Published twice a month

Radio World®

Harris to acquire Allied, p. 2

Vol 12 No 18 | September 15, 1988 | $2.00 Per Copy

Filings Focus on AM Studies

by Alan Carter

Washington DC ... The findings of two AM comprehensive listener studies that addressed interference woes received the attention of broadcasters in yet another round of filings before the FCC on AM technical improvements.

The comments due 17 August were submitted as part of a reply comment period in the second phase of the Commission's comprehensive review of AM assignment criteria in Docket 87-267.

Throughout the various comment periods of the review that the FCC initiated in July 1987 with a Notice of Inquiry, broadcasters generally criticized the Commission's current AM allocation policies and urged the Commission to move deliberately but with caution on the matter of interference.

The NAB-sponsored listener studies, submitted to the Commission in June in this second phase comment period, addressed AM technical assignment criteria and listener perceptions.

Assignments and perceptions

One study on assignment criteria conducted by Harrison Klein of the San Francisco-based consulting firm of Hammett & Edison concluded that no single protected contour is appropriate for all circumstances and that "differing requirements should be accommodated by the Commission's allocation scheme."

It also noted that man-made noise such as power lines, industrial machinery and noise-generating appliances has become a serious allocation consideration.

In its initial comments to the Commission, the NAB had raised the possibility of creating "noise-free" zones in the US, noting that "atmospheric noise may vary as much as 60 dB."

But in its reply comments, NAB had a change of heart, stating that since man-made noise levels exceed atmospheric noise levels in many areas, and since it recommended no change in AM protection contours, noise zones may not be a useful criteria for AM allocations.

The second study of radio listeners by B. Angell & Associates of Chicago found current FCC interference protection contours are sufficient for co-channel AM stations but inadequate for adjacent channels.

The NAB used the listener studies to reiterate its position that the Commission should not change signal strength values of the protected contours of existing AM radio stations.

Noting it did not address co-channel AM protection in previous filings, the association wrote that the B. Angell study showed significant variation in required protection levels based on programming format. Based on the findings, a 26 dB co-channel protection ratio appears to be the correct value of co-channel protection for the existing AM band, NAB stated.

NAB also said the B. Angell study

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Spokane RF Levels OK

by Charles Taylor

Spokane WA ... A study that measured levels of RF radiation emitted by broadcast towers here shows minimal potential for harm to nearby residents and structures.

The FCC/Environmental Protection Agency (EPA) report, issued in early August, is based on measurements taken 29 June 1987 to 3 July 1987. It is one of a number of surveys the two organizations conducted across the country in the past few years to better understand the effects of electric and magnetic fields near AM towers.

"The pattern has been that once a year we try to do some kind of a joint study that will expand our data base and give us more information on topics related to exposure from broadcast or other transmitters," said Robert Cleveland, a physical scientist with the FCC's Office of Engineering and Technology.

The study measured levels of current in an individual climbing an active AM tower or nested in a nearby fire lookout tower as well as measurements of electricity in buildings near AM antennas.

Spokane was chosen for this round of testing because of the large number of AM stations in the vicinity—eight within a 1.5-square-mile radius—most of which are in close proximity to residential and commercial areas. There were also several potential measurement sites which included FM and TV stations, according to the report.

Results from the tests have been anticipated since October 1987, but were delayed by understaffing at the EPA following the departure last fall of Rick Tell, chief of the agency's Electromagnetics Branch, Office of Radiation Programs.

For its test of body currents in workers climbing an AM tower, EPA used a ¼ wavelength, guy-supported, 119-meter single tower belonging to KKPL-AM. The station operates at 1 kW.

Electricity was measured using a Simpson RF current meter, which was mounted in a jig, allowing the meter to be inserted in a series between the tower and the climber's hands. The jig also included a 150 mA fuse in series to protect the meter.

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Stations Put DAT to Work

by Frank Beacham

Los Angeles CA ... Digital Audio Tape (DAT), Japan's controversial new consumer audio cassette technology still officially unavailable in the American marketplace, is starting to find a home in radio broadcasting facilities throughout the US.

But the new technology, though universally applauded for its outstanding sonic quality and tape reliability, has some cueing and search limitations which are preventing widespread acceptance in the broadcast environment.

Between 200 and 300 US radio stations own DAT audio tape recorders, according to Gerrett Conover of Radio Systems, Edgemont, PA, a company that markets DAT tapes and modified DAT players to the radio industry.

"Right now, the application is across-the-board," Conover said. "Down the road I think you'll see it used for syndication, automation and production,"

(continued on page 12)

DAT goes to Vietnam, as National Public Radio's Flawn Williams (l) and Alex Chadwick (r) test out the Technics SV-MD1 for the network's special on that country.

For details, see Buyers Guide, p. 33.

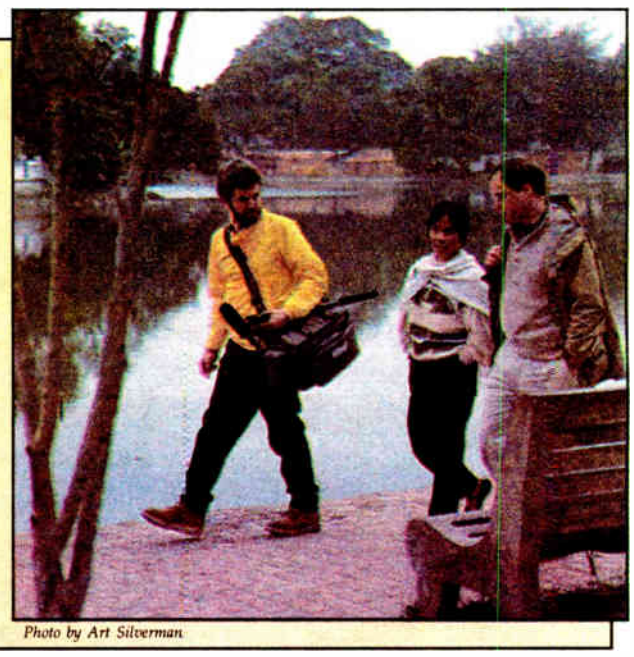

Photo by Art Silverman

VOA Rehab Project Goes Forward

Consoles Have Been Delivered, Although Some Officials Maintain Schedule Can't Be Met

by Charles Taylor

Washington DC ... Voice of America's studio renovation project, drawn out by numerous delays since its start 15 months ago, took a significant step toward first-phase completion with the delivery of 19 audio consoles to a subcontractor in August.

But that still was not expected to allow the project to catch up to a predicted August completion on the first nine of 19 studios scheduled for renovation, according to an official with the National Federation of Federal Employees (NFFE), VOA's technicians' union.

The renovation includes the complete overhaul of 19 broadcast facilities at the agency's headquarters here, many dating back to the 1950s. Included are new electronics and wiring, remodeled studios and an updated heating/air conditioning and electrical system.

Phase one originally was scheduled for completion in May with the entire project finished by January 1989. Setbacks, however, pushed the predicted phase one completion date to August.

But even that was looking doubtful: VOA is in the process of renegotiating a completion date with Jullien Enterprises, one of the project contractors.

According to Gary Marco, president of NFFE Local 1418, any expectation for an August phase one completion was unrealistic.

"September is pushing it," he said. "If they push it, they're going to make a mess of it. I'd say we're looking at October at the earliest."

According to one VOA official interviewed in July, a major reason for the project's lag came from delays in delivery of the 19 audio consoles designed and manufactured by Harrison Systems. But a follow-up discussion with VOA blamed contractor delays instead of any individual supplier.

Claude Hill, VP at Harrison, said the design and manufacturing of the consoles has not been off schedule since the purchase order was approved 24 August 1987. The first console was shipped by Harrison to contractor Jullien Enterprises in Chantilly, VA, 28 June, he said.

The remaining 18 were to be delivered every two weeks through 8 September, Hill said, and were to be stored at Jullien until the VOA studios were ready for their installation.

The custom-designed on-air consoles feature many of the standard features of Harrison's 790 series consoles, including program origination signal technology and APL/Audition Logic Circuitry, which allows the operator to audition inputs without interfering with program or buss assignments to the mixer's control room monitors.

"We're very proud of the product. It was very well thought out by VOA and by the VOA consultants who helped with the design," said Hill. "What we consider special things are elements related to (VOA's) meter requirements, communications and signaling, which the machine represents through various lamps and switches."

Neither VOA nor Harrison would estimate the consoles' value, though Hill said they were manufactured at a profit.

Following delivery, installation of the first nine will ensue in the remodeled studios, according to John Birch, chief of the audio and studio engineering division. When the deliveries will start, however, is up in the air.

"Wiring is complete between the mainframe and the studio blocks. We're now working on wiring between the studio blocks and equipment locations," Birch said. Crews also have begun installation of modular amplifiers and some of the smaller equipment.

But Marco maintained, "They're pretty far along with some of the studios in terms of putting up the wall treatments, ceilings, lights and things like that, but they still have a lot to do overall in terms of finish work."

The agency expects to begin accepting delivery "in the autumn," according to Judy Jameson, a spokesperson at VOA.

For more information, contact Charley White at Harrison, 615-834-1184; Gary Marco at NFFE, 202-472-7029; or VOA at 202-485-8238.

Harris Announces Acquisition of Allied

Melbourne FL ... Harris Corporation announced at the end of August that it has agreed to acquire the radio equipment distribution business of Allied Broadcast Equipment Corp. of Richmond, IN. Terms of the agreement were not disclosed at press time.

Privately-owned Allied Broadcast is the largest US full-line distributor to the international broadcast industry. The acquired business will operate as a new subsidiary of Harris Corp. and be part of Harris' Communications sector under senior VP and sector executive Guy Numann.

Allied founder and chief executive officer, Roy Ridge, will continue as head of the acquired business.

Included in the transaction are Allied's international distribution of radio broadcast products, its radio broadcast satellite operation and commercial printing operation, which specializes in technical publications.

Also included in the agreement is Allied's newly formed systems division which is based in two offices in California and Texas. Allied Telecommunications, serving the custom audio/visual market, is not included.

The two companies have been working under a joint sales agreement for the past year and a half. That agreement allowed Allied and Harris to sell equipment from both companies.

The acquisition increases Harris' sales coverage to the broadcast industry with the addition of Allied sales offices in Richmond, IN; Los Angeles and Newport Beach, CA; Atlanta; Chicago; Dallas and College Station, TX; and Toronto, Canada.

According to Numann, the acquisition of Allied allows Harris to "further demonstrate our commitment to the industry" and to "continue to grow in the broadcast market both domestically and internationally."

According to Ridge, "the combination of Harris and Allied will provide the largest single source of radio broadcast equipment and services in the industry."

TTC Buys Jampro

Louisville CO ... Television Technology Corp. (TTC), a manufacturer of television and radio transmitters, has reached an agreement in principle to purchase Jampro Antennas Inc. of Sacramento, CA.

The purchase agreement announced 22 August was expected to be finalized in October or November, said TTC President William Kitchen.

According to TTC, the company has agreed to pay $1 million cash to Jampro stockholders within six months of the signing of the purchase agreement. TCC placed $2 million in seven year subordinated convertible notes to finance the purchase, TTC stated. The proceeds of the financing in excess of the purchase price will be used to finance research and development, reduce current bank borrowings and other general corporate purposes, the company explained.

Kitchen said the acquisition of Jampro would enhance TTC marketing effectiveness in the worldwide broadcast products industry and increase p rofitability by permitting TTC to hold the full manufacturing profit of anntennas and related radio energy handling systems previously purchased from OEM vendors.

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FCC Filings Cite NAB AM Studies

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found variations of desired protection with the type of AM programming format, indicating that the Commission should not establish "as a matter of allocation policy" a co-channel protection that varies depending on station format. The group suggested a national co-channel protection standard is warranted.

The Association for Broadcast Engineering Standards (ABES) recognized the B. Angell finding that the present level of "listener expectation" is a desired-to-undesired ratio of 26 dB where narrowband receivers are used, but as much as 40 dB where wideband receivers are used.

ABES also pointed out that the Klein report, as well as the Angell study, made clear that reception quality depends on adjacent channel interference protection as well as co-channel protection.

Quoting the Klein report, "Existing protection ratios are entirely inadequate to prevent adjacent-channel interference, even with today's narrowband receivers. New protection ratios can be calculated that will reflect present and future technical parameters such as the NRSC audio standard."

Protection ratios

Continuing on the findings of B. Angell, Capital Cities/ABC, which owns and operates radio networks and 11 AMs, recognized that a 40 dB signal to interference ratio is necessary for acceptable talk radio reception, as stated in the Angell study.

While generally supporting the findings of the Klein report, the Clear Channel Broadcasting Service (CCBS), an association of Class I clear channel stations, cautioned against relying totally on those findings for atmospheric and man-made noise because it may be based on too general conclusions.

WGN Continental Broadcasting, licensee of WGN in Chicago, drew attention to the Klein conclusion that noted the RSS 50% exclusion rule—and adjacent channel protection requirements—are "grossly inadequate."

"The report makes a clear case that, at the very least, protection levels should be raised with regard to future facilities modifications of new stations, including the co-channel and adjacent channel groundwave, adjacent channel skywave and RSS exclusion standards," WGN Continental stated.

WGN Continental also said the B. Angell findings underscore the findings in the Klein report that greater protection of AM stations is needed.

The group wrote, "The B. Angell study shows that the public is willing to accept less interference than it may have in the past, while, at the same time, as the Klein report demonstrates, the present AM assignment rules and technical standards continue to allow additional interference."

For information on Docket 87-267, contact Wilson LaFollette at the FCC, 202-632-5414.

Relaxed Skywave Plan Nixed

by Alan Carter

Washington DC ... Proposals by Crawford Broadcasting to eliminate secondary skywave service and reduce groundwave protection were critized extensively in the latest round of filings on the AM technical review before the FCC.

Crawford, a group owner of six stations including KPBC-AM, Dallas, and KRBT-AM, Avalon, CA, in comments filed in June on Docket 87-267 called for deletion of protection to secondary skywave service areas of clear channel stations and use of 50% rather than 10% skywave field in the determination of skywave interference.

The broadcast group also suggested modification of the normally protected contour for AM stations from 0.5 mV/m to 2 mV/m both day and night.

But in reply comments due 15 August, a majority of broadcasters, many of whom own clear channel stations with strong skywave service, noted their opposition to the proposals.

Most notably, CBS Inc. focused a significant portion of its comments on Crawford stating its "strong exception."

CBS said Crawford's position on lessening protection standards is "diametrically opposed" to a majority of commenting broadcasters who urged retention or increases of present protection standards.

The network continued by claiming that Crawford "totally ignores" the ability of the AM signal to provide reliable wide-area service and instead seeks to treat AM stations as if they were FM stations.

"However, as pointed out by various parties filing comments, the ability of Class I, Class II and certain regional Class III stations to provide wide-area service can be likened to a valuable public resource that must be preserved, particularly if AM is to be competitive with FM," CBS stated.

In the area of reducing AM skywave service, CBS said commenters proved that secondary service of clear channel stations, if destroyed, would cause a loss of relied-upon nighttime service for large areas and populations—losses that Crawford failed to calculate. CBS estimated it to be "millions of persons."

The Association for Broadcast Engineering Standards (ABES) also argued against Crawford's proposal to reduce skywave service and groundwave protection. "Such a regime would make AM

(continued on page 15)

Mile High Convention for SBE

by Judith Gross

Falls Church VA ... Heading off to the Rockies for the **SBE show** next week, right after the hoopla of the NAB's radio bash across the Potomac in DC—a whirlwind few weeks **chock fulla radio.**

Denver's the one place where even engineers can say they're **"high"** legitimately, since the city is a mile up.

The SBE has a full slate of seminars planned, including a few unique sessions on such things as contract engineering and the use of computers.

It will also be interesting to check out some of the "Night Owl" discussions, including one on **management for engineers.** SBE is now including questions on management on its exam for advanced accreditation—another sign of the times.

I believe it was **Margaret Bryant,** now at WMAQ in the Windy City for Group W, but at the time a colleague of mine in beautiful downtown **Binghamton, NY** (the site of the very first SBE chapter in the country, by the way) who shook her head and told me most emphatically that radio engineers had better begin looking toward the future and **thinking more like managers.**

Some four or five years later her words have turned out to be **prophetic** and the SBE is smart to realize it as well.

Anyway, it's nice to see an organization put on a show and give a darn about exhibitors, for a refreshing change. The breakdown of events at the show includes some **25 hours of seminar** time and **22 hours of exhibit** time with only six hours overlap between the two. Now *that's* what I call planning.

☆☆☆

Well, nearly three years and reams and reams of paperwork later ... the **last Docket 80-90 window** closed on 25 August. There were 45 filing windows in total; the first one closed on 15 November back in '85.

The FCC reports that **thousands of applications** for new CPs were filed, not to mention the thousands of existing FMs who filed for upgrades. And Larry Eads in the MMB also told me that while intially the processing was behind schedule, at the finish the Commission actually managed to come out **18 months ahead** of schedule in getting the paperwork done.

The result? Well there were **689** cities where **new FMs** were to have been assigned. With the new stations and the upgrades, hopefully it's **better radio** for the listening public. After all, think of all the trees that died to make those thousands of applications possible.

The FCC hasn't tallied up the exact number of CPs issued, or the upgrades. But they aren't going to be able to sit back and take it easy yet, either. Now it's on to the **expanded AM band** ...

☆☆☆

Scandal pays off, at least on the airwaves, it seems. **Jessica Hahn,** religious secretary, Playboy playmate and the downfall of defrocked PTL leader Jim Bakker is the latest entrant into the **world of radio.**

The former church secretary will be joining the Morning Zoo at **Y-95 in Phoenix,** where male listeners will have to use their minds instead of their eyes to appreciate her charms.

Come to think of it, this could start a whole new trend of radio shows for ladies of scandal. Can you imagine the most requested song for each one?

For **Hahn** it would have to be Dusty Springfield's hit *Son of A Preacher Man.* If **Fawn Hall,** the Pentagon femme fatale who helped **Ollie North** shred those documents got her own radio show, it would be the Dave Clark Five's *Bits and Pieces.* And if **Donna Rice,** Gary Hart's, um, friend, got a morning show of her own the featured song would have to be Elvis' *Heartbreak Hotel* ... or is that "Hart-break?"

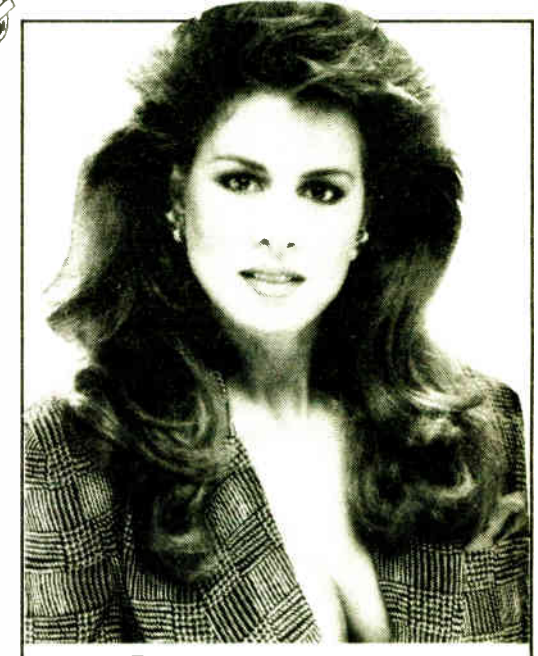
Breaking a long and baffling silence on **AM stereo,** the NAB finally decided to address the issue in its weekly radio member newsletter, with a story about AMers' frustration in **letting listeners know** that there are stereo radios out there.

Nice of them to notice. But why exhort AMers to undertake "an intense campaign directed at manufacturers etc ...?" Why not show instead of tell? Why doesn't NAB show up with a booth or a **campaign of its own** at the CES show to talk directly with the manufacturers about the **future of AM,** stereo or otherwise?

And why hasn't the NAB included AM stereo as part of its work with the NRSC and as part of its **AM improvement** efforts and comments, which to date have carefully skirted AM's **six-letter four-letter word** and addressed everything but ... ?

Heard of lots of stations who have gotten creative in a pinch over the years, including the first station I ever worked at where the nighttime DJ **bailed out of a fire** to the sound of live sirens from the window adjacent to the control room.

But New York's **WXRK** got "hot"—literally, when a fire hit the **Empire State Building** a few weeks back and knocked 11 FMs off the air for awhile. The station came back on with **"Disaster Request"** radio—you know, songs like Deep Purple's *Smoke On The Water.* That's one time when all of the city's FMs really sizzled.



Jessica—Taming the Morning Zoo?

Had the pleasure of chatting with some radio engineers and technicians from places as far afield as **Sri Lanka and Sierre Leone** recently. It was all part of a special training program from the US Telecommunications Training Institute.

They found my chat on **digital effects and processing** interesting, mainly because such mainstays of our own radio sound aren't used in their countries. So it was kinda hard to explain what **"flanging"** is ...

Oh, yes. Almost forgot. Late word just before the shows started has a **competitively-spirited give-away** from cartridge maker **Audiopak.** I've told you how **Fidelipac** is giving away trips to **Hamburg** for next year's European AES with the purchase of three Dynamax players and one recorder.

Well, Audiopak decided to get in the spirit of things by giving away maps. Yes. Of Hamburg.

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.*

OPINION

Readers' Forum

If you have comments for *Radio World*, call us at 800-336-3045 or send a letter to Readers' Forum (Radio World, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776). All letters received become the property of Radio World, to be used at our discretion and as space permits.

The last word

Dear RW:

Had Rob Meuser called or written to me as so many of you have, he certainly would have had less reason to question my understanding (see RW 15 August, *Guest Editorial*).

To state the facts succinctly:

The Kahn ISSB system is compatible with reduced carrier operations and synchronous detection.

Tests made by me and the ABC Broadcast Operations and Engineering Division RF department on a TUX 1000 Sansui synchronous detector AM tuner which was given to ABC by its designer Mr. Takahashi indicated that even with the pre-distortion placed on the signal for envelope detector compatibility the signal was completely "listenable."

Measurements confirmed precisely what theory prdicted. Such reception caused about 10% **even order** harmonic distrotion. Odd order distortion was not significantly affected.

As a real world engineer I am aware that this amount of even order distortion is common in vinyl records and is the main reason for the warmth of their sound. Companies such as Aphex build processors which purposely add even order products!

The problem is that envelope detector radios are not compatible with carrier free transmissions. The decision to drop carrier levels below more than a small amount would make present AM radios obsolete.

I continue to believe that as AM audience levels continue to drop . . . that is what is occurring anyway.

The fact that Kahn-Hazeltine ISSB does provide compatibility with synchronous receivers allows manufacturers to make new generation radios which will only improve when the carrier is removed and pre-distortion eliminated.

Robert L. Deitsch, DE
WCSX/WHND, Greater Media
Detroit, MI

Editor's note: **RW** *is going to let Rob and Bob, and any other AM stereo advocates of one system or the other duke it our on their own turf and time from now on.*

The questions which won't go away still are: where are the radios? What system are they? Does stereo even matter as AM continues to struggle for its life?

The impasse over stereo is pretty moot if the decline of AM listeners continues. Isn't it time the industry put some effort behind a **unified** *effort to help AM? Who's going to take the first step?*

More mountain tales

Dear **RW**:

I read with interest Tim McCartney's "Maintaining A Mountain Site." Good article, but the title missed the target.

Many of us in charge of Rocky Mountain transmitter and translator sites can empathise with Tim's slogging through snow. Or with lack of water. Or with difficulties in transporting ungainly equipment.

I myself have had to trudge 5½ miles on snowshoes when the powder was too deep for any snowmobile, and the only available snowcat was tied up evacuating stranded motorists—at ten o'clock at night. (If you're in a hurry, you strap on the crampons and ice axe and go straight up the north face of the mountain!)

Tim's right; with the closest reliable source of water an elk-tainted spring two miles downhill, the Coleman stove does come in handy to melt snow. I've gone a step further and developed a snow-melter utilizing transmitter exhaust—even gives me a nice hot shower. But bring your own liquid in the summer!

By the same token, I'll never forget the time I had to secure a 3CX15000A7, with all its bulky packing components, to my back and cross-country ski to the immediate base of the site and then slog through waist-deep snow up the 30° slope.

Or when I belted down a repaired blower motor to a sled and played draft horse for a couple of miles.

But I expected the article to at least hit some of the maintenance and engineering problems experienced in high-altitude, remote site situations.

At 8000' elevation the poor blowers gasp for breath. Pine tree pollen and minute dust particles sneak into an 'air-tight' building and coat everything.

The hot southwest sun beats mercilessly down on the world and bakes and cracks everything and makes surfaces and interiors very hot.

A ton of other problems need to be addressed: How do you anchor guy wires sufficiently in shale? What precautions do you need to take being out on the far end of a remote power line?

How should you maintain your access road? What construction should your building be? What should it be painted? What should the roof be? What sort of emergency provisions should you maintain at the site? What kind of maintenance schedule should you have for this area's two seasons—hot and cold?

Tim is right, though. After an all-nighter, stepping out of our building into the crisp Colorado dawn and greeting the 14,000 foot peaks of the mighty San Juans makes it all worthwhile.

Bruce Anderson, Manager of Operations
KIQX Radio
Durango CO

A better ground loop

Dear **RW**:

I found the article by Bill Higgs (15 July RW) regarding ground loops in control circuits most interesting, but there is an easier way to eliminate the problem altogether.

Higgs shows the cart machine ground being used as the shield on the input line to the console. This would be the major source of any ground loop effects introduced in the circuit.

When wiring a control room, the console ground is king! Stated another way, it makes more sense to use the *input* end of the shield in the example circuit.

Forget the ground strap and let the machine ground "float." As the only reference to ground will be the console ground, most problems would be eliminated.

I've wired many control rooms over the years and I've found time and time again that the input side of any piece of gear should carry the appropriate shield. The input ground is where noise is received.

It just makes good sense to ground only on the input side of any broadcast circuit. This has never failed me, whether using balanced, unbalanced or high impedance bridging units.

Of course, there are those who would disagree. But I believe more problems are caused by trying to connect many different ground points together than by just using ground on the input side.

Richard W. Irwin, Operations Manager
KSAC-AM
Sacramento, CA

Radio World

Vol 12, No 18 September 15, 1988

Publisher: Stevan B. Dana
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Production Dept: Jean Barnes, Mgr.
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Radio World (ISSN: 0274-8541) is published semimonthly by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone: 703-998-7600. Application to mail at second-class postage rates is pending at Falls Church VA 22041 and additional mailing offices. POSTMASTER: Send 3579 forms and address changes to Radio World P.O. Box 1214, Falls Church VA 22041.

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Building On SBE's Success

The SBE national convention, in its third year, is showing every sign of becoming a major industry trade show.

Attracted by the opportunity to reach mainly engineers, increasing numbers of exhibitors continue to support the convention.

In addition to more companies exhibiting this year, exhibit hall hours have been increased and the convention has also benefitted from the hiring of professional show management.

Unfortunately some hasty scheduling placed this year's SBE show within a week of the NAB's Radio '88, forcing some attendees as well as exhibitors to choose between the two.

The SBE managed to turn potential disaster into an advantage by offering special arrangements for those exhibitors wishing to send their booths directly from Radio '88 to the SBE show.

It also saw the wisdom in establishing an exhibitors advisory committee to avoid future problems of this type.

But while the fledgling convention appears to be thriving there are still some crucial caveats for its organizers to keep in mind.

Fall remains a highly competitive time for industry shows and several regional SBE shows are still being held in addition to the national convention.

The SBE convention, still in its infancy, can't afford even small mistakes if it is to continue to grow.

The midwest location of the last two shows worked in the SBE's favor and it remains to be seen if this year's Denver site and future locales will help or hinder.

But perhaps the greatest challenge will come from the changing nature of engineering in the radio industry itself.

As the role of engineers shifts, the SBE has wisely begun to focus more on engineering management. Whether the SBE can continue to grow will depend on its ability to adapt to new realities.

Strong industry support for the national convention is a good sign, but ultimately the fall show will only be as healthy as the SBE organization and the segment of the industry it represents.

—RW

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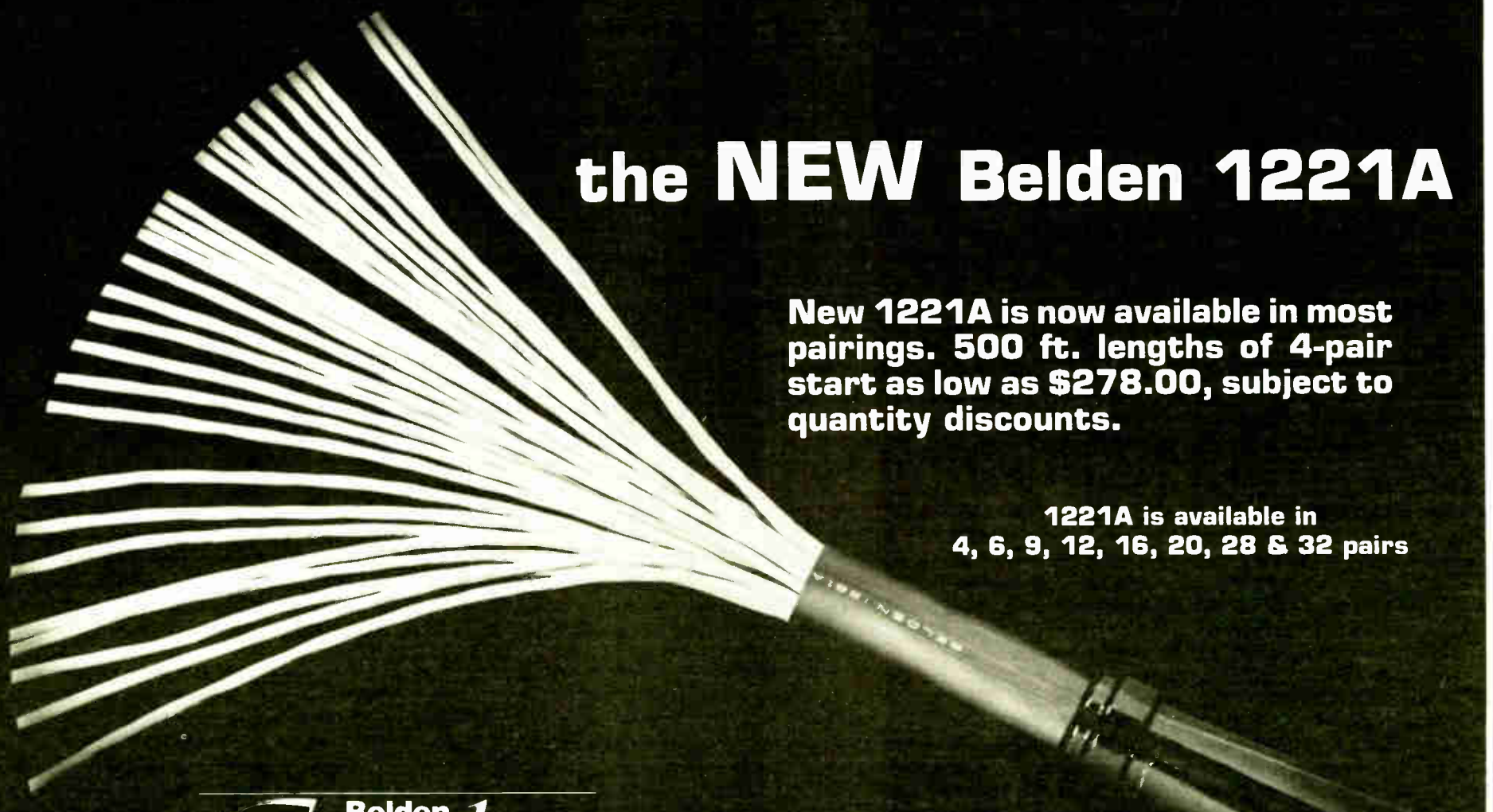

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SPECIFICATIONS

22 AWG tinned copper -
28 individually shielded pairs, each with 22 AWG stranded tinned copper drain wire, each individual PVC jacketed, overall PVC jacketed
Nom. Capacitance between Conductors of Pair @ 1 kHz = 34 pf/ft
Nom. Capacitance Conductor to Shield @ 1 kHz* = 67 pf/ft
Nom. Inductance of Pairs = 0.18 uh/ft
Nom. Conductor DC Resistance @ 20°C = 16 ohms/1000 ft.
Nom. Shield DC Resistance @ 20°C = 14 ohms/1000 ft.
Temperature Rating — -20°C to +60°C
Insulation Material — Polypropylene
*One conductor to other conductors and shield

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Tech Sessions Highlight SBE '88

by Alan Carter

Indianapolis IN ... Topics covering the spectrum of AM and FM headline engineering sessions at this year's third annual Society of Broadcast Engineers (SBE) national convention.

The convention will be held in Denver 22-25 September, with sessions each of those days and exhibits open 23-25 September.

"We are about the only source that individual broadcast engineers have to keep themselves up to date on the practical aspects of their profession," said SBE Executive Director Andy Butler, WFAN-AM engineering director. "That's our basic framework in planning our convention."

Sessions are divided into two categories, Butler explained. Daytime seminars are in a lecture format, and evening presentations are round tables where broadcasters can obtain "shirt-sleeve useful information," he said.

Of particular interest on 25 September are sessions focusing on the FCC, Butler pointed out.

Mass Media Bureau Chief Alex Felker will address a noon engineering luncheon. Also in the afternoon, the FCC's John Reiser of Washington, DC, and Dennis Carlton, of the agency's Denver office, will lead a question and answer session on implementing FCC rules.

Another session will be led by Wallace Johnson on standards-making efforts of the Association of Broadcast Engineering Standards (ABES).

Bulter noted that in organizing this year's convention, planners tried to keep the overlap between the exhibit hours and sessions to a minimum. There are 25.5 hours of seminars and 22 hours of exhibit time, with only six hours of overlap.

Session topics include use of the expanded AM band (1605-1705 kHz), led by D.R. Ford, communications authority of Canada; transmission of high-speed facsimile over a subcarrier by Harold Walker of Pegasus Data Systems; and application of microcomputers to the directional antenna by consultant Tom Osenkowsky.

Other topics are FM directional antennas, by Ralph Evans, a consulting engineer; digital AM technology, by Ron Frillman of Harris Corp.; and use of FM boosters by Kinley Jones of Omega International.

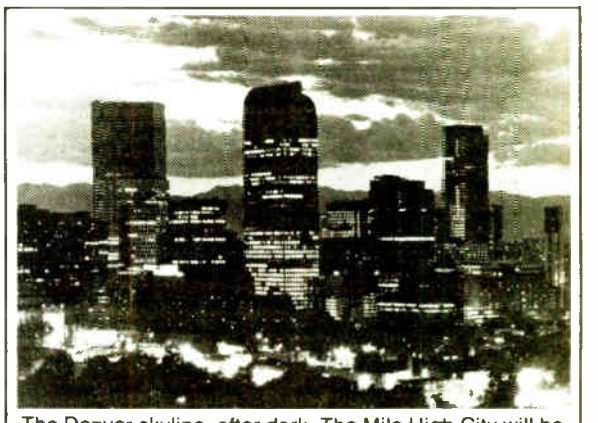
NAB Science and Technology VP Michael Rau will make a presentation on projects underway by the association on AM improvements and FMX.

Some of the panel discussions will address changing technology demands on engineering education, the NRSC standard and the state of contract engineering.

On the exhibit floor, Butler said broadcasters should find new digital products and new and improved analog equipment highlighted.

If registration continues at the ongoing rate, the number of exhibits and size of the exhibit space should be about a third larger than in 1987, Butler estimated.

For information on the SBE convention, call 303-989-8648.



The Denver skyline, after dark. The Mile High City will be host to :his year's SBE convention.

Trade Show Focuses on Digital

Indianapolis IN ... With approximately 170 exhibitors registered for the 1988 Society of Broadcast Engineers national convention, an array of new and established products—many of which are digital—will be on the floor.

The convention, which runs 22-25 September in Denver, will be held at the city's convention center. Exhibits are open 10 AM to 7 PM, 23 September; 10 AM to 6 PM, 24 September; and 9 AM to noon, 25 September.

Among the products that exhibitors plan to show are "professional" DAT players and some equipment that was introduced in prototype form at the 1988 NAB spring show, according to a random survey of manufacturers and distributors.

DAT

Response from equipment exhibitors to the SBE show continues to be positive because the show is aimed at engineers. Because it falls within a week of the NAB's Radio '88, some equipment vendors decided to forego the NAB show, which also attracts managers and programmers.

Others, however, took advantage of special arrangements worked out by the SBE to ship booths and equipment directly from the Washington, DC site of Radio '88 to Denver.

Response from equipment exhibitors to the SBE show continues to be positive because the show is aimed at engineers.

As with Radio '88, digital technology continues to be a big attraction for the convention.

Broadcast Supply West (BSW) will show the new Panasonic DAT recorder than it had in prototype at the NAB convention, according to marketing VP Tim Schwieger. BSW also will display the Sony professional DAT machine that debuted at the 1987 NAB show.

Other products from BSW will be a demonstration of Broadcast Devices' Rightrack audio phase corrector, model APC-200. Also, the company will show Broadcast Tools' SMI (Studio Monitor Interface), what Schwieger described as an inexpensive intercom system for radio.

Schwieger said BSW feels "positive" about the 1988 SBE. He also noted the company expected a larger attendance from the West Coast since the show is in Denver.

Console manufacturers will also be represented in force at the SBE show. Wheatstone will show four new products, according to President Gary Snow.

The company will have a new version of the A500 air console—the A500-as. Building on the company's A500, Snow said it includes features that can sequentially trigger cart machines and an optional VCA modular control.

Another product new to SBE will be the A20 console that Wheatstone premiered at NAB '88. It is a smaller format air console intended for small stations and news production areas.

The company also will display an enhanced version SP6 8-track production console that has new modules allowing multi- and 2-track mixing.

More debuts

Brand new at the SBE 88 from Wheatstone will be the SDA 82-A distribution amplifier. It is a single mount DA with eight stereo outputs, each with individually trimmable gain controls.

This is the second year Wheatstone has exhibited at the national SBE. "The thing that we like about SBE is it is just engineers, so the people who show up at a booth know what they're really looking at," Snow said.

Another console maker, Arrakis, will highlight several products including the 10,000 Series on-air multitrack console, according to VP Clarence Palmer.

Also at the booth will be the SC Turbo Series, Modulux Supreme furniture and Arrakis will demonstrate the Modulink complete furniture system.

CDs

Studer Revox will feature new products including the Studer A730 professional CD player, which allows direct access to track and index, minutes, seconds, frames as well as to elapsed and remaining track time, according to Charles Conte, public relations manager.

The A730's disc recognition feature has

(continued on page 8)

SBE Radio Equipment Exhibitors

ADC Telecommunications Inc.
Advanced Micro-Dynamics Inc.
Allied Broadcast Equipment
Allied Tower Company Inc.
Alpha Audio
Alpha Wire Corp.
Altronic Research Inc.
Amperex Electronic Corp.
Andrew Corp.
Arcor Wire & Cable
Arrakis Systems Inc.
ATI-Audio Technologies Inc.
Audio Accessories Inc.
Audio Precision Inc.
Audiopak Inc.
Autogram Corp.
Bogner Broadcast Equipment
Bradley Broadcast Sales
Broadcast Audio Corp.
Broadcast Communications Syst.
Broadcast Electronics Inc.
Broadcast Rentals & Sales
Broadcasters General Store Inc.
BSW/Broadcast Supply West
CESCO (Comm. Equip.& Serv. Corp.)
Circuit Research Labs Inc.
CompuSonics
Comrex Corp.
Continental Electronics
Cortana Corp.
Crouse-Kimzey Co.
Current Technology Inc.
Dataworld
Delta Electronics Inc.
Dielectric Communications
Dolby Laboratories Inc.
Econco Broadcast Service
EEV Inc.
EG & G Inc.
Electro-Voice Inc.
Fidelipac Corp.
Flash Technology Corp.
Gentner Electronics Corp.
Harris Corp.
Harrison Systems Inc.
HM Electronics Inc.
Holaday Industrys Inc.
Howe Technologies Corp.
Hughey & Phillips Inc.
Ice Krackers Inc.
International Tapetronics/3M
Jampro Antennas Inc.
Kintek Inc.
Kintronic Labs Inc.
LDL Communications Inc.
Lightning Eliminators & Consults.
LPB Inc.
Lyncole/XIT Grounding
Marti Electronics
McCurdy Radio Industries
Media Touch Systems Inc.
Modulation Sciences Inc.
Moseley Assoc. Inc.
Motorola AM Stereo
Omega International .
Otari Corporations
Pacific Radio Electronics Inc.
Pacific Recorders & Engineering
Potomac Instruments Inc.
QEI Corporation
Radio Design Labs
Radio Resources
Radio Systems Inc.
Ram Broadcast Systems
RF Specialties Group
Rohn
Scala Electronic Corp.
Shively Labs
Shure
Sony Corporation of America
Sound Technology
Sprague Magnetics Inc.
Studer Revox America
Tascam
Television Technology Corp.
TFT Inc.
Utility Tower Co.
Wheatstone Corp.

Digital Trend at SBE

(continued from page 7)

a non-volatile memory for up to 100 CDs. A directly accessible cue memory stores up to three start cue points for each CD, and it plays 3" CDs without an adapter.

The company also will debut the Revox C270 series of professional recorders: C270 ¼" 2-channel recorder for broadcast, on-air and production applications; the C274 ¼" 4-channel and C278 ½" 8-channel recorder for multitrack and video post-production applications and special low-speed versions for low speed and logging applications.

Other new Studer Revox products include the Studer A807 VUK high speed 2-track professional recorder for use in recording studios and for general high performance applications, specifically meant for console mounting with overbridge metering.

Another new product from Studer Revox will be the ReVox PR99 MKIII professional recorder, with features different from the MKII, including a new push-button power switch, no self-sync and line inputs only.

Transmitter manufacturers QEI will show products including the 675 and 695 exciters. The company also will highlight the 150 W, 300 W and 500 W low power transmitter and the 10 K transmitter.

QEI said it has "a couple other things in the fire" that the company is preparing for exhibit.

At TFT, among the products on display will be a second generation prototype remote pick-up unit (RPU), according to Marketing Director Jesse Maxenchs. The unit includes suggestions made by engineers when the company displayed a prototype at the 1988 NAB show.

Bradley Broadcast will show the balance of the Telos 100 digital telephone system, which includes a key interface system, switch consoles and software for use with Apple Macintosh.

Gentner Electronics will display the EFT3000, 3-line frequency extender that uses digital signal processing to give 7.5 kHz on three dial-up remote lines, according to Gary Crowder, director of marketing and sales for the broadcast audio division.

The company also will have a new 3.0 version of the VRC1000 voice remote control for transmitters, and it will be showing the EasyTerm prewired patch panel.

For more information, call Tim Schwieger at 206-565-2301; Gary Snow at 315-455-7740; Clarence Palmer at 303-224-2248; Charles Conte at 615-254-5651; QEI at 609-728-2020, Jesse Maxenchs at 408-727-7272, Neil Glassman at 301-948-0650, and Gary Crowder at 801-268-1117.

SBE Highlights of Radio Engineering Sessions

Thursday, September 22

Morning Session	
10:00 AM	Conference Opening and Welcome
10:20 AM	Facts About Fax
11:00 AM	Protecting Against Power Line Disturbances
11:30 AM	The Computer's Place in Broadcast Engineering
12:00 PM	The Application of Microcomputers to the Directional Antenna
Afternoon Session	
1:30 PM	NAB Project Update
2:00 PM	Using the Expanded AM Band
2:30 PM	Engineering Education for the Broadcast Engineer (panel discussion)
4:00 PM	SBE National Membership Meeting
5:00-7:00 PM	Attendee Reception in Exhibit Hall
Night Owl Session	
7:00-9:00 PM	Audio Processing and the NRSC (panel discussion)

Friday, September 23

Morning Session	
8:00-10:00 AM	Television Sessions
10:00 AM-7:00 PM	Exhibit Floor Open
1:00 PM	SBE Certification Exam, Radio
Afternoon Session	
1:00-4:00 PM	Television Sessions
Night Owl Session	
7:00-9:00 PM	Management For Engineers (group discussion)

Saturday, September 24

Morning Session	
8:00 AM	FM Directional Antennas
8:30 AM	Visualizing Antenna Fields
9:00 AM	FM Licensing Update
9:30 AM	Avoiding Problems With DA Proofs
10:00 AM-6:00 PM	Exhibit Floor Open
Afternoon Session	
1:00 PM	Digital AM Technology
2:00 PM	On-Frequency Retransmission of FM Signals
2:30 PM	The State of Contract Engineering (panel discussion)
6:00 PM	Ham Radio Reception
Night Owl Session	
7:00-9:00 PM	Care and Feeding of Directional Antennas (panel discussion)

Sunday, September 25

Morning Session	
8:00 AM	Frequency Coordination Update
9:00 AM-12:00 PM	Exhibit Hall Open
12:00 PM	Engineering Luncheon - Featured Speaker Alex Felker, Chief MMB, FCC
Afternoon Session	
1:30 PM	ABES Status Report
2:30 PM	Making and Implementing FCC Rules
3:30 PM	Good-Bye

Consult SBE for full schedule and changes

Criticisms Top Translator Filings

by Charles Taylor

Washington DC ... Organizations concerned about the effects of translators on full-power stations presented the FCC with a thick stack of opinions in recently filed comments on the issue.

The filings came in response to a 15 August comment deadline on the Commission's Notice of Inquiry regarding Docket 88-140, which aims to "study the role of FM translators in radio broadcast service," according to the document.

Specifically, the Notice, released 2 June 1988, solicits comment on first, the concern that relaxation of translator rules would lead to "spectrum inefficiency" because the amount of spectrum required for multiple translators to duplicate the coverage area and the signal quality of a full-power FM station exceeds that of a full-power station.

The FCC also wondered if added competition from the licensing of new translators might financially harm or displace existing full-power stations and impede the licensing of new full-power stations.

Finally, the Commission sought opinions on whether translator licensees should have to maintain their own studios and to provide locally oriented programming as full-power stations do.

Most groups responding had serious reservations about various ramifications of the FCC's proposals.

Foremost was the NAB, which objected to every proposal in the Commission's notice.

"Today, the FM translator service is undergoing a metamorphosis into an entirely different communications medium," the NAB said. "The Commission should act decisively in rejecting all proposals to increase origination limits, power limits and to permit alternative signal delivery methods.

"We urge the FCC to craft a rule which places the burden on the translator applicant to demonstrate a need for the FM translator. Where the area to be served is currently unserved, the burden would be met instantly," it wrote.

The NAB also critized the FCC's willingness to "open up a Pandora's Box' by creating what it called a separate low-power FM service, as well its proposal to allow power increases for translators. The NAB also opposed allowing translators to originate programming.

"The Commission would be sliding down the slippery slope toward translators requesting unlimited origination status," the NAB stressed. "Translators should not be allowed to accept commercial advertisements or in any way to make a profit."

Finally, the NAB voiced its opinion that the use of alternative signal delivery, including satellite and terrestrial microwave transmission, should not be permitted.

These would allow distant signal stations to "erode the economic base of existing full-service stations attempting to serve their community of license with issue/responsive programming," said the NAB.

"Translators should not be allowed . . . in any way to make a profit."

A few respondents, however, heartily supported relaxing translator regulations.

Comments filed by the Bureau of Economics of the Federal Trade Commission (FTC) directly contrasted the NAB. The agency enthusiastically encouraged increased station competition.

Granting increased flexibility in the use of translators might benefit consumers by permitting greater competition "for the patronage of listeners and the development of additional listening options for consumers," wrote the FTC.

More specialized programming

Current rules prohibit translators from originating programs and full-power FM stations from obtaining translator licenses if the translator would compete with another full-power station, the agency noted.

Relaxation of such rules might raise the probability that highly valued but normally less profitable formats will be aired, said the FTC. "In a more relaxed regulatory environment, translators may be more likely to offer specialized programming by locating in those areas in which listeners who prefer a distinct format are concentrated geographically."

Regarding the Commission's concern that relaxed issuance of translator licenses might lead to inefficient spectrum use, the FTC supported the view that consumers would best benefit from "a policy that relies not on regulation, but on the interaction of advertisers and radio station owners to determine the kind and amount of programming provided listeners.

"A policy that permits the market to determine the mix of full-power stations and translators as well as the mix of program formats may yield greater consumer benefits than one which protects full-power stations from economic harm," the FTC wrote.

Encourages program variety

Finally, the Commission concern that the lower cost of operating a translator might encourage prospective station owners to operate translators rather than full-power stations was disputed by the FTC.

"In deciding whether to impose on translators the same public interest obligations borne by full-power stations, the FCC might wish to weigh the loss in program variety against the gains in eliminating the artificial incentive to select translator technology," the FTC said.

National Public Radio (NPR) also filed comments, once again stressing that no rules should alter radio's concentration on serving local needs.

NPR implored the FCC to require translator applicants to "make a showing which demonstrates a nexus to the community served by the translator. "Networks of translators owned by an individual or organization should be discouraged since they have no real relationship to the listening public and are not likely to meet the purposes of localism," said NPR.

The organization also said that current FM translator rules do not adequately protect full-service stations from interference.

A filing from Athens Broadcasting Co., licensee of full-power WZYP in Athens, AL, supported that view with examples of problems the company has had from a competitor's FM translator.

Translator degrades coverage

Athens said that operation of a translator on the third adjacent channel to WZYP "significantly degrades the coverage of WZYP. Thus, rather than providing a supplementary fill-in service, (the) translator serves to limit the local coverage that the community would otherwise receive.

"Being forced to compete with FM translators bringing in big market stations has serious economic implications for WZYP," it added. The company "requests that the Commission act to restrict

(continued on page 15)

Sports Network Plan Strikes Out

by Charles Taylor

Baltimore MD ... Following a calamitous contract as network owner of Baltimore Orioles' games and an equally unfortunate attempt to make flagship station WCBM-AM fill an all-sports niche, a once-potent radio entrepreneur has been left standing at home plate without a bat.

Two inventive ideas with two bold game plans both were struck down by the powers of competition and ill-timing, forcing Ellek Seymour, the navigator of both, out of the market and into debt.

Today, Orioles rights are controlled by a Washington, DC, AM after team officials cited Seymour for breach of contract.

WCBM, meanwhile, went dark in May, and is working its way through the process of receivership, in which a failed station is taken from the owner and assigned a lawyer who arranges for just enough money and resources to return the station to the air, and then offers it for sale. The law requires that a station must be on the air before it can be sold.

The goal for WCBM was to return to the air by 15 September, according to Bennett Gilbert Gaines, a partner with Adelberg, Rudow, Dorf, Hendler & Sameth in Baltimore and the lawyer overseeing the station's receivership.

"This is a very short-term step just to get something credible on the air," Gaines said.

For Seymour, who did not return a string of phone calls, the circumstances mark a humiliating finish to an ambitious effort that endured more than a decade.

Ambitious beginnings

In 1986, media conglomerate Metromedia Inc., which owned WCBM, was in the process of being liquidated, and sold nine radio stations and a Texas network as a package. It did not include WCBM in the deal, because the station was suffering through poor ratings with its middle-of-the-road format.

The station seemed appealing, however, to Ellek Seymour, once a radio ad salesman and at that time the owner of Resorts Broadcasters, which was actively putting together a string of AM and FM properties in the mid-Atlantic region. Within the 12 months ending in April 1986, Seymour had bought 22 stations.

His theory, according to Tyree Ford, a Baltimore freelance writer has who followed the issue, was to acquire properties in highly leveraged deals, make improvements, then sell out at a healthy profit to another round of buyers.

Seymour paid Metromedia owner John Kluge $500,000 for the station, and received a $2 million loan from the company. In return, Kluge obtained a lien on

(continued on page 17)

Blaze Knocks NY FMs Off Air

by Alan Carter

New York NY ... A fire 12 August in the Empire State Building knocked off 11 FM stations for a portion or all of that afternoon and forced them to operate several days at reduced power.

Stations affected by the blaze that started in a shaft between the 86th and 87th floors were WBLS, WLTW, WNSR, WNCN, WNEW, WHTZ, WBAI, WRKS, WEVD, WQXR and WXRK. The stations are on a master antenna. WHTZ and WNEW were knocked off but came back on immediately when they switched to back-up antennas. The other stations were off for approximately four and one-half hours.

WCBS, which operates on a separate antenna from the 11, had to switch to a back-up antenna because its transmission line was in the shaft where the fire took place. WCBS was able to operate on back-up without reducing power.

The fire, which at press time in late August was of an undetermined origin, broke out shortly before 1:30 PM in a shaft where the stations' flexible transmission lines run to the 103rd floor to the master antenna, according to WLTW CE Bob Tarsio, chairman of the association of radio stations with transmission facilities in the Empire State Building.

The plastic coated transmission lines caught fire and burned to the roof, he said. The fire burned several interlock lines that run to each multiplexer and the master antenna interlock, causing them to fail. Other problems included damage to an interlock breaker and diplexer interlocks.

To get stations back on the air, Tarsio said engineers patched around various interlocks including the master antenna interlock, a safety system that detects any problem with the antenna or a patch panel.

Engineers also were afraid the fire damaged the upper bay of the master antenna, which they also patched around.

Because all the stations would be using the lower bay of the antenna and some interlocks were bypassed, engineers could not go to full power. They did not know if the lower bay would handle all the RF power being fed into it.

Stations operated at lower power until the middle of the next week, when interlocks were permanently or temporarily repaired and the antenna was determined to have not been damaged.

Tarsio said stations did not suffer as much damage as they could have because transmitters are spread out from the 80th to 85th floor.

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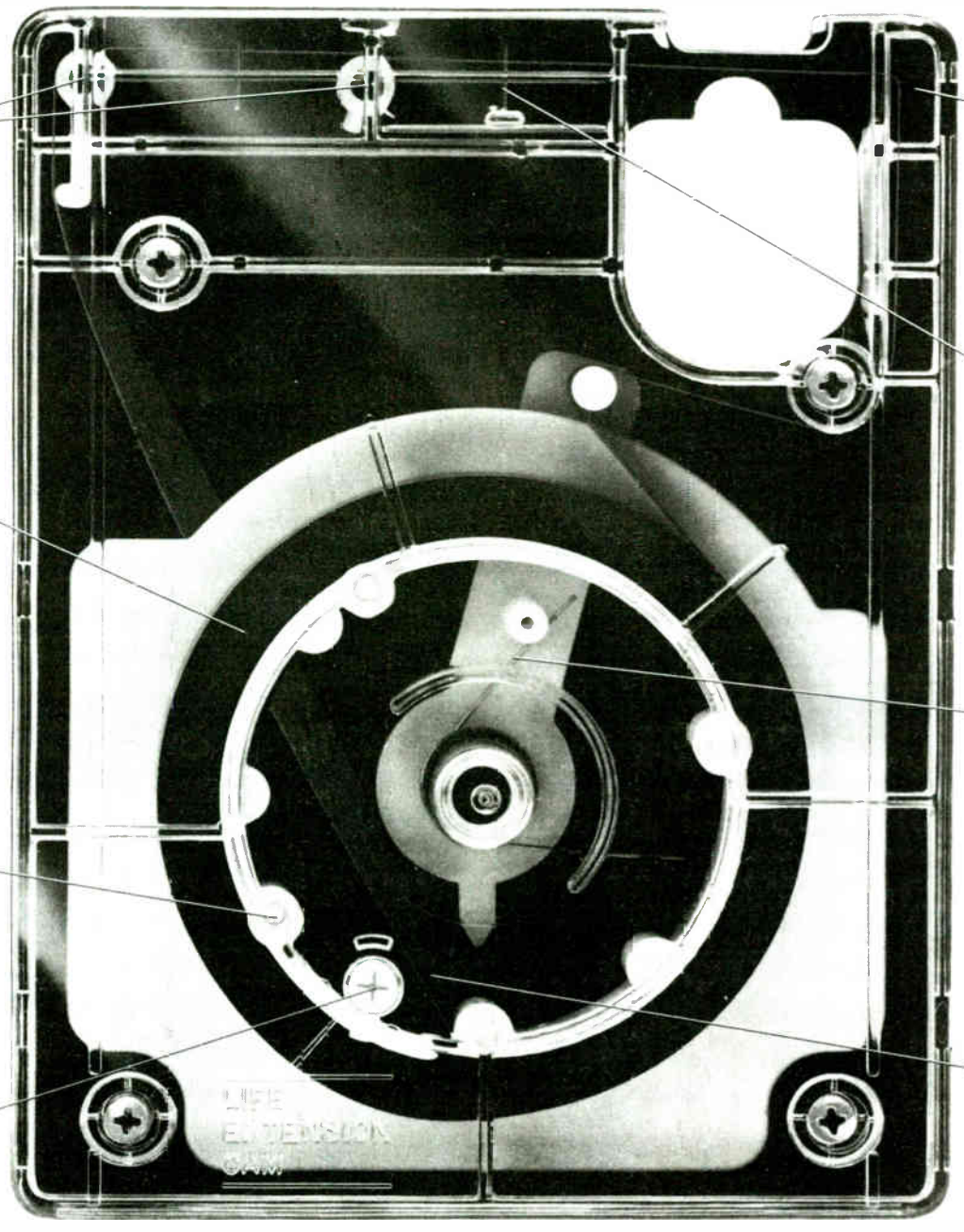

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Circle Reader Service 21 on Page 32

DAT Fills Radio Niche

(continued from page 1)

All stations contacted use the Japanese version of Sony's DTC-1000ES, a consumer DAT recorder selling on the "grey market" in the US for $1500 to $2000.

Consumer DAT players aren't yet sanctioned in the US due to concerns from the recording industry about copyright infringements in copying from CDs to DAT cassettes.

The issue is stalled in Congress and the Recording Industry Association of America has threatened lawsuits to any manufacturer marketing consumer DAT recorders.

Professional models, however are being marketed by several companies through traditional channels of distribution. Most professional models are designed for studio recording application, and their higher costs appear to make broadcasters shy away.

However, as is the case when CDs first became popular, many stations are looking first at the consumer models to explore DAT's potential for radio.

KSTE-FM of Corpus Christi, TX, switched to DAT 1 April and has put three Sony units to a grueling test. DAT operates 24 hours a day as the station's primary music source.

"We were faced with changing from a reel-to-reel music service to a system that gave us more control over the rotation," KSTE GM Dan Cutrer said. "We had a choice of cornering the market on 1950's technology—tape cartridges—or trying DAT.

"I had some sleepless nights at first," Cutrer said. "The smiles got a little bigger when we saw it would work well and much bigger after four or five months." Cutrer said DAT has noticeably improved his station's sound.

KSTE engineers created a cueing system that allows insertion of erasable start and stop tones at any point of DAT tapes. This permits precise start up from the station's console, Cutrer explained. The station now has a library of 1200 musical selections on 50 two-hour length DAT cassettes. All selections are logged in a computer.

Cutrer also provided some early evidence about the durability of DAT tape cassettes. "Some tapes have gone 600 passes in four months without any diminution in audio quality." So far, Cutrer reported not a single tape defect.

The DAT machines at KSTE are thoroughly cleaned each week. The first head replacement was needed after about 90 days of use. The station also discovered it was important to use voltage converters to supply the 100 V specified for the Japanese version DAT units. A tape skipping problem during the early days of operation was traced to running the DAT machines on the 110-120 V supplied by standard US power outlets.

As for how long the DAT will last in his 24-hour operation, Cutrer said he can only guess. "The jury is still out on how long they will work. We simply don't know."

KLSX-FM, a Los Angeles classic rock station, uses a DAT unit as a direct on-air source for music not available on CD. The station transfers records to DAT under good conditions, thus avoiding scratches and dirt in the control room environment. It also promotes digital technology with listeners. "If it's on CD or DAT, it's on KLSX," a promo exclaims.

Though the DAT sounds great it is not easy to cue, said KLSX engineer Chris Hays. "That's one of the sore spots. Most of our DJs use the manual cueing feature and actually use an audio cue point and check the cue before they go on the air," Hays said.

Rochester, MN, station KNXR-FM uses DAT to record local symphony concerts for re-mixes and for long-form programming. "We're really turned on by the thing. We're anxious to get reel-to-reel out of our air control room," GM Tom Jones said.

The station has transferred most of its reel-to-reel material to DAT and also uses the digital format to archive programs for re-airing. No taping problems were reported by KNXR.

The difficulty in cueing DAT has caused WJLK-FM in Asbury Park, NJ, to alter its originally planned use for DAT. The station has five DAT units and had intended to use them as a replacement for cart machines.

"The main problem was getting it cued up to the proper place and getting a consistent start time," WJLK CE Al Bonner said. "It wasn't reliable. We couldn't count on hitting the button and it being cued exactly where we thought it was." As a result of the difficulty, WJLK returned to carts in July.

He said the DAT units will be used for applications which do not demand precise cueing.

Radio Systems' Conover said his company intends to help broadcasters overcome the obstacle now limiting the DAT format. The company has entered a joint venture with Peak Audio of Philadelphia to develop modifications for the Sony DTC-1000ES DAT unit to make it more usable in the radio station environment.

DAT search capability should be more like that of a CD player, Conover said.

The controversy between record companies and consumer electronics manufacturers over the sale of DAT in the US will impact the ultimate use for the format in the broadcast industry, Conover predicted.

He noted that when the CD was introduced, broadcasters gobbled up as many machines as were available and so did consumers. There was a synergy between the consumer and broadcasters.

Said Conover, "Nobody is out there championing the DAT machine like they did the CD when it came out."

For information, contact Gerrett Conover at 215-356-4700; Dan Cutrer at 512-883-5576; Chris Hays at 213-383-4222; Tom Jones at 507-288-7700, and Al Bonner at 201-774-3655.

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Ray Klotz, C.E.

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Ray Pollard, G.M.

KSKG, Salinas, KS

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Circle Reader Service 23 on Page 32

Spokane RF Levels OK, FCC Says

(continued from page 1)

Measurements were taken at seven heights on the tower while the station operated at normal power. The climber, who was Tell himself, held the metal jig contacts with both bare hands, leaned away from the tower and took each reading.

Currents of more than 100 mA were measured, which have been related to calculated radial electric fields near the surface of that tower with a correlation coefficient of 0.98. These levels were not judged harmful, according to the report.

Tests also were taken of body current induced in someone standing close to an AM tower. Measurements were taken from a number of body configurations with and without shoes.

Currents of 0.4 mA were measured using an Eaton Model 91550-1 current probe for a person standing in a 2 V/m, 630 kHz vertical electric field. That current is reduced by a factor of two when wearing boots, the report said.

"Although magnetic fields can induce currents in conductive loops that include body parts—such as a person swinging on a park swing—it is unlikely that strong enough AM magnetic fields will be found in the environment to induce significant currents," it noted.

Measurements from a fire lookout tower on Mount Spokane found no location where the power density exceeded the American National Standards Institute (ANSI) guideline at VHF frequencies when station KXLY-FM was broadcasting from its main antenna nearby.

When the auxiliary was used, however, localized power densities over the ANSI guide were found in the cab, so use of the main antenna was recommended in the report.

It was also found that the KXLY-FM and KXLY-TV auxiliary antennas can each cause power densities on the roof of the transmitter building that exceed the ANSI guideline. Cautions are posted on the roof concerning this.

Measurements around 19 locations of Spokane were taken from a Nanofast fiber optically isolated spherical dipole (FOISD) mounted on a mast 5' above the roof of a measurement vehicle.

Among the locations were houses 100' and 200' from 50 kW KGA-AM. The study showed that electric fields were well below the ANSI guideline of 632 V/m. Electric field values throughout a cluster of antennas rarely were over 5% of the ANSI guideline.

Measurements also were taken at The Mullan Road School, located across the street from the KGA-AM antenna. About a year after the school was built, complaints of electric shocks or RF burns within the facility prompted construction of a metal roof connected to driven ground rods at eight points around its perimeter.

The EPA measured current at each of the ground connections, inside nine rooms of the building and at various locations outside.

Test results showed again that field values rarely exceeded more than 5% of the ANSI guideline. In the ground straps, the highest flowing current was 0.8 ampere, which the report said would pose no danger "as long as the ground strap remains continuous. However, should the ground straps weather and break, a serious risk of being burned would exist for anyone who would contact it."

Inside, magnetic fields generally were less than 50 mA/m. Exceptions occurred near ground wires and conduit electrical panels or metal fixtures that could carry an RF current. These currents create localized magnetic fields, said the EPA, however, none of them approaches the 1600 mA/m ANSI guide.

Overall, in tests performed around the vicinity, no electric or magnetic field values exceeded the ANSI guideline at AM radio frequencies in publicly accessible areas, though it cautioned, "levels far below the ANSI guide can cause annoying RF shocks/burns and can interfere with the operation of electronic equipment."

The FCC/EPA's next report, based on measurements completed last month, tested close-end field strength at eight AM stations in southern California, which will be related to theoretical predictions of the field strength levels.

The report will be issued next year.

For more information or for copies of the recent released report, titled "Radiofrequency Electromagnetic Fields and Induced Currents in the Spokane, WA Area," contact Robert Cleveland at the FCC, 202-653-8169.

Groups Oppose Translator Plans

(continued from page 9)
the uses of FM translators."

AGK Communications, however, argued that even when the use of a translator carries a large market signal into a smaller market, it should not affect revenues of stations operating from the smaller market.

The company used as an example stations in cities surrounding Syracuse, NY, which charge an average rate of $5 per spot, whereas stations based in Syracuse charge at a $40 to $50 per spot rate.

"Thus, no local advertiser who isn't already advertising on the (smaller-market stations) is going to be attracted to an additional station who now has a translator, but whose rate is also in the $50 range."

The Association of Maximum Service Telecasters (MST), in its comments, was concerned about preventing interference on channel 6 television stations from FM translators and opposed what it called an after-the-fact approach to dealing with such.

Nix current interference rules

"Under the current rules, a translator could begin operations, cause interference and then resist modifications for a prolonged period," MST said. "Meanwhile, the public suffers interference or loss of service, the broadcaster whose station receives interference bears the expense of litigation before the Commission or the courts, and the Commission is subjected to the administrative burden of resolving the dispute."

Family Stations Inc. (FSI), which operates 17 noncommercial educational FM stations and 35 noncommercial educational FM translators, said that translators already adhere to stricter standards than full-service noncommercial stations with regard to channel 6 intereference, thus further regulations are unneeded.

Current standards "presently compel FSI to respond immediately and responsively to any interference claim," the company said.

How to issue licenses

The FCC also asked for comments on how to best issue translator licenses, whether through a lottery or through administrative hearings.

According to the FTC, in either case, resale should be permitted so that the initial licensee could transfer the translator license to the entity that places the greatest value on its use.

It noted that comparative hearings might delay introduction of the service, whereas a lottery would insure more rapid license assignment.

FSI also did not favor comparative hearings, particularly in the case of mutually exclusive applicants.

"Rather, the Commission should send a letter to the mutually exclusive applicants, advise them of the situation and encourage (them) to reach a compromise within a certain time frame," FSI said. "If no settlement is reached, the first-filed application should be accorded channel priority."

For more information on Docket 88-140, contact Marcia Glauberman at the FCC, 202-632-6302.

AM Skywave

(continued from page 3)
stations more like FM stations, i.e., local facilities of limited reach, and ignore the greater potential for service inherent in AM," ABES stated.

Capital Cities/ABC questions Crawford's use of the 50% standard, when the group claimed that small sations could increase their nighttime service with negligible damage to the nighttime service of other co-channel stations. "We urge the Commission to reject Crawford's calculations on the ground that it advances no theoretical justification to support the use of the 50% standard, and we know of none."

The Clear Channel Broadcasting Association (CCBA) said limiting all AM stations to their 2.0 mV/m groundwave contour would not only eliminate "the only aural service for millions of persons," but it would adversely affect nearly every class of AM station, "particularly those unable to increase power in an effort to recapture loss service."

CCBA also said clear channel stations would not be the only ones affected by the Crawford proposal. "Many regional and local stations would also be prejudiced as would those stations with international protection requirements that could not be met."

Fisher Broadcasting, licensee of Class I-B KOMO, Seattle, said Crawford's assertions that a minimum signal level of 2 mV/m is necessary for acceptable reception "fly in the face of reality."

Without that standard, Fisher argued, regular clear-channel reception by far-away listeners would be physically impossible.

For information on comments filed in Docket 87-267, contact Wilson LaFollette at the FCC, 202-632-5414.

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Station Fails at Sports Network

(continued from page 10)

the assets of WCBM, which put the license back in the hands of Metromedia in the event of failure.

Metromedia, meanwhile, retained the land and the antenna, giving Seymour control of the license only, according to Morton Hamberg, president of JAG Communications in New York, and at one time an interested party in buying WCBM from Seymour.

An untapped niche

The license was to be enough, however. The station fit in nicely with Seymour's plan to provide a station in Baltimore with an appealing and untapped niche. His all-sports format would air city league soccer, basketball and college games. But to score credibility—and to initiate the cash flow he would need—his plan also required obtaining the rights to Orioles games, which, conveniently, were up for renewal as Seymour was arranging his deal to purchase WCBM.

With an offer from Resorts of $5.5 million for the three-year contract along with the promise of a 100-station network throughout the mid-Atlantic, the Orioles gave Seymour the nod.

WFBR-AM, the station that previously had controlled Orioles rights, wasn't pleased with the prospect of losing a major part of their programming and threw a glitch into the works that would ultimately result in the fall of Seymour's seemingly imminent empire.

Harry Shriver, general manager and part owner of WFBR, filed a petition in August 1986 with the FCC to deny Seymour's acquisition of WCBM, based on alleged violations of Commission rules at stations in Ocean City, MD, and Dillon, SC, also owned by Seymour.

To proceed with his plans, Seymour set up a separate company, USA Radio Network, to maintain rights to the Orioles broadcasts, and formed Magic 680 in order to continue pursuing WCBM.

Shriver withdrew his petition in November 1986, but by then the damage was done. Seymour's purchase of the station wasn't finalized until March 1987, leaving advertising and promotion months behind schedule. The baseball season, meanwhile, was only a month away.

In debt, out of luck

In the end, Seymour never was able to make up for the lost time by signing enough major advertisers. At season's end, he owed the baseball club $700,000. Also, his proposed network of 100 stations fell short with only 51 member stations.

In an effort to hold on, Seymour sold seven Resorts stations for a reported $12 million, while putting others up for sale, Ford said. He paid back the $700,000, but the Orioles insisted he had committed a breach of contract and withdrew its contract with Seymour.

WCBM then defaulted on its $2 million loan from Metromedia, leaving Kluge the owner once again. He filed for a receivership.

Gaines's role as assigned by the Baltimore County Circuit Court is to preserve the assets of the corporation for the benefit of creditors, which in this case is primarily Kluge.

Once the station gets back on the air, Gaines explained, the license immediately goes up for sale. "It's a little bit like if I became the receiver of a machine shop and the machines were broken. I get them repaired first and then sell them."

Receiverships have become fairly common in the last several years across the broadcasting industry with AM, FM and TV stations, according to Thomas Dougherty, a Bethesda, MD, attorney. In general, many stations are just unable to pay bills, he said.

These days, however, AMs seem to be dominating among stations that file, according to Tom Albers, chief of the FCC's AM branch.

"The service is not competing particularly well with FM as far as listeners are concerned," Albers said. "It would appear that its very economic disadvantage in that respect would be its primary woe."

But it is unusual for stations to file in as large a market as Baltimore, he said. Out of 259 markets nationally, Baltimore is the 16th largest.

For WCBM, Gaines planned at press time to initiate a 1960s/1970s music format with the help of local retired radio personality Lee Case. The station was expected back on the air by 15 September.

Not all, however, think the idea is particularly sound.

"I don't really think there is a future for it," said JAG's Hamberg. "I am surprised that Mr. Kluge is trying to put it back on the air unless he's prepared to give somebody a long-term lease on the property. I think the land is worth more than the station would be worth even if they can sell it."

Kluge was not available for comment.

Seymour, meanwhile, is involved in bankruptcy proceedings outside of Maryland "for a myriad of entities," according to Gaines.

For more information about WCBM, contact Bennett Gilbert Gaines at 301-539-5195.

Upgrades Beyond Blueprinting

by Bill Higgs

Louisville KY ... Last time, we looked at the techniques of wringing every possible bit of performance out of older equipment *as designed*.

Unfortunately, "as designed" is often not enough for "refugee" equipment in today's marketplace. Arguments such as "OK for small-market or limited-market radio" no longer wash.

The problem is not so much that studio and transmitter technology has improved significantly, but rather that consumer equipment has improved dramatically.

BottomLine— Broadcaster—

It is now quite possible to walk into K-Mart and buy a receiver with much cleaner audio than some 10 year old consoles can produce (I've been tempted more than once to buy one of these $99 wonders to use for line amps!).

To put it another way, crummy audio that once was masked by poor receivers no longer is. Translation: Any improvement in the plant's audio will likely be detectable by your listeners. It is, therefore, quite worthwhile to go "beyond blueprinting".

Problems inherent in older audio equipment generally fall into three categories: hum, noise and distortion. All three of these gremlins are functions of the specifications of the active devices used and the circuit configuration.

Unless the decision is made to scrap the innards and start over upgrading dated circuitry is usually a matter of four steps: enhance the power supply, update the active components, eliminate capacitors and isolate the VU meters.

Humless power

Upgrading the power supply to lower the hum level is often the easy part. Many early solid-state units used a simple zener diode and pass transistor for voltage regulation.

Newer solid state regulators such as the 78xx and 79xx (negative) are far better in regulation under load. Most smaller audio units draw less than 1 amp, so a pass transistor won't be necessary.

The xx in the part number indicates the output voltage. Since the regulator requires at least an 2 volt differential, choose the lower value if your required voltage falls between standard values.

Figure 1 shows a typical 78xx replacement. In many cases, the original circuit board can still be used by removing the existing zener and replacing it with a jumper. The regulator will run just as hot as the original pass transistor, so be sure that it is heat sinked (and insulated) properly.

Don't forget to add decoupling capacitor Cx to prevent the regulator itself from oscillating.

Active devices are either transistors or ICs. Chances are that replacement with newer components can improve the performance of your older equipment.

Newer and quieter

Noise figures and linearity of modern silicon transistors are much better than even ten years ago. For transistors, choose devices which are identical in type (silicon or germanium), polarity (PNP or NPN) and have similar characteristics.

Look for part numbers with lower noise figures and preferably with higher gain (Beta). The higher gain allows you to use more negative feedback (twiddle with resistor values) and hence lower the distortion level.

A little experimenting is in order here, as biasing may well be diiferent.

Earlier transistorized audio equipment used mostly PNP transistors and a negative supply, since PN's were more readily available.

Figure 1.

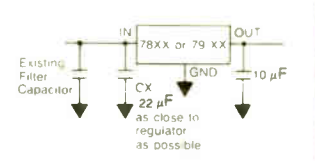


Figure 2.

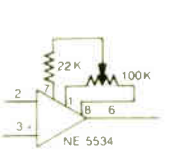
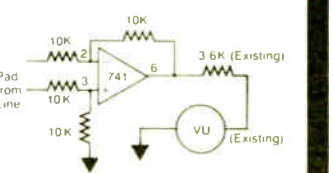


Figure 3.



These transistors are becoming harder and harder to find. One radical solution is to reverse the polarity of the power supply and all diodes and electrolytics, and use NPN transistors. Last resort, perhaps, but sometimes the last resort is all we have left!

IC upgrade

ICs are a bit easier to upgrade. The familiar NE5530 series by Signetics (second-sourced by TI and Exar) has become the standard for high-quality audio.

The good news is that the NE5534 is a pin-for-pin replacement for earlier devices such as the 709 and 741. The NE5534 is a dual unit which works well as a replacement for the 1458 and 4558.

In low-level circuits, FET input chips such as the TL071 (single) and TL072 (dual) work well and provide low noise.

Compensation may need to be added or changed if the gain of the stage is less than five.

Some earlier equipment used a quad op-amp, the RC4136. The only chip I have been able to find to upgrade this is the TL075, which is an FET-input device. It works fine in lowlevel circuits, but is inadequate for line outputs.

Elimination of capacitors is usually possible only with IC equipment and bipolar supplies. Tbe idea of DC coupling is to operate the devices such that the DC output level is zero with no signal input.

Modern ICs such as those noted above allow this to be done easily. Often it is as simple as adding one thumbwheel pot per stage as an offset control.

Since offset compensation techniques differ from chip to chip, consult the manufacturer's data sheet. A typical application (for the NE5534) is shown in Figure 2.

By the way, if the equipment is to be switched on and off line downstream, coupling capacitors should be retained on the output of the unit.

Improving meters

A final enhancement is the isolation of the VU meters. VU meters contain a rectifier, which tends to add clipping to the amplifier even though the meters are fed through a pad.

Isolation is easily done with a general purpose op-amp as shown in Figure 3. A 741 or 747 (dual) will work just fine here. Keep the pad in place at the input of the op-amp.

One quick word about aesthetics. Yes, older equipment is often battered and ugly. Grease up the faders; fix the broken switch and the pilot light jewel.

Add a coat of paint, new lettering, and a new set of knobs (check your favorite surplus dealer for bargains) and they'll begin to notice the amazing things going on in your refurbished refugee.

Bill Higgs has been CE for WXLN/WFIA for six years and has also done station consulting work. He has a PhD. in Theology which helps explain his patience with small market radio. He can be reached at 502-583-4811.

"Do-Attitudes" of Performance

by John Cummuta

You've got to be moving to get somewhere. So get moving, even if you're not sure where you're going when you start.

Downers Grove IL ... "You read a book from the beginning to the end. You run a business the opposite way. You start with the end, and then you do everything you must to reach it." Harold Geneen, from his book *Managing*.

Geneen knows a few things about management. He took ITT Corporation from $766 million to over $22 billion through 58 uninterrupted quarters of growth.

You'll notice that the key concept from his quote is a sense of action. Success requires an ability to "Do," not just "Know." Let's listen to Mr. Geneen again.

"When all is said and done, a company, its chief executive, and his whole management team are judged by one criterion alone—performance."

Performance is the result of "doing" the right things, not just thinking the right thoughts, so let's examine some active concepts I've realized over the years. I call them my "do-attitudes."

The "do-attitudes"

You won't find the "do-attitudes" in the Bible like the beatitudes, but you will find that they are practical principles that can put power into your professional life. In fact, they'll probably serve you well in any area of endeavor. They've done me a lot of good.

Engineering-Manager

Let me describe "do-attitudes" by telling you what they are not. They are not just positive attitudes.

You see, thousands of trees have given their lives to produce millions of books on positive mental attitude (PMA), and I believe that much of that pulp was wasted. Not that PMAs are useless.

They are critically important elements of success. My only problem with the PMA school of thought is that trying to get success out of simply thinking positively is like trying to get heat from a fireplace by staring at it expectantly.

An attitude—any attitude—without a corresponding action is powerless.

Act—even if you're not sure

The first of the "do-attitudes" is to do something—even if it's wrong.

So many people spend more than an adequate amount of time planning and thinking, thinking and planning, making sure that they've looked at every angle. They maintain a positive attitude and are sure that this is the formula for great things.

But they've left out the most important key to reaching their goals: you've got to be "moving" to get somewhere. So get moving, even if you're not sure where you're going when you start.

This suggestion may sound risky, even irresponsible, but it's one that many winners consider their primary weapon: their ability to act.

The proponents of a process called Neuro-Linguistic Programming (NLP) call this ability to take action "personal power." Their research has led them to conclude that this is the main and key difference between those who achieve and those who don't.

These researchers looked at many factors such as professional knowledge, background, ethnicity and others, but they could only find this one attribute that stood out among the successful—their ability to take action.

It's really not as dangerous as it seems, because as you move forward your view of the circumstances improves and you can then use the second "do-attitude," to increase your chances for success.

Not even the geniuses at NASA can aim perfectly at their goal or target, so they regularly correct the course of a space ship as it makes its voyage.

That's also the way that winners and leaders move their organizations toward their goals. They act, then as circumstances unfold, they make the necessary corrections to capitalize on the latest data.

The mid-course correction process is also how you avoid the paralysis of analysis. Too many would-be achievers wait until they think they have sufficient information before they make a decision

(continued on page 28)

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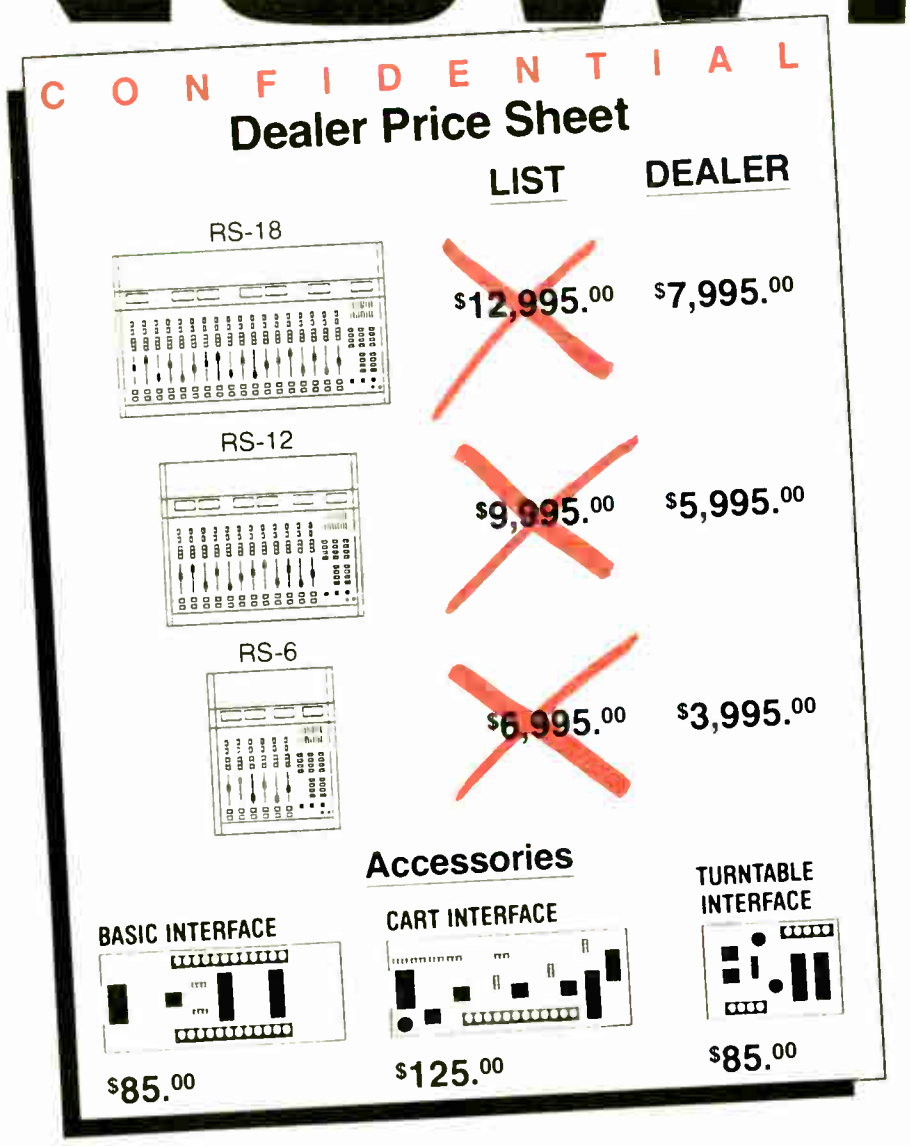

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Exploring CD Demo Bed Uses

by Ty Ford

This edition of *Producer's File* finds me back on the road in search of CD production music libraries. Since the journey began I've discovered a lot about CD technology as well as the music business.

Take the "demo bed" market for example. Production houses and advertising agencies are often called on to come up with jingles for a campaign. The client may contact four or five companies and invite them to submit a demo.

Although all of the material may be great stuff, only one will be chosen. That leaves three or four disappointed vendors with unsold music inventory.

If the piece has been produced with lyrics, the lyrics can be mixed out and replaced with an instrumental melody line and resold.

Some companies will buy the use of the composition and re-record it. This is a good way to insure the cohesive sound of the library. Still others will buy the masters and use them with only slight modifications (EQ and other effects) to bring them closer to a unified sound.

Technology Update

Then there are companies that regularly contract out to a small collection of regular composer/producers. Because of the different tastes involved these libraries are usually wider and more varied.

If you're considering using multiple libraries, and many production houses do, it's good to think about how these different libraries might mix and match.

Consistency, or variety?

For the most part it's a matter of taste, but at some point (usually where the the pen meets the check book) you will have to decide where to stand on the consistency vs. variety issue.

Another issue is indexing offset. In the review of the Century 21 library I mentioned that while the index points for cueing up cuts on the library were close, there were some that worked better when I cued them manually.

Dave Scott, President of Century 21, noted that the offset start up of each CD player can be slightly different. The offset is the amount of time after the start button has been pushed on the CD player before audio is heard.

He claims that the CD player which is part of the deal with their package works with their indexes. Since the Century 21 package offers separate 60 and 30 second beds the indexing issue only occurs when you're trying to edit within them.

For maximum control it's a good idea to consider a CD player with a cue wheel. It's also a good idea to get a CD player with a loop or repeat function. Then once you bracket a particular selection you only need to push one or two buttons to recue it.

Digital Production Music At A Glance

Title	Total Minutes	Selections	Instrumentation	Suggested Use	Comments
Jet Stream	54	7	Contemporary Orchestra	News, Sports, Action promos	Good TV theme music.
Comedy Craft	54	7	Small ensemble	Humorous situation	Some call this "specialty" music.
Direct Hits	55	8	Pop rhythm section	Spot beds A/V	"Sound alike" versions of pop hits.
Barnstorming	51	7	Country rhythm section	Spot beds A/V	Harmonica, pedal steel and banjo accents.
Peace Of Mind	57	5	Small ensemble	spot beds A/V	Low tempo sweet stuff, piano & flutes, some cuts have rhythm section (see text)
Streamline	49	7	Pop rhythm section	Spot beds,TV theme	Mostly sax spotlight, mostly up tempo.
In Step With Tomorrow	53	6	Contemporary rhythm section	More A/V than spot beds	Piano and synth accents.
Close To Home	64	8	Small ensemble & contemporary rhythm section	Spot beds and A/V	Flute, piano, guitar accents.
The Piano Album	56	10	Solo acoustic piano	Spot beds A/V	Plaintive flowing compositions, you can hear the foot pedal with headphones.
Paper Planes	41	5	Contemporary rhythm section	Spot beds and A/V	Electric guitar and synth accents, nice positive stuff.
Image Makers	49	7	Full orchestra with rhythm section	News and Industry on parade, all up tempo.	
High Flyer	52	7	Contemporary rhythm section	More A/V than spot beds	100% synth, #7 sounds like Axel F.
Hits Of The Great Masters	36	6	Specialty	100% synth arrangements of classics, including Masterpiece Theater theme.	
Fantastic Journey	39	6	Contemporary ensemble	Spot beds A/V	Very new age, mostly mellow, mostly synth.
On A Serious Note	50	6	Small ensembles except for one cut	Spot beds A/V	Aptly subtitled "Music for Serious Topics."
Road Challenger	51	7	Mostly contemporary rhythm section	TV spot beds, A/V	Mostly synth funk and new age.
The Guitar Album	48	9	Solo steel and nylon acoustic guitar	Specialty	Mostly low energy reflective pieces.
Ad-Vice	53	7	Contemporary rhythm section	Spot beds A/V	Synth based visual tunes, TV drama stuff.
Synth Drops	54	98	Synth	Specialty	A cornucopia of synth logos, beds, pads, zaps, arpeggios, glissandos, portamentos, cues and other weird noises and 20 Hz to 20 kHz test tones.
The Competitive Edge	66	6	Contemporary orchestra	Spot beds A/V	High energy beds, TV action themes.
The Heartbeat Of America	65	6	Contemporary rock	Spot beds A/V	Good visual music.

This tricky index issue has led the producers of some libraries to abandon the idea in favor of the use of separate track numbers.

Because the Century 21 package includes 60 music beds and 38 sound effects on each CD, they would have run out of tracks (99 being the current maximum) unless they indexed the less than 30 second music outtakes.

AirCraft

The AirCraft Music Library, with 21 CDs as of this article, contains only music. There are between five and 10 themes per CD.

The 137 different themes in this package exist in full theme length, full theme minus melody, 60, 30, 15 and 10 second lengths. In those cases where the removal of the melody instrument would make the arrangement too sparse, other instruments are added to the rhythm section.

Exceptions to the norm are CD #5 which contains a collection of five Contemporary/Classical and MOR (light rock) themes with the basics plus lots of extra mixes; CD #9 which contains 10 solo acoustic piano pieces; CD #13 which contains six classical selections performed entirely on synthesizer and includes synthetic audience applause; CD #17 which contains nine acoustic guitar themes and various strums; CDs #5, #9, #13 and #17 also include theme, 60, 30, 15 and 10 second lengths.

CD #19 contains over 200 very handy synthesized music logos, sweeps and test tones. CD #21 includes four 'bumpers' or vamps for each of its six themes in addition to its standard outtakes. Please refer to the chart for more specific information about each CD.

AirCraft has gone to considerable length to provide a manual for its library. Selections are cross-referenced by style category, disc number and by track listings.

AirCraft has also made the package more accessible with its SpeedSearch feature which puts announced 30 second versions of each theme at the beginning of each CD.

The slating of each cut allows you to remember which is which and is a good way to familiarize yourself with the package.

Selection of styles

The musical styles of the AirCraft CD library cover quite a wide range. In all there are 10 category styles; Orchestra/Contemporary Orchestra, Contemporary backgrounds, Contemporary Pop/Rock, MOR, Country/American Music, New Age/Futuristic, Dramatic, Comedy, Classical/Contemporary Classical and Solo instruments.

Style, energy, orchestration, featured instrument, tempo and a short descrip-

(continued on page 28)

Radio Links for Boosters

by Ed Anthony

Part II of II

Quincy IL ... In part I of this article we covered some of the basics of adding a second carrier and the problems associated with it. In this part we will look at some practical ways to interconnect the studio, main transmitter site and booster site(s).

Two main components must be present at the booster station. A way must be found to transmit the station program material, either in the form of composite stereo or possibly discreet left and right channels (or mono, if necessary).

Composite stereo is preferred, otherwise a second stereo generator would be necessary at the booster. Some form of frequency locking information must also be present.

By far, the most flexible method of interconnection is by the use of a radio link, such as a composite STL between the main transmitter and the booster.

Some selected systems

Figure 1 is a block diagram of a typical booster configuration whereby the composite FM stereo signal, generated at the studio, is sent via composite STL to the main transmitter site.

At this point, the composite signal is sent to both the main transmitter's exciter, and to another composite STL.

The frequency locking information derived from the "Master" exciter is transmitted along with the composite signal, either as an STL subcarrier frequency or as an audio tone modulating an STL subcarrier generator.

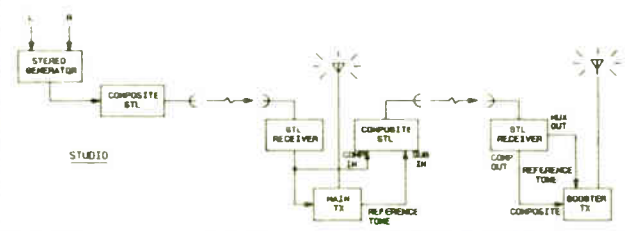
At the booster facility the composite stereo is fed to the booster transmitter's exciter and the subcarrier information is used to frequency lock the "Slave" exciter's carrier frequency.

This has the advantage of completely independent main transmitter frequency stability, as opposed to the arrangement in Figure 2.

In the second example a reference frequency is derived at the studio and is sent, along with the composite stereo, to both the main and booster sites. Once there, the reference is used to lock both transmitters, essentially creating two "slaves."

The frequency stability of the studio reference must be as good as found in the original exciter, as this directly determines the accuracy of the station frequency.

Figure 1.



This setup is ideal for main and booster locations on either side of the studio. It also allows the use of IF repeaters for multiple hop STLs to the booster.

In an effort to reduce the number of STL hops to the booster by at least one, the method shown in Figure 3 may be an alternative.

It is similar to Figure 1 in the way it transmits the composite stereo from the studio to the main transmitter. However, instead of sending the reference to the booster via an STL subcarrier, the reference is sent on a composite subcarrier frequency in the 67 to 92 kHz range.

Figure 2.

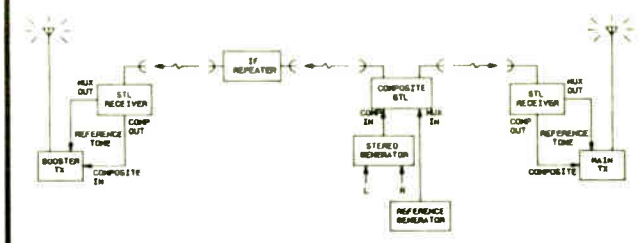
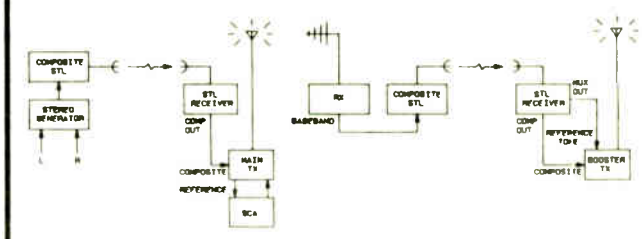


Figure 3.



A high quality receiver is used to pick up the signal off-air somewhere in the coverage area in the direction of the booster, but still well shielded from the booster signal. Care must be taken to insure adequate shielding to prevent reception of the booster signal.

The signal is demodulated to baseband, including subcarrier, and used to modulate an STL transmitter linked to the booster site. Once there the composite is used to modulate the booster and the subcarrier information is used to lock the slave exciter.

These are just a few examples to show various ways to configure a booster system. They are by no means all inclusive and are only the foundation on which to build other configurations.

A working system

Figure 4 details an actual working system utilizing two or more Broadcast Electronics model FX-30 FM Exciters. The first FX-30, configured as the master, derives a 1.25 kHz reference tone.

This tone is then sent, using one of the methods previously described, to the booster site. There it is used to frequency lock the second slave FX-30.

The system is designed to be very immune to both amplitude and phase noise degradation of the reference caused by the transmission of the signal to the booster.

(continued on page 27)

Radio World Extra

Harris Acquires Allied

Quincy IL ... On 31 August, Harris Corporation and Allied Broadcast Equipment inked an agreement that will have a great impact on the marketing of broadcast equipment both in the US and internationally.

Under the new arrangement, Harris acquires Allied, which becomes a subsidiary of the Harris Corp. under its Communications sector.

Allied Broadcast Equipment is the largest US full-line distributor to the international radio broadcast industry. Harris Corp. is a $2.1 billion supplier of information, communication and semiconductor systems, products and services to government and commercial markets worldwide.

Hours after the agreement was completed, Guy Numann, senior VP and head of Harris Communications sector; Tom Yingst, VP and general manager of Harris' Broadcast Division; and Roy Ridge, Founder and CEO of Allied talked with **RW** editor Judith Gross about the details and implications of the acquisition.

RW: *What is the background of the agreement signed this morning? We know that Harris and Allied have been working under a joint sales agreement.*

Numann: I would say that I personally got to know Roy about two years ago and we seemed to have a common belief that if we could put these two companies together, one-plus-one would be greater than two. I think we almost used those words from the first time we met, didn't we?

Ridge: We carried them for two years.

Numann: And so we had a little rocky start, like some marriages, but we kept getting better and better. Finally we got to the point where we just said look, the only hurdle for making this one-plus-one greater than two is to become one company.

So we became convinced to do it and we've been working hard right up until 1:30 last night, to make it happen.

Ridge: I think it's important to note that even with those hurdles over the past two years we have several success stories to tell and verify what we've jointly accomplished, projects with new stations, getting stations back on the air.

We've accomplished this jointly where neither company could have done it separately.

RW: *Would it be fair to say that it was your intention from the beginning to culminate an agreement such as the one you signed today and that you were "trying it out" with the sales arrangement that you had previously?*

Numann: I don't know as it would be fair to say we were "trying it out," but it is fair to say that from the start we had this vision, that this could be possible.

Actually, quite frankly I think that we felt that it would only really come together after Roy got to the point in time where he would want to retire. But now, here it is, Roy's going to be working full time with us as a team, and we just accelerated our vision.

RW: *How long is Roy going to stay with Harris? Roy, are you on some kind of a contract?*

Ridge: I am under a contract, but I plan on retiring from Harris Corporation. And I plan on looking at the next several years with great enthusiasm and being able to look back on it with this being today one of the best decisions I've ever made.

RW: *You're under contract but you're planning to stay with Harris until you retire from the business?*

Ridge: Absolutely.

RW: *How long is the contract for?*

Numann: Well, it's forever. Right now I have a reputation inside my company that I don't let people retire, and as a matter of fact some of the people who work for me enjoy working past age 65, and they are doing so and they enjoy it. If Roy wants to do that, I'd love to have him.

RW: *Can you disclose any more details of the arrangement, any of the financial details or anything?*

Numann: No, we are not disclosing that, but I would say what I've said to the people here, that the arrangement we have with Roy is that he looks out for the success of Harris Broadcast as much as he looks out for the success of Allied Broadcast Equipment.

We believe that we can't find anybody we know of in the world today, much less the US, that has as much strength now as these two combined companies have both in product offerings and in sales to the radio industry.

RW: *What does it mean immediately in terms of Allied customers and Harris customers. What changes might they expect?*

Harris senior VP Guy Numann and Allied founder and CEO Roy Ridge

Numann: One thing is, as you know, Allied has instituted a 1-800 number, and we now have one number that any customer can call for any kind of service they want, whether it be from the Allied's Richmond operation or the (Harris) Quincy operation.

RW: *What about in terms of who the customers are used to dealing with, are they going to be dealing with Harris people if they've been dealing with Harris people, or Harris and Allied people now?*

Numann: Whatever the customer wants to do—we're customer oriented. We have what we believe is the right combination, that certain Harris DSMs—district sales managers—are skilled and knowledgeable in the intricacies of the middle sized to higher power transmitters.

It takes quite a long time for the station managers and chief engineers to understand the virtues of what we have to offer, and we believe that Harris sales peo-

(continued on back)

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(continued from front)
ple will work in concert with Allied people to sell studio equipment.

We have it such that any salesman can sell any product, and it's a win-win thing. But we look at the different sales teams to concentrate on different areas of expertise.

RW: *What about in areas where there is overlap? Is there going to be a lot of duplication now that you need to eliminate—too many sales people selling too many of the same products?*

Numann: No, we don't think that there's duplication. Right now, when someone dials the 1-800 number, it would come to an Allied sales office, and if it's a call related to a transmitter the expert from Harris would deal with it.

If it dealt with a studio product that Allied has, the Allied person would deal with it, but if either one was busy the other one would take it over and handle it. Of course, if there are preferences for who the customers want to deal with we'd let them deal with their preference.

RW: *With both companies having a full sales force aren't there going to be some areas of overlap that are extraneous?*

Numann: No, because the Harris salesmen have for the last year been selling transmitters *and* been selling the studio products from the Allied inventory and from Allied supplies, so we really haven't had any duplication for a year.

What we've had are certain little conflicts that would develop because we weren't one company, that is, who gets credit for this or what have you. Now we're all the same company and everyone will get credit for the sale to the customer.

RW: *There are some areas that might be considered conflicts for Allied, where Allied sells from manufacturers who may be considered in competition with Harris. How is that going to work out?*

Ridge: We are still going to be the department store of the broadcast industry and we are going to handle products of other manufacturers. There may be certain products, if they're not in conflict with Harris transmission products, we will carry them.

RW: *How do your other manufacturers feel about this? Don't they feel that this would necessarily mean a worse competitive situation for them?*

Ridge: Not at all, they feel that they have additional sales people on the street and additional marketing that will be applied. They look at it as a big opportunity.

There will be a few suppliers, of course, who have some questions but I think we can deal with those.

Numann: I can just tell you as a matter of policy that we are not going to restrict the entry into the Allied catalog of competitive products, where the customers want those products.

We here in Quincy have to be bold enough to develop what we think are products that are different, or better, and if they're not, we'll offer whatever products through Allied that need to be offered.

RW: *So is Allied going to have to renegotiate with some of its suppliers as a result of all this?*

Ridge: We will probably renegotiate with some of the suppliers, but I think by and large 90% of them will be very happy with the arrangement here.

RW: *How about some of the corporate things, any changes in policy, corporate structure or employee relations?*

Numann: Well, my view is that Allied is a good company and we're not going to damage its effectiveness. Like I said to Roy's people today, we're going to work hard to help each other. But we're not going to change any good things, or the basic way in which Roy operates.

Harris tends to let its units be pretty autonomous. This is a particular situation where we want to retain the autonomous strengths of these operations, but we want to have more teamwork on how we work together.

RW: *Does either company see a restructuring of personnel as far as managers, sales managers or divisions?*

Ridge: Not on Allied's end, we don't see any restructuring.

RW: *Everybody there will maintain their positions as they stand now?*

Yingst: Yes, as far as our people are concerned there will be no restructuring but they will be working and getting some of their phone calls through that 1-800 number which will come through the Allied office. So in that sense it will be a little bit of a change.

RW: *Will there be any restructuring of prices as a result of this arrangement?*

Numann: We're not planning any, no.

RW: *How about the international market, will it work the same as it will domestically?*

Numann: Internationally we each have a set of dealers and representatives. Right now Allied has quite a few of the same representatives we have, but they do have some different ones. We're going to work out a method to deal with that positively.

RW: *Will that mean some consolidation?*

Numann: We'll try to maintain all the dealers that we have. In cases where Allied has a dealer and we don't, we'll assign that dealer to both units and vice versa.

RW: *How will your agreement affect the newly-formed systems division of Allied?*

Ridge: The systems division has been doing very well, and we think that this gives some additional resources to expand that department even more. We have been doing systems work both internationally and domestically and I think now, with the additional resources of this facility, we have great hopes for that division.

RW: *So it will enhance the systems division?*

Ridge: Absolutely.

Numann: When we have a new facility that buys a transmitter we now have the opportunity to do the special systems work in the studio in a total package that we have not been doing here at Harris. And so that offers the customer a good situation. In addition we have certain technical expertise that can support that operation.

RW: *What about the two company names?*

Ridge: We will be Allied Broadcast Equipment Corporation, a Harris company.

RW: *And on the products?*

Numann: Allied products will still say Allied on them. And Harris' equipment will still say Harris.

RW: *Thank you for giving us this opportunity to talk with everyone.*

Introducing the DAT recorder a professional can't afford to ignore.

The future of audio lies in the all-digital facility. And Panasonic's new SV-3500 DAT recorder/player answers the need for a fully-professional digital audio tape machine.

The SV-3500 is a full-function studio DAT machine from a company committed to servicing and supporting the demanding needs of audio professionals. It features: □ Dual 18-bit ADCs for encoding, and twin 18-bit DACs per channel for playback. □ Industry standard sampling and replay frequencies. □ Interface for digital-to-digital transfers. □ XLR inputs and outputs. □ Switchable +4/−10dB output level. □ Full-feature wired remote. □ 200-times high speed search mode. □ Comprehensive programming and loop functions. □ High-precision peak-reading meters. □ Erasure and re-recording of Start and Skip IDs.

Drop by a Panasonic dealer and ask to see the SV-3500. Because without a DAT recorder with these features, you never know who might ignore *you*. For the name of your nearest dealer, call 714-895-7278. Or, write to Panasonic AVSG, 6550 Katella Avenue, Cypress, CA 90630.

Panasonic
Professional Audio Systems

Circle Reader Service 6 on Page 32

Introducing Harris HT FM Transmitters...

WORLD-CLASS POWER AND PERFORMANCE FOR ANY SIZE FM MARKET

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

No matter where you are or what your FM coverage requirements, Harris' new HT FM transmitters will provide the outstanding reliability and performance you want, at the power level you need.

HT transmitters come in 3.5, 5, 10*, 20, 25, 30 and 35 kW models, with dual configurations available. A perfect blend of rugged construction and proven technology, the HT FM transmitter family will deliver years of top performance and value.

At the heart of every HT transmitter is Harris' new solid-state 55 watt FM exciter, THE-1™. With two selectable RF power outputs, a low-profile slide-out design, ultra-linear voltage controlled oscillator and full stand-alone capability, THE-1 provides a super-clean signal, maximum reliability and minimum maintenance.

For enhanced signal performance and low synchronous AM noise, HT transmitters use a high-efficiency single tube in a standard quarter-wave cavity. Other on-air features include RF Emergency Bypass or FlexPatch™, automatic VSWR foldback, automatic power control and convenient diagnostic systems.

For complete information on Harris HT FM Transmitters, write: Harris Radio Sales, P.O. Box 4290, Quincy, IL 62305-4290, or phone TOLL FREE:

1-800-4-HARRIS
Extension 3018

**Available in three or single phase models.*

HARRIS

Circle Reader Service 3 on Page 32

SPECIFICATIONS

GENERATOR

Sinewave, Toneburst, Sine/Step

Minimum Frequency: 1 Hz (10 Hz during automatic sweep or panel recall)
Maximum Frequency: 102.39 kHz ± 4% Vernier
Frequency Accuracy: .03% fixed parameters
.1% automatic sweep
Frequency Resolution: .01% 10 Hz to 102.39 kHz
Frequency Sweep: User selectable 4 to 255 pts/decade, internally calculated to provide linear increments on a log-frequency scale; start and stop frequencies selectable from 10 Hz to 102.39 kHz. Sweeps up or down.
Level Sweep: User selected end points in dBm (600 or 150). dB/STEP keyed-in .05 dB to 20.00 dB. Sweeps up or down.

Squarewave

Minimum Frequency: 1 Hz
Maximum Frequency: 50 kHz
Risetime: less than 1 μsec, controlled by 3-pole, linear phase filter.

SMPTE IMD (option 004)

IMD Residual Distortion: < .001%

Toneburst (option 005)

Toneburst Time On/Off adjust: 5 msec to 9,999.9 sec.
Toneburst Off adjust: burst off set from 5 to 60 dB in 5 dB increments

Sine/Step (option 005)

Sine/step Sine On/Step On adjust: 5 msec to 9,999.9 sec.

General

Maximum Output: 30.65 dBm/600 Ω load
Balanced or Unbalanced) 30.00 dBm/both channels loaded
30.00 dBm/150 Ω load
24.00 dBm/150 Ω, both channels loaded
Maximum open circuit voltage: 28.6
Minimum Level: -90 dBm (24.5 μV)
THD at Maximum Output: < .0008% to 10 Hz to 20 kHz
< .0015% to 50 kHz
.008% to 100 kHz
10 Hz to 20 kHz Flatness: 0.1 dB; .15 dB to 100 kHz
Level Accuracy at Mid-band: 0.2 dB
Level Resolution: .05 dB
600 Ω Source Resistance Tolerance: ± 0.5% (-0.35% both channels loaded)*
150 Ω Source Resistance Tolerance: ± 2% (-5.6% both channels loaded)*
50 Ω Source Resistance Tolerance: ± 3%
Selectable Load Resistance: Key-in 50 Ω to 99,999 kΩ
Number of Channels: 2
Balance: > 120 dB (Floating, DC coupled)
Separation: > 100 dB to 20 kHz, > 80 dB to 100 kHz
Sync Output: (Ground Referenced) 5 V positive-going squarewave - follows Lo Freq on IMD and Burst Envelope on Burst or Sine/Step
De-emphasis: (option 006) 10 μsec, 25 μsec, 50 μsec or 75 μsec. Applies to all functions
De-emphasis Accuracy: .02 dB

*Output Level is automatically corrected for 2-channel loading.

ANALYZER

Level, Flat or Filtered

Units: Volts, dBm 600, dBm 150, Watts (8Ω)
Bandwidth: > 300 kHz
Ranges: 30 μV to 100 V, Autoranging
Filtered: one each of Hi Pass and/or Lo Pass
Common Mode Rejection: > 100 dB at 60 Hz
Residual Noise: < 4 μV with 80 kHz B.W.
10 μV with 300 kHz B.W.

ANALYZER, cont'd.

Ratio

Measures against user set reference level
Units: dB
Filters: Hi Pass, Lo Pass and Weighting selectable

THD

Units: % or dB
Range: .001% to 100% full scale
Residual Distortion: < .001% 10 to 20 kHz*
< .002% to 50 kHz
.008% to 100 kHz
Residual Noise: < 4 μV with 80 kHz B.W.
*using 80 kHz filter
Measurement bandwidth: > 300 kHz
Fundamental Rejection: > 10 dB below residual noise + Distortion
Accuracy: ± 1 dB to 20 kHz, ± 2 dB to 100 kHz
Minimum Level: 30 mV

Notch Lock (option 010)

Same as ratio except Notch Filter used. Notch auto-nulls with signals above 0.1 V, then locks-up when signal drops below 0.1 V. Time for ensuing measurement of noise in the presence of a low level signal (e.g., quantization noise): approx. 30 sec.

IMD (SMPTE - option 004)

Residual Noise + Distortion: < .002%
Accuracy: ± 1 dB
Frequencies: 60 Hz, 7 kHz

Phase

Range: ± 180.0°
Frequency: 10 Hz to 40 kHz
Level: 50 mV to 100 V
Accuracy: ± 0.8°
Resolution: 0.1°

Channel Separation

Measures cross-talk into selected channel
Residual cross-talk: 100 dB to 20 kHz
80 dB to 100 kHz

General

Input Channels: 2
Frequency Measuring Error: .01%
Frequency Measuring Resolution: 5 digits
Flatness: 20 Hz to 50 kHz: < 0.1 dB
50 kHz to 100 kHz: < 0.2 dB
10 Hz to 20 Hz: < 0.3 dB
Crest Factor: 6
Detectors: AVG, RMS, Q-PEAK
LP Filters: 80 kHz, 30 kHz, 22 kHz, 15 kHz
HP Filters: 22 Hz, 200 Hz, 400 Hz
THD Measuring Speed (Sweep, autoranging off)
at 10 Hz - 5.0 seconds/reading
at 100 Hz - 1.25 seconds/reading
at 1 kHz and above - 1.0 seconds/reading
Amplitude Measuring Speed (Sweep, autoranging off)
at 10 Hz - 2.5 seconds/reading
at 100 Hz - 650 msec/reading
at 1 kHz and above - 500 msec/reading
(Double above times for "autoranging ON")

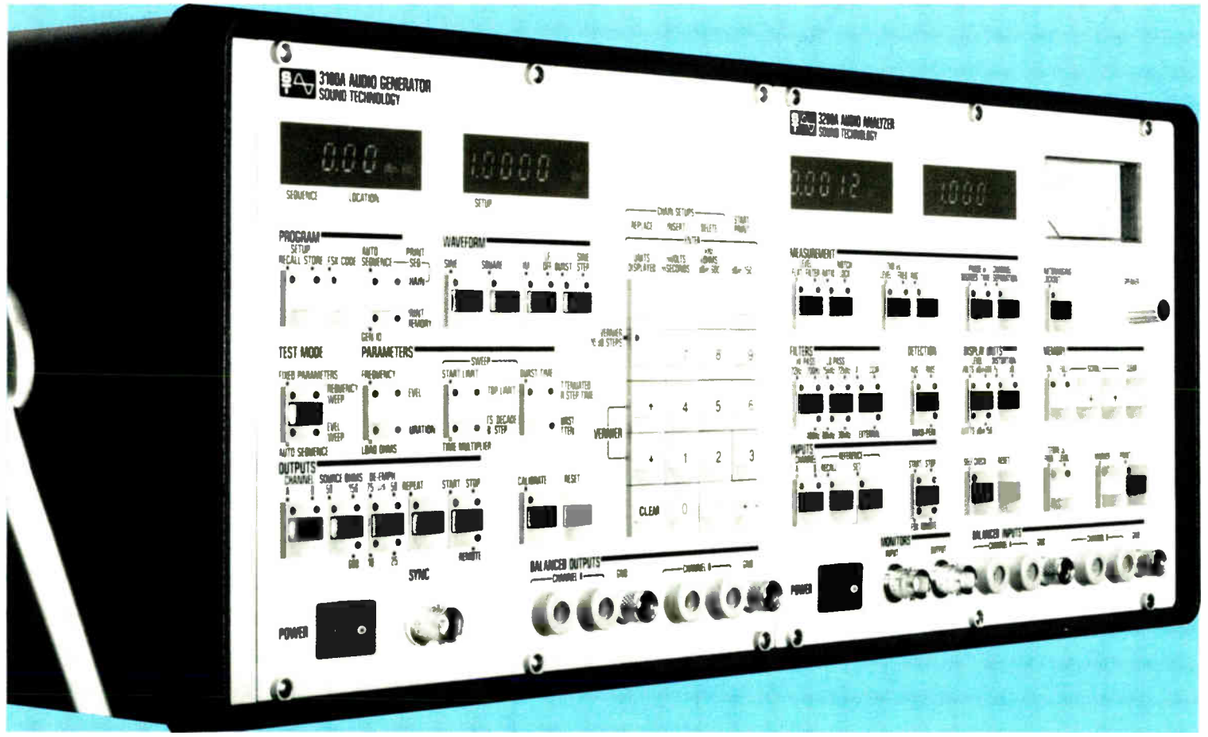
SYSTEM

Power: 100, 120, 220, 240 V, 48-66 Hz, 140 W.
Dimensions: HWD: 8.0 × 18.5 × 17.4" (20 × 47 × 44 cm). (Handle adds additional 2.0" (5 cm) to width).
Weight: Net/Ship: 52 lbs (24 kg) / 59 lbs (27 kg).
Environmental: 90% RH, + 50 to +104° F (+10 to +40° C).

SOUND TECHNOLOGY
1400 DELL AVENUE
CAMPBELL, CALIFORNIA 95008
TELEX: 357445
(408) 378-6540

MODEL 3000A PROGRAMMABLE AUDIO TEST SYSTEM

SOUND TECHNOLOGY



communications protocols:

GP-IB
RS-232C
FSK
CENTRONICS® Parallel Port

The ST 3000A has the following exclusive features:

- **MANUAL MODE.** Use the system *manually* when troubleshooting.
- **INTERNAL-PROGRAMMING MODE.** Store and chain up to 80 different front panel set-ups into 16 different "proof" locations. Perform automated check-outs without computers!
- **EXTERNAL COMPUTER AUTOMATION.** You can automate the ST 3000A using *any* computer having GPIB or RS-232 capability! Or, simplify your automation task by utilizing our IBM™/Compatible bundled software modules.
- **COMPREHENSIVE HARD COPY.** Obtain complete *tabular and graphic* printout directly from the ST 3000A to an inexpensive Epson™ compatible dot matrix printer.
- **INDUSTRY-LEADING SPECIFICATIONS.** Will test the best 16-bit digital systems!

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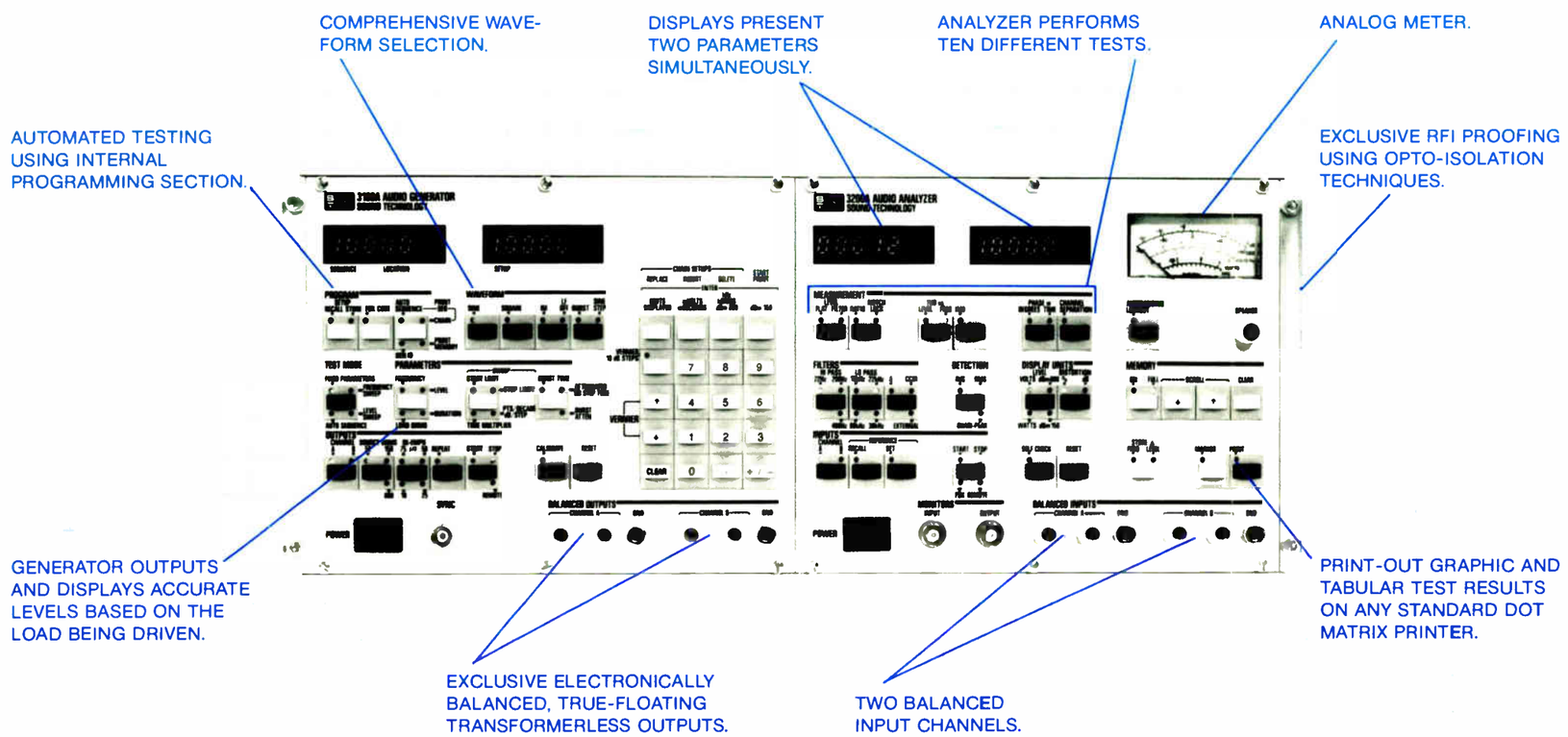
3000A PROGRAMMABLE AUDIO TEST SYSTEM



HARD COPY PRINTOUT

Both the Generator and Analyzer sections of the 3000A test system have printout capability through their respective Centronics parallel ports.

The Generator can download a printout of all programming contained in its memory section.

The Analyzer automatically stores test results in its battery-protected memory section. Test results can be printed out in Tabular or Graphic (option) formats. Analyzer test results also include Generator ID information, as well as time and date.

TABULAR PRINTOUT

The standard 3000A test system prints out test results in tabular fashion. Each individual test is broken out and given its own test number on a sequential basis. For example, the printout to the right is a ThD vs. Frequency test described as TEST No. 3. The Analyzer memory section can hold over 1,000 lines of test result (up to 3,000 actual measurements).

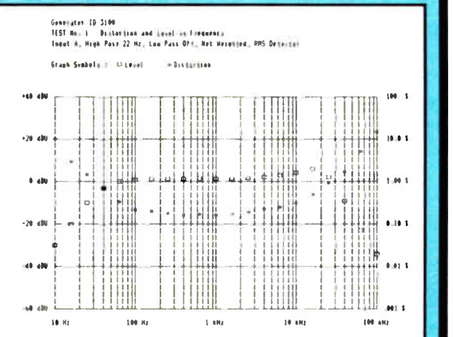
```
TEST No. 3   *****  *****  *****

Generator ID :
Input A
High Pass 22 Hz   Low Pass 80kHz   Not  Weighted
RMS  Detector
      THD              FREQUENCY          LEVEL
      0.0013 %         10.063 kHz         0.70 dBU
      0.0013 %          6.351 kHz         0.70 dBU
      0.0014 %          4.007 kHz         0.70 dBU
      0.0017 %          2.528 kHz         0.70 dBU
      0.0017 %          1.595 kHz         0.70 dBU
```

GRAPHIC PRINTOUT (option)

22 different tests can be printed graphically directly from the Analyzer to any Epson™ compatible printer. No computer interface is necessary.

The graph shown to the right is a reduction. The graph's actual size is 6.12" wide by 5.00" tall. Two graphs fit on a standard 8.5" by 11" sheet of paper.

A user can also select a combined Graphics + Tabular printout.



The Sound Technology 3000 Serles... The NEW generation in audio testing!

The ST3000 Series design philosophy combines the "best of all worlds" for audio testing in one package. You can use the instruments *manually*, use *internal automation* or *externally automate* using one of the 3000 series' industry standard interface busses!

AUTOMATED BENCH-TOP TESTING

Simple bench-top automation results from Sound Tech's unique use of FSK (frequency-shift-keying) generator-to-analyzer communication. The use of FSK, which is transmitted through the audio line(s) or circuits being tested, allows for *automation without external computers*! Up to 16 proofs or test sequences can be built into the Generator's programming section. Running a proof is as easy as recalling a two-digit number and pushing "start"!

MANUAL MODE

Up until now, when purchasing an audio test system you had to make a choice. A choice between manual or automated testing. The conflict exists because Engineers naturally prefer a manual "mode" of operation when troubleshooting, and they prefer automation when they want to get an overall performance picture.

The solution is the 3000 Series. It excells both in manual use and under automated control. Easy to understand and use front panels make manual troubleshooting easy. Exclusive *two LED displays* on both the Generator and Analyzer give you twice the information of competitive systems. And, the Analyzer's exclusive *Memory Storage* section is continually storing away test results for your later use.

COMPREHENSIVE WAVEFORMS AND ANALYSIS

More than just a sinewave generator, the 3100A is a low distortion function generator having the following waveform capabilities:

Sinewave: ..... 1 Hz to 102.39 kHz
Squarewave: ..... 1 Hz to 50 kHz
SMPTE-IMD:* ..... 7 kHz on 60 Hz, 4:1
Toneburst:* ..... 100 Hz to 102.39 kHz
Sine/Step:* ..... 100 Hz to 102.39 kHz

* Denotes an option.

All of the above waveforms are generated by the world's best generator: a *transformerless, electronically balanced—true floating* two-channel output generator. This digitally controlled, analog oscillator runs "RF cool" as the enclosed oscillator is isolated from the multi-layered pc board digital control section using opto-isolators. There is no electrical connection between the digital control circuits and the analog oscillator—therefore, no RF or digital "hash" path to the oscillator. Engineers are amazed to sweep either the Generator or Analyzer out into the MHz regions and find no digital hash or clock frequencies in the spectrum.

Because the balanced outputs are truly floating and transformerless, you can single-end either side to ground without loss of level. Also, you can output a clean (-90 dBm) signal in order to test well below mic-line levels: the oscillator attenuates the noise as well as the signal (over 100 dB of attenuation after the power amp)!

The *3200A Analyzer* is no less comprehensive. The analyzer measures the following:

Frequency to 500 kHz
Flat Level to 350 kHz
Filtered Level to 350 kHz
Ratio
Notch Lock*
ThD vs. Level (300 kHz BW)
ThD vs. Freq. (300 kHz BW)
SMPTE IMD*
Φ Error in Degrees to 40 kHz
Φ Error in Time to 40 kHz
Channel Separation to 100 kHz

All measurements are fully automatic. Merely select the test and press "Start." Two LED displays autorange and show two parameters simultaneously. For example, 'A' channel Level will show the incoming frequency on the left display and Level on the right display. The LED readings will keep updating in real-time until the "Stop" button is depressed. No range changing or scaling is necessary.

INDUSTRY-LEADING SPECIFICATIONS

The 3000 Series was designed for testing 16-bit digital audio systems.

The 3000 Series specifications are some of the best to be found. We welcome comparison to any other audio test system regardless of where manufactured. Beware of confusing specification claims when shopping for a new audio test system!

BENCH-TOP TESTING

FSK automation lends itself to bench-top testing. Auto-sequences can be designed entirely for audio equipment check-out purposes. Also, FSK automation can be recorded on audio and video tape recorders such that automated 2-head type testing can be accomplished without external-computer control.

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The 3000 series can also be controlled using external personal computers. The 3000 series is controlled using standard interface busses (GPIB and RS-232C). By using a standard interface we allow you to configure the 3000 series with other automated test systems. Sound Technology also sells bundled IBM-pc/compatible software modules for use with our automated systems. With these modules, no software experience is necessary to automate ST equipment.

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(continued from front)

ple will work in concert with Allied people to sell studio equipment.

We have it such that any salesman can sell any product, and it's a win-win thing. But we look at the different sales teams to concentrate on different areas of expertise.

RW: *What about in areas where there is overlap? Is there going to be a lot of duplication now that you need to eliminate—too many sales people selling too many of the same products?*

Numann: No, we don't think that there's duplication. Right now, when someone dials the 1-800 number, it would come to an Allied sales office, and if it's a call related to a transmitter the expert from Harris would deal with it.

If it dealt with a studio product that Allied has, the Allied person would deal with it, but if either one was busy the other one would take it over and handle it. Of course, if there are preferences for who the customers want to deal with we'd let them deal with their preference.

RW: *With both companies having a full sales force aren't there going to be some areas of overlap that are extraneous?*

Numann: No, because the Harris salesmen have for the last year been selling transmitters *and* been selling the studio products from the Allied inventory and from Allied supplies, so we really haven't had any duplication for a year.

What we've had are certain little conflicts that would develop because we weren't one company, that is, who gets credit for this or what have you. Now we're all the same company and everyone will get credit for the sale to the customer.

RW: *There are some areas that might be considered conflicts for Allied, where Allied sells from manufacturers who may be considered in competition with Harris. How is that going to work out?*

Ridge: We are still going to be the department store of the broadcast industry and we are going to handle products of other manufacturers. There may be certain products, if they're not in conflict with Harris transmission products, we will carry them.

RW: *How do your other manufacturers feel about this? Don't they feel that this would necessarily mean a worse competitive situation for them?*

Ridge: Not at all, they feel that they have additional sales people on the street and additional marketing that will be applied. They look at it as a big opportunity.

There will be a few suppliers, of course, who have some questions but I think we can deal with those.

Numann: I can just tell you as a matter of policy that we are not going to restrict the entry into the Allied catalog of competitive products, where the customers want those products.

We here in Quincy have to be bold enough to develop what we think are products that are different, or better, and if they're not, we'll offer whatever products through Allied that need to be offered.

RW: *So is Allied going to have to renegotiate with some of its suppliers as a result of all this?*

Ridge: We will probably renegotiate with some of the suppliers, but I think by and large 90% of them will be very happy with the arrangement here.

RW: *How about some of the corporate things, any changes in policy, corporate structure or employee relations?*

Numann: Well, my view is that Allied is a good company and we're not going to damage its effectiveness. Like I said to Roy's people today, we're going to work hard to help each other. But we're not going to change any good things, or the basic way in which Roy operates.

Harris tends to let its units be pretty autonomous. This is a particular situation where we want to retain the autonomous strengths of these operations, but we want to have more teamwork on how we work together.

RW: *Does either company see a restructuring of personnel as far as managers, sales managers or divisions?*

Ridge: Not on Allied's end, we don't see any restructuring.

RW: *Everybody there will maintain their positions as they stand now?*

Yingst: Yes, as far as our people are concerned there will be no restructuring but they will be working and getting some of their phone calls through that 1-800 number which will come through the Allied office. So in that sense it will be a little bit of a change.

RW: *Will there be any restructuring of prices as a result of this arrangement?*

Numann: We're not planning any, no.

RW: *How about the international market, will it work the same as it will domestically?*

Numann: Internationally we each have a set of dealers and representatives. Right now Allied has quite a few of the same representatives we have, but they do have some different ones. We're going to work out a method to deal with that positively.

RW: *Will that mean some consolidation?*

Numann: We'll try to maintain all the dealers that we have. In cases where Allied has a dealer and we don't, we'll assign that dealer to both units and vice versa.

RW: *How will your agreement affect the newly-formed systems division of Allied?*

Ridge: The systems division has been doing very well, and we think that this gives some additional resources to expand that department even more. We have been doing systems work both internationally and domestically and I think now, with the additional resources of this facility, we have great hopes for that division.

RW: *So it will enhance the systems division?*

Ridge: Absolutely.

Numann: When we have a new facility that buys a transmitter we now have the opportunity to do the special systems work in the studio in a total package that we have not been doing here at Harris. And so that offers the customer a good situation. In addition we have certain technical expertise that can support that operation.

RW: *What about the two company names?*

Ridge: We will be Allied Broadcast Equipment Corporation, a Harris company.

RW: *And on the products?*

Numann: Allied products will still say Allied on them. And Harris' equipment will still say Harris.

RW: *Thank you for giving us this opportunity to talk with everyone.*

Radio World Extra

Harris Acquires Allied

Quincy IL ... On 31 August, Harris Corporation and Allied Broadcast Equipment inked an agreement that will have a great impact on the marketing of broadcast equipment both in the US and internationally.

Under the new arrangement, Harris acquires Allied, which becomes a subsidiary of the Harris Corp. under its Communications sector.

Allied Broadcast Equipment is the largest US full-line distributor to the international radio broadcast industry. Harris Corp. is a $2.1 billion supplier of information, communication and semiconductor systems, products and services to government and commercial markets worldwide.

Hours after the agreement was completed, Guy Numann, senior VP and head of Harris Communications sector; Tom Yingst, VP and general manager of Harris' Broadcast Division; and Roy Ridge, Founder and CEO of Allied talked with **RW** editor Judith Gross about the details and implications of the acquisition.

RW: *What is the background of the agreement signed this morning? We know that Harris and Allied have been working under a joint sales agreement.*

Numann: I would say that I personally got to know Roy about two years ago and we seemed to have a common belief that if we could put these two companies together, one-plus-one would be greater than two. I think we almost used those words from the first time we met, didn't we?

Ridge: We carried them for two years.

Numann: And so we had a little rocky start, like some marriages, but we kept getting better and better. Finally we got to the point where we just said look, the only hurdle for making this one-plus-one greater than two is to become one company.

So we became convinced to do it and we've been working hard right up until 1:30 last night, to make it happen.

Ridge: I think it's important to note that even with those hurdles over the past two years we have several success stories to tell and verify what we've jointly accomplished, projects with new stations, getting stations back on the air.

We've accomplished this jointly where neither company could have done it separately.

RW: *Would it be fair to say that it was your intention from the beginning to culminate an agreement such as the one you signed today and that you were "trying it out" with the sales arrangement that you had previously?*

Numann: I don't know as it would be fair to say we were "trying it out," but it is fair to say that from the start we had this vision, that this could be possible.

Actually, quite frankly I think that we felt that it would only really come together after Roy got to the point in time where he would want to retire. But now, here it is, Roy's going to be working full time with us as a team, and we just accelerated our vision.

RW: *How long is Roy going to stay with Harris? Roy, are you on some kind of a contract?*

Ridge: I am under a contract, but I plan on retiring from Harris Corporation. And I plan on looking at the next several years with great enthusiasm and being able to look back on it with this being today one of the best decisions I've ever made.

Harris senior VP Guy Numann and Allied founder and CEO Roy Ridge

RW: *You're under contract but you're planning to stay with Harris until you retire from the business?*

Ridge: Absolutely.

RW: *How long is the contract for?*

Numann: Well, it's forever. Right now I have a reputation inside my company that I don't let people retire, and as a matter of fact some of the people who work for me enjoy working past age 65, and they are doing so and they enjoy it. If Roy wants to do that, I'd love to have him.

RW: *Can you disclose any more details of the arrangement, any of the financial details or anything?*

Numann: No, we are not disclosing that, but I would say what I've said to the people here, that the arrangement we have with Roy is that he looks out for the success of Harris Broadcast as much as he looks out for the success of Allied Broadcast Equipment.

We believe that we can't find anybody we know of in the world today, much less the US, that has as much strength now as these two combined companies have both in product offerings and in sales to the radio industry.

RW: *What does it mean immediately in terms of Allied customers and Harris customers. What changes might they expect?*

Numann: One thing is, as you know, Allied has instituted a 1-800 number, and we now have one number that any customer can call for any kind of service they want, whether it be from the Allied's Richmond operation or the (Harris) Quincy operation.

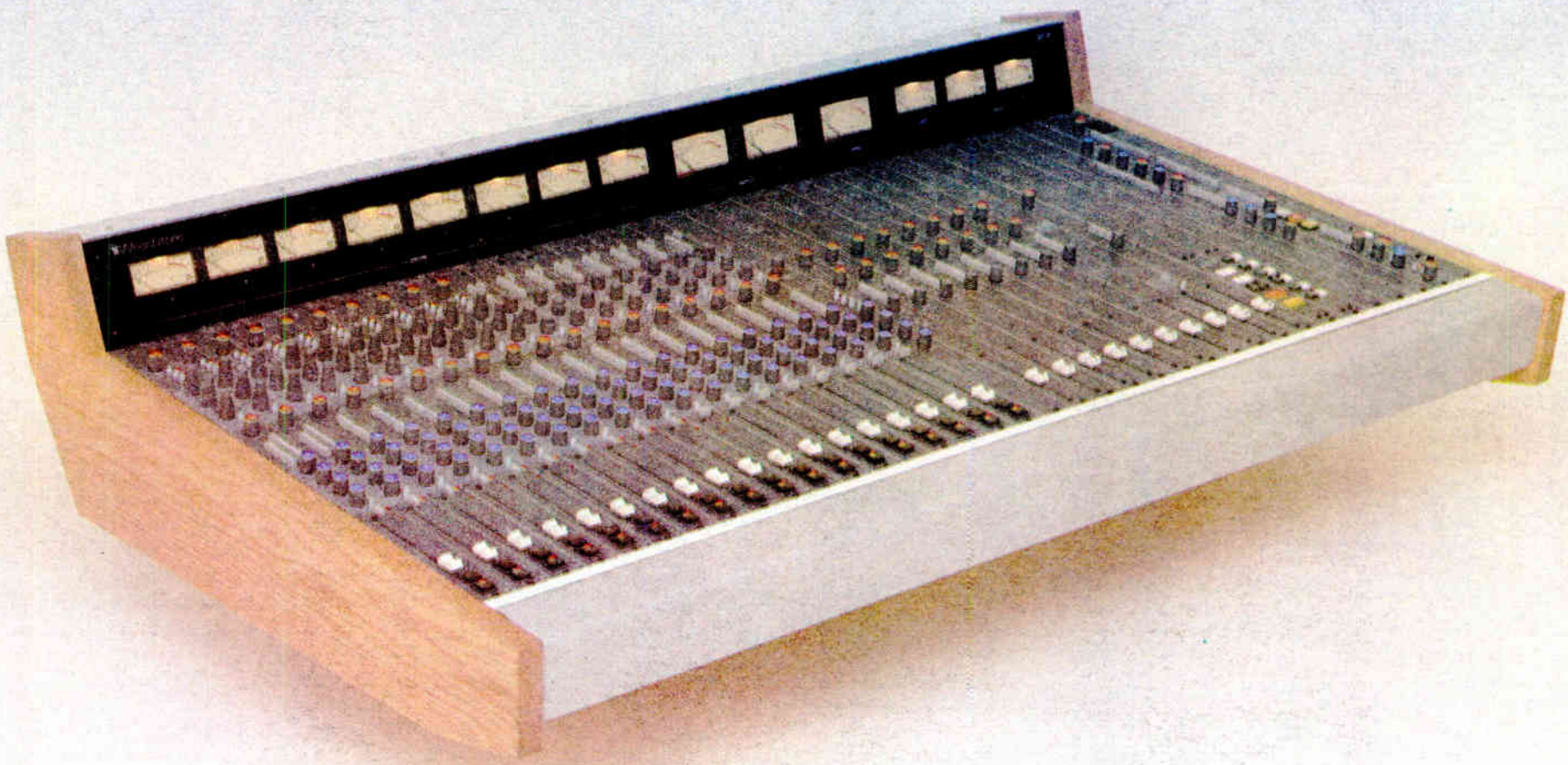
RW: *What about in terms of who the customers are used to dealing with, are they going to be dealing with Harris people if they've been dealing with Harris people, or Harris and Allied people now?*

Numann: Whatever the customer wants to do—we're customer oriented. We have what we believe is the right combination, that certain Harris DSMs—district sales managers—are skilled and knowledgeable in the intricacies of the middle sized to higher power transmitters.

It takes quite a long time for the station managers and chief engineers to understand the virtues of what we have to offer, and we believe that Harris sales peo-

(continued on back)

ONE THING WE DEPEND ON:



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Circle Reader Service 25 on Page 32

Overnight Planning to Improve Operation

by Thomas Vernon

Harrisburg PA ... In most radio markets engineering operations seem to fall into two groups. One group has a station that sounds great, runs well and has very few outages.

The other group sounds mediocre, is constantly putting out fires, and is off the air during every electrical storm and a few other times as well.

Probably the biggest difference between these two groups is in the area of preparation and planning that goes into their operations.

One area where planning is paramount is overnight work. At most stations, time when the station can be off the air is a precious resource.

If the time is properly utilized, major repairs can be completed and equipment peaked to perfection. But if squandered, it is a period when things are torn up and barely put back together in time for the 5:30 sign-on.

This month we'll examine the psychological and physical preparation necessary for productive overnight work.

Overnight planning

Careful planning is essential. At most stations "overnight" lasts from midnight until 5:30 AM—that's 5½ hours to cover a lot of ground.

Start a few days ahead with a written list of everything you'd like to accomplish. Now prioritize it! Replacing weak finals or damaged ATU components is probably more important than tweaking the STL.

Assign high priority to investigating changes in transmitter readings. Now is the time to catch small problems before they turn into off-the-air emergencies.

Don't plan to do too much in one night. Experience will tell how many projects you can safely fit into those 5½ hours. The main criterion for a putting a project on your checklist is that it can be done at no other time.

Use your completed project list to produce a materials check list. Include everything you'll need to complete projects: tools, test equipment, parts, air filters, manuals, dymo label tape, etc.

Don't leave anything out. Gather everything at the transmitter site at least a day before the overnight. Check items off the list as they're in place.

Check those parts

If you've ordered parts, open the boxes and verify that these are indeed the ones you need. There's little worse than opening boxes at 3 AM and finding that what's inside doesn't match the packing slip, or that the most critical parts were back-ordered (Murphy's Law, you know).

Station Sketches

Take equipment manuals home and review any adjustments or alignment procedures you will need to make. It might help to write down some procedures in your own words.

With a priorities list and parts in place, it's time to talk about psychological planning. Being in the right frame of mind for an overnight is critical to your success.

During quiet periods, visualize what you're going to do. Try to see every step in your mind's eye. By doing this you may discover that something got left off your list.

Also, this mental dress rehearsal will allow you to work more efficiently since you will have "been there" before. Such mental preparation will allow you to approach the overnight with a sense of calm and self-confidence.

At most stations, time when the station can be off the air is a precious resource.

Try to get a few hours sleep before working. This may also be a good time to do your visualizing.

The buddy system

Safety is an important consideration when planning overnights. Working alone in a high voltage environment without enough sleep can be dangerous.

Try to have someone with you, preferably a person who knows CPR. If this isn't possible, have someone call and check up on you occasionally.

Also check the weather forecast and be ready to duck out if a thunderstorm appears. If you're working at a remote tranmitter site, be sure your car is secured and lock the fence and transmitter building behind you. This should prevent any unwanted encounters with the local night life.

It's important to dress in something that allows unlimited freedom of movement and something which you can get completely filthy in.

Sweat pants, heavy socks (no shoes), and T-shirt work well for me. Also re-

(continued on page 31)

Simple Booster Interconnection

(continued from page 22)

Another interesting advantage to having a booster station is that there is no requirement for the booster to leave the air if the main transmitter were to fail.

In fact, it would be in the public interest to have the booster on during interruptions of the main signal. The FX-30 booster option is designed to remain well within FCC limits for frequency tolerance, even if the reference frequency is lost.

So if the reference to the slave FX-30 is lost, the booster returns to the factory calibrated station frequency. While no longer frequency locked to the main, it will be close, and most likely, inaudible. Most importantly, it will still be on the air, providing a signal to the booster's coverage area.

In the field

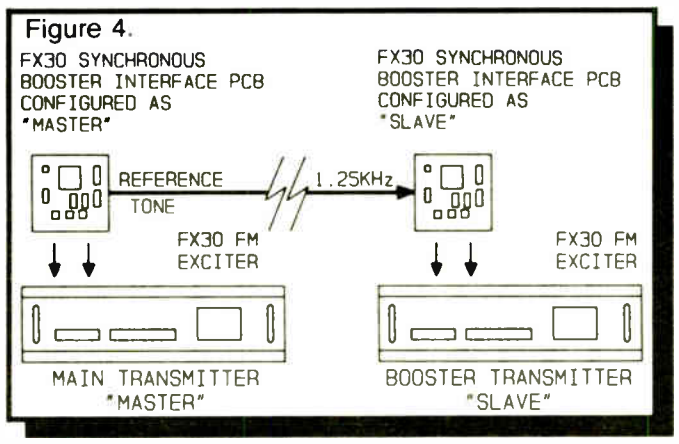
In early 1988, after several months of design and bench testing, a field test of the FX-30 synchronous booster option was conducted.

The system diagram was very similar to that of Figure 1, whereby the reference tone was added to an STL subcarrier at the main transmitter site and sent to the booster.

The plug-in interface boards were installed in both the main and booster exciters, and the system was turned on. The system quickly achieved frequency lock.

A later test in the equal carrier zone verified that the transmitters were indeed locked, and the frequency locking method used in the FX-30 booster was very immune to noise degradation of the reference.

Figure 4.



The booster site was located in the center of a large metropolitan area.

The station was experiencing severe multipath and intermodulation problems in the downtown area, and the booster was being installed in an experimental effort to eliminate the problem.

With the addition of the booster there was a significant increase in signal strength in the immediate area and the multipath problem was virtually eliminated throughout downtown.

While the intermodulation problem was not completely overcome, the area of interference was somewhat reduced.

Outside of downtown, however, a wide area of interference was created. The use of a directional antenna helped to move the areas around, but it was impossible to eliminate them.

The areas of interference did not seem to follow any of the predicted theoretical equal contour lines. The differences in terrain between the main signal path and the booster signal path made the prediction of equal contour or fixed ratio contours difficult.

The end result was a scattering of interference "pockets" with inadequate carrier ratios for quality reception. A carrier ratio measurement of 17 dB was made just at the point of "quality" reception.

After some improvement in the tracking of the two modulators, that number was reduced to about 14 dB.

Carrier ratios

The actual threshold of acceptable carrier ratio appears to be both a subjective measurement and varies from radio to radio.

The ratio should be smaller for a fixed receiver than for a mobile one, but with the great emphasis put on the mobile listener by most stations, this is of little consolation.

The addition of a booster station requires a great deal of planning and careful selection of the booster site, power level and antenna.

It is most suited to areas of natural signal shielding, such as mountainous areas. Boosters can be implemented in other areas with a greater risk of interference to potential listeners.

Ed Anthony is a design engineer at Broadcast Electronics, Inc. His primary responsibilities are design and support of the small signal RF products including the FX-30 FM exciter. He can be reached at 217-224-9600.

A Look at Demo Bed Libraries

(continued from page 21)
tion are well laid out in the style category and disc number listings.

Of particular interest to some will be the "% synth" notation which shows the percentage of synthesizer used in each composition.

The track listing section basically replicates the information printed on the insert of each CD: track number, length, mix, tempo, energy, attitude, style and edits.

The package is designed for both industrial A/V and commercial use. According to executive producer Mark Cuddy, AirCraft positions itself as a service with a newer sound.

A larger percentage of its material is used by radio and TV stations than by industrial A/V producers. Since virtually every full length theme has an alternate mix or "minus melody" mix, the collection is very well suited for industrial production.

For those who don't have extensive experience with this kind of production, the full mixes are often used when there is no narration. When narration is present, alternate mix or "minus melody" mixes work better because they don't get in the way of the voice.

Without the melody line the track can be pumped up a little louder, which usually increases the momentum of the program.

the best way to use a production music library is to do your music search before you write the copy. First choose the music which fits each segment, then write the copy to the music. This "lyrical" approach works for spots or A/V productions.

Because all of the compositions are channeled through music director John Kiehl and mixdown engineer John Nagy, The AirCraft library is very consistent. At the same time, the musicianship is of such a high level that the different styles of music never sound contrived.

This library is a very good attempt at creating a body of work that is useful in spot production, promo beds and industrial A/V tracks. It is very well recorded and produced.

If you're stuck back in the old spot bed frame of mind, however, it may sound too hip. If, after listening to a demo you still feel uncomfortable, you should pay more attention to the music on national TV spots and programs and network promos.

If you still feel uncomfortable it may be time to pass on the music choosing chores to someone younger.

About the only thing that bothered me about any of the tracks was the occasional strange edit of the 30 second beds. The problem was finding a good place to cut to the ending.

Although the solutions worked, there were a few that didn't work as well as others. Unless you have a degree in music composition and the headphones on you probably won't be able to find these edits. All in all AirCraft should be credited for coming up with a good fresh sounding package.

The AirCraft Library is not available on a needle drop basis. There is an annual lease and a three or five year lease with a buyout plan.

In-house industrial clients can buyout a 20 LP (not CD) library. The price of the CD library ranges from $1200 to $2500 depending on market size and use according to Cuddy includes 10 new CDs per year. You can call him at 800-343-2514 for more information.

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

Do-Attitudes

(continued from page 19)
and move on it.

The trouble is that they never seem to have quite enough information. And even if they do wait to get it all, someone else has probably taken off with far less hard data and beaten them to the goal.

Don't buy the lie that changing direction shows a lack of perseverence or a tendency to be erratic.

While you should avoid making complete changes in direction without giving a concept time to fully develop, today's fast-moving business scene rewards those who are flexible enough to catch the opportunities of the moment.

Trust your gut instincts

I don't want to get cosmic here, but there are powers of the mind that go beyond the conscious, and those who can harness these powers are at a dramatic advantage over their peers.

I'm talking here about instincts or intuition. I believe that if you've fed the computer of your mind with information relevant to your undertaking, your subconscious will be working on the problems constantly.

Then, when you get a hunch that you should take a certain course of action, or maybe modify the course you're on, do it.

You'll probably find that your instinct was right on, and you've cut hours, days, months, maybe even years off of the time it would have taken to scientifically reach the same conclusions.

Again, the real key is to trust your mind and then . . . ACT.

John Cummuta is president of Marketline, a broadcast management and marketing consulting firm and a regular **RW** *columnist. He can be reached at 312-960-5999.*

Bringing FMX Stereo to the Air

by Jim Monahan

With the Availability of New Stereo Generators Installing the System May Be Easier Than You Think

Greenwich CT ... Within the last few months, the list of FMX Stereo broadcasters has grown to more than forty stations.

There are two significant reasons for this recent growth—the introduction of the Inovonics model 705 FMX stereo Generator and the expected availability of several brands of FMX receivers early in 1989.

Through these installations and various station tests, we have gained important information about the system. There are implementation considerations for maximum broadcast performance and compatibility.

Some of this information is presented here for the benefit of those who will begin FMX stereo broadcasting in the near future.

First, let's briefly review the technology. FMX is a noise reduction system designed to improve the received SNR and reduce the effects of multipath noise and distortion in an FMX equipped receiver.

In automobiles it can provide good stereo separation in areas where conventional radios are fully blended to monophonic reception.

Quadrature signal

The FMX system incorporates an additional L–R stereo difference signal which is compressed and is transmitted at 38 kHz in quadrature with the regular stereo difference signal.

At the broadcast station an FMX stereo generator includes a quadrature modulator which generates the second subcarrier and a 14 dB compressor with a unique curve to allow transmission of full modulation capability to existing receivers.

An ID tone for automatic receiver acquisition is generated for the quadrature channel by dividing the 19 kHz stereo pilot by 1920 to approximately 10 Hz.

Figure 1.

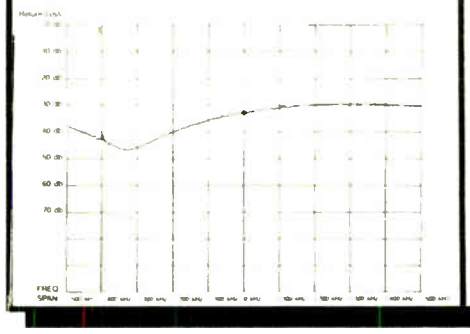
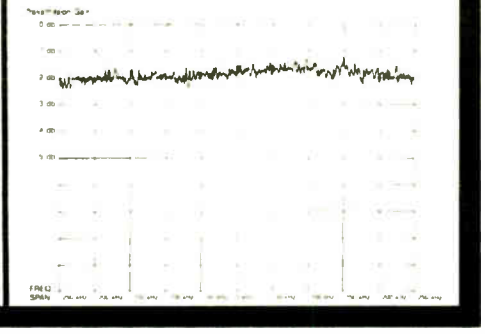


Figure 2.



In a receiver, the FMX expander uses the conventional stereo difference signal as a decoding reference for accurate expansion of the compressed signal to achieve noise reduction.

Conventional stereo receivers should not detect the quadrature subcarrier, and since there is no increase in the bandwidth of the composite signal, auxiliary broadcast service should not be affected by FMX transmission.

Station testing

In the earliest installations, special emphasis was put on measurements of certain RF parameters including antenna VSWR bandwidth, transmitter frequency response, group delay and incidental AM.

The importance of these performance specifications is not unique to FMX broadcasting. They are equally important for conventional stereo.

The four tests were defined by my colleague Aldo Cugnini. Measurements were made using an HP 3577A Network Analyzer and a 35677A S-Parameter test set, an HP 7470A Digital Plotter and an RDL ACM-1 AM Component Monitor. Representative graphs are shown in Figures 1, 2 and 3.

VSWR is a measure of RF power reflected back to the transmitter due to any mismatch in the antenna and/or feedline.

In this test a frequency sweep of the antenna/feedline is used to measure VSWR and symmetry of the sidebands around the carrier frequency.

Significant degradation of these parameters can produce source induced synchronous AM as a function of reflected power and delayed retransmission of the signal. Poor antenna bandwidth can introduce AM components as the signal deviates over a sloped response.

... auxiliary broadcast service should not be affected by FMX transmission.

Figure 1 is a graph of return loss over a 1 MHz span with a center frequency return loss of about 33 dB or 1.05 VSWR.

Antenna VSWR below 1.12 measured over a bandwidth of ±100 kHz is considered desirable for good performance. As the graph indicates, tuning is often off frequency to compensate for the effects of icing.

The RF amplifier transmission coefficient is a measure of the exciter/IPA/PA frequency response. The network analyzer sweeps these stages to determine flatness out to a minimum of 100 kHz.

Poor response can introduce synchronous AM with a corresponding reduction in stereo separation and an increase in SCA crosstalk. Figure 2 shows a swept response over ±250 kHz with flatness within 0.5 dB; this represents good performance.

RF Amplifier group delay is a measure of the exciter/IPA/PA phase response flatness.

Group delay is the derivative of the

(continued on page 31)

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On the Air with the FMX System

(continued from page 29)

phase with respect to frequency and indicates the degree to which all the modulation sidebands are transmitted in the proper phase relationship.

Figure 3 shows group delay within ±100 ns over ±200 kHz, representing typical operation.

Incidental AM

Incidental or synchronous AM is the result of amplitude modulation generated with frequency modulation when there are non-linearities in the RF transmission system.

The tuning of the IPA stage of the transmitter is typically the most critical for reducing incidental AM. The RF match between the exciter and the IPA is also important.

This should be checked with a VSWR meter installed between these two stages in conjunction with minimum incidental AM tuning of the IPA and following stage.

In a few cases changing the component values of the IPA bandwidth filter may be necessary to obtain minimum incidental AM.

This should be attempted only when satisfactory results cannot be achieved by tuning. Flatness of these transmitter bandwidth filters is important to reduce SCA to stereo crosstalk.

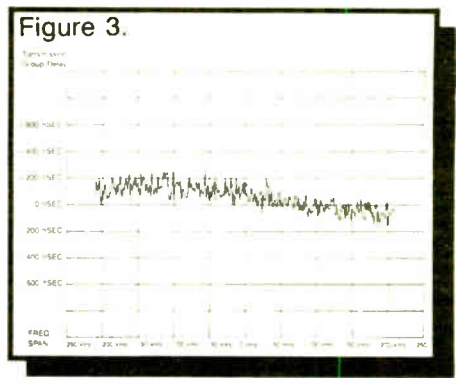
Since transmitter tuning tends to drift due to component and tube aging, it is important to check this parameter on a regular basis.

In this way, you will be able to control incidental AM before you begin to hear any degradation such as an increase in multipath artifacts.

Keep it in check

While the first three tests have been presented for informational purposes and are not normally performed by station personnel, incidental AM can be measured with inexpensive available equipment.

It is clearly the most important of the test parameters to be measured. Recently, many articles have been written on this subject and the correct way to measure it.



Our experience with FMX stereo installations has verified its importance in minimizing SCA to stereo crosstalk and apparent multipath artifacts.

Incidental AM should be at least 45 dB below 100% FM modulation for quality transmission with either conventional stereo or FMX stereo broadcasting.

Installing the FMX system

The installation of FMX equipment into your station is easier then perhaps most realize. Available FMX stereo generators interface readily with existing processing systems.

On the back of the Orban 8100A, for example, there are audio jacks that can feed the left and right inputs of any FMX stereo generator with the processed and preemphasized audio.

After the appropriate controls of the new FMX stereo generator are adjusted per the manual, you simply disconnect the composite cable from the old stereo generator and attach it the the new FMX generator. You are now on-the-air with FMX stereo!

For additional information, please contact Jim Monahan at Broadcast Technology Partners at 203-622-2631.

Improving Your Station's Operation

(continued from page 26)

move rings and watches. It's surprising how fast a gold ring heats up with a little current flowing through it, not to mention the damage it can do to the circuit.

As for watches, exposure to high RF fields doesn't do much for their accuracy, even the supposedly "non-magnetic" types.

Before beginning any transmitter work take a full set of meter readings and note positions of all tuning controls. This will give you a "normal" reference for later use.

Do major work on the transmitter or associated equipment right after sign-off, while you're most alert and your energy level is highest.

Keep a written record of your work. After each project or major step is completed put the covers back on and make sure the tranmitter still operates.

This may seem annoying and time consuming, but it beats trying to troubleshoot a transmitter that won't operate after you've made five or six major changes and you don't know which one is causing problems.

It is a medically proven fact that an engineer's brain cells begin to turn into steel wool around 4 AM, resulting in diminished concentration and irrational thought. Time for a break.

Have someone make a pizza run for you or pack a thermos and sandwich. Food and caffeine are important at this time of the morning. Use this break to jot down notes on what's been accomplished so far, while the details are fresh in your memory.

Now work on those minor projects, things that don't require as much mental or physical energy. Clean the insides of the transmitter, change air filters or take the blowers apart and clean them.

One useful project is to check all the interlock switches with a DVM. Switches that show more than a half ohm when closed are probably packed with micro dust and should be worked over with a good spray contact cleaner until they act properly.

Doing this will probably save you at least one emergency call in the next year.

Allow time to get everything put back together and cleaned up before sign-on. Have the studio operator turn the rig on and take readings. This will verify that remote metering and control are still intact.

Stay around for about a half hour after sign-on. If anything major is going to go wrong with the transmitter, it will probably happen in this time.

If everything has been planned and organized properly, you can look back over your list and congratulate yourself on how much work you've completed.

If not, you may find the clock creeping closer to 5:30 with a transmitter that won't go on, wishing that you were anyplace but at the radio station.

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

Radio World Marketplace

If your company has a new product you wish us to consider in *Radio World Marketplace*, please send a press release and black and white photograph to Radio World Marketplace, P.O. Box 1214, Falls Church, VA 22041

Digital splicing tape

New from 3M is the #8175 digital audio splicing tape, part of the company's line of professional audio accessories.

The splicing tape incorporates 3M's synthetic adhesive to ensure roll-to-roll tack consistency and maximum shelf life.

For more information, call **3M at: 612-733-1110**, or circle **Reader Service 62.**

Universal turntable controller

Recent changes to Henry Engineering's universal turntable controller have made the unit compatible with more consoles.

The UTC can now start and stop the turntable even if the console provides only a "start" output. The UTC will generate the "stop" function automatically and still maintain full sync.

D-type connectors are used in the new UTC.

For more information, call **Hank Landsberg at Henry Engineering: 818-355-3656**, or circle **Reader Service 63.**

Audio distribution system

McCurdy Radio Industries' ADS-500 is a modular audio distribution system in a single rack unit size.

The ADS-500 contains a switch-mode power supply module and ten modular DAs, each with six actively balanced outputs utilizing complementary-symmetry FET stages. Thirty decibels of gain are adjustable in five 6 dB steps.

A separate front panel trim potentiometer provides adjustment within a ±6 dB range.

Short term redundant operation is possible when the power supplies of two frames of DAs are interconnected.

For more information, call **Omar Fattah at McCurdy: 416-751-6262**, or circle **Reader Service 65.**

ICON network

ADC Telecommunications has introduced the Integrated Cable Organization Network (ICON), a family of products for terminating and cross-connecting audio cabling in the broadcast and audio and video production industries.

The ICON uses ADC's QCP insulation displacement contact for cable termination, designed to provide gas tight secure terminations. The QCP contact uses a rapid punch down method of termination, and color-coded contact insulators.

For more information, call **Lynne High at ADC: 612-835-6800**, or circle **Reader Service 60.**

DAT machines

Panasonic/Ramsa now has two professional DAT machines. The portable SV-250 (shown) has balanced XLR input connectors and a 2.2 hour record capacity (with a NiCad battery pack).

The SV-3500 features XLR inputs and outputs and remote control. It is intended for rack mount applications in broadcast studios, post production and recording.

For more information contact **Steve Woolley at Ramsa: 714-895-7278**, or circle **Reader Service 69.**

Cellular production unit

Broadcast Services Company has introduced a new concept for broadcast remotes. The Cellular Production Unit system allows any remote audio mixer to be fed directly into nearly any cellular phone for transmission back to the studio.

A proprietary interface unit accomplishes the task via simple plug-in cables. No phone modifications are required.

For more information, call **Neal Davis at Broadcast Services: 919-934-6869**, or circle **Reader Service 61.**

Circle Reader Service 42 on Page 32

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

NPR Takes DAT to Vietnam

Technics' SV-MD 1 is Put Through its Paces in Southeast Asia

by Flawn Williams
NPR

User Report

Chicago IL ... In December of 1987, I began work on a stereo radio documentary project for NPR. It involved traveling to Vietnam for a series of reports on current conditions in that country.

A group of us would spend three weeks in Vietnam and record 60 to 80 hours of interviews and sound scenes.

For a trip of this length, the need to stay portable with tape and supplies made the option of using a portable DAT recorder enticing.

I opted to turn to a "grey market" importer to get a Technics (Matsushita) SV-MD 1 portable DAT recorder. Though the importer's literature was sketchy and in many cases inaccurately translated from Japanese, I placed an order in mid-December.

Consumer DAT

Even in its bare bones consumer version, the DAT recorder appeared to be a dream come true. Measuring 6" × 9" × 2" and weighing 3½ lbs. with a two-hour battery, it was definitely portable.

It had both line inputs (–10 dBm, RCA jacks) and mic inputs (¼" jacks, unbalanced) similar to semi-pro analog cassette machines.

The unbalanced mic inputs were the first hurdle to clear. Their sound is clean but not state-of-the-art and obviously they don't provide phantom power.

I had decided on a Neumann RSM-190 MS stereo shotgun mic to do most of the Vietnam sound gathering; fortunately, Neumann was just bringing out a new stereo mic battery power supply with DC-free outputs which would tolerate unbalanced operation.

The power supply for the SV-MD 1 turns 100 V Japanese power into 6 VDC, connecting via a typical coax power plug to the side of the deck.

The 100 V adapter, it turned out, would have no trouble handling up to 122 V in Vietnam and the US as long as it was kept well ventilated.

Battery charging

The battery for the DAT recorder recharges in the machine in four hours, and will run the deck for a little over two hours. (The machine must be turned off in order to charge the battery.)

The battery is removable, so multiple batteries can be charged sequentially and then used ... but I couldn't get any spare batteries in time for the trip.

The solution was to use outboard power packs. The Bescor Half-Pints, nominally 12 V packs, are actually made of two 6 V cells in series; by rewiring them it was possible to charge them with their 12 V transformer and then draw power from them in parallel at 6 V.

More potential problems existed in the analog input circuitry. Input controls include a mic-line switch, a 20 dB mic pad and a switchable limiter.

The input gain pots are tightly-ganged concentric knobs. Unlike most audio gear, the input gain controls are after the first amplifier stage; running +4 dBm line-level signals into the SV-MD 1's line inputs can clip the input stage badly and the input pots can't help. An attenuating patch cord or level interface box is necessary.

NPR's Flawn Williams (l) and Alex Chadwick (center) interview children in a Vietnamese park.

Photo by Art Silverman

Fixed level outputs

Outputs are fixed level (–10 dBm, RCA jacks). There is also a stereo headphone jack with volume control which can be used as a line-level output.

The SV-MD 1 also has a digital output on a gold sub-mini jack with accessory cable supplied to connect to an RCA digital input jack on other DAT models.

When properly fed the recording quality of the DAT deck was wonderful. The A-to-D conversion sampling rate is 48 kHz. This machine has no digital input and does not record at 44.1 kHz, further removing it from the spectre of CD pirating feared by the recording industry.

The signal is oversampled going in at 64 times the sampling frequency, which allows use of a *very* mild analog low-pass filter; the high-frequency aural texture is much smoother than the older F-1 digital recorders.

DAT recorders have a Program Number (PNO) subcode locator system similar to CDs. In DAT, the information is recorded as a nine-second burst on a separate linear tape track which can be read at high speed.

Using buttons provided on the top, the SVMD 1 can be instructed to locate a particular PNO (up to 99 on a tape).

What promised to make this feature so useful for the Vietnam project was the ability to create PNOs while recording. The machine puts a number at the beginning of the tape each time recording is restarted from Stop or Pause.

Also, a PNO can be laid down by pressing the Play button while recording. During interviews, each question and answer could be assigned a PNO number!

Because of the short evaluation period before the Vietnam trip, I could not be certain the machine would do everything required of it. What if the mic preamps proved inadequate for the rigors of Tet fireworks?

What if I couldn't get to recharging power for several days? What if the humidity or dust of Southeast Asia did DAT in?

Nagra back-up plan

For back-up, I decided to take a Nagra IVS stereo reel-to-reel machine and a small supply of tape.

This provided several options: I could switch to reels if DAT batteries died; by wiring the DAT's line inputs and outputs to the noise reduction loop of the Nagra, I could use the mic preamps of the Nagra and record on the DAT; and I could monitor through the Nagra, which allows left-only, right-only, stereo or mono-sum listening.

The SV-MD 1 is small enough to stow

(continued on page 44)

BUYERS GUIDE INDEX

Also, technology updates from Studer Revox on its C270 Series, Tascam on its new DA-50 DAT machine and Radio Systems on its DAT Controller.

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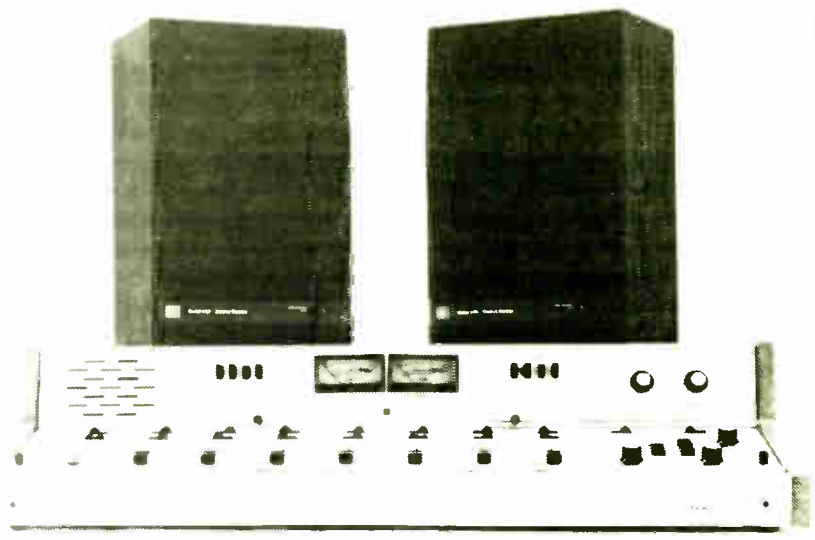

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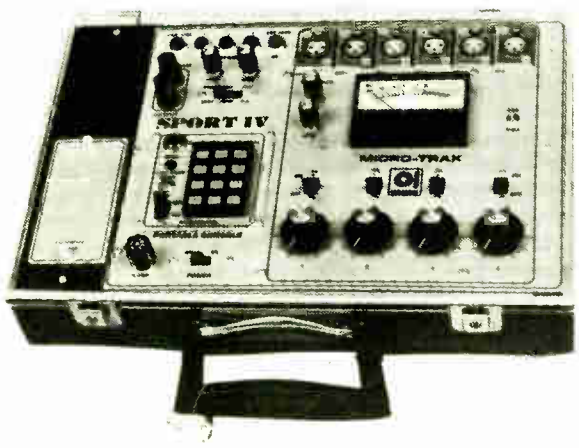

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Circle Reader Service 27 on Page 32

BUYERS GUIDE

Sony Suited to KPBS Remotes

by Chris Durso, ACE
KPBS-FM

San Diego CA ... Late in 1987 KPBS-FM changed its format from a largely news and information operation to classical music and fine arts.

With this change came a commitment to bring high quality music performances in and around the San Diego area to both local and national audiences. The shift in program material was soon followed by a shift in the technical facilities of the station van.

Shortly after the format change, arrangements were made with the La Jolla

User Report

Chamber Music Society for the recording, production and national distribution of its annual Summerfest.

The station van, designed for remote news gathering and production, was quickly updated for its new mission. Since National Public Radio has had great success using the Sony "pseudo video" PCM (pulse code modulation) system we decided to pursue that route.

Finding a PCM system (already discontinued by Sony) was a difficult task. The search led to a high end hi-fi dealer in the Los Angeles area who had one unit and was also importing grey market consumer DAT machines from Japan.

Grey market DAT

A week later KPBS had a PCM system and a Sony DTC-1000ES DAT recorder/player. One of the reel-to-reels was removed from the van and the "digital age" was screwed into the rack.

The recordings were made using both digital systems; a back up was made on the remaining analog recorder. The DAT machine worked flawlessly "out-of-the-box" and during the entire concert series.

It was a good thing the buttons were labeled in English; the manual that came with the machine was in Japanese.

Each evening's performance (nearly two hours or 1.6 gigabytes of data) was contained on one DAT tape cartridge approximately half the size of a conventional audio cassette. In nearly 40 hours of recording no dropouts were heard.

Operation of the DAT recorder is similar to that of a CD player and/or cassette machine. Using a level matching box the consumer unit is easily interfaced to the +4 dBm balanced broadcast world.

Recording and subcoding

The recordings were made at the 48 kHz sample frequency. The Sony DTC-1000ES will record at 48 kHz and 32 kHz, the latter being the Japanese digital audio direct broadcast satellite standard.

The DAT unit will play back at 44.1 kHz (the compact disc standard) but does not record at that rate to prohibit direct CD-to-digital tape dubbing.

The DAT recorder incorporates extensive subcode features which allow the user to write information to the tape during the recording.

Start IDs can be written to the tape manually or automatically. An ID number is assigned to each selection on the tape and is used to locate a desired point for playback. Skip IDs can be placed on the tape to instruct the player to ignore or skip over that particular selection.

The record/playback system utilizes a rotary head with a rotation speed of 2000 RPM. The small size of the cassette and head system (30mm diameter) makes possible compact and lightweight portable units.

The transport is quick and positive. A 120 minute cassette can be fast wound end-to-end in about 40 seconds.

The cassette cartridge is similar to a conventional VHS cassette in the sense that it has been designed to be dust-free and self-locking. One DAT cassette should be good for around 200 passes.

Double Reed-Solomon code

Behind the fluorescent display and black matte finish is a 16-bit linear machine with a 48 kHz sample rate. Audio information is encoded using a double Reed-Solomon code and interleave structure similar to the compact disc.

Frequency response is rated 2 Hz to 22 kHz, ±0.5 dB with greater than 90 dB of dynamic range. As would be expected, total harmonic distortion is very low (less than 0.05%) and wow and flutter cannot be measured.

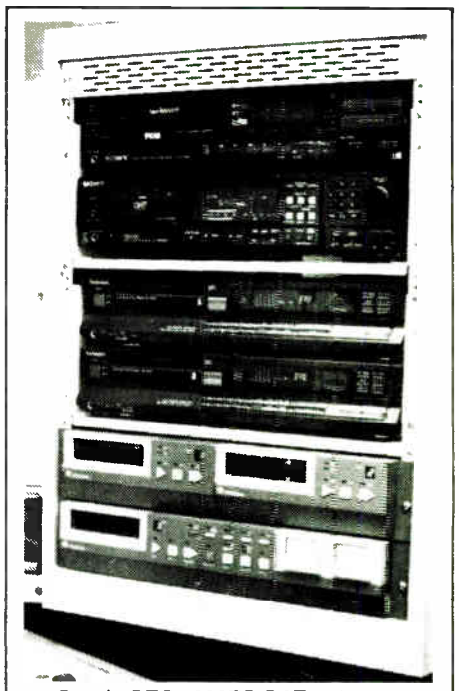
How does it sound? Great! The DAT machine performed up to par with the Sony PCM system. The results are fantastic compared to those of an analog machine costing twice as much.

Now here is the problem. How do you do post production with a DAT cassette without compromising the quality of the master tape? Dubbing to analog and blade editing is one solution, but that introduces the noise and mechanical problems we tried so hard to eliminate.

Translating the data to the Sony 1630 digital format and using a digital editor is cost prohibitive.

Post production solution

The solution: Dolby SR. The DAT master tapes of the concert were dubbed to analog using Dolby SR noise reduction



Sony's DTC-1000ES DAT unit, rack mounted second from the top

for blade editing and mixing. The finished analog reels were then transferred to the Sony PCM format for distribution through NPR.

(continued on page 38)

DAT Breaks Into Broadcasting

by Marlene Lane

Falls Church VA ... Not long ago the compact disc was the hottest new technology to breeze into the radio marketplace. Today R-DAT, minus the "R" and despite the fact that it is available only from the "grey market" for consumers, appears to have taken at least some of the wind from its sails.

"Unlike the CD, DAT gives you the ability to record the spots you want, you can move and erase start ID number, it's digital and it's dependable," says Jim Lucas, marketing support manager for Tascam Professional Products.

Tascam recently introduced the DA-50, a professional DAT machine with several unique features, including a position function which allows you to quickly change "start" and "skip" IDs.

Manufacturers, however, are still in disagreement at this early stage as to what role, if any, the new format will play at the radio station.

Congress' feeble attempt at finding an alternative to DAT copycoding, a controversial method of dealing with the copyright infringement which would occur if direct CD-to-digital tape copies are made, has hindered the importation of DAT to the US consumer market.

What this has done is hamper the quick acceptance of DAT into stations, the way consumer CD players were embraced by stations when they were relatively new to the market.

However, this has not stopped the resourceful radio station from going to the "grey market" for consumer DAT, even though pro models are being marketed—albeit at a higher price.

Waiting for an editor

One shortcoming of DAT yet to be addressed (besides copycoding) is the lack of any suitable edit device for the format. Those currently using DAT for production must revert to analog for any substantial editing.

(continued on page 40)

"Features and specs sold us on Auditronics 200 consoles."

Robert Lankton, Chief Engineer
WDUV/WBRD in Bradenton, Florida

"Their performance and reliability keep us sold."

"We wanted a console flexible enough to use in master control, production and news. We shopped for features and specs, but we also looked for ease-of-use and reliability. We got just what we wanted in our four Auditronics 200s."

Features

"I insisted on outboard power supplies and no monitor amps in the console for noise reasons. I was impressed with Auditronics' VCA technology, which at the time was not available elsewhere. We wanted the self-contained clock and timer. We needed the switching logic to interface between the A and B inputs, (a neat concept most other consoles don't offer). And we needed a lot of extra line inputs to support our satellite feeds. We needed a first-rate telephone interface. Auditronics beat its competitor hands-down on this. And, of course, modular design was a must for serviceability. We got it all in the Auditronics 200."

Specifications

"We go for the widest dynamic range we can get because much of our programming originates on CD. So the 200's 3dB better S/N is really important. Everything on the Auditronics 200 tests out better than the specs they publish, and you can't ask for more than that."

Ease of Operation

"I found the 200 logically laid out and very easy to train our people to use. The jocks like them and can easily understand them, which is very important to management."

Reliability

"We're just ecstatic about the Auditronics consoles. They've run 24-hours, 7-days since turn-on without a failure. What's more, they've held their specs, which I check every month to audiophile standards."

"Would I buy Auditronics again?"

"At WDUV/WBRD everybody is happy with both the Auditronics consoles and the support we've received from the company. We look forward to doing business with them again." If you'd like to know more about why Rob Lankton swears by Auditronics consoles, call 1-800-638-0977 or contact

auditronics inc.
3750 Old Getwell Road, Memphis, TN 38118
901-362-1350

Circle Reader Service 16 on Page 32

BUYERS GUIDE

Stepping Up to Studer Revox

by David Bowman, Dir
Professional Dealer Products
Studer Revox

Nashville TN ... The Revox C270 Series of recorders offers a step up for the serious professional who needs a solid combination of excellent recording quality, fully professional features and overall value.

The Revox C270 family of recorders includes ¼" two-channel and four-channel machines, as well as a ½" eight-channel machine.

Defining "professional"

The fact that a machine is used in professional applications doesn't necessarily make it a professional machine. A truly professional machine has to perform up to professional standards, in all respects.

All of the C270 Series machines are based on the same mechanical system architecture. They are built on a die-cast, precision-machined deck plate that provides stability within the tape path and assures precise tape tracking and multi-channel phase response.

Its basic mechanical stability is intended to ensure that the C270 delivers high performance over a long life with only routine maintenance.

Because stability and precision of the head assembly is critical to all tape recorders, the C270 head assemblies are separate die-cast plates and incorporate an integral scrape flutter filter for eliminating this noise component of the recording process.

In addition, ceramic edge guides ensure that the tape is positioned properly as it passes the heads, further improving phase response.

Microprocessor control

Advanced control features are a necessity for a professional machine intended for use in today's varied applications. The C270's microprocessor based control logic makes many special functions possible that aren't usually found in small machines.

In production environments, tape editing is a mainstay operation. The C270 offers manual tape cueing under full servo control.

This means that locating a specific point on tape is a one-hand operation that uses the control systems of the machine rather than "brute force" to move the tape.

Fully constant tape tension control across the record and playback heads, always used in large multitrack recorders, is part of the C270 Series as well.

Constant tape tension minimizes head wear, maximizes recording consistency throughout the length of the tape and assures accurate tape speed regardless of tape reel size.

Technology Update

If an operator has to set the reel size on the machine manually, there's always a chance that he or she will set it incorrectly, thus severely compromising the quality of the recording.

The ability to service a machine in the field quickly is a primary requirement for a truly professional recorder. The front panel of the C270 is dual hinged and opens to two positions.

One is for easy access to all critical alignment controls. The other is for servicing the machine's fully modular audio electronics that can be quickly replaced, if necessary, even if the machine is rack mounted.

Special applications

In addition to traditional recording applications, the four-channel C274 and the eight-channel C278 machines are also available in a low-speed configuration.

These machines are especially suited for logging applications where extended unattended recording is required. Up to 25 hours of information can be continuously recorded on a single reel of tape using the lowest tape speed of 15/32 ips.

(continued on page 43)

Every recorder in the C270 Series comes *loaded* with professional features that aren't available—not even as options—on "comparable" machines from other manufacturers . . .

- **Dolby HX Pro® Headroom Extension and proprietary phase compensated audio electronics**
- **Seamless and gapless punch-in and punch-out**
- **Integral scrape-flutter filter in head assembly**
- **Constant tape tension on both spooling motors**
- **One-hand cueing under full servo control**
- **Fully modular audio electronics allowing quick interchange of individual circuit elements**
- **Front access to all audio electronics, even when rack-mounted**
- **Plug-in record and reproduce equalizers for optimal performance and easy speed pair conversion**
- **3 peak LED indicators: +6, +9, +12 dB (C270)**
- **Adjustable Mute-to-Play time of audio output from 50 to 990 msec**
- **Built-in variable speed allows −33% to +50% range**
- **Selectable library wind and record inhibit**
- **Optical End-of-Tape Sensor**
- **1-year parts and labor warranty**

Plus, other features *standard* on the C270 Series that are available *only* as options on other machines . . .

- **Fader start circuitry**
- **RS 232 serial port allows full control of *all* machine functions**
- **Rack mount adapters**

The C270, 274 and 278 all have 3 tape speeds (3 3/4, 7 1/2 & 15 ips), any pair of which can be selected and quickly changed in the field.

Low speed versions (15/32, 15/16 & 1 7/8 ips) of the C274 and C278—especially suited for logging applications—come with a built-in time and date code generator and reader with search capabilities.

All audio electronics fully accessible through front panel.

The C270 Series is designed to give you what you need, *included* on every machine . . . pro transport functions, pro audio quality and pro construction (rugged die-cast deck-plate, head assembly and chassis). Add overall value too, because that's very much what the C270 Series is about—giving the professional more for less. (Accessories and options, if you need them, *are* available—autolocators, remote controls, floor consoles and SMPTE center track time code.)

But one feature built into the C270 Series no one else has *ever* been able to offer . . . the Studer Revox 40-year reputation for reliability and unequaled performance.

Available from Studer Revox Professional Products Dealers. Or contact: Studer Revox America, Inc. 1425 Elm Hill Pike, Nashville, TN 37210. (615) 254-5651

STUDER REVOX

Circle Reader Service 8 on Page 32

BUYERS GUIDE

DA-50 Curbs Oversampling

by Jim Lucas, Mktg Mgr
TEAC/Tascam Prof Div

Technology Update

Montebello CA ... We think the Tascam DA-50 is the best sounding DAT recorder available.

Now that is a pretty bold statement even for a manufacturer to make.

Let's look at some of the features of the DA-50 and examine some of the other benefits that make the DA-50 so suitable for radio broadcasters.

The Tascam DA-50 incorporates every conceivable design feature that could improve the sonic quality. First among these is the use of TEAC's proprietary ZD (zero distortion) circuit in both the A-to-D and D-to-A conversions.

Unlike analog recording, where distortion rises as sound level increases, distortion in digital products rises as the sound level decreases.

This distortion, known as granulation noise, is caused by the increased quantization error when attempting to sample low level signals such as a quiet music passage.

Zero distortion circuit

The ZD circuit, found on the DA-50's A-to-D ZD LSI generates dither (random noise in the form of digital 1s and 0s) in the digital domain. It is then passed through a DAC and mixed with the analog audio.

This combined signal passes through the ADC back to the ZD LSI where the dither is then subtracted back out of the audio signal, resulting in true 16-bit quantization resolution.

Oversampling or digital filtering is employed in digital reproduction circuits in order to reduce quantization error.

This has the effect of increasing the SNR, as well as reducing phase shift error because a more gentle final analog low pass filter may be employed.

In general, many people believe that "more is better." Therefore if two times oversampling is good, then four times oversampling must be better, and eight times must be better yet.

Too much of a good thing

This unfortunately is not exactly the case with oversampling.

Too much of a good thing can be detrimental to the overall sound quality. It is true that with four times oversampling the magnitude of the final low pass filter can be reduced.

However, this is often at the expense of bit loss error or the use of 14-bit D-to-A converters, which can result in audio artifacts as unwanted as the original quantization error or any phase shift error that might be induced by the low pass filter.

On the playback side of the DA-50 again the ZD circuit is employed. During the D-to-A conversion, 12-bit dither is used as well as two times oversampling digital filters and finally a seventh order analog low pass filter, preserving true 16-bit resolution with minimum phase shift error.

The ZD circuit is not the whole DA-50 story. To prevent electrical or RF interference generated inside or outside the DA-50 from affecting the sonic quality, the six main sections (power supplies, transport, digital, analog, servo and control) are shielded in individual internal boxes.

In addition, the analog and digital sections have separate power transformers. That is the main reason for the DA-50 weighing in at 44 lbs.

Glass epoxy printed circuit boards are used throughout for dependability. All critical internal wiring is mono-crystal silver coated cable by van den Hul, and all analog circuits are made from hand-selected discrete components.

The final linear phase reproduction circuit is direct coupled to extend the low frequency response to 0 Hz.

Tascam's DA-50 professional DAT unit, with remote control

Remote controllable

The DA-50 rack mounts and has a hard wired 38-key full function remote to further enhance the use of the DA-50 in the world of broadcasting.

The full complement of input and output connectors include balanced XLR analog in and out, unbalanced RCA analog in and out, coaxial 75 ohm digital in and out (RCA) and optical digital in and out.

The ability to write Start and Skip IDs is common to all DAT recorders and in fact is one major advantage of the DAT format.

However, Tascam has provided a unique feature which gives you the ability to place the Start ID exactly where you want it using the Position function.

A Start or Skip ID is written for a period of nine seconds. The reason for such a long ID is so that it can be recognized during a search at high speed.

If a Start or Skip ID is written in the wrong place it must first be erased before a new ID can be written.

Changing IDs

On a normal DAT recorder if you write an ID (nine seconds) and find that it is not correct, you must go back and erase it (nine more seconds) and then try it again (nine more seconds).

With the Position function on the DA-50, you simply touch the Position button where you think you want to place the ID. The DA-50 then forms a three-second loop and lets you preview the ID point.

If it isn't where you want it, you can move it in increments of 0.25 seconds until you're happy. Then touch the Start or Skip write button and the ID is committed to tape.

This unique feature adds to the ease of use as well as saving valuable production time.

Editor's note: For more information on the DA-50, contact the author at Tascam: 213-726-0303.

Sony Tapes the Classics

(continued from page 35)

The SR generation is so noise free that no noise is noticeable on the final digital master tape. This solution not only sounds great but is very cost effective since it uses existing analog recorders in your facility.

KPBS has purchased another DTC-1000ES for this year's recording of the Summerfest concert series.

Sony has since introduced a professional DAT, the PCM-2500. This machine is similar to the DTC-1000ES but it includes the audio interface and is capable of recording at 44.1 kHz from an analog input.

Consumer type products sell for around $2500; the pro machines in the $5000 dollar range. Blank 120 minute tapes are sold by a number of major tape suppliers for around $15 each. Other tape times are also available.

If you buy a grey market product keep in mind that the Japanese machines are designed to run on 100 VAC 60 Hz lines. The equipment runs a little warm at 120 VAC. Cube type voltage converters are available to adapt to the US standard.

After the official introduction of DAT to the consumer market prices will undoubtedly fall while product improvements will skyrocket.

Hopefully the future will bring with it a digital audio editing system for DAT. The high quality digital audio, small size, simplicity of operation and long record/play times of the DAT machine make it well suited for remote recording and in studio use.

Editor's note: Chris Durso is a frequent contributor to **Radio World.** *He can be reached at 619-265-6463.*

For more information on the DAT machines, contact Sony at 201-833-5200.

BUYERS GUIDE

RS Adapts DAT for On-Air Use

by Dan Braverman, Pres
Radio Systems Inc.

Edgemont PA ... Radio Systems believes strongly in DAT's tremendous potential as a broadcast format.

Unfortunately, like the CD, DAT was developed as a consumer format. A station that tries to implement DAT into an air environment with the hardware available today (grey market or any "pro" model) is in for a major disappointment.

While the digital audio quality is excellent, interface and operational difficulties render the format almost useless as an on-air source.

Enter the RS Controller

Design engineer Mike Sirkis of Peak Audio began work with the Sony DTC-1000ES DAT machine a year ago. Mike literally took the unit apart and probed every aspect of its control and logic infrastructure (at the time, with only the help of a Japanese version of the service manual).

The successful result of Mike's efforts was a prototype of an add-on controller for the Sony unit, shown at this year's NAB convention.

A microprocessor-based production version of this controller with upgraded capabilities is being demonstrated at Radio '88 and will be available for shipment by the end of the year.

The controller has two main functions. First, it converts and interfaces all unit control and audio functions to broadcast standards.

Secondly, it modifies the way the DAT system operates to convert it to a functional on-air or production tool.

This is accomplished via a microprocessor installed internally in the unit which is extensively interconnected to sensor and control circuitry.

Sophisticated microprocessor routines constantly scan unit functions to provide complete status information and force certain operations, alien to the unit's basic instruction package.

Technology Update

New routines for different DAT system formats can readily be implemented to easily integrate this machine in any system. User remote control commands and status information is via the microprocessor ports, which process and interface all of this information.

Perhaps the most basic broadcast need is the ability to remote start and otherwise control the DAT machine.

Even "pro" units which feature "wired remote control" require that you use the manufacturer's remote control box, which is serially scanned and therefore does not allow a basic remote start closure from a console or user pushbutton.

Radio Systems' DAT Controller (bottom), with the Sony deck it operates.

The Radio Systems' modified Sony DAT provides standard, pull-to-ground contacts for all unit functions. These are available on rear user connectors.

They can be connected to factory or user provided pushbuttons so that the broadcaster never has to fumble with the small, closely clustered buttons on the machine front panel.

Machine status indicators complete with lamp drivers are also provided. Contacts which allow the user to select a cut number as well as an external LED readout are present on the remote connector. The controller also provides balanced in and out audio connections.

A two-way serial port for computer data access to the microprocessor is also available. This is provided for direct automation system control of the machine as well as the interconnection of a soon-to-be-available system sequencer.

Enhanced functions

Your basic DAT machine (yes, even the "pro" models) functions very poorly in a broadcast environment. The operational aspects of the unit are where the Radio Systems controller does its real magic to convert the Sony DAT machine.

A DAT player "plays through" all the cuts on the tape. The Radio Systems' unit stops at the end of the cut, mutes the audio, cues up to the next cut and waits for a start command.

This minor magic is accomplished via an EOM tone, not available on other DAT machines, which is also provided on the remote connector for user machine sequencing functions. The Radio Systems DAT player will also cue up the next mu-

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BUYERS GUIDE

DAT's Future in Radio

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Some manufacturers say the problem can be overcome to some extent by using SMPTE time code (available on some machines) and two DAT players.

"DAT time code allows for basic electronics editing," says Ron Frillman, Harris' manager of radio sales. "You can do slow motion in reverse in DAT and do a digital dump from one machine to another," he adds.

Although some manufacturers believe DAT is a potential replacement for the reel-to-reel in a station, others are not convinced.

"Until we get a real editor for DAT, it won't replace reel-to-reels on playback and recording," states Dan Braverman, president of Radio Systems, which markets the Sony consumer model DTC-1000ES as well as Sony's pro model, the PCM-2500.

An on-air source?

Manufacturer opinion is mixed on whether DAT is yet suitable for on-air use as well. DAT plays from cut to cut; most machines provide no end of message tone.

"We got spoiled with the cart system," says Braverman, who hastens to add that DAT is not a real replacement for cart machines. "The tape is small and must be treated more carefully; you can't slap DAT into a machine 10 times a minute," he says.

Although an EOM tone is not critical to those playing only one song from DAT, it is critical for regular on-air use.

Radio Systems' DAT controller, developed by Mike Sirkis of Peak Audio, addresses the EOM problem by inserting an EOM tone on the Sony 1000ES.

"The machine stops at the end of a cut, mutes the audio, cues up and waits for the start command," explains Braverman.

Frillman says that the lack of an EOM tone, and the relatively long search time (about 70 seconds end to end on a 120 minute tape) can be easily overcome. He cites two DAT machines which have been used on-air by a broadcaster on the West Coast for more than a year.

"The station uses two DAT machines which have the same material on the tape so that the second machine is searching while the first is playing," he says.

"There have been no head failures at all," he adds.

DAT in automation

Automation is another potentially popular use for DAT. But here, too, manufacturers caution that DAT is not without its problems.

Systemation President Steve Bellinger, whose company produces automation systems for radio, says that although his system will interface to DAT, he tends to shy his customers away from using it.

"I try to discourage DAT in automation," he says. "The helical head technology can't cue rapidly, although we can overcome that problem with a countdown cue (pause) five seconds ahead of play," he explains.

"Also, if you use DAT, you're paying 50 cents for two hours of storage; if you use the 8mm format, you're paying only three cents for 20 hours of storage," he explains.

Braverman, however, has high hopes for the modified Sony 1000ES DAT in automation.

"DAT, with the RS controller, is a definite for automation," says Braverman.

Other manufacturers are taking a "wait-and-see" approach to DAT before they consider the market.

"Broadcast is a highly specialized market, with its own unique demands and requirements," says David Bowman, director of professional dealer products for Studer Revox.

"To satisfy all these requirements a DAT machine must, among many other things, cue and start quickly, be extremely durable, meet all sorts of special remote needs and requirements for safety, etc.," he adds.

Obviously, DAT manufacturers will have to make some modifications to their machines if they want them to be successful in a broadcast environment. Some have already done so.

Harris's DAT machine, the XD-001UH, can be wired to a console for start/stop and pause control.

Radio Systems' controller for the Sony DTC-1000ES DAT machine converts and interfaces all unit control and audio functions to broadcast standards. More refinements from the company are on the way.

And more companies, such as Tascam, Panasonic and Sony, are introducing "professional" DAT machines, with balanced inputs and outputs, rack mount capability and other features needed for a radio environment.

The DAT machine companies seem to know that they have their work cut out for them and are anxious to work towards enhancing what is now largely a consumer format.

Industry Roundup

TUNED IN

New Directions ... Tape cart manufacturer **Audiopak** recently announced it has formed a **West Coast sales office** and has established a **new toll-free number**—800-522-CART—for customers, dealers and distributors.

Customers can use this number to get technical advice directly from the company's engineering and design staff. "Of course, any urgent calls that arise between 5 PM and 8 PM Eastern time can be directed to our California office," says Audiopak president Nick Krassowski.

People ... Former Studer Revox GM **Thomas Mintner** has been appointed director of sales and marketing for **Audio Precision,** manufacturer of System One audio test equipment. The newly created position was prompted by "continued company growth and the upcoming introduction of new digital testing and signal processing options," says company president Bob Metzler ...

Also in the news is **Dan Sessler,** who was recently appointed by Harris Corporation's manager of domestic radio sales Ron Frillman as radio district sales manager for the southeastern US. Sessler was formerly CE and salesman for WEEJ-FM before joining Harris.

Of Special Note ...

It looks like the **Telos 100 Digital Hybrid Telephone Interface** from Cleveland-based Telos Systems is a winner for the 1988 Olympics.

The 100 was chosen by NBC to be incorporated into a large-scale communication system developed by McCurdy Radio Industries. It will provide an interface between that system and dial-up phone lines for communication between NBC production personnel working at various production sites and producers, directors, cameramen and on-air talent.

Telos tells us that the 100's dramatic improvement in "trans-hybrid loss" produced by the digital technology, as well as smart gain control and other benefits derived from the digital approach gave it the edge.

If you have industry/equipment news to report, send it to **Radio World Buyers Guide,** *PO Box 1214, Falls Church, VA 22041.*

Control Unit

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sic cut and wait on tape insertion.

The Sony machine, as modified by the Radio Systems controller, also allows the user, or an external controller or automation system to load in future event data to which the unit responds.

During inter-cut travel, the modified unit mutes program audio and provides the left track for logging data.

Radio Systems has been authorized by Sony under special license to import the DAT player and modify the otherwise restricted machine for broadcast use. The warranty is domestically honored by Radio Systems.

The microprocessor based nature of the design and parallel and serial access ports allow a host of external control and interface options. Many of these are currently under design by Radio Systems.

As the format is accepted in the industry, Radio Systems intends to remain a DAT leader and innovator, with a slew of new products and format refinements due out shortly.

Editor's note: For more information on the DAT controller, contact the author at Radio Systems: 215-358-4700.

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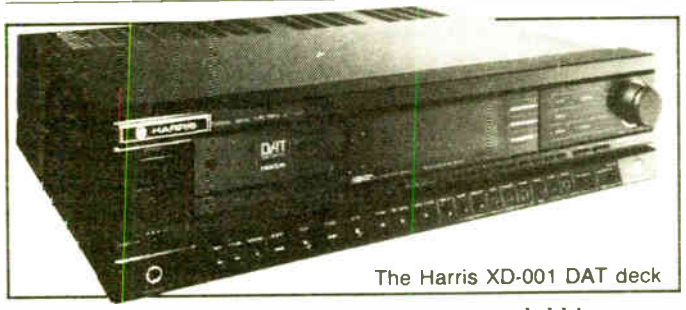
The Harris XD-001 DAT deck

Harris DAT Dubs To Cart

by Gerry Dalton, Eng Mgr
KKDA-AM/FM

User Report

Dallas TX ... KKDA-FM is the top-rated FM music station in the Dallas-Ft. Worth market. Our mix of urban contemporary music, personalities and high-powered promotions constantly pushes us to be more creative.

We recently purchased two Harris DAT machines. In an overall effort to improve our on-air sound, we were looking for a way to improve the quality of music that goes on the air.

Many options were considered, including direct-to-air compact disc, but ultimately the programming department felt that the current "cart based" record system was needed. So the problem became how to get even better quality to cart.

Investigation of "audiophile" type record playback systems showed that many very good turntable and cartridge systems were available, but all suffered from one major drawback when it came to dubbing to cart.

None can be back-cued without damaging the cartridge needle.

My idea was to eliminate this problem by dubbing records directly to a medium which could be used to archive the music when needed for redubbing, recurrent use and end-of-year countdown shows.

Cassettes and reel-to-reels were eliminated from consideration because of the noise levels.

Harris to the rescue

About this time, Harris announced the availability of a moderately priced DAT machine.

DAT gives the advantages of the cassette format—simplicity of operation and compact format, but eliminates the problems with noise, tape hiss, etc. Our local Harris salesperson, Ed Pryor, arranged a demonstration of the unit for us at our studios.

Manufactured by Aiwa for Harris, the unit looks like a CD player or cassette machine, with all of the usual controls on the front including two analog audio inputs.

Included with the unit is a 60-minute digital audio tape and an infrared remote control which duplicates the functions on the front panel.

We set the unit up in our small production room in place of a cassette machine which already was wired with an ATI inteface to match levels and impedances.

Figuring it out

The Harris unit is supplied with RCA jacks for inputs and outputs conforming to the "consumer" standards of −10 dBm.

The first thing you notice about the machine's operation is how similar it is to the cassette machines we have all come to know and love. Then you start to notice the extra features which are common to many DAT machines, such as Back Skip, Forward Skip, PNO and ID.

The first two buttons are pretty easy to figure out, but the last two took some studying of the instructions to determine what was going on.

ID and PNO are related. ID is the ID number which you or the machine can assign to a cut on the tape for direct access by cut number.

PNO is a system which will go through and automatically preview the first 10 seconds of each cut and then mark each in order.

The real selling point for our application in record dubbing is the automatic numbering and start codes. When in the automatic mode, the machine waits for the input level to exceed a predetermined level and then places a Start ID onto the tape.

Correcting a cue snafu

This ID is used to cue the tape with the Back Skip, Forward Skip and direct cut access. Our demonstration unit proved to have a problem with cueing properly which made the system unusable for our purposes.

Harris checked a new unit at the factory and found the same problem. Within a week, with our input, the problem was corrected.

Harris is now shipping all units with the modifications we recommended concerning the cueing. Similar consumer DAT units imported via the "grey market" may prove to have similar cueing problems.

With the cueing problem solved by Harris, we were able to focus our attention on the mechanics of dubbing the records, and the procedures we would have to follow.

Using the Harris DAT machine has proved to make this operation very simple. The similarity to a cassette machine has made training of the two operators

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BUYERS GUIDE

Fostex 20 Performs Well Under Pressure

by Michael Callaghan, CE
KIIS AM/FM

Los Angeles CA ... It seems as if almost every day a new reel-to-reel machine comes to market—and each one seems to be larger and to have more gee-whiz features than the one that came before it.

Lost in the midst of all this exciting one-upmanship, the needs of broadcasters without a lot of space seem to have been forgotten.

Fostex recently introduced the Model 20, a high quality tape deck whose small size satisfies this need, yet whose full-size features and performance equals machines much larger and more cumbersome.

The Fostex 20 only takes 7" reels, so it won't play those one hour syndicated specials. But it will let you tape interviews and actualities, edit them and play them back on the air easily and without a lot of hassle.

Three different memory pointers make production easy. A return to cue point feature automates shuttling back to the start of a project or a different setpoint inside it.

Another option makes the deck continually play and then rewind between two setpoints, making it effortless to run a number of takes over a given bed.

Sync monitoring off the record head and an easy and silent punch-in feature saves wear on razor blades and can really speed things up in high-pressure situations.

Running at 7½ ips and 15 ips, the Fostex 20 uses two audio tracks and a center cue track to provide SMPTE and external sync compatibility.

The tape handling is smooth and the transport is easy to use. Unlike some other machines in this size range, the capstan engagement is quiet and unobtrusive when used near a live microphone.

A real edit function spills tape when needed, and the deck can be threaded with one hand.

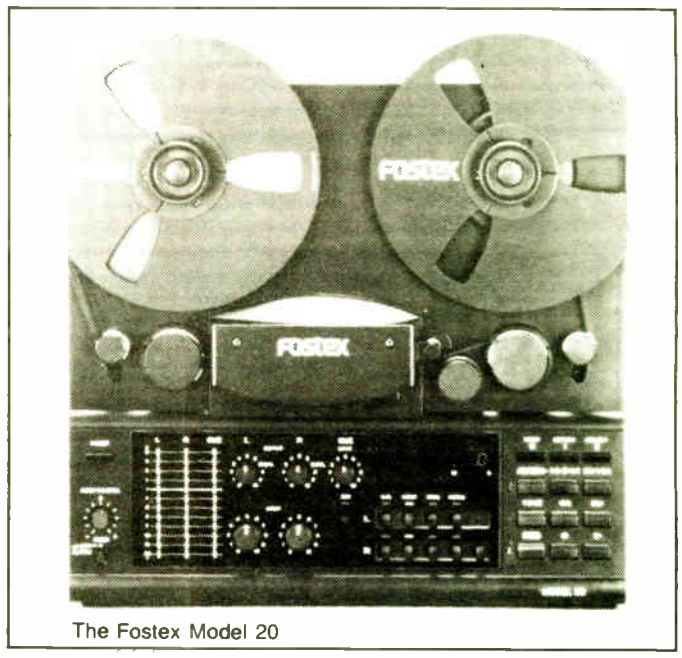
Control placement is convenient, with the tape motion pushbuttons and electronic function controls grouped under the right hand and the level knobs placed in front of the head gate.

User Report

Marked calibration point

Rather than include the conventional "calibrate" clickstop on the level controls, Fostex has a CAL point marked by the knob skirt. The varispeed knob and speed select button fill out the left side of the control panel.

Editing would be much easier if the head cover didn't extend so far in front of the playback head. The part is made of plastic and can be easily modified.


The Fostex Model 20

Elapsed time is displayed in minutes and seconds on a red LED display. Surprisingly, it doesn't reset to zero when the capstan speed is changed.

Bar graph LED VU meters monitor left and right audio levels, with a third display for Cue record.

The manual is mostly well-written and easy to read. Definitely directed towards small studio operators, it details punch-in operation, creative use of the pitch control to squash and stretch material and routine maintenance along with instructions to build a footswitch for remote punch-ins!

No lack of diagrams

The step-by-step record and playback setup instructions are clear and easy to follow.

One deficiency I found in the documentation was the reference to a pair of "record mode" buttons which are supposed to preset either or both channels to the record ready condition.

On the deck, these were labelled "R/S," which I assume stood for "Record Set." It's not a problem for an experienced engineer but it would baffle a novice.

Although no schematics are included, Fostex readily responded with some when I asked for enough technical information to make a logic change.

Alignment and setup controls are under an access plate on the bottom of the deck and are clearly labelled.

The audio inputs and outputs are high impedance RCA pin plugs, and a pair of accessory connecters provide remote control and external punch-in features.

Fostex should have gone to the trouble of including balanced line-level audio connections. Considering the price of the tape deck and the low cost of opamps, they should have been standard.

Up to spec

The Fostex 20 easily met its performance specifications. The SNR was −68 dB below 3% distortion with Ampex 406 tape. The response curves are shown on the graphs.

As received, the transport had one disconcerting characteristic. The capstan would idle at 7½" even in the 15" speed mode.

When the tape started, it would pull in the pressure roller and then quickly ramp up to 15". Even though it was almost instantaneous, it did cause a discernible wowing problem.

Fostex's engineers explained that it was to prevent a spooling "bobble" when the tape suddenly started at 15". They provided a schematic of the servo system, and I developed a simple and non-destructive modification to keep the capstan motor at the selected speed.

Even after the change, there was still no noticeable "startup bobble."

The Fostex 20 pulls only 44 W of power, so it can easily be driven by a battery inverter. It's small enough (14" wide × 13½" high × 8½" deep) to fit into almost any environment. The modest size is made up for by its husky 29 lb. weight.

KIIS got the Fostex 20 to use in our mobile studio, where cramped quarters, temperature extremes, fluctuating power, a lot of vibration and distraught air personalities combine to threaten the life of any broadcast equipment.

This is a sturdily-built tape deck from which we expect many years of service.

Editor's note: Mike Callaghan teaches broadcast electronics at California Community College in addition to keeping on top of things at KIIS. He may be reached at 213-466-8381.

For more information on the Fostex 20, contact Bud Johnson at Fostex: 213-921-1112.

BUYERS GUIDE

Tascam Earns Respect at KTWV

by Steve Keating, CE
KTWV-FM

User Report

Hollywood CA ... TEAC Corporation has been designing and building tape recorders for broadcasters, recording studios, NASA, the US Air Force and other clients for more than 30 years.

The experience the company has gained during this time has enabled it to offer a wide variety of high quality products at economical prices.

One such product is the Model 122 audio cassette recorder and reproducer series, which has been manufactured by the professional audio division for more than seven years. The most recent version in the series is the 122B-MkII.

KTWV needed to purchase five new cassette recorders for an impending studio upgrade and expansion project. I was sufficiently impressed by the preliminary performance specifications measured from the prototype units to place a firm order.

I had previous experience with the 122B series, and found the promised performance characteristics and operational features offered in the new series ideal for my requirements.

I came away from the TEAC facility so impressed by the company's degree of professional competency and commitment to satisfying the needs of the pro end user that I recommended the new Tascam gear to colleagues.

All tape handling functions of the 122B MkII are available for remote control via a back panel-mounted female connector. No tally voltages except for record status indication is provided.

Pushbutton switches located on the front panel allow the injection of either a 1 kHz or 10 kHz tone to both left and right input channels. This is useful for setting record reference levels and spot checking high frequency record and reproduce capabilities of a particular tape.

One-quarter-inch phone jacks are located on the front panel. They accept unbalanced audio inputs. Standard three-pin XLR type female connectors located on the back panel provide for permanent system installation.

Perhaps the single most useful feature found in the new unit is the combination digital real time and tape footage counter. It can be programmed to find a flagged position at any point on a tape or return to zero.

Selector switches on the front escutcheon also permit the selection of any one of the three standard recording equalization and bias settings for Type I (normal tape), Type II (CrO^2 tape) and metal tape. Dolby Type B and C noise reduction encoding is also selectable.

Not having had to perform any repairs or elaborate maintenance on any of the units in almost constant usage over the past nine months, I have yet to take advantage of a somewhat hidden fact regarding the mechanical design considerations found in the unit.

Few other pro, semi-pro or consumer type cassette decks go to such great extent to ensure easy access to, or in most cases any access to head azimuth adjustment, pinch roller pressure or individual take-up and supply reel/motor tension torque levels. Access to all these areas is easy in the 122B-MkII.

In many cases the machine exceeds performance levels of open reel decks in such areas as mechanical durability, tape handling and signal recording/reproducing capabilities.

All things considered, and given the few choices of professional audio cassette tape recorders available on the market today, the Tascam Model 122B MkII has earned my respect and admiration.

Should I need additional cassette decks or be asked to recommend a make and model to another pro user, my choice is clear.

Editor's note: Steve Keating began his career in broadcasting while a ninth grade student in his home town of Topeka. He has served as vice chairman of the LA Chapter, Number 47 of the SBE and is a frequent contributor to **RW.** *He may be reached at 213-466-9283.*

For more information on the 122B MkII, contact Bill Mohrhoff at TEAC/Tascam: 213-726-0303.

Moving Up to Revox C270

(continued from page 37)

Both the low speed C274 and the C278 also incorporate an internal logging time code generator and reader that makes it possible not only to record the information, but also to record the time and date of the recording simultaneously.

All C270 Series machines incorporate RS-232 serial communication. Controlling any of the machine's functions remotely, either automatically or in a computer-assisted environment, is simply a matter of connecting the machine to a computer.

Broadcasters thinking about upgrading their facilities should take a look at the Revox C270 Series.

Editor's note: For more information on the C270 Series, contact the author at Studer Revox: 615-254-5651.

BUYERS GUIDE

Technics Sees Action in Vietnam

(continued from page 33)
in the accessory pocket of the Nagra's case; this piggyback arrangement evoked memories of early tests of the Space Shuttle, when it was hauled aloft on the back of a Boeing 747.

The first few days of recordings were made using the DAT/Nagra piggyback; gradually, though, I became confident of the DAT's ability to fly on its own, and by week's end most recordings were being made direct-to-DAT.

Easy listening

As the tapes began to stack up, I listened back and indexed during free moments. I could even do playback during brief lulls in recording, and get back to the right spot on the tape to resume recording, thanks to the End Search button on the SV-MD 1.

The machine will fast-forward until it finds blank tape, rewind until it finds out what the last PNO number assigned was, then relocate to the blank tape prepared to lay down the next PNO number when recording resumes.

One of the scariest parts of doing a large documentary project like this is coming home after the trip with suitcases of tape and far too vague an idea of what is *on* the tape.

But DAT makes logging tape a pleasure. The PNOs and rapid access made it easy for us to keep laptop computer logs.

The DAT spent most late evenings and early mornings with the reporter or producer, reviewing the day's catch, planning story ideas and identifying useful actualities and sounds. We could really have used two SV-MD 1s to be efficient!

Most of my fears about equipment problems on the trip did not come true. No shutdown of the DAT was ever noted due to dew condensation, the weather was moderate (for Vietnam) and the digital circuitry in the DAT radiates enough heat to keep the head drum dry in most conditions.

The dire warnings about power outages in Vietnam turned out to be exaggerated.

While the power is confusing—showing up on American and European jacks at 120 V or 220 V (or, once, 188 V!) with no correlation of jack type and voltage—only once in 24 days did I notice a 10-minute power outage. The inboard and outboard batteries performed well.

DAT in motion

The DAT proved to be insensitive to the effects of machine motion. I could record while running or bouncing along in a pedicab with microphone shockmounting the only limiting factor.

Having two-hour tapes meant far fewer tape changes in the middle of sessions. The tape counter made it easy to know when to change tapes. Few of the tapes came back with more than five minutes of blank tape.

The complete recorded output of the trip, about 60 hours, fits easily in a shoebox. On open reel it would have taken three suitcases of tape!

The SV-MD 1 did develop a recording problem in the last few days of the trip. The first ten minutes or so of several tapes experienced breakup on playback; backing up the tape a few seconds and replaying generally caused the distortion to disappear.

It remains to be seen whether this problem is limited to this unit or is endemic in the model. Perhaps the problem lies in the SV-MD 1's downsizing.

Other DAT machines have a 30 mm head drum and 90° tape wrap; the Technics uses a 15 mm drum and 180° wrap. (Outside of this one problem, no compatability problems have been found between the SV-MD 1 and other DAT machines.)

The occurrence of the problem shows that DAT is not the perfect, physically robust, professional format we would have hoped for. Tape guidance problems can create irregularities on the tape surface that error-correction cannot deal with.

And most important, without read-after-write confidence playback head problems cannot be detected during recording.

Matsushita, Technics' parent company, has already announced a new machine using the same transport, the Panasonic SV-250, which takes care of the analog input overload problems. It will be sold through professional dealers in the US.

All in all, portable DAT was a definite asset to the Vietnam project, and it has shone in other music and spoken-word projects since then.

Editor's note: Flawn Williams, based in Chicago, works for NPR on documentary and music projects. He also does independent recordings of traditional music. He may be reached at 312-263-4530.

For more information on DAT, contact Steve Woolley at Panasonic: 714-895-7278.

KKDA Dubs with Harris

(continued from page 41)
responsible for record dubbing a painless task.

We now use a LINN Basic 5 turntable connected through an NAD preamplifier to go directly to the DAT machine. Also connected to this preamp is a CD player.

The DAT is placed into record and the record is started. When the first beat of the music is heard, the Harris machine places the Start ID into the digital tape and resets its timer for that cut.

When that cut finishes, we know how long the cut will be, how it ends, the intro time and where to place the secondary cue tones on the cart machine.

With a simple press of the Back Skip button on the DAT machine, the cut is backed up, cued and ready to go to our ITC 99 record center.

KKDA dubbing center

The output of the DAT machine is connected to a Benchmark Audio Systems custom-built "dubbing center." This center provides level control and impedance matching to the ITC recorder.

Using a Dorrough Loudness Meter for level monitoring, the operators only have to press one button to activate a Henry Engineering SynchroStart, which in turn starts the pre-cued DAT, waits about ½ second and then starts the cart machine recorder.

The operator must ride levels on the recorder input and place cue tones in the appropriate places. When the tape finishes, the operator enters the artist, title, length, intro and outro into a computer, which catalogs the DAT tape number and cut and then prints the cart label.

How well does this work? Engineering dubbed about 10 records on the playlist and replaced them without informing programming. Within 24 hours we were getting questions about why certain records sounded different on the air.

Records dubbed on the system have a more open sound, there is more clarity and certain nuances are discernible within the music.

We have to attribute this different sound to the turntable, but it would not be possible to get this sound to the carts without the Harris DAT machine as the host.

What happened to the other DAT machine? Our production director is using it for mixdown, mastering and archiving of our in-house production. The tapeless studio may still be a few years and many thousands of dollars away, but we feel our investment in the Harris DAT machine is sound in many ways.

Editor's note: Gerry Dalton has been with KKDA since 1980 and has worked with the local SBE Chapter as convention chairman, president and frequency coordination chairman. He also has chaired the SBE's National Frequency Coordination Committee and is a charter member of the National Frequency Coordination Council. He may be reached at 214-263-9911.

For more information on the DAT machine, contact Ron Frillman at Harris: 217-222-8200.

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APC-200 Gets Phase in Order

by Terry Hall, Prod Mgr
Radio Program Services

Colorado Springs CO ... I have a storeroom full of goodies and gadgets guaranteed to improve the quality of my audio production. All of them work with varying degrees of success and difficulty.

Overwhelming demand by client stations has retired any and all processing gear, but one ghost remains in our machines—phase error. Because of this, the Rightrack APC-200 Audio Phase Corrector from Broadcast Devices Inc. is the one piece of equipment that will never see the storeroom.

At the source

Ninety-nine percent of audio phase problems are in the source material rather than in the recorder used in the final production. The remaining 1% (in our case) has been in reel-to-reel playback decks requiring realignment or replacement of tape guides.

There is one thing we have found when requested by client stations to help troubleshoot phase problems. The length of the audio cables coming from tape decks to boards and then to recorders can affect audio phase.

In the case of one station, the right channel audio path was 6' longer than the left in one studio, and just the opposite in another. Those mismatched leads provided the station with a phase error. All of the tape decks looked fine when observed on an oscilloscope!

The point here is that regardless of the source of the phase error, the Rightrack can handle it, up to an error of 150° at 12.5 kHz.

Monitoring by scope and by ear

In all cases where I have tested the Rightrack I have been able to come within 5° consistency from all situations onto my final cartridges. This was accomplished with the tweak of one control, and by keeping an eye on the L–R VU meter on the unit.

The phase can also be monitored on an XY scope through a rear panel pair of BNC connectors. If you have a mono sum on your console, you can use your ears to tell when you are in phase.

In addition to music dubs, the Rightrack comes into its own for correcting commercial dubs. Phase correction can be made at the output of the reel-to-reel recorder or just in front of the cart deck as we have done.

The Rightrack is a standalone system. No add-ons are required except for the addition of an optional scope. The Rightrack is not an encode-decode system. It is a manual, user-controlled device. You dial in the amount of phase correction needed and it stays set.

The result of phase error correction in radio is crisp, compatible mono sound and a high quality stereo image.

I have found that training an operator to use the Rightrack is a snap. Handy stick-on instruction cards are provided for the first time user and as a convenient reference. There are no mechanical adjustments required such as head azimuth adjustment or misadjustment to bring an out-of-phase tape into alignment.

The level of difficulty is equal to that of tuning in a radio station on a receiver while observing the tuning meter. Watch the L–R meter and tune it for a minimum deflection consistent with a maximum deflection on the L+R meter.

Once that is accomplished, you have made the best correction possible based upon the source material. For more accurate monitoring, I suggest the use of

User Report

an XY scope. Just connect it to the rear BNC connectors which are supplied with the unit.

For checking the tape machines themselves, the Rightrack doubles as a piece of test equipment. The built-in reference oscillator allows for quick, easy head azimuth and frequency response verification. With the flip of the meter switch, the L+R, L–R meters become L and R for the frequency response tests.

A few suggestions

One thing I'd change if I could would be the external wiring strip. The metering circuit is externally wired and must be hooked up by the user. It can get a little complicated wiring input to the unit, bridging the meters and then bridging the output wiring in place. It would be preferable not to have to contend with this.

The scope hookup is easy via standard BNC jacks. The unit could also use a pilot light to indicate the power is on.

Radio Program Services has undertaken a massive project of compiling over 1200 hits of the 1950s and 1960s into a set of 50 compact discs. The format we have created is called Rock 'n' Roll Graffiti.

We considered material from over 800 sources ranging in age from 15 to 35 years old. It was a monumental task of upgrading, phase correction and electronic wizardry to bring those oldies but goodies up to today's broadcast standards.

We accomplished this without changing the original ambience. The Rightrack was the single most useful tool in bringing tapes from 1963 through 1971 into some degree of phase standard.

Oldies remastered by record companies for digital use on PCM 1630 and compact disc have numerous phase problems. All, including the most severe (Rascals, *Ultimate Rascals*, Warner Bros.) were easily corrected.

Editor's note: Terry Hall can be contacted about the Rightrack or Rock 'n' Roll Graffiti CD library at 719-576-4184.

For more information on the Rightrack, contact Bob Tarsio at Broadcast Devices, Inc.: 914-737-5032.

BUYERS GUIDE

WSM Selects Otari for Reliability

by George Stephenson, Jr.,
Studio Eng Supvr
and Jim Gilmore, Audio Eng
WSM/Opryland USA, Inc.

Nashville TN ... Most of us can remember the days when audio commercial production at the radio station level was accomplished using little more than a turntable, reel-to-reel, cart machine and a microphone for source equipment.

If we were lucky, there were two reel-to-reel machines, a second turntable and maybe even a couple of cart machines. The main problem was the number of appendages attached to a single operator and of course how many of them could be used for starting machines, manipulating faders, etc.

Multiple operators could alleviate this problem somewhat, but then one faced the task of getting everything coordinated; one blown cue, start, fade or level could ruin the take.

When that occurred, every source had to be rewound and re-cued, levels reset and the whole process repeated ... and overall timing was rarely consistent.

When multitrack recording began to come within reach, the larger production houses were quick to utilize it. This not only increased their efficiency, but allowed a level of sophistication heretofore unattainable in audio production.

It wasn't very long before the larger radio stations began to look to multitrack, not only for the same reasons, but also to bring their own production up to the standards of the agency commercials which the station aired.

But for many of the same reasons which prompted the inclusion of multitrack recording in these facilities, the multitrack machines we have grown to rely on have begun to give way to a new generation of very sophisticated units.

One of these new machines is the Otari MX 70.

One of the operational difficulties of the earlier multitrack machines was that of "punching in."

User Report

Notwithstanding the "pop" which many machines exhibited, there was the problem of switching from the "sync" to "input" monitor position. Without a special system for switching, it was just about impossible for one person to operate the machine in this mode.

This seems to have been an area in which Otari took a good close look before they designed the MX 70; from both a cost and performance standpoint, it seems to be right on target.

The MX 70 is controlled by an internal microprocessor which makes it possible to cut down on the number of physical controls and indicators by assigning more than one function to many of them.

This not only reduces the amount of real estate required by the control panel, but keeps the operator appendage requirement at a minimum. The microprocessor control takes care of all the bias/record timing and monitor switching, too.

Admittedly, this does take the fun out of peering into the production room, placing bets and watching a couple of operators perform a poorly orchestrated ballet when they need to punch.

Well thought out

There are many handy features present on the MX 70 including the timer and its associated Search Zero, Set Cue and Search Cue functions, speed timing and location of program material.

The cue button allows a high speed preview, and has a handy feature which attenuates the audio and rolls off the high frequencies in the fast cue mode, thus saving ears and speakers.

Spot Erase can selectively erase small areas on tracks, allowing clean-up of minor glitches and mistakes without reworking the entire track.

The remote control is well thought out and requires a minimum of space, which means it can be placed conveniently near the operator.

The transport functions so smoothly and predictably that there is no great need for the operator to be near it, except for the Spot Erase function—which is as it should be.

We talked with WSM chief production operator Tom Bryant and asked him how he felt about the machine after having used it for the better part of a year.

He told us a number of things he liked about the product. These included:

- Sync frequency response: "We ping (consolidate) a lot of tracks, since we often require more than the eight tracks available, and the sound is great!"
- Good human engineering: "I like the tactile response of the buttons, the control layout and the brightness of the displays; it was also very easy to learn to operate."
- Physical attributes: "It's a nice size, you can see the meters easily, tape handling is super and it's quiet so you can keep it right in the room with an open mic."
- Reliability: "We just don't have any trouble with it."

Next we asked Tom where he saw room for improvement. He could think of only two areas.

One was that he would like to see the relocation of the wire exits on the remote control from the top to the rear. In our situation, the wire exits on the top preclude us from mounting the control at a convenient angle.

His other observation was that the meter lamps have a shorter life than he expected.

Finally, we asked Tom for an overall statement. With no hesitation he replied, "I think the machine is a dream to operate."

Easy to care for

Aside from routine cleaning and setup, there is little maintenance to do; the MX 70 rarely requires more than a slight "tweak" on equalization and biasing and there has been no down time since it was installed.

At some point we will probably elect to expand our eight-track unit to 16 tracks. Since the MX 70s are already wired for 16 channels, the change will require only the addition of eight more electronics cards, a new head stack and realignment.

We thought about any changes we'd like to see incorporated in future models. About the only thing we could come up with was the inclusion of some sort of sensor to determine the presence of tape on the outside of the head shield, thus preventing tape motion if this situation arises.

When the time came to add another production room to the complex, the multitrack choice was obvious—another MX 70.

It was also necessary to add new two-track machines. After a survey of available units we once again chose Otari.

The MTR 10/12 II machines have performed on par with the MX 70s. The similarity of features is convenient, tape handling is superb, electronic performance is excellent and required maintenance is minimal. The operators especially like the Search Cue and Reverse Play functions.

It is very evident that Otari did a lot of market research when the MX 70 and MTR 10/12 machines were conceived. Our choices were made after considerable cost/performance/reliability analyses. We think we made the right ones.

Editor's note: George Stephenson, Jr. has been in both operations and manufacturing in broadcasting since 1956 and was CE of several radio and TV stations, as well as an employee for Harris Corporation. Jim Gilmore has been in broadcast engineering since 1963. He taught at MTSU and was CE of several AM and FM stations. He, too, is a former Harris employee. They can be reached at 615-889-6840.

For more information, contact John Carey at Otari: 415-341-5900.

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