK, \$5000. E Denke, Amer Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Richmond Hill EVS-7, 1 ME 7 input switcher w/12 pattern SEG, title keyer, color background gen, black burst gen, w/books, clean, complete, \$350. H Ruh, WOVF, 540 Oakton, Des Plaines IL 60018. 312-803-8443.

TAPES, CARTS REELS

Want to Sell

Fidelipac AA2's, 3's & 4's, var lengths, \$3@; Lauderdale Elect var lengths, \$1.50@; Ampex 7.5" reel tape, 1800' w/plastic reels, hundreds avail, \$2@; Magnetic Media 30, 60 & 90 min blank cassettes, white & black shells, case of 100 tapes, \$30@ any length. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

We have largest quantity of reprocessed audio tape in the world. We also have the lowest prices! Sizes from 5" to 14" & 1/4" to 2", all brands, all types. We carry a full line of cassettes, broadcast carts, reels, boxes & related accessories at unbeatable prices. Call for our new catalog & more info. 1-800-331-3191/516-678-4414 in NY. Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572.

NAB reels, 10.5" metal 1/4", all in gd cond, 1-10, \$1.50 ea, 11-100, \$1.25 ea, 100+, \$1 ea. Falk Recd Srvs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Fidelipac Mastercart, varied lengths (150), BO. D Talmage, Future Snd Studios, POB 8042, Marion OH 43302. 614-383-2566.

Scotch 2500' 1", new (13) 201, all \$115; 2500' 1/4" 206 (12) new, all \$95; 5", 7", 12" empties, cheap. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

NORTHWESTERN HAS AUDIOPAK CARTS

**Northwestern Inc.
1224 SW Broadway
Portland, OR 97205
1-800-547-2252
Oregon 226-0170**

Scotchcart II, never used, 80 5 1/2 min, 30 3 1/2 min, \$385 takes all. G Elliot, WKEE, Box 2288, Huntington WV 25701. 304-525-7788.

Capital HOLN Q-17, 60-3500' hubs, \$15/hub. P Talerico, WWAX, POB 750, Olyphant PA 18447. 717-489-0005.

Recortec tape evaluators, 1", 2" & 3/4", sev each. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

Want to Buy

Airchecks, transcriptions, 78's, 1920-50. G Tognacci, Starstream Comm Group, 9800 Richmond Ste 300, Houston TX 77042. 713-781-0781.

Pre-recorded automation tapes of big band or adult oldies. B Van Prooyen, 2111 Shargria Dr SE, Grand Rapids MI 49508. 616-532-1168.

Aristocarts for rebuilding, 25+ ea. B Anthony, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

Library of instrumental music on 10" reel, 1/2 trk or full trk mono, pay or trade for broadcast equip. B Mountjoy, Custom A/V Srvs, Box 1240, Elizabethton TN 37644. 615-543-5840.

Inexpensive carts needed from 2 to 5.5 min except for Fidelipacs. K.L.N.I. 94-539 Puahi St, Waipahu HI 96797. 808-671-6500.

TAX DEDUCT. EQUIP.

School needs FM xmtr for educ purposes, 10 W & up. Rev M Mullen, Intl Mission Radio Assn, St Johns Univ, Jamaica NY 11439.

Donations wanted for non-profit non-comm traditional Christian station starting from ground up, have CP, need all equip, 5.5 kW FM 200'. J Blodgett, WGTF, 308 Westgate, Dothan AL 36303. 205-794-8813.

School station looking for console & other bdcst studio equip for donation or at reasonable price. L Huber, WSAP, Box 640, St Andrews College, Laurinburg NC 28352. 919-276-3652 X496.

Eng student desiring donation of old bdcst equip (anything) in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

FM xmtr, 1.5-3.5 kW for educ station. B Sample, WEAX, Stewart Hall, West Park St, Tri State Univ, Angola IN 46703. 219-665-3314.

Donation of any FM equip, low-power xmtr, antenna, tape cart, etc for non-profit community station in West Indies. C/O Comm-Systems, 16 Addington Rd, Brookline MA 02146. 617-566-8613.

16mm sound & film equip for developing educ & ecological films, any equip accepted. Dr R Gerber, College of St Joseph, Windham ME 04062. 207-892-6766.

SCA subcarrier receivers, any condition, for non-profit radio reading service. T Vernon, Penna Assn for the Blind, 1800 N 2nd St, Harrisburg PA 17102. 717-238-2531.

Donations of AV & lighting equip. Any condition for non-profit religious group in North CA, will pick up or pay freight. R Scott, I'Sot, Box 125, Canby CA 96015. 916-233-5155.

TEST EQUIPMENT

Want to Sell

B&W test osc; B&W distortion/noise meter. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Tek 527 waveform monitors, tube type, as is, \$150. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

**FOR FREE LISTINGS IN
BROADCAST EQUIPMENT EXCHANGE**

**CALL TOLL FREE
1-800-426-8434**
15 LINES TO SERVE YOU

Free listings in Broadcast equipment exchange are offered to all United States Broadcasters AM/FM/TV and all Pro-Sound end users. BSW will accept up to three listings by telephone. For more than three listings BSW will send you an ad order sheet for your convenience. BSW will list each ad for a period of three full months.

PACIFIC MOUNTAIN CENTRAL EASTERN
6:00 AM to 6:00 PM 7:00 AM to 7:00 PM 8:00 AM to 8:00 PM 9:00 AM to 9:00 PM

*Open For Business When You Are
12 Hours Daily - In Your Time Zone*

BSW • 7012 - 27th ST. WEST • TACOMA, WASHINGTON 98466

RW

Broadcast Equipment Exchange

TEST ... WTS

GR 1606-A RF bridge, thru AM band, \$400/BO. L Albert, MSU-TV, Box 2266 Univ Sta, Murray KY 42071. 502-762-4664.

GR 916 RF bridge, BO. E Slimak, WWAK, POB 1195 Redwater Lake, Hawthorn FL 32640. 904-481-2310.

Potomac AT51, Sencor SG61. J Phillips, All Am Bdcg, 414 Washington, Defiance OH 43512. 419-782-8591.

Potomac AA-51 & AG-51 audio test set, excel cond, \$2800/BO; Delta 01D-1 impedance bridge, gd cond, \$900. N Lindsey, 2913 Neaces, Harlingen TX 78550. 512-423-3910.

Tek 1450-1 TV demod, 2.5 yrs old w/wide-band stereo option, vgc, \$3500/BO. G Coulter, Video Services, 424 Commerce Ln Unit 5, Berlin NJ 08009. 609-768-2439.

Sencore VA62, NT64, VC63, all mint cond, \$2500. L Clinton, KKYK, POB 4189, Little Rock AR 72214. 501-661-7590.

Heath SG-18A, \$100/BO. P Wolf, 241 NE-10th, Cape Coral FL 33909. 813-574-5548.

Lambda LNS424 power supply, \$85. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

SWR 6681 field strength meter, \$20. J Klauck, WSAM, 200 Bloomfield, W Hartford CT 06117. 203-726-9083.

Goldline ASA10, \$125/BO. R Cobb, POB 5332, Sun City Center FL 33570. 813-634-1940.

Heath IM-4110, gd cond, Heath assembled, \$100. CE, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

HP AC voltmeter 400EL, \$300; HP attenuator set 350D, \$150; G-R oscillator type 1310A, \$150; Data Royal waveform sweep gen. F230A, \$600. R Branske, WLOO, 875 N Michigan Ave, Chicago IL 60611. 312-440-3100.

Plastic Cap power supply, HV50-403A, new, \$250. R Branske, WLOO, 875 N Michigan Ave, Chicago IL 60611. 312-440-3100.

QE1 691-1 mod monitor w/SCA card; Potomac AT51 audio test set; Sencor SC61 scope, gd through 100 MHz & misc test gear. J Phillips, Allstar Bdcg, 414 Washington, Defiance OH 43512. 419-782-8591.

OVER 110 AM AND FM TRANSMITTERS

AMs: 50kw, 10kw, 5kw, 2.5kw, 1kw. FM's: 40kw, 25kw, 20kw, 10kw, 5kw, 1kw. All Manufacturers. All powers, All working, All spares, All inst. books.

ALL IN OUR INVENTORY.

World leader in AM and FM transmitters.

BESCO INTERNACIONAL

5946 Club Oaks Drive
Dallas, TX 75248

214-630-3600
214-276-9725

Potomac FIM-41 field strength meter, excel cond, some cosmetic damage to case, 6 yrs old, \$1900/BO. J Seaman, WSWA, POB 752, Harrisonburg VA 22801. 703-434-0331.

Wavetek 860 VHF, UHF, IF sweep gen, marker gen, RF output w/attenuator, no book but clean & compl, \$150. H Ruh, WQVR, 540 Oakton, Des Plaines IL 60018. 312-803-8443.

Want to Buy

AM signal gen. T Sneed, Radio Paradise, POB 908, Hixson TN 37343. 615-877-0100.

Small X/Y scope, such as EICO 430, portable or rackmount OK. A Tucker, Foothill Prod, 70 W 83 St, NY NY 10024. 212-877-0973.

TRANSMITTERS

Want to Sell

WE 1 kW, 1930 vint, 4 units, D87740 osc unit, D88485 amp, HV rectif & motor gen set, museum piece SN 102-some inside damage, no PCB's, free/u pick-up. B Frahm, KBOI, POB 1280, Boise ID 83701. 208-336-3670.

RCA BTA-5F mod Xfrmer, new, in crate, \$600; RCA BTA 5F, 5 kW AM, excel cond, operational & phys w/floor layouts & manuals, recently removed from serv, \$10,000; RCA BTA 50F 50 kW AM, recently out of serv, excel cond, cosmetically & operational, comp w/manual & floor layout, \$18,000. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187

CCA FM 10000DS w/spare tubes & fan. T J Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Powerpak, 40 W solid state digital prog exciter. J Phillips, All Am Bdcg, 414 Washington, Defiance OH 43512. 419-782-8591.

Solatron 39-59-325 3 phase 25 kVA, 208-230V, working when removed, you ship, \$500/BO. L Albert, MSU-TV, Box 2266 Univ Sta., Murray KY 42071. 502-762-4664.

CCA AM50,000D w/2 new mod xfrmers, had fire in pwr sup cabnt, needs new rectifiers & filter caps, BO. D Glenn, WJGR, 5900 Picketville Rd, Jacksonville FL 32205. 904-783-1530/813-634-1611.

RCA TTU-12 UHF TV xmtr (2), \$5000; AEL 10 W solid state FM exciters (2) mdl 2202A, \$300/both. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

CCA FM 10-DS exciter TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Collins 20-V 500/1000 W AM, works gd for standby or night power, \$1100. D White, WYBR, POB 7180, Rockford IL 61126. 815-874-7861.

CSI 25 kW AM, 1 yr old. M Pulley, 304 E Jackson, Boliver MO 65613. 417-326-5257.

Gates M-5863 xmtr RC, xmtr site only, fair cond, \$50. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

CCA FM-10,000D w/exciter, stereo gen, harmonic filter, tuned to 100.7, in service as standby, \$7500. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

RCA BTA5F at 1310 kHz, mostly complete for parts, cheap. S Johnston, WGH, 281 Independence Ave #1A, Virginia Bch VA 23462. 804-497-1310.

RCA BTA1R or 5T 980 kHz crystal. R Dufault, WEBB, 3000 Druid Park Dr, Baltimore, MD 21215. 301-367-9322.

Wilkinson SG1E exciter. E Kazmark, KAZZ, POB 1369, Deer Park WA 99006. 509-276-8816.



High performance at affordable prices.

15, 20, 30, 80 W exciters and translators /boosters.

100, 250, 400, 500, 1000 and 2000 W amplifiers.

All front panel programmable, broadband.

2 and 20 W STLs.

24 Hr. technical support on call.

Credit/Leasing options available.

Bext, Inc.
739 Fifth Avenue,
San Diego, CA 92101
619-239-8462
Telex 229882LJMUR

CCA AM1000D 1000/500 W, excel cond, at 1340 kHz, \$5000/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

Want to Buy

RCA 5H or **10H** for tubes & parts; also a 500-1500 W FM in gd cond. B Zellmer, KROZ, POB 2224, Greeley CO 80632. 303-351-8354.

Gates BC1T xmtr or parts, need T-2 low voltage transformer. E Slimak, WWAK, POB 1195 Redwater Lake, Hawthorn FL 32640. 904-481-2310.

FM 5 kW. H Parshall, WDPR, 1514 W Dorothy Ln, Dayton OH 45409. 513-299-3297.

SUPER-GEN

This high-performance FM Stereo Generator has selectable pre-emphasis, overshoot-controlled lowpass filters, digital pilot/subcarrier synthesis and built-in overmod protection. CBS/NAB's "FMX" system is available as a plug-in option.

Inovonics
SANTA CRUZ, CA (408) 458-0552

Manual for RCA BTA5F. M Numerick, WJCO, 1293 Floyd, Jackson MI 49203. 517-784-1510.

Service manual for ITA FM 10 kW or 15 kW xmtr. A Weiner, 178 Lawrence Park Terr, Bronxville NY 10708. 914-337-4554.

Stereo FM xmtr, 3-5 kW. J Stitt, WIOK, 7075 Industrial Rd, Florence KY 41042. 606-727-0800.

Remote controllable, 2.5-4.0 kW w/exciter, 240 V single phase only, all makes considered. D Carmine, WKKM, Box 549, Harrison MI 48625. 517-539-7105.

FM 1 kW, in gd cond. J Caracciolo, WDRE, 1600 Stewart Ave, Westbury NY 11590. 516-832-9400.

FM xmtr, 10 kW; also 300' 1-5/8" xmsn line, air dielectric. D Murphy, FL Public Radio, POB 6501, Titusville FL 32782. 305-268-3000.

TUBES

Want to Sell

Eimac 4CX15000A (2), \$850 ea/BO. K Har-nack, WCRV, 4554 Fleming Rd, Collierville TN 38107. 901-529-0098.

T-12 crystal, 1250 kHz (2), \$150 ea or will trade for 1370 or 1010; CCA AGC-1D AGC amp tube, fair cond, \$100. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

FM xmtr tube, 4CX10000D, used & rebuilt, \$100. D Woodcock, WNNC, 5606 Medical Circle, Madison WI 53719. 608-271-1025.

Want to Buy

T-12A VAC crystal for 1010 kHz or will swap for T-12 1250 kHz crystal. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Eimac 4-500B xmtr tubes, new or good. K Larke, POB 151, Caro MI 48723. 517-673-2136 after 6PM.

SK800 sockets in any cond (2). B Morris, POB 854, Mulino OR 97042. 503-829-2738.

TURNTABLES

Want to Sell

Technics SL1500 MKII, gd cond, w/Shure BC-70 bdct cart w/2 extra styli, digital speed & pitch controls, \$200. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

QRK 12" studio TTs, 3 speed, vgc, w/Rek-O-Kut arms, \$110 ea. P Combs, Only Son Prod, 2316 Forrest Home, Dayton OH 45404. 513-236-2340.

Russco Studio B TTs w/Micro-Trak tone arms, \$75. T Gorton, KQEV, POB 48, Olympia WA 98507.

Gates CB77 (2). D Tabor, WLCK, POB 158, Scottsville KY 42164. 502-237-3149.

Russco Studio Pro TTs (2), less headshells & cartridge, \$150 ea. D White, WYBR, POB 7180, Rockford IL 61126. 815-874-7861.

Russco Cue-master (2) w/Micro-Trak tone arms, both in vgc, BO. R Ballard, Gospel Up-beat, 2110 N Second, Cabot AR 72023. 501-843-5512.

Russco Studio Pro (2), gd working cond, will ship UPS COD or prepaid, w/toner, cartridges, preamp & PS, \$20 ea. M Schaaphok, Protestant Radio & TV Ctr, 1727 Clifton Rd NE, Atlanta GA 30329. 404-634-3324.

RCA TT plays up to 14" discs & has two tone arms, one for old transcriptions & one for regular recordings, 45, 78 & 33-1/3 rpm, vgc, \$250. L Bergman, Universal Snds, POB 18716, Spokane WA 99308. 509-328-0766.

QRK 3-speed, w/Micro-Trak 303 arm, vgc, \$140. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Shure M64 phono preamp, BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

TV FILM EQUIP.

Want to Sell

Singer/Grathlex 16mm projector w/film chain shutter, like new, \$300. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

RCA TK27, w/35mm Simplex proj, TP66 16mm & slide proj, \$4000. T Judge, Tag Comm, 75 Weaver Rd, W Milford NJ 07480. 201-697-8545.

Want to Buy

Philco Cinescanner TV broadcast projector. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

Complete RCA film chain, either TK28 or TK29. H Henson, Henson Prod, 3796 Bethunia St Rd, Winston-Salem NC 27106. 919-924-8717.

VIDEO PROD. EQUIP.

Want to Sell

JVC 8200 & 5500 editing system, w/Convergence ECS90, 44500; JVC BY110 camera, 10:1 zoom lens, \$2200. Sony 4800 3/4" recorder, \$1400. D Weber, Sound Images, 57 E 11th St, NY NY 10003. 212-995-8822.

Sony VCR 2850 (3), \$750; Sony VP2002, \$500; Panasonic VCR color 3/4" R-R NV3132 & 3161; Magnecord TT58 (3) voice only; Xerox 3400; Compugraphic 4 typesetter; 11 x 17 press; 007 Intimus shredder. A Curtis, POB 2387, Arlington VA 22202. 703-521-1089.

Convergence ECS 103B w/cards for Sony 5000 Series, \$3500; Convergence SWI 110, \$1200; Convergence TC 100, \$900; Lenco sync generator, proc amp, DA's, \$2200. E Denke, Amer Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

We've taken the cream of the old crop . . .

Charlie Goodrich—Eng/Customer Svcs; Dallas Lawyer, Stanley Martinkus. Glenn Skovgaard—Srvs Techs; Alma Johnson, Evelyn Freer, Betty Konz, Helen Zdravkovich—Factory Techs; John Fletcher—Metal Shop Supr; Joel Krier—Customer Sales; Bill Abbott—Customer Svcs, with combined experience of over 100 years.

Added New Management and New Facilities . . .

The result is the new

McMartin Industries

Call us for dependable Sales & Service for all McMartin Products
Telex No. 484485 712-366-1300

TRANSCOM CORP.

Fine Used AM & FM Transmitters
and Also New Equipment

For the best deals on Cablewave cable,
Rohn towers
and Celwave antennas.

- | | |
|------|---------------------------|
| 1976 | Harris FM 20H3, 20 kW FM |
| 1977 | AEL 25 KG, 25 kW FM |
| 1983 | Harris FM-25K, 25 kW FM |
| 1978 | Collins 820E, 5 kW AM |
| 1966 | Continental 315B, 5 kW AM |
| 1960 | Gates BC-10P, 10 kW AM |
| 1966 | Gates BC-50C, 50 kW AM |

201 Old York Rd.
York Plaza Ste 207
Jenkintown PA 19046
215-884-0888

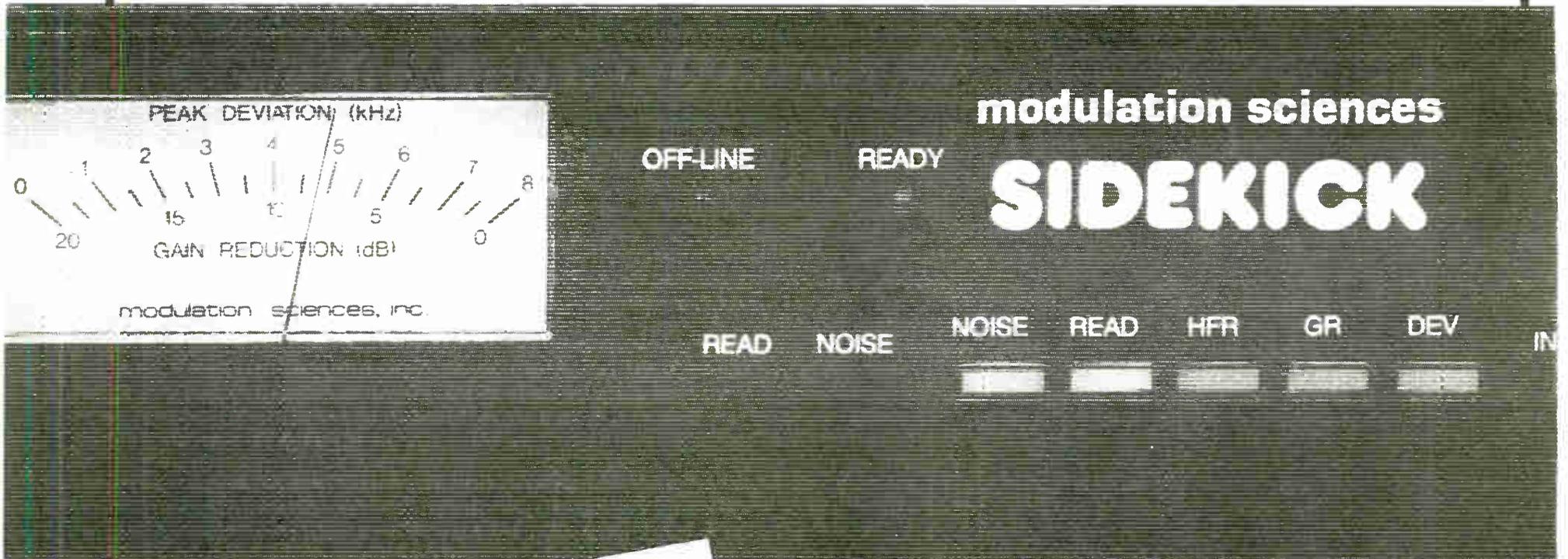
Telex No. 910-240-3856 (TRANSCOM CORP. UQ)

Can't Find It?

Call 1-800-426-8434 For Immediate Action!

Want To Sell It?

THE ONE BOX SOLUTION THAT MADE SCA WORK



RF IDEAS

E.J. PRYOR, JR. Broadcast Technologies, Inc.

"I have been operating one SCA on 67kHz on my Dallas, TX station for some years. After many years of the normal problems of crosstalk, noise, etc., Modulation Sciences came forward with the 'Sidekick' SCA generator. I have never spoken out for a particular device in this column before, but I found that virtually every problem I had been experiencing, disappeared when I finally got one of these units and installed it at the studio between my stereo generator and composite STL. I found that the crosstalk, main to sub and sub to main, was improved almost 20db and the system noise was markedly improved also. There is no measurable degradation to the stereo performance or loudness whatever. With the new rules allowing stations to increase their total modulation 5% for each 10% of injection, the main channel (mono) level suffers a negligible 0.5db reduction in loudness."

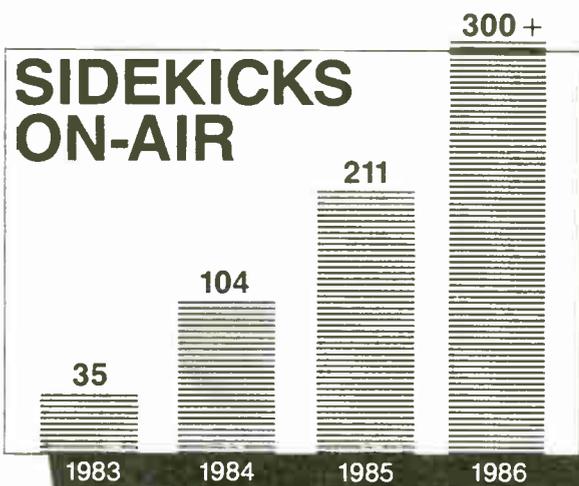
Reprinted by permission from Broadcasters ID. Aug/Sept 1985

**30-Market Survey Results:
SIDEKICK IS THE
#1 CHOICE OF MUSIC
SCA OPERATORS.**

From SCA: Radio Subcarrier Report 9/85
© Waters Information Services, Inc.

**modulation
sciences, inc.**

115 Myrtle Ave. Brooklyn, NY 11201 In N.Y.S. (718) 625-7333



Here's how Sidekick makes SCA work:

Sidekick installation is quick, easy, and problem-free:

- Install at studio or transmitter.
- Insert anywhere in chain via Sidekick's loop-through composite input/output (SCA input NOT required).
- Remote control provisions standard.

Sidekick's elegant circuit design takes the hassles out of SCA:

- Sidekick is tweak-free and drift-free.
- Crystal-locked synthesizer is stable over time/temperature.
- Excellent RF and EMI shielding.
- Performance certified by an independent P.E. (to receive a copy, just call).

Sidekick's "One Box Solution" builds in everything you need:

- Integrated audio processor for superb SCA performance.
- Noise generator and synchronous AM meter lets you tune transmitter for minimum crosstalk.
- Super-accurate peak & hold SCA deviation monitor.

Call Toll-Free (800) 826-2603

And Get Sidekick Working For You.

NEW ARRIVAL

THE WHEATSTONE A-20



THE RADIO CONSOLE ENGINEERING AND MANAGEMENT CAN AGREE ON

Finally engineers confined to tight budgets can choose a console that won't compromise station reliability or signal integrity. After all, the A-20 is a Wheatstone console. It borrows from the componentry and design of our larger A-500 consoles, currently installed in major markets all over the country, from frontline independents to national networks.

The A-20 features modular construction, a fully regulated rackmount power supply, logic follow, full machine control and, of course, an all gold contact interface system. This console has two mic channels and eight stereo line channels, each with A/B source select and program/audition bus assign (plus cue switches on the line modules). Standard features include program and audition VU meters, digital timer, and a monitor module for control room and headphone functions. Optional accessories include a studio control module, multiple line selector switchbanks and machine control panels, plus a full family of studio turret components.

The A-20 is a perfect choice for stations planning an upgrade in signal quality and control room image. It is also a natural choice for the newsroom. So profit from Wheatstone's experience and reputation—call us today for immediate action!

 Wheatstone® Corporation

6720 V.I.P. Parkway, Syracuse, N.Y. 13211 (315-455-7740)