

Early bird
SBE coverage
pages 4, 11

Radio World®

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Radio's Best Read Newspaper

October 25, 1989

Class A Group Re-Petitions FCC

by John Gatski

Washington DC Citing too many unnecessary requirements for Class A power upgrades under new FCC guidelines, a recently formed national Class A special interest group filed a petition for reconsideration.

The United Class A Broadcasters Coalition, created by members of the New Jersey Class A Broadcasters Association, said more stations could upgrade from 3 kW to 6 kW less expensively and in a shorter time if the FCC modified its new rules.

The Commission's report and order,

approved in July, automatically authorized 500 of 2000 Class A's to double their power.

But hundreds of other stations have to apply case by case and are subject to "a variety of regulatory requirements which unnecessarily handicap their ability to secure improved coverage," according to the United Class A Broadcasters Coalition petition.

A Class A battle

Class A stations clashed with the NAB for much of 1988 and '89 over the power hike issue. The New Jersey Class A Broadcasters Association proposed a

blanket increase for the stations, but the FCC adopted a version of the NAB's plan for a case-by-case review process.

In response to the petition, NAB Science and Technology VP Michael Rau said, "I think it is very unlikely the FCC will change its decision."

Mike Rice, president of Nutmeg Broadcasting and a board member of the United Class A Broadcasters Coalition, said the requirements in the Commission's ruling will slow down the process for stations.

He said the Commission's 12-18 month estimated timetable to process and approve FCC Form 302, the application for

the Class A upgrade, is too long.

"We are very disappointed that this Commission said it is going to take 12-18 months," he said.

"If the FCC will go along with these revisions (contained in the petition for reconsideration), the stations should be able to upgrade in a shorter amount of time and for less money," Rice added.

FCC misses the point

According to United Class A Broadcasters Coalition attorney William Keane, the Commission failed to consider or address several points when approving the

(continued on page 18)

AM Open Forum Called

by Charles Taylor

Washington DC In an effort to paint a brighter future for AM radio, the FCC will hold a special hearing addressing concerns about the ailing band and ways to improve its reputation on the spectrum.

Scheduled for 16 November, the hearing was ordered in late September at the first public Commission meeting under the chairmanship of

Al Sikes. A letter from the NAB asking for a special session on AM prompted the action.

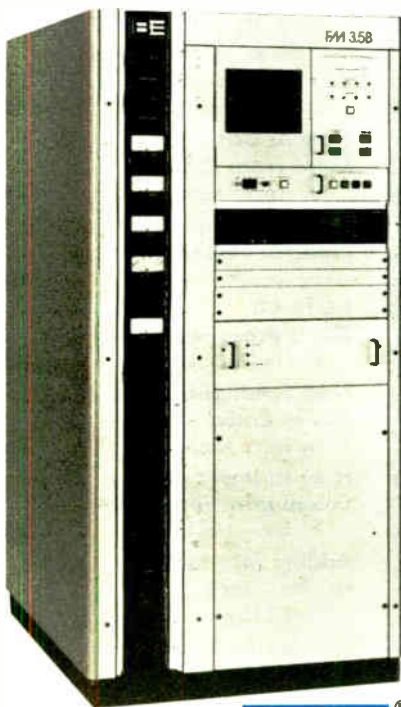
The forum intends to cover all the AM topics that have been relevant through rulings and proposals over the past several years, including the AM expanded band, AM stereo and its impact on technical criteria and assignment policies, receiver quality, and AM improvement and its future.

(continued on page 12)



New FCC Chairman Al Sikes has called for an *en banc* hearing on AM radio issues.

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BEAR Fights Against New FAA Tower Rule

by Alan Carter

Washington DC A group of broadcasters, communication attorneys and consultants has organized to fight the Federal Aviation Administration (FAA) on what it sees as "unlawful rule" over new tower construction and frequency control.

The coalition was formed in the wake of a filing by the FAA which may interfere with Class A and C3 upgrades.

Broadcasters for Equal Air Rights (BEAR) will initiate a petition at the FCC and take similar action within the FAA to address a growing point of contention between federal aviation officials and broadcasters, according to communications attorney Gregg Skall of Baker & Hostetler. BEAR also will address the issue on Capitol Hill.

No quick fixes

"There has never been an open comment proceeding that would tie things down to reality," Skall said. "We're not

looking for a quick fix."

In particular, BEAR claims the FAA exceeds its statutory requirement to evaluate broadcast towers for potential obstruction impact on aircraft.

Tower proposals higher than 500' are subject to regulatory scrutiny in an unprecedented manner, BEAR said.

Other arguments between the FAA and broadcasters focus on FAA intermodulation requirements, which BEAR said exceed those incorporated in any FCC authorized service.

BEAR also said adjacent channel overload intermodulation performance characteristics used by the FCC for aircraft receivers are considerably inferior to typical FM receivers.

If electromagnetic interference is a safety issue, BEAR suggested the FAA could order installation of low-cost filters in those aircraft receivers susceptible to interference.

Rob Bednarek, an engineering consul- (continued on page 3)

NEWS BRIEFS

FCC Reaffirms Drug Policies

Washington DC The FCC reaffirmed its policy to just say no to station license renewals when station owners are charged with drug trafficking.

The Commission stressed its stance at a Commission meeting in late September amid a license renewal case where a South Carolina radio station owner was convicted on drug-related charges.

The FCC noted that illicit

trafficking had become a "major federal public policy priority," and said that it "intends promptly to take all appropriate steps, including initiation of license revocation proceedings where information comes to our attention" that licensees or their principals have been convicted of drug trafficking.

It added that no evidence supports the idea that FCC licensees are any more involved in drugs than American society in general. However, "the Com-

mission regards drug trafficking as a matter of the gravest concern and intends to apply policies that reinforce both private and government efforts to eradicate drug trafficking."

The adoption of drug counseling and education for licensees was encouraged by the Commission and the prohibition of drug use by employees was urged.

Questions on Class A Upgrade

Washington DC The NAB has petitioned the FCC to clarify several points in the ruling to allow some Class A upgrades from 3 kW to 6 kW.

The NAB asked the Commission to spell out notice and con-

sent procedures for spacing requirement, in particular how a Class A seeking an upgrade notes the consent of any affected station.

The NAB also suggested that the FCC should not exempt upgrading stations from the five-mile limit on directional antenna use, pending reconsideration, nor rely on contours to determine the presence or absence of interference.

Radio: A Trading Commodity

Los Angeles CA The lifting of anti-trafficking rules by the FCC that required station owners to hold them for three years has placed radio in the

hands of impatient investment bankers seeking quick fixes to generate cash necessary to pay off huge debts they've accrued.

That's according to the consulting firm of Pollack Media Group, *Daily Variety* published.

"When (buyers) spend \$55 million on a station, they don't want to hear (long term plans) to develop an audience," Jeff Pollack said. "They want it now."

Former Pirate CE At USC Radio

Los Angeles CA Former KQLZ CE Lyle Henry has joined USC Radio as director of engineering, reporting to the VP of engineering and operations.

Henry will work on signal improvement for KUSC in Los Angeles, and take over construction of USC Radio's newest station in Palm Springs, KPSC. He will work with Engineering and Operations VP Bill Kappelman on developing a second application to the FCC for a transmitter move for KUSC on Mt. Wilson.

Henry was with KQLZ, previously KIQQ and KLITE, when Westwood One bought the station and later introduced the new Pirate Format.

Radio Campaign Contest

Washington DC The Radio Futures Committee is conducting a nationwide contest among radio stations for the best locally produced announcement promoting the "Radio. What Would Life Be Without It." campaign.

The winning commercials will be used in the next flight of the \$100 million national awareness campaign, underway since 26 May.

Deadline for entries is 24 November. Contact the NAB at 202-429-5350 or the Radio Advertising Bureau at 212-254-4800.

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Hugo's Wrath Strikes SC Radio

Charleston SC The devastation caused by September's forceful hurricane Hugo left many residents of this hard-hit city not only without electricity, but without radio stations to stay informed.

All radio and TV stations were knocked off the air during the worst of the storm, the NAB reported, with three

radio stations—WOKE-AM, WWHT-AM and WXCH-FM—actually losing their towers.

Eleven of 18 stations the NAB contacted in Charleston were back on the air two weeks after the disaster.

During the storm, a number of the city's radio stations broadcast from an emergency center, until that location be-

came too disabled. Most of the stations were ordered to evacuate their facilities as the hurricane swept across the state's coastline.

In Puerto Rico and the Virgin Islands, where the damage was even more extensive, the NAB said between 12 and 15 broadcast towers were devastated. Many of the stations were operated on limited power from makeshift antennas by the beginning of October.

To aid the disabled broadcasters, the NAB sent staff members from several departments to South Carolina and Puerto Rico to assess what equipment they need to return to the air. The NAB



Ruined equipment at WXLY-FM

BEAR Opposes FAA Rule

(continued from page 1)

tant with the group, said broadcasters' problems with FAA approval became quite evident with new 80-90 FM stations. "We had people that were just ready to give up," he said. "We are trying to get a lot of individuals together who can act as a group."

A united front

At present, the group's membership includes six to eight groups representing about 40 stations.

Broadcasters also are not pleased with how the FCC has reacted to the FAA. Bednarek said it appeared the FCC was "hesitant to assert its rights," more or less giving in to the FAA.

On the Class A upgrade issue, the FAA has filed an objection with the FCC over the upgrading of 149 Class A FMs to the new C3 status of 25 kW

at present sites. The NAB said the FAA action may be a precursor to the FAA opposing all Class A upgrades, including those who want to go from 3 kW to 6 kW.

The FAA said the Class C3 power increases may interfere with aeronautical frequencies in the 108-118 MHz band used for Instrument Landing System and VHF Omnidirectional Range facilities. The FAA wants individual notification for evaluation.

NAB is working with the FCC over the issue and planned to call a meeting between FCC officials and various broadcast engineering and legal organizations.

For information on BEAR, contact Gregg Skall at 202-861-1706; for information on the FAA's C3 opposition, call NAB Science and Technology at 202-429-5346.



NAB's John David (right) assesses damage with WCSC representatives.

said it would then coordinate an expanded equipment clearinghouse through the Science and Technology department.

For additional information about the NAB's clearinghouse plans, contact the NAB Science and Technology Department at 202-429-5346.



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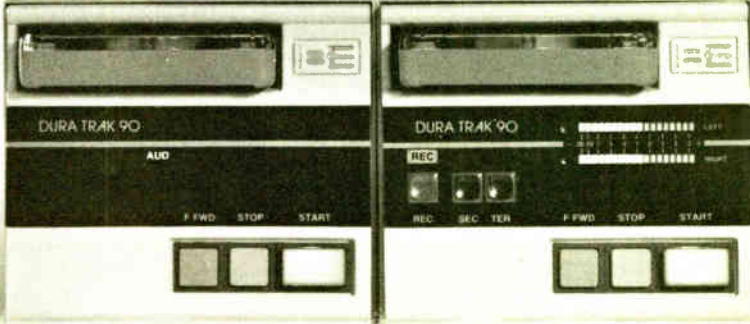
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"Shop"ping Around at the SBE

by Judith Gross

Falls Church VA Was it the *Night of the Living Dead*, or did all those white coats clustered together mean I was headed for a massive round of blood tests?

We're talking shop coats here, and in all fairness, they did draw visitors to the SBE exhibit hall in droves to grab one and wolf down the goodies stuffed in the pockets.

Hope those sandwiches were yummy. And the brownie, too. (I never got to find out because a certain publisher beat me to the food. But I kept the shop coat.)

The coats are kind of nifty, if white is your color. It's embroidered with the new logo the SBE came up with for its 25th anniversary, a colorful affair which reminds me of my scout merit badge days.



But truth be told it was a tad, um, well, unusual to see all those white-frocked souls on the exhibit floor. One exhibitor said it looked like the butchers were in town for their convention. Not too far wrong, since superb steaks were the order of choice at nearly every restaurant.

Another said it was so close to Halloween that they resembled a coven of zombies. Hmmmm.

☆☆☆

The seminars were fairly crowded, with old and some new faces. The newly-elected board took its seat to kick things off. Congrats to Brad Dick and

the others.

Liked the roundtable format of the FCC and new technology sessions, with nuts and bolts questions getting at the heart of things. Enjoyed John Battison's comments. He's the patriarch of the Society and the show, and as always, a gentleman.

The show itself was upbeat. No pitching dimes in the aisles, which were a lot more crowded this year. They took my advice and issued free drink tickets at



"Gentleman John" (Battison, far right) and the new tech "roundtable."

the opening reception (hey, priorities are priorities, know what I mean?).

But they could lose that band. OK, I know, one of the guys was a former broadcast engineer and all. But a grateful thanks to the exhibitor who got them to pull the mic plug halfway through.

The first day traffic was good, but it died off the second day. There's talk about making it two weekdays next year in St. Louie, since even engineers have families, you know. But listen, maybe it is only a one day show. How 'bout eight hours of show only, with seminars scheduled the other days?

And how about doing what Midwest did to boost up attendance? The com-

pany arranged for a private train to party all the way to Kansas City to bring folks in. The SBE might do the same with a beer bus, you know: wine, men/women and song? (But if they start singing '99 bottles..." I'm outta there.)

Products were pretty similar to what we saw three weeks earlier in N'Awlins. Liked Continental's new 1000/500 W for Class A upgrades. Ditto the Harris low-power solid state FMs.

It was nice to see QEI's CAT-Link

drawing the crowds.

But my favorite was Steve Kravitz's new gizmo, a "twin stereo" walkman type radio from a company called Sangean. Yes, it's stereo. Yes, AM and FM, both stereo. Finally.

Steve will be handling them through his own company, RRADCO Group. He'll let me know when he has 'em ready to sell and I'll let you know, so stay tuned.

☆☆☆

Speaking of AM stereo, it'll be mighty interesting to see if it comes up during the FCC's *en banc* meeting on AM scheduled in November.

Remember that we have a new Commission seated and that Al Sikes was the one who did that multimode study under the auspices of the NTIA a few years back. So he's no stranger to the AM stereo situation.

But hey, I got a solution to the whole problem. Guaranteed to do the job to get AM stereo moving, and it's lawsuit-proof, too. And it even lets the FCC off the hook about picking a single standard.

Here it is: Taking its cues from the mandatory NRSC standard, the Commission should OK a rule saying that all stations, AM and FM (non-commercial FMs exempt) have to be broadcasting in stereo by 1992 (or 1993) or turn in your license. No system specified. It could be any of the ones originally investigated by the FCC back in the early '80s. Go stereo or go dark, AM and FM. Period.

Maybe the NAB could help out with a "hardship" fund for stations having a tough go of it financially. And now all those industry high muckety-mucks making flowery speeches about the benefits of AM stereo have a bandwagon they can jump on, so we don't want to hear any hemming and hawing about "increasing the regulatory burdens, blah, blah."

All it takes is some daring soul to pe-

tion for rulemaking. And problem solved, once and for all. Anybody out there want to give it a go?

☆☆☆

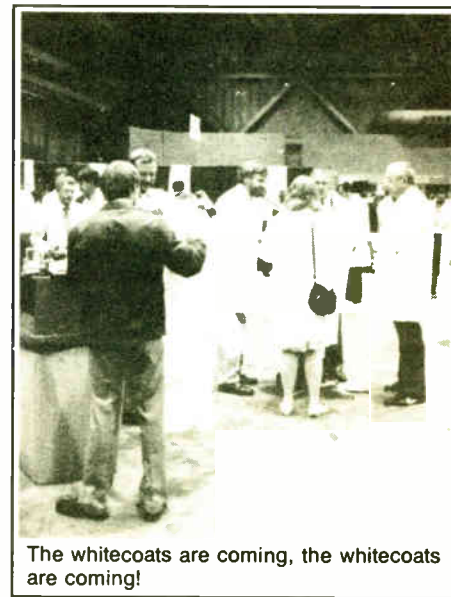
Hugo did a number on quite a few stations down in Carolina, where nothing could be finer than all the community-minded souls who pitched in to get stations back on the air, including NAB Science & Technology, which has become a clearinghouse for such aid.

Joe Tolbert, who works with a computer services company called Decision Data Corp. phoned to chat about station WJBS down in Holly Hill.

Seems Joe was in town visiting relatives when the wrath of Hugo hit. The station was knocked off the air but Joe and others helped them get back on. The station proceeded to broadcast for the next week, commercial-free, as a public service, figuring the service done was more important than the revenue lost.

Anyway, it seems the station used a three-phase 10 kW generator dating back to WWII to get back on-air and broadcasting some 112 hours with it kind of burned a few things out around the station.

They pressed on, though, finally getting back on the air with regular equipment. According to Joe, it was a struggle to get the emergency info out of the local agencies responsible, but the sta-



The whitecoats are coming, the whitecoats are coming!

tion was diligent and lived up to its public service mandate.

Only problem now is, there's some damage cost, in equipment and time and such. There's going to be a fund set up. If you think you could help, try getting details from Gene Schobinger at WJBS. The number is 803-496-5352. Or let me know and I'll see if I can't channel the info to the proper quarters.

Well the fall show whirlwind is just about over. The product lit and pix are neatly filed away for future reference, the diet is back on track and also the sleep patterns. And the shoes have been re-heeled.

It was great to schmooze and share the gossip and all. Hey, you're all beautiful, ya big palookas. Now go home and rest up. Five months 'til NAB spring.

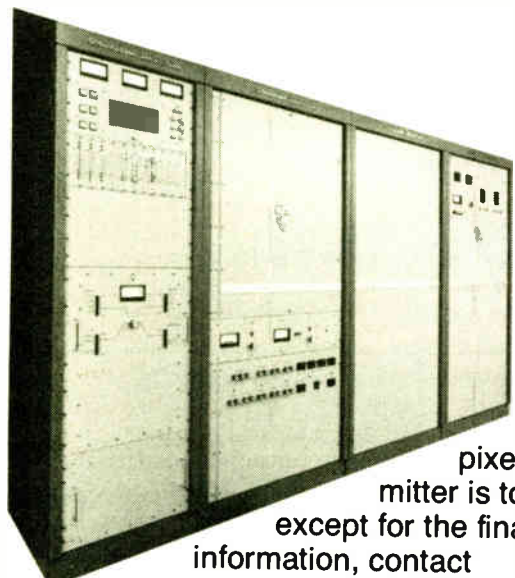
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Let's Get to the Truth In Audio Processing

by James Sorensen

Ft. Lauderdale FL Further to comments on processing in *Earwaves* (23 August RW), I would like to ask *Radio World* to perform what I would consider a valuable service and conduct some sort of poll with reference to "processing."

It has been my experience that some stations that process heavily are very successful in some markets, while others who process little are equally successful.

I have yet to meet anyone, however, who can successfully explain why processing is needed at all.

GUEST EDITORIAL

We have all heard the "pat answers" which programmers trot out, that you must be loud to win. I simply have never seen a survey verify that statement *except in a second-hand fashion*.

It is certainly not fair to say that loudness or processing *may not* have an impact on listenership, but I doubt that anyone ever listened to the radio for loudness. Certainly, in the case of Scott Shannon's efforts, the reason for listening was the programmed material. If the use of processing became an interesting audio effect listeners liked, then it should be just as interesting at any level of modulation.

Standing out

One argument for loudness is that a station stands out on the dial. Huh? You can't see stations on the dial like you can neon signs on Broadway. I don't think I know anyone who actually gets into an airport rental car and tunes up and down the dial trying to

find the loudest station.

Again, the decision is made based upon format, programmed material and execution. When you think of it like that, you should be able to have a station that is softer than anyone else and get the same result. Of course, that's logical and probably not practical.

It seems that TSLs are the indicator to the efficaciousness of any processing string. Does this stuff produce a sound which people want to listen to, or does it create its own tune-outs by producing fatigue? The Muzak people did considerable research on this in the late '50s.

Here again, the Shannon experience seems to indicate that some people, listening to some formats, like to hear some things some ways. How's that for a string?

What does that mean?

Market specific?

The above probably means that you can only be a winning station in a given market by using techniques you have tested specifically in that market for winning value. What worked in "Noo Yawk" and LA may not work in Miami or Houston.

The problem is that many decision makers at stations tend to follow the big players and accept as gospel what they do. They really must do their own research in their own markets and make decisions based upon "science" rather than hopes.

As a side comment, perhaps the "crank-it-up" people should be glad they are not in Scandinavia and other parts of Europe where by local law transmitters must be equipped with crow-bar clippers that chop holes in your modulation if you try to exceed 100% . . . much less 110% give or take meter slop and "integration errors."

Recourse during inspection

The early work I was given on the Modulation Sciences ModMinder makes very much sense. Those boys are heap smart anyway, and the new device gives you a box in the rack to point at when the RI walks in after measuring your deviation by the direct method to cite you for over-mod.

The ModMinder is type-approved and type-accepted, and it's "in calibration." What can the poor FCC guy do but let you slide? I want one for here. It's in the budget for next year.

In conclusion, I guess if there is a "true" comment to be made here, it is that processing is simply another audio effect—like reverb, or flanging—added by the station to obtain a certain artistic result.

If that's true, let's do the processing, but keep the modulation within rational limits, if for no other reason than that it is intellectually dishonest not to put a limit on modulation. So far I have never seen an article written by someone who was not a processing salesperson that supported the idea that ratings and heavy, super-loud processing are tied together.

James L. Sorensen is CE of WJQY-FM. He can be reached at 305-484-8107.

The Society of Broadcast Engineers has managed a one-year turnaround in the success of its national convention.

The show, perceived as disappointing after last year's turnout in Denver, was able to satisfy exhibitors by responding to criticism and instituting much-needed changes this year. The SBE has every reason to bask in the aftermath of the show.

But there is still a general consensus in the radio industry that there are too many trade shows. If each of them were overwhelming successes, this would not be a problem.

But the fact that they each continue to draw only modest attendance and to pull from the programming, management and engineering ranks in a split fashion means that no single convention is dominant and all are still jockeying for position.

Insuring SBE Show Future

This could mean that a change in fortunes in the industry would spell disaster down the road for the show which is perceived as being "the weakest."

The SBE would do well to avoid that perception by continuing to strengthen its convention. It could do this by drawing on its unique position as a society of regional chapters.

Currently, the national SBE show is a seminar series with concurrent exhibits. If the SBE could convene a large percentage of its 5500 members in one locale each year it would strengthen not only the national show, but the future of the organization as a whole.

The SBE should employ whatever means possible to get every chapter's active membership to come to the convention. This could even take the form of providing transportation and more "fun" activities to attract its members.

If the SBE national convention, and the Society itself, is to succeed over the long haul, the convention needs to be more than an event which draws some 1500 mostly local attendees.

For the SBE show to avoid becoming vulnerable to the vagaries of showgoers and the industry, it can and should truly become a convention of its members. —RW

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.

MIDI oversight

Dear RW:

I wanted to point out a slight oversight appearing in Bruce Bartlett's column on recording with multi-timbral synths (6 September RW). In it he suggests that the mix volume of virtual tracks can be adjusted via keyboard velocity scaling.

Well, yes, but this will also affect any other parameters which are modulated by keyboard velocity.

Synthesizer patches routinely route velocity to their filters or modulating operators so that higher velocity levels (the harder a key is struck) yield a brighter sound.

By adjusting velocity in order to control track volume in a mix, you inadvertently change the timbre of the patches.

A more useful method of adjusting the mix volume would be via MIDI controller #7. This is the standard volume control in the MIDI spec.

It can be edited like any other MIDI parameter and will not affect timbre or any other patch parameter. It will also work on synthesizers that are not equipped to respond to velocity messages.

R. Hoover Ross, CE
The Auditory Perception Lab
Brooklyn, NY

In support of compression

Dear RW:

I've really enjoyed *Radio World* in the few weeks that I've been receiving it.

I must take exception to the comment made in a letter from Keith Isley in the 6 September issue: "Audio consumers don't buy home compressors and limiters to give their CDs and cassettes that grungy 'radio sound.'"

Compression and limiting doesn't automatically ruin the sound of a CD; in fact, I think a lot of things sound better slightly compressed.

The removal of 20 dB of the dynamic range of the CD still leaves 70 dB or so, which is more than enough for me. And a good compressor won't add audible noise or distortion.

Besides, it'll protect your speakers from those woofer-busting cannon shots and then crank up the gain a little so you can hear the quiet passages that follow!

I've already asked Santa Claus for an Orban 424A for my stereo.

Andrew Dart
Andy's Bureau of Standards
Duncanville, TX

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Accounts Receivable, Caroline Freeland



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AN OPEN LETTER TO A CONCERNED BROADCAST COMMUNITY

From Jim Somich

COMPOSITE CLIPPING has always been a controversial topic among concerned broadcasters and, indeed, there is no quicker way to butcher your sound than to improperly process your composite baseband!

But those of us who do battle with the competition every day know that clipping is a way of life and that baseband clipping is the most effective way to compete for the attention of today's fickle listener.

Idealistic notions about "CD Quality" broadcasting aside, the number one contemporary music stations in the number one markets process very heavily. They have learned that burning a hole in the dial is the sure route to great ratings. The incredible numbers garnered by these stations reflect their audience's acceptance of highly processed audio.

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The winners in the broadcast wars have set the rules of the game and these rules tell us that it doesn't pay to be a purist or an audio perfectionist when it comes to the sound of your station. Processing for Maximum Dial Impact is a major component in the overall makeup of a **NUMBER ONE STATION!**

Until now, you only had one choice in a baseband processor, but now you can choose my DBE-1000 Dynamic Baseband Enhancer. In less than one year, the DBE-1000 has revolutionized the way major broadcasters in New York, Los Angeles, Chicago, Cleveland, Dallas and dozens of smaller markets in the U.S., Canada and Europe process their baseband for maximum dial impact.

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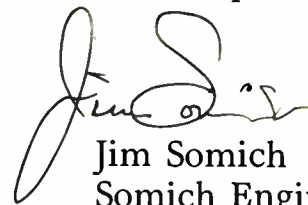
A test drive on your station will prove that I am not just making idle claims. My excitement about the DBE-1000 is real. It is the result of honest testimonials by top broadcasters who, understandably, request anonymity.

If you are looking for a Processing Weapon that is cost effective, stable, simple to set up and guaranteed to outperform its competition, then the DBE-1000 is for you.

Call your local Allied office today for more information. After hearing what the DBE-1000 can do for your station, I think you will agree with me that it is the most revolutionary piece of processing gear on the market today. It can make the difference between being **NUMBER ONE** or just an also-ran.

If you have any questions, please contact me personally at (216) 526-4561.

Sincerely,



Jim Somich
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World Radio History

FM Tests Raise More Questions

WAEB Multipath Study Indicates that Further Investigation is Needed

by Charles Taylor

Allentown PA Preliminary results of multipath interference testing conducted at WAEB-FM here in July revealed at least one predictable conclusion: The whims and whys of multipath are wholly unpredictable.

The results, scattered with expected inconsistencies regarding the effects of multipath on FM radio reception, are still being put in final form, but initial conclusions were shared by Harry Simons, WAEB's CE and leader of the project, at the NAB radio show in New Orleans.

The multipath tests come out of the National Radio Systems Committee's (NRSC) desire to find out more about what causes the distortion and how it might be alleviated.

Simons, with the aid of vendors such as Delco Electronics, Ford Audio Systems, ERI Antennas and TFT, sponsored the first of several rounds of testing at his station for four days beginning 29 July.

Two elements of multipath

Two major elements of multipath were approached during the first round of testing: its relationship with antennas and with AM incidental noise.

Among the few definite conclusions, according to Simons, is the realization that "a lot more needs to be explored. A number of different areas that were investigated gave us information that was inconsistent."

Antenna testing primarily revealed the basis for more tests in conjunction with circularly polarized antennas, vertically only polarized antennas, horizontally only polarized antennas and antennas

that have the ability to be varied between the ratio of vertical and horizontal, Simons said.

"We have yet to make any conclusions as to the optimum type of transmitting antenna that should be used in a high-multipath environment," Simons said. "Additional computer software is being developed, which will give us the abil-

changes in the level of incidental AM noise when the receiver is in an area with a high level of multipath.

"You can change the parameters in relation to incidental AM noise drastically, between 27 dB and 57 dB and hear virtually no change," he said. "I think what was most interesting out of all of this ICAM research was that in an area of

The whims and whys of multipath are wholly unpredictable.

ity of further real-time signal characterization to allow us to gather much more detailed information in this area."

He added that there is concern over the results of the field tests versus what the manufacturer of the antenna predicted in relation to its range testing.

Testing from the air

Antenna testing was conducted from an airplane by Air System Technologies using a data acquisition system and LO-RAN C navigation.

Data was gathered in a circular pattern three miles from WAEB's transmitter and included a polar plot of the main antenna pattern, horizontal and vertical polarizations as installed on the pole at the top of the station's tower; and a polar plot of the station's auxiliary antenna mounted on the side of the tower.

The group's tests on AM incidental noise (ICAM) addressed its effect on the ability of the listener to detect audible distortion at the receiver end from artifacts of AM noise.

A Radio Design Labs AM-1 was used to measure the amount of AM noise used.

Simons said that preliminary results determined that one cannot hear major

what would be considered mild or moderate multipath, when you made a substantial change in ICAM, the majority of people could hear the difference.

"That's an important factor because the level of ICAM in relation to the amount of audible distortion that ICAM can in fact produce in the receiver is critical to the station's ability to maintain quality to the majority of listeners," Simons added.

Testing continues with DAT

Testing will continue in the area of AM incidental noise using DAT recordings of the station's signal with four different levels of ICAM—27 dB, 37 dB, 47 dB and 57 dB. The recordings will be played for a variety of listeners and, using a survey provided by Delco Electronics, more conclusions regarding the effects of AM incidental noise are hoped for soon.

Simons' second round of testing, expected in mid-November, will concentrate on the effect of subcarriers on multipath.

In addition to a number of the companies that participated in round one, Simons said that AT&E Corp., the broadcast technical arm of Seiko, will offer assistance with the subcarrier tests.

The company has developed a wrist-watch/pager, which works via radio FM subcarrier transmission. AT&E will provide test equipment, a field evaluation vehicle and technicians, Simons said.

One of Simons' goals for this round of testing will be changing the antenna ratio from circularly polarized to all-vertical versus all-horizontal polarization.

To help achieve proper testing conditions, Shively Labs will provide hardware and technical support toward the goal, Simons said.

For information about the multipath testing, contact Harry Simons at 215-434-4424.

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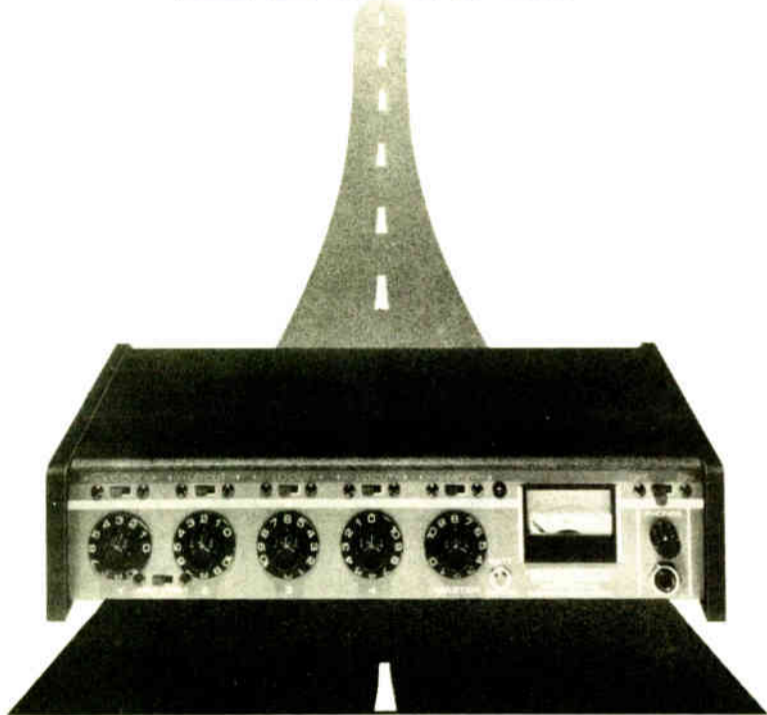
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39th IEEE Focuses on AM, FM Transmission

by John Gatski

Washington DC Radio technology topics were discussed at the IEEE's 39th Symposium held here at the Hotel Washington 21-22 September, including tube transmitters, improved AM antenna performance and combiners.

Mukunda Shrestha, RF manager of engineering at Broadcast Electronics, opened the symposium with a discussion of his recent paper analyzing FM tube transmitters and optimizing their performance.

Shrestha noted in his research that "careful consideration" must be placed on which input and output circuits are used with tube transmitters because they have an effect on bandwidth and group delay.

"RF bandwidth affects audio performance. It is, therefore, necessary to minimize bandwidth limiting components in the RF path to reduce performance degradation," Shrestha said.



Shively's Bob Surette addresses IEEE attendees.

He said a bandwidth of 1 to 1.5 MHz is adequate for excellent modulation and immunity to RF intermodulation.

Other factors to consider for getting the best performance out of an FM tube transmitter include addition of such circuits as broadband input matching and

(continued on page 20)

Bellcore Developing New Digital Telephone System

by Alan Carter

St. Louis MO A new digital telephone delivery system with 7 kHz audio and 64 kbits/s calling under development by Bellcore would introduce digital technology into another facet of radio broadcasting.

With listeners used to digital recordings at home expecting improved audio, radio would gain an advantage through access to end-to-end digital telephone delivery for remotes and other off-site broadcasts with the system, known as Integrated Services Digital networks (ISDN). A dedicated ISDN line would

replace an equalized loop radio stations currently use.

Radio broadcasters and equipment manufacturers attending a recent Bellcore forum on ISDN came away clearly impressed with it. But several noted that ISDN is not yet available to test in the US and pointed out that Bellcore does not expect the system to be widespread until 1991.

access to improved audio for news bureau operations and live remotes.

"There is tremendous application," ABC Radio Technical Operations Manager Mark Kalman agreed. A radio broadcaster's "Utopia" would be a 7 kHz-to-7 kHz broadcast line on demand, he said.

On the equipment manufacturing side, Telos President Steve Church and Comrex President John Cheney recognized the value of the improved audio but were short of jumping on the bandwagon.

"Things little known are presumed to be wonderful," Cheney said.

Looking for a market

Cheney did not question the claims Bellcore makes about ISDN, but he said he does not perceive enough of a market to make a product for broadcasters to tap into the service. But he added, "When ISDN is ready, Comrex will be ready."

Church, however, said Telos definitely will be making product for ISDN and will conduct in-house lab tests. With a dealer in France where ISDN is available, Telos may conduct field tests there, Church said.

"A lot of people are shaking their heads and saying we'll see," Church said. "The technology does what they say it does. But the real problem is you can't get it (in the US)."

Bellcore said ISDN uses complex hardware and software. The signal passes through a filter before being sampled and converted to digital code words. Once digital, the signal is encoded and transmitted. At the receiving end, the signal is decoded, reconverted to analog and passed through a reconstructive filter.

For information from Bellcore, call 1-800-521-CORE.

**"The technology
does what they
say it does."**

replace an equalized loop radio stations currently use.

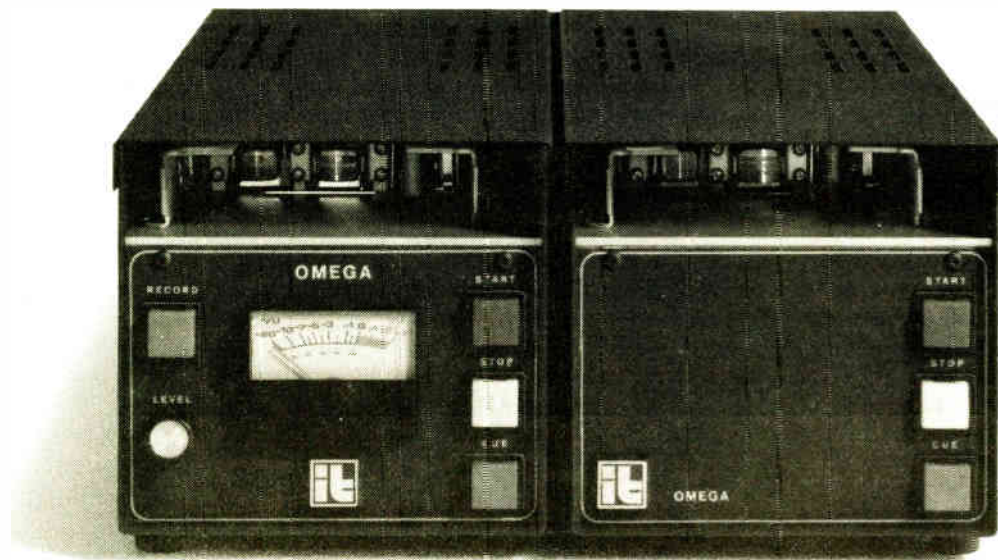
Radio broadcasters and equipment manufacturers attending a recent Bellcore forum on ISDN came away clearly impressed with it. But several noted that ISDN is not yet available to test in the US and pointed out that Bellcore does not expect the system to be widespread until 1991.

A pre-ISDN option

While waiting for ISDN, CBS Radio Technical Operations Manager Tony Masiello said broadcasters can access the phone companies' switched 56 option of 56 kbits/s, which CBS uses for some remotes and also in its new point-to-multipoint satellite network for its owned AMs.

Masiello said that once ISDN is implemented, it will give widespread ac-

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Another Fine Mess

Dear JG:

Here comes Autumn in New England. The foliage, the woodstove nights, Harvest festivals, Halloween . . .

The fall Arbs, antifreeze for the news van, new nitrogen for the STL feeder coax . . .

Ya know that little guy in the foxhole up in the corner? I'll bet he's really a CE. Look at him: everything all around him is either destroyed, disorganized or buried under everything else,

but he's still in control of the whole situation. Smiling, yet!

It's a pity that GMs and PDs can't appreciate the good, wholesome disorganization of a shop the way a Chief can. "Clean up, the owner's coming," is the most usually said about that less-than-perfect room.

But I'm in genuine awe of these micro-shrines to Marconi, and I'm especially dazzled by how they always know just where everything is.

Hey, need a new bulb for the production room's left VU meter? Why sure, it's filed under Bulbs, Lights, Meters, Incandescent, Bayonet, or—my favorite—"Tungsten." (We do have LEDs now, of course.)

Call me a romantic, Jude, but there's nothing homier and friendlier in a station than the engineer's shop. It's cozy, it even looks a lot like my first two apartments. All that's needed is a pile of dirty laundry. (It al-



**FROM
THE
TRENCHES**

by Alan Peterson

ready has the half-eaten box of Fig Newtons.)

When you think about it, Reception can be downright sterile, with its trade pubs arranged in a neat fan. The Sales office is empty (hope so, anyway), the PD is always "in a meeting" with the GM and Op Manager and the faces in the

jock lounge are pretty much the same.

But the shop—The Shop! Depending on the CE's disposition, you can put your feet up on the desk, place your luke-warm coffee among the other nine styro cups, share some nitty-gritty tech talk, and where else could you get a good laugh leafing through a 1970 (!) Lafayette catalog?

Of course, there have been shops which have it and those which don't. Ron Taylor's office at WRHP/WHEN Syracuse is one that does. It feels like it ought to have brandy in a snifter and a fireplace (there are two 5 kW transmitters so at least he's warm).

Boston's brilliant Bob Shotwell had an office that even his dog felt at home in, over at WMAS Springfield. And KZZP Phoenix even has a spiral staircase in the rack-room. They tell me it leads up to the STL cluster but I don't buy it. I think they've got a piano lounge up there.

Sad to think that with fewer stations employing fulltime CEs, the once cozy, happily messy office is destined to become a cryo chamber for Matt Munro records.

I'd like to see this corner of cozy clutter, the engineer's domain, preserved. So how 'bout yet another worthy organization?

Let's call it SPREADER: the Society to Preserve and Encourage Amazingly Disorganized Engineering Rooms, dedicated to keeping intact that happy mess that makes a CE a person of singular honor.

If interested SPREADER members inquire along with a SASE, I'll even throw in the membership card, granting freedom from neatness nuts and true happiness to all owners of such shops.

Maybe later on we can put together a kit of old coaxes, wads of solder and spare tubes to help create the homey atmosphere for those CEs just starting out. It takes time to reach that level of deliberate clutter.

Well, I gotta rush off. Time to get ready for the big event. You know, ugly faces, weird clothing, scary noises and a night of total terror . . .

That's right, Election Night Coverage.

Contentedly disorganized,
—Al

Al Peterson is a dedicated observer of radio's front lines from his foxhole near WSBS/WBBS Great Barrington, MA. He and the Great Pumpkin have never been spotted in the same place at the same time. You can contact him c/o RW.

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a call. Remember, we're the ones who made the missing link a shadow of the past.



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World Radio History

Hours Make Show a Success

Kansas City MO Shorter exhibit hours and no conflict with seminar schedules gave the fledgling SBE national convention "a reprieve"—in the words of one exhibitor—in its fourth year of operation.

The show, which faced long hours of light traffic in Denver last year, generated clusters of crowds and used exhibit hall activities to lure attendees to booths.

Products on display closely duplicated those seen three weeks ago at the NAB's Radio '89 show, with a few minor exceptions.

But it was the ability to draw enough booth traffic which had manufacturers and vendors voicing satisfaction and promising to be back again next year when the show moves to St. Louis—its most successful venue of the four years.

The numbers

The actual attendance figures for the SBE convention tell a slightly different tale than the opinions expressed by exhibitors.

The total number of those at the show was 3022—down from the 3297 of last year's turnout in Denver, which most exhibitors characterized as "disappointing."

But the rescheduling of exhibit hours into a two-hour reception on opening night and five hours each on a Friday and Saturday with no simultaneous seminars was the factor cited by exhibitors as the crucial difference in this year's show.

"I think the idea of having everybody here at once without any sessions to distract them was good," said Gary Crowder, marketing manager for Gentner's Broadcast Division.

"I think it's worked out. Not having sessions during exhibit hours is, I think, outstanding," agreed Roy Ridge, president of Allied Broadcast.

Jeff Detweiler, VP of sales for QEI, whose company passed up Radio '89 in

New Orleans in favor of SBE, said that the turnout indicated that his company had made a good choice.

"We were initially concerned about the rollback in hours, but based on how the

Eddie Barker and Associates reported that this year 778 exhibitor passes were issued, compared with 503 last year and that 743 attendees were admitted with exhibitor guest passes, compared with

were calling the show a success.

A survey of exhibitors by the convention advisory committee was scheduled to be underway in the week following the show. Many exhibitors suggested informally that the Saturday hours be changed to a weekday.

"There's some talk that having the show on Saturday doesn't work as well with engineers' schedules, that maybe we could have exhibit hours on Thursday and Friday instead," said Jack Williams, president of Pacific Recorders & Engineering.

Longer hours?

Other exhibitors suggested that while the major portion of exhibit hours could be set so as not to conflict with sessions, the hours could be lengthened at the beginning or end even while sessions were taking place.

"Some attendees come for the exhibits only," said Jesse Maxenchs, director of sales for TFT. "If someone wants to stay past three o'clock, I don't think they should turn down the lights and close things up."

Many exhibitors also favored the central location of the show and some suggest that St. Louis should be the permanent venue, to allow the convention to "mature and grow roots there," according to Williams. Most said they thought that a move to Houston in 1991 should be reconsidered.

There was still some discussion about a possible joining of efforts with the NAB's fall radio show, to relieve what most consider a grueling show schedule, but talks between the two organizations have so far proven fruitless.

And the satisfaction of exhibitors this year has apparently put to rest the urgency for any remedial measures.

"I think they've won a reprieve from anybody nixing the show by the results out here in Kansas City," said Broadcast Electronics' Tim Bealor.



Shorter exhibit hours with no conflicts generated increased booth traffic at SBE.

traffic patterns have worked out we've had a much better flow through the booth this year than we have in the past," Detweiler said.

More numbers

Even though the overall numbers were down slightly, exhibitors apparently saw more of the "quality engineers"—in the word of one vendor—that spell success for a convention.

Of the 3022 in attendance 125 were registered for the concurrent ITVA show compared to 920 who signed up for the simultaneous Rocky Mountain Film & Video last year in Denver.

646 last year.

Several exhibitors reported that they saw attendees from as far away as Maine and California and even some international visitors. The SBE board has promised a geographical breakdown of attendees.

Activities designed to lure visitors to the exhibit hall, which included free drinks at the opening reception and a walk-around lunch stuffed into engineers' "shop coats" brought the crowds they were designed to attract.

But by Saturday, much of the traffic had slacked off, although this did not dampen the opinions of exhibitors who

SBE Gets a New Prez

Kansas City MO The new president of the SBE told attendees to the society's fourth national convention that they've "been in the back room too long."

Brad Dick, a former radio CE who works for *Broadcast Engineering* magazine won the presidential race over KXXL's Paul Montoya.

Dick called the convention to order with an SBE general meeting, along with Bill Garris, newly elected treasurer, Paul Lintz, the new secretary and Richard Farquhar, the new vice president.

Dick told those gathered that the needs of broadcast engineers have changed and that they can no longer rely on the FCC to give technical guidelines as in the past.

"For too long we relied on the Commission to set our agenda, define our jobs, tell us what to do," said Dick. "But we're grown-ups now."

He said that part of his agenda as SBE president will be to help engineers show their GMs how important they are to the "station's bottom line."

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Circle 27 On Reader Service Card

FCC Eyes Upgrades To Its Lab Facilities

by **Benn Kobb**

Washington DC With laboratory facilities built in 1974 and equipment dating back to the 1940s, the FCC is looking at what it would take to modernize its operations.

The directive came from Sen. Robert Packwood (R-OR) after Oregon-based Tektronix Inc., manufacturer of TV test and measurement equipment, and computer maker Atari Corp. told Congress the lab facilities are inadequate.

"We make equipment that the lab might consider purchasing, but that was not the reason for our inquiry," said Gary Conkling of the Tektronix government and public affairs office. "We became increasingly aware that the FCC lab was not functioning with state-of-the-art equipment that would enable them to test products more quickly and efficiently."

Immediate response

Tektronix contacted Packwood, a member of the Senate Commerce Committee. Packwood asked FCC Chief Engineer Thomas Stanley to describe improvements needed at the lab.

"Much of the equipment is near the end of its useful life," Stanley told the senator in a letter. "While the telecommunications industry has made major advances since 1974, budget constraints over the years have left the Commission with little additional funding for replacement and upgrading of equipment."

He said that upgrades are particularly necessary if the FCC is to perform an active role in the development of new technologies such as HDTV.

While radio equipment manufacturers don't send a large amount of their product to the FCC for lab testing, Stanley said they are also indirectly affected. If the Commission were to question outside contract lab certification results radio equipment would have to be sent to the FCC labs for re-testing.

Stanley presented two options for lab renovation.

Option A would replace aging equipment and remedy current deficiencies for about \$1.5 million. Purchases would include spectrum analyzers, signal generators, PCs and EMI software.

Option B would provide complete modernization, including a \$2.5 million anechoic chamber, bringing the total cost to approximately \$5 million.

Benefits of upgrading

Lab upgrades would help speed FCC equipment approval, and would allow more extensive post-grant sampling capability for enforcement purposes.

Among many items, the lab's shopping list includes an enclosed site for radiated emissions tests. Because FCC emissions rules are defined for outdoor testing, inclement weather at the lab produces backlogs in obtaining Commission authorization for new products, Stanley said.

The request also includes \$150,000 for the purchase of a transversal electromagnetic (TEM) cell for testing consumer television and radio receivers. The Communications Amendments Act of 1982 gave the FCC authority to establish RFI susceptibility rules for such home equipment, but the FCC currently has no way to enforce those rules and the lab has no means to test the products.

Option B would provide the lab with more capability needed in HDTV studies. For \$485,000, the lab would purchase a video frame grabber, HDTV waveform monitor, HDTV video and other components of a general TV interference workstation to produce high quality video signals.

Some additional staff members and equipment for HDTV support may be forthcoming if the FCC receives its requested \$10.2 million increase in funding. FCC Chairman Alfred Sikes has asked Congress for \$109.8 million in FY 1990 and \$121.5 million in FY 1991.

En Banc AM Forum Set

(continued from page 1)

"It's a good idea to see how AM proposals relate to one another," Commissioner James Quello said. "It will update our record from the best thinking we can get in the industry."

Bill Hassinger, assistant chief of the FCC Mass Media Bureau, added that the meeting will insure that the public, the broadcasting industry and the Commission are "of the same mind" when it comes to improving AM.

The Commission encouraged participation in the meeting through comments, both written and oral, and asked for an evaluation of the FCC's AM improvement efforts in terms of cost effectiveness. It also asked for improvement options the FCC might have overlooked.

A Commission news release announcing the ruling mentioned specific dockets dealing with AM improvement, including those aimed at improving the quality of AM broadcasting by reducing adjacent channel interference and

eliminating restrictions pertaining to the protected daytime contour; improving methods for calculating skywave field strength on the AM band; encouraging interference reduction between AM broadcast stations; and improving methods for calculating nighttime protection for AM stations.

All of these, it added, stemmed from docket 87-267, an overall effort to improve AM service.

Encouragement also came from concern from some that the effects of individual proceedings might have little impact on overall AM improvement, the FCC said.

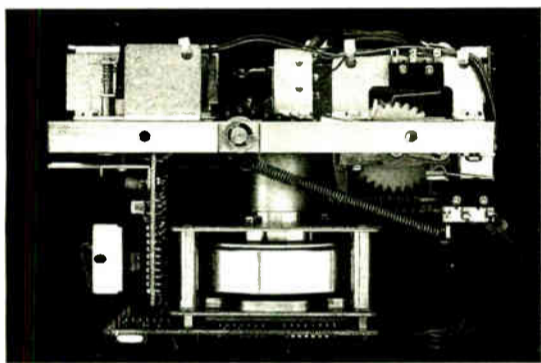
"By taking this approach, we believe that the Commission will be able to move forward, both rapidly and coherently, in an effort to improve AM broadcasting," the FCC said.

Format of the meeting and a list of participants have not yet been determined.

For information from the FCC, contact Bill Hassinger at 202-632-6460.

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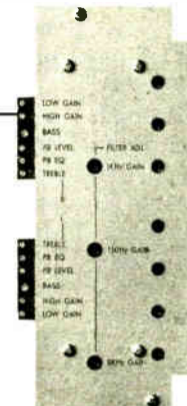
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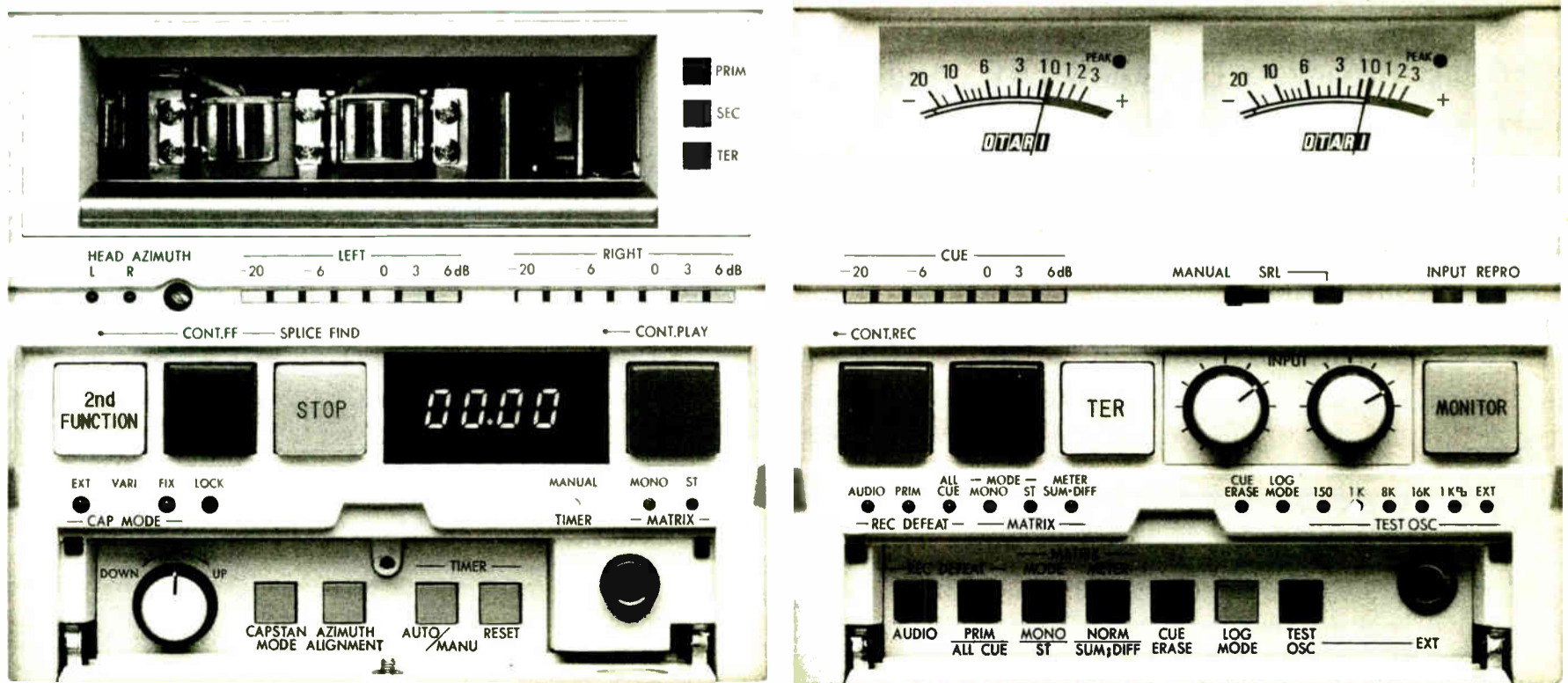


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RF Limits Closer to Towers, Study Shows

by John Gatski

Las Vegas NV AM radio stations do not need as much land as previously estimated to fence out the public around antenna sites in order to meet FCC radio frequency (RF) radiation emission distance requirements, according to a new FCC-commissioned study.

A study conducted by Richard Tell Associates Inc. concluded that prescribed RF electric and magnetic field strength limits were found to be much closer to the tower than calculations contained in a 1982 American National Standards Institute (ANSI) RF protection guideline.

The report also noted that RF magnetic field measurements should be made along the perimeter of an antenna and not just along one straight line.

The FCC-mandated guidelines, known as OST 65, were established in 1986 and are based on the ANSI guideline. They require a fence around an antenna to protect the public from exposure to greater-than-prescribed RF electric and magnetic fields.

The distance requirement for fences will vary depending on the power rating.

However, based on research and tests Tell undertook at four Las Vegas AM stations, he concluded that the FCC's distance requirements are overly conservative because they are based on theoretical calculations for AM rather than actual field data.

"Use of predicted clearance distance from OST Bulletin 65 will yield overestimates" for AM antennas, Tell stated in the report.

In measurements at KDWN, KVEG, KLAV and KENO in Las Vegas, Tell said the estimated OST 65 distances for acceptable RF magnetic and electric field levels are four times further out than actual measurements indicated.

Each of those stations he tested uses a quarter wave antenna and their power ratings vary from 1 kW to 50 kW.

"We figured those distances were sort of overkill," before the test was conducted, Tell said. "Hopefully, this (report) will be used in some modification of OST 65."

Because of the shortage of land for antenna space for AMs, Tell said a rules revision could save a station money if it has to install a fence because the barrier could be allowed closer to the antenna.

Robert Cleveland, a physical scientist for the FCC Office of Engineering and Technology, said the Tell report is informative and useful, but OST 65's modification is not among the FCC's immediate plans.

Along with Tell's RF test of AMs, Cleveland said ANSI's proposed revision of its RF radiation standard must be considered as well as other recommended guidelines that have been created since the FCC incorporated the ANSI standard into OST 65.

DISTANCES (IN METERS) AT WHICH FIELDS FROM AM STATIONS ARE PREDICTED TO FALL BELOW VARIOUS ELECTRIC FIELD STRENGTHS (*See notes below)

Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Transmitter Power (kW)								
		50.00	25.00	10.00	5.00	2.50	1.00	0.50	0.25	0.10
25	0.06	109	83	60	47	37	27	22	18	13
50	0.13	65	51	37	29	23	18	14	11	8
75	0.19	49	38	28	23	18	13	11	8	6
100	0.25	40	31	23	19	15	11	9	7	5
150	0.38	30	24	18	15	11	8	6	5	4
200	0.50	25	20	15	12	9	7	5	4	3
300	0.75	20	16	11	9	7	5	4	3	< 2
400	1.00	16	13	9	7	6	4	3	< 2	< 2
500	1.25	14	11	8	6	5	3	3	< 2	< 2
632 (ANSI)	1.58 (ANSI)	12	9	7	5	4	3	< 2	< 2	< 2
750	1.88	11	8	6	5	4	3	< 2	< 2	< 2
1000	2.50	9	7	5	4	3	< 2	< 2	< 2	< 2

Notes: (1) This table can be used for any AM frequency or electrical height.
(2) The entries in this table apply to both electric field strength and the corresponding magnetic field strength (assuming impedance of free-space equals 400 ohms).

Hot Spots Found Less Of a Radiation Hazard

by John Gatski

Washington DC A new NAB study concluded that field strength levels measured in radio frequency (RF) "hot spot" areas are not as significant as contact current levels found on or very near those objects.

So important is the study's finding, it likely will change the existing mindset of RF hot spot testing, according to NAB Science and Technology VP Michael Rau.

Conducted by Richard Tell Associates Inc. of Las Vegas, tests were run in simulated hot spot areas, which are defined as small areas of space where RF field strength is much higher than ambient field strengths.

Hot spots sometimes alarm engineers when they make RF field strength measurements because the higher readings lead them to conclude that the levels in the small area exceed the American National Standards Institute (ANSI) RF radiation limits suggested for human exposure.

Re-radiation hot spots

Tell's report focused on re-radiation hot spots, which are prompted by metal objects and are more common near radio towers.

To research this type of hot spot, Tell used a mailbox, filing cabinet, aluminum window frame, an antenna guy wire and a half-wave dipole antenna.

(continued on page 18)

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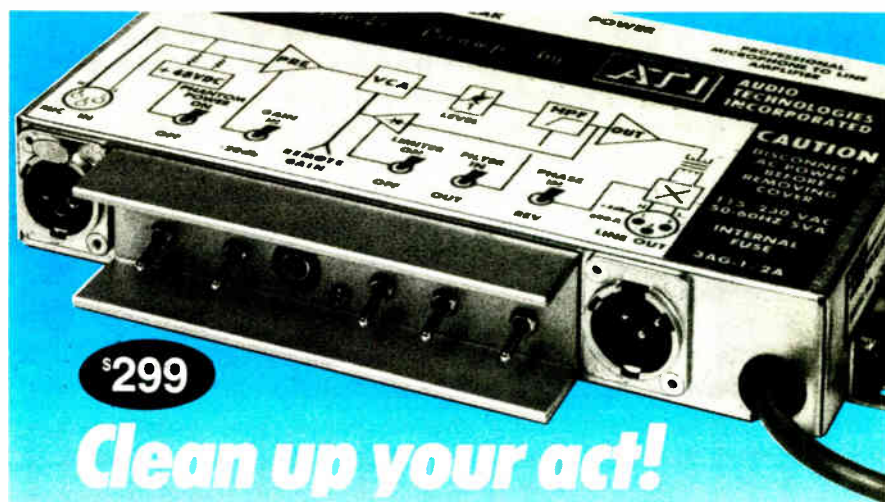


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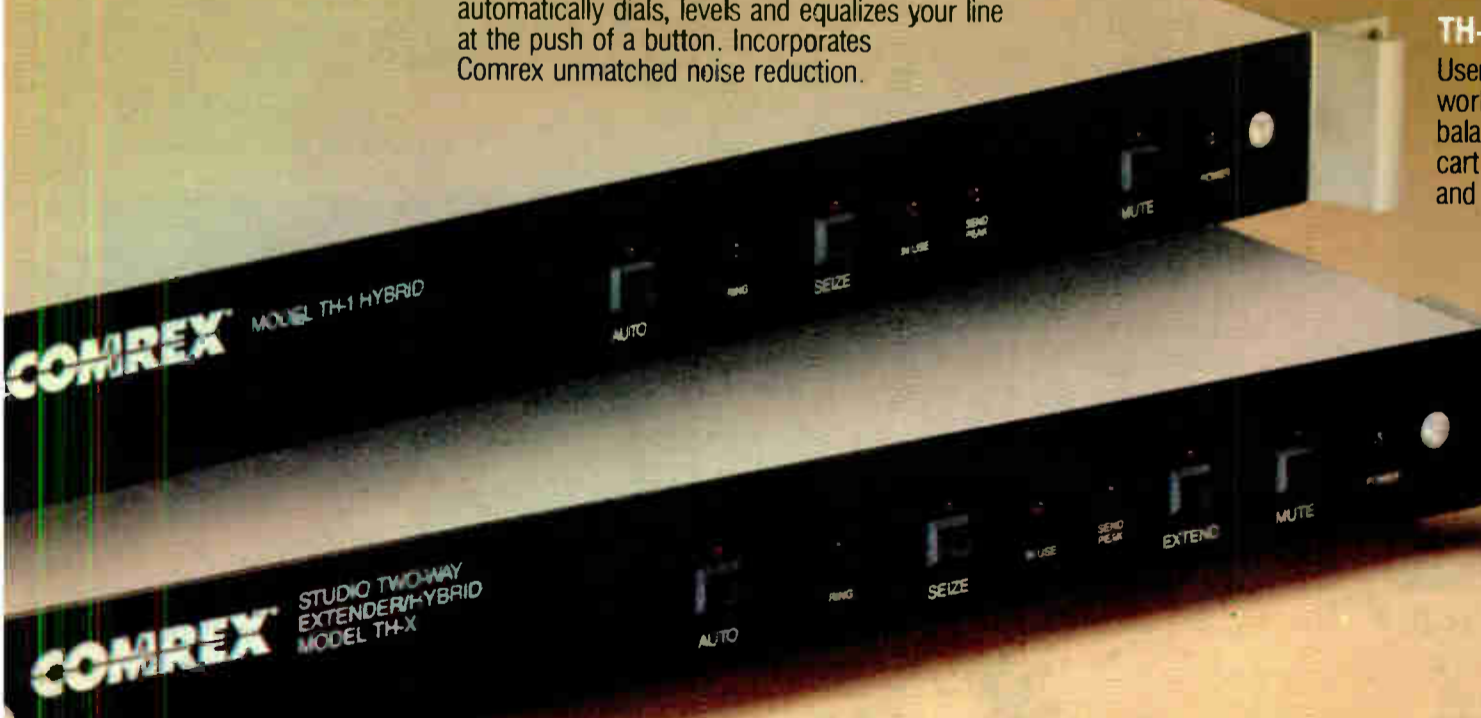


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Circle 46 On Reader Service Card

KKBT Enters LA Radio Dogfight

by Alan Carter

Los Angeles CA KKBT-FM is the new kid on the block here, but as one of the most powerful stations in the market, it is not going to be bullied around—signal-wise, that is.

Abandoning a classical format to rock to the beat of Paula Abdul and Fine Young Cannibals, KKBT GM Jim De Castro pointed out the difference between his processed sound and that of what some call the "smash-it-to-the-wall" practice of Pirate Radio or the softer approach of the AC competition.

"I want to find the finest modulated sound," De Castro said as he takes the station into the highly competitive LA modulation and processing war to gain ratings for the all mighty advertising dollar. Ad sales are projected to reach \$399 million this year in LA, making it one of the most lucrative radio markets in the country.

What it takes

But where does the signal fit into the scramble for ad dollars?

Sound is "as important as anything we do," said De Castro, ranking processing on equal ground with the power of the facility, the music format and the talent.

KKBT went on the air 20 September when Evergreen Media changed the call letters from KFAC and abandoned a 58-year run as a commercial classical station. Evergreen bought KFAC in January for \$55 million and was forced to find a

new way to carry the debt service.

Money apparently is no object when it comes to the operations side of KKBT. How much will Evergreen spend to get the station where it wants?

"Whatever it takes," De Castro said. "We hope to eventually become the leader."

In addition to significantly altering the audio chain from the classical days of KFAC, De Castro said the station is installing a new 30 kW Broadcast Electronics transmitter and received FCC approval to increase its antenna height on Mt. Wilson from 2910' to 2945'. De Castro also said he will not renew the station's current SCA agreement, which he feels limits the facility's full

"I want to find the finest modulated sound."

modulation capability.

The station coverage area runs south to San Diego and north to Santa Barbara. The added antenna height should eliminate some nulls and decrease multipath.

Processing game

KKBT's new audio processing scheme was designed by a well-known name in the processing side of the industry: Greg

Ogonowski, an LA radio engineer and owner of Modulation Index design and consulting firm.

Ogonowski said he installed a customized multiband processor and will add his linear composite processor, which he described as "a totally new development in composite processing."

The piece of equipment, Ogonowski explained, is fully linear, does not generate distortion or harmonics and deals with STL overshoot problems. "It does not involve clipping of any type," he said.

The processing uses a time-aligned 18 dB/octave crossover, digital pulse-width controlled VCAs for the gain control, peak control eleventh-order 15 kHz overshoot low pass filter with less than 1% overshoot.

Ogonowski said that since KKBT went on the air, he had "to turn it up to give it pizzazz."

To critics who would say Ogonowski is only aggravating the already volatile processing scene in LA he responded: "The station can't fall off the dial. They have to have a commercially successful sound."

Going too far

But Ogonowski conceded that the processing and modulation situation in LA is out of control. "Everything in LA is past the point of reference. We're to the point of diminishing return with audio processing," Ogonowski said.

"I think everybody has gone past the



KKBT GM Jim De Castro

stops. I think maybe we could lower things even 1 dB, and things would sound a lot nicer. But at least, things don't sound as bad as New York."

De Castro said he suspects the competition is overmodulating and the station will have measurements taken.

Asked for his position in the debate between audio purists and programmers who want a loud sound, De Castro said, "I think there is a legitimate school of thought on both sides."

De Castro, however, argued that the average listener can't detect that one station sounds better than another. But he added that he wanted listeners to spend time with KKBT and not suffer listener fatigue and punch in another station on

(continued on page 19)

Fans, Staff Share the Loss Of Classical Format KFAC

by Frank Beacham

Los Angeles CA It was like attending the funeral of a murder victim. While the eulogies were beautifully drawn and even touching, there was an undercurrent of bitterness permeating the entire affair.

The victim was KFAC, Los Angeles' only commercial classical radio station. Earlier this year the station was bought for \$55 million by Dallas-based Evergreen Media Corp. The debt load, Evergreen contended, was too high to support a classical format and on 20 September KFAC was transformed into "rock with a beat" KKBT. The change left the nation's largest radio market with no classical commercial station. Many in this city thought it was nothing short of cultural murder.

To mourn the passing of a station that has brought classical music to Southern California since December 1943, Los Angeles public station, KCRW, broadcast a three-hour *Requiem for a Radio Station* the morning after KFAC fell silent. Produced and hosted by Nicola Lubitsch and edited by Tom Lowery, the program brought together KFAC's former announcers, PD and fans for a warm and moving broadcast memorial.

But beyond affectionate memories from KFAC announcers laced with favorite classical recordings, *Requiem* poignantly revealed how much a radio station can mean to a community and how

painful its loss can be. It was as if—in this age of out-of-control smog, traffic congestion, mini-malls and corporate takeovers—the demise of KFAC was far more than the loss of a radio station, but another nail in the coffin of LA's quality of life.

"When you try to impede young people from hearing great music, great things or from seeing great acting . . . in other words, if you control their spectrum and point them into a banal atmosphere all the time, you are going to get the kind of young society we have today," said veteran KFAC announcer Thomas Cassidy.

Industry consensus is that the only FM radio format with a broad enough audience to service the debt on a \$50 million station investment is pop or rock music and that older, not younger, listeners tend to listen to classical stations. Cassidy called that industry thinking "propaganda" generated by pop/rock broadcasters. "It's amazing the tremendous response we have had from young people," he said.

"What they (broadcasters) are doing here by saturating the market with this kind of presentation (pop music) to the young people is they are closing their minds to the atmosphere, the depth and the importance of a different kind of listening that can shape their whole lives," Cassidy told the radio audience.

Fred Crane, another KFAC veteran an-

(continued on page 19)

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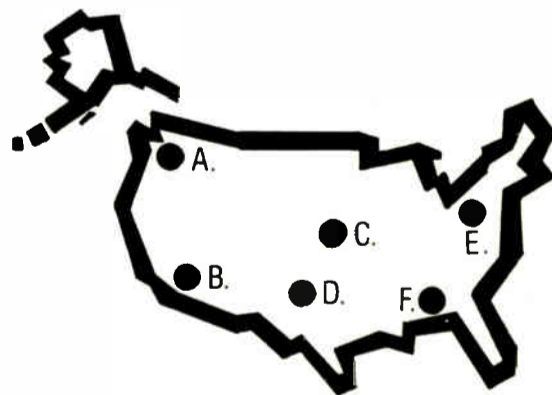
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Class A FM Coalition Asks FCC to Reconsider

(continued from page 1)

process, including evidence that Class A upgrades would not cause significant interference if a blanket approach were adopted.

The petition said the FCC was particularly remiss in not weighing possible "marginal increased interference" against the much-improved community service the blanket upgrade would bring about.

On another point, the petition noted that "it makes no sense" for the FCC to require a Class A station seeking an upgrade to file a public interest showing when the station uses a directional antenna to protect a nearby short-spaced station.

Keane also challenged the Commission's logic in requiring a short-spaced Class A station to show that a full or less short-spaced alternative site is available.

Keane said even in the unlikely event another site is found, the cost would be way more than "the average mom-and-pop Class A station can afford."

Problems for short-spaced stations

The petition to reconsider said the alternative site provision is "irrelevant" because alternative site showings are required only when an applicant seeks a waiver to install a new transmitter at a

new short-spaced site.

"The majority of Class A's seeking to increase their power wish to do so at their existing sites," not at a new site, the petition noted.

Another point of contention, according to the petition, is the FCC's requirement that Class A's get an agreement from short-spaced direction neighbors for the power upgrade.

The United Class A Broadcasters Coalition contended that if a Class A station proves it will not increase its coverage, the agreement is not necessary, the petition said.

The group also found fault with the FCC's decision to prohibit power increases in second and third adjacent channel directions.

According to the petition, the Commission routinely allows grandfathered short-spaced stations to increase power in those directions.

For 20 years, the Commission has said interference from second and third adjacent channels causes very little interference and that insignificant amount is more than offset by the power hike advantages, the petition noted.

For information about the petition to reconsider, contact William Keane at 202-861-7845 or Mike Rice at 203-456-1111.

What's In a Name?

Willimantic CT The New Jersey Class A Broadcasters Association has helped form a larger group, the United Class A Broadcasters Coalition, in order to enhance the collective image of Class A's across the country.

According to Nutmeg Broadcasting President and United Class A Broadcasters Coalition board member Mike Rice, the group was formed to alter the image that

East Coast Class A's were the only ones behind the push for a blanket power increase.

Rice said there are scores of member stations from all over the country including the East and Midwest who are in the group and support its efforts to get the FCC to modify its recent Class A ruling.

For information about the coalition, contact Mike Rice at 203-456-1111.

RF Hot Spots Analyzed

(continued from page 14)

tenna as objects for the test.

Testing equipment included a field strength meter and test probe for measuring current contact levels, which consisted of a copper tube soldered to another smaller copper tube hooked to an RF transformer. Measurements were made by an RF field strength meter.

Hot spots were created by using a 144 MHz 25 W transmitter and a four-element Yagi antenna aimed at the objects.

In his test results, Tell explained that RF field strength readings from hot spots should not be used as determinants for judging "safe" RF exposure levels, which are set at 1000 $\mu\text{W}/\text{cm}^2$.

What is more important, Tell said, is the contact current that can be absorbed into the body from the metal object when a person is touching or is very close to it.

The contact current is responsible for the Specific Absorption Rate (SAR) into the body, Tell said.

During the test, he experimented on himself by measuring the RF field strength using the probe on his wrist.

Although debated in the scientific community, the suggested maximum SAR spelled out in ANSI and FCC guidelines is 4 W/kg average and 8 W/kg peak.

According to Tell's report, "A measurement of the contact current which flows

between the exposed person and a radiating object provides a meaningful alternative to field measurements and permits evaluations of the peak specific absorption rate, which may exist in a person touching the hot spot source."

New approach to hot spots

"Contact current measurements appear the only practical avenue for evaluating RF hot spots found in public environments where field levels are usually weak within the RFPG (Radio Frequency Protection Guideline), but local fields are apparently excessive," the report said.

Tell emphasized that even though an object within a hot spot has a high field reading, the SAR in most cases will not exceed the ANSI/FCC limits.

Tell said contact exposure areas, such as antenna ladders, are objects that stations may want to measure to safeguard against high RF exposure of workers if the contact current/SAR is found to be higher than suggested limits.

Rau said the Tell hot spot research is a "great study" and its information could be used in altering the FCC rules when it comes to measuring RF hot spots.

"It potentially lessens the liability of broadcasters for faulty measurements due to hot spots," Rau said.

For more information about the hot spot study, contact Richard Tell at 702-645-3338 or Michael Rau at the NAB, 202-429-5346.

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LA Sings a Requiem For a Radio Station

(continued from page 17)

nouncer, called the fall of the station "a sad statement" and lamented that we live in a time when "the almighty dollar is a game that causes a great many people to be deprived."

"If everything is based on the almighty dollar then you have a true problem," Crane said. "We can kill our planet, we can kill art, we can burn the library."

Crane said in another time we had the Renaissance man who studied many things and possessed a broad view of the world but now we "have a tunnel vision and you have a great deal of depth on a narrow subject to the exclusion of many other wonderful things which enrich a person's life."

Announcer Rich Capparella said, "I feel a profound sense of shame, indignity and sadness as a resident of Southern California that this sort of thing should happen."

"I think what really caused the demise of KFAC was its greatest asset," Capparella said. "The biggest asset of KFAC was—as they say in the trade—its 'stick.' KFAC was blessed with a monster signal—you could hear that station in Ethiopia, for goodness sakes—and it was its Achilles' heel. It became the subject

of a high-priced buyout." (KFAC broadcasts with 43 kW from Mt. Wilson with an antenna whose top is 2910 feet above sea level.)

Another KFAC veteran, Tom Dixon, lamented the day broadcasting became rich. "People found they could make a lot of money out of it," he told the KCRW audience. "A lot of fun went out of it for us."

"But I don't think the poor public can do anything to stop it," Dixon said. "It isn't in their hands. It's a business now. It's bottom line. What can we make on it and the public be damned!"

KCRW's *Requiem for a Radio Station* ended with Ricardo Muti and the Philadelphia Orchestra performing Beethoven's *Fifth Symphony*, causing listeners to wonder if the composer, 162 years after his death, could ever have imagined his timeless music having to do battle with the Fine Young Cannibals for survival in the world's richest radio market, where the price of owning a radio antenna has become a significant arbiter of mass culture.

But not for the faithful, who no doubt agreed with defiant host Lubitsch proclaiming, "Beethoven rolls over for no one."

KKBT Enters LA's Rock Station Processing Wars

(continued from page 17)

their car radios.

KKBT is loud, Ogonowski said. But he maintained it is "a little less fatiguing" because the compression runs slower than at KPWR-FM, which he said also uses a piece of his equipment.

Ogonowski said KKBT does not have the "real open sound" of KIIS or the "muddy" sound of KQLZ's Pirate Radio.

What's good for radio

"Achieving audio quality is something a good radio station should strive for," Ogonowski said. "Striving for loudness is something the listener can do with the volume control, without increased distortion. After all, who are we trying to impress—ourselves or our listeners?"

KKBT CE Bob Conger, in an interview prior to the format change, said he did not see anything wrong with adding

processing, considering the highly competitive LA market.

"The only thing I object to is, in an attempt to compete, some stations will go too far," Conger said. "I do object to the mash-it-to-the-wall processing. I think it must be presented clearly and distortion free."

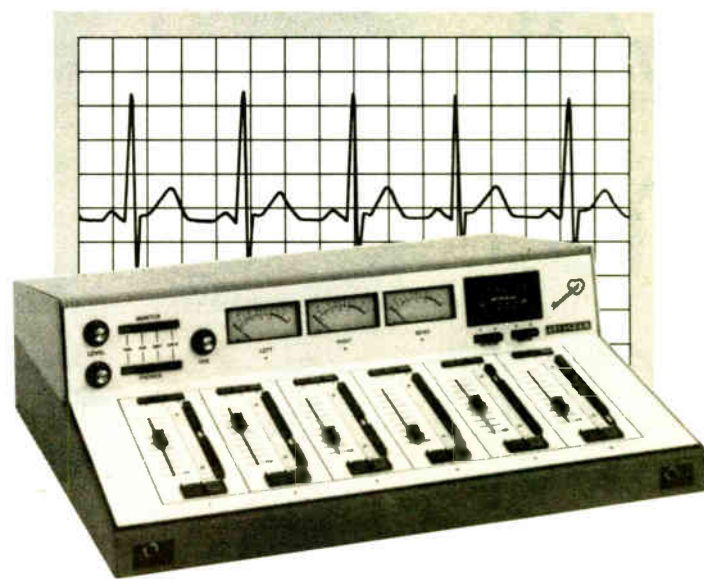
Ogonowski said he doesn't agree with the compromises other stations have made.

"Audio processing is just a set of compromises," Ogonowski said. "A massive set of details, and a massive set of compromises."

"The only improvement is a means to clean up the transmission path to allow the processed signal to accurately pass through the transmission system."

For information from KKBT, call 213-466-9566. To contact Greg Ogonowski, call 714-860-6760.

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IEEE Tackles Transmission Topics

(continued from page 8)

a magnetic output coupling loop, Shrestha added.

He said transmitter manufacturers should provide information about the amplitude and group delay response to allow engineers to tailor their systems toward station needs.

FM combiners and more

Bob Surette of Shively Labs presented his findings on when to use four- or five-pole bandpass filter FM combiners.

He said four-pole filters are adequate for a combiner with a few stations that are 2 MHz to .8 MHz apart, but a five-

pole filter provides more isolation for a larger number of stations.

Consulting engineer Thomas Osenkowsky discussed the relationship between the field ratio and the monitored current ratio of AM directional arrays and computer modeling to predict performance.

Osenkowsky said engineers should carefully analyze directional arrays on tall towers and use of the "Moment Modeling Method" programming tools.

"With the wide availability of Moment Method programming tools, it is possible to construct a model of the current (or voltage) sampled location vector sen-

sitivity matrix so that the actual effects of changes in the antenna monitor readings can be translated into predicted variations in the radiation pattern," he said.

Saving on field time

James Hatfield of Hatfield & Dawson Consulting Engineers Inc. gave a step-by-step discussion of using the MININEC computer program to determine antenna monitor parameters for an AM directional pattern, rather than spending a lot of time field testing.

The technique also allows an engineer to determine the detuning reactance for unused or re-radiation towers, according

to Hatfield.

"In many instances, it is possible to save time in the field (by) using modern methods of antenna analysis. Whether sitting in front of a computer terminal is preferable to spending extra time at a scenic transmitter sight is another matter," Hatfield said.

Following Hatfield's presentation, Valentin Trainotti of CITEFA in Argentina discussed improved AM nighttime performance through calculations of the height radius relationship for an AM monopole.

He also explained a formula to determine the theoretical nighttime service area of a station using AM vertical arrays.

Spectrum planning

In a final area, Richard Parlow, associate administrator for the National Telecommunications and Information Administration (NTIA) Office of Spectrum Planning, covered a variety of spectrum topics including planning for domestic and global allocation.

"RF bandwidth affects audio performance."

He said the NTIA will participate in a comprehensive review of spectrum management in this country, which is necessary because of the tightening demands for spectrum by current broadcasters and from future technologies such as HDTV and fiber.

Because of the scarcity of spectrum with current and future demand, Parlow said a spectrum auction may not be out of the question.

"I think it is time to take a broad-based look at that and put it into perspective, even though Congress has opposed it," Parlow said.

NAB Radio Hits a Snag

Washington DC It isn't the "ultimate"—as in last—straw for the NAB's "Ultimate" radio, but generating interest among manufacturers is proving to be a difficult task.

The NAB radio, designed by Richard Sequerra, incorporates state-of-the-art technology for AM and FM and was unveiled about a year ago at the Radio '88 convention.

The project was plagued with some initial snags, including an incomplete product at the time of its unveiling, but the concept was sound enough to spark talks with receiver manufacturers, according to Michael Rau, NAB VP of Science and Technology.

Several months ago Rau announced that the NAB had a letter of intent from a receiver manufacturer interested in building the radio.

But at this year's radio show, Rau reported that for "reasons unrelated to the project's concept or design" the manufacturer had bowed out.

The project received a vote of confidence from the NAB's Executive Committee, however, at a meeting held the day after the show.

"They gave me the go ahead to try to interest another receiver manufacturer," said Rau, "so the project is still alive."

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How to Get More from RPUs

New Products and Tips For Improving on Your Remote Broadcasting

by Barry Mishkind

Tucson AZ Last time out we discussed some of the considerations in dealing with Remote Pick Up (RPU) broadcasts.

By utilizing a combination of planning and equipment, it is not very expensive to get a good deal of improvement over a basic telephone call.

In fact, depending on the situation, you can get acceptable to excellent audio on the air with very little lead time.

Most such schemes rely on variations of telephone service, from frequency extenders to cellular technology. New options are appearing all the time.

For instance, at the NAB Radio '89 Convention in New Orleans, an Oklahoma company by the name of Tri-Tech showed a combined remote mixer and cell phone.

The Cellcast can be taken virtually anywhere and set up to broadcast in minutes. It has four microphone and two

ECLECTIC ENGINEER

line inputs with four individual headphone level controls. A built-in cellular phone completes the basic 18 pound unit.

Designed to utilize on-site AC or car battery, the Cellcast will run on internal batteries for up to 15 minutes. While this might seem a trifle short for some applications, it does get you up and running instantly in an emergency, while power cords are strung.

Fred Holmes of Tri-Tech noted that refinements are under design, and a built-in compressor or frequency extender may soon be available. Already rear panel jacks provide access to the signal chain and for an external antenna, or even modular telephone connections.

We are certain to see other manufacturers introduce their variations to meet the market demands. Check with your supplier for the latest gear.

Telco tips

Before passing on to other methods of getting the remote broadcast signal to the studio, let me pass on a couple of other tips to add to your arsenal.

Mike Fast of WPLC, Baltimore, kindly called and mentioned a few things he has found useful in getting his remotes up and running successfully. Mike uses his local telephone company for equalized loops almost exclusively.

Mike mentioned WPLC's station policy of having remotes scheduled early enough to meet telco installation times. Further, he purposely sets the due date with the telco three or four days early to reduce tension.

Of course, in many cases, getting enough advance notice is hard. A good rapport with sales may or may not gain

services. While that seems like it doesn't need saying, there is a hidden clause.

That is: fiber optic and T-1 lines. Mike says that these are really something to learn about, as they are cheaper to use than traditional loops, as long as you have the equipment to take advantage of them.

The underlying factor is summed up in the word for the 90's, digital. As the telephone companies are now set up to handle digital transmissions more easily than analogue, it is appropriate that we look in that direction, too.

Among the sources of equipment and

On the other hand, many stations have decided that for flexibility, they want to bypass the telephone company completely.

There are choices out there. For instance, depending on your market and location, you can often get a connection from the local cable company.

If cable service is available at or near your studio, you may be able to tap right in and get your signal. Modulated RF as well as digital transmission is usually available.

In some cases, you may find that cable service exists in places from which it is impossible to get cellular service, such as deeply inside certain public facilities.

A side benefit of investigating what the cable company can do is that a working relationship may be built with the cable company that can even include promotion and advertising connections.

But, maybe you don't want to have wired service through a monopoly to depend upon. If you would rather control the signal path to the maximum extent, consider your own microwave system, or look to the sky. More on this coming up.

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

... it is not very expensive to get a good deal of improvement over a basic telephone call.

some breathing room.

This is especially true with equalized loops. However, Mike mentioned a loophole many have found in the FCC Tariff One.

It is not required that every loop begin at the remote site and end at the studio. Mike said, "WPLC maintains a permanent equalized loop from the phone company central office to our studio.

"That way, no matter where the remote is, the telco never has to come to the studio to finish a line. All they have to do is patch the incoming line to the central office to studio loop."

Cost effective

Several advantages accrue to this method, he noted. First, you only pay once for the loop to the studio. Even if you have three or four remotes scheduled for one day, the telephone company can patch each of them in to you on your schedule.

Second, as the minimum billing is usually for one month, a station doing a lot of remotes from certain locations can leave the loops in place to the central office, patching up the one needed rapidly.

That works well from a car dealer's lot, for instance, or from the local convention center or stadium.

Mike also pointed out his "theory that nothing happens without a good reason." He feels this applies to the difficulty that many stations have had in dealing with the local telcos.

As the telcos used to get regular price increases in their tariffs, the fixed rates remove incentive to provide traditional

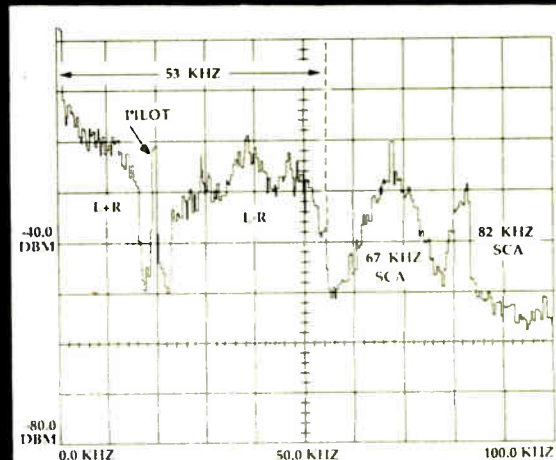
information out there, QEI recently introduced their CAT-Link to take advantage of this newer telco offering.

Divorce from Ma Bell and friends

As we have seen, there are a number ways of getting signals through those wires on the telephone block. But, whether you are on a dial-up set, cellular phone, or equalized loop, you are depending on the local telco in one way or another.

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See Your Way Clear to Success

by John M. Cummuta

Downers Grove IL Success is a decision.

I've never heard anyone else say it quite that way but I've heard hundreds of successful people express the same thought in thousands of other ways.

If you want to be successful as a manager, you're going to have to master your relations with yourself and with those around you. And you can decide to do just that. It's up to you and no one else.

Technical people aren't particularly crazy about developing "people" skills. In general, they feel much more comfortable in the predictable, measurable world of technology. But what I'll be discussing in this issue is a technical approach to human relations. So maybe—just maybe—this will be a concept that even the most analytical personality can comfortably incorporate.

Technical side of skills

The science is called Neuro-Linguistic Programming, or NLP. An analysis of these terms reveals that this is a system for programming our nervous system or brain, using its own language patterns. Millions of people can attest that these concepts work, and the results can be dramatic.

NLP begins from the premise that you are first honest with yourself about your

values, your goals, your passions, your beliefs, your strategies and your level of committed energy.

What am I talking about?

I'm saying that you can enjoy much greater success, in your personal life, as well as your professional life, if you get these areas of your thinking and acting in line.

Starts in your own mind

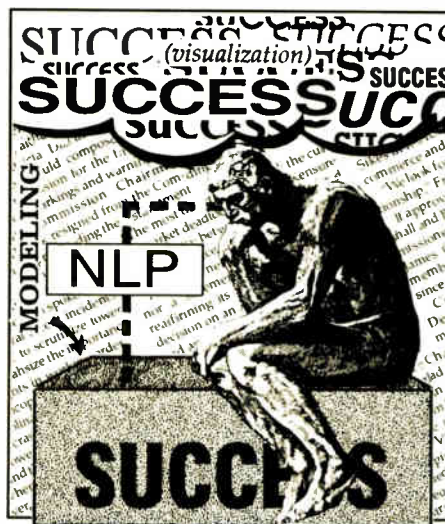
Before you can ever think about being able to successfully influence others, and thereby increase your levels of personal and professional success, you must first successfully influence yourself. You must master your own thinking.

For example, relatively few situations are either good or bad in themselves.

ENGINEERING MANAGER

Rather, their value is established in our own minds. We frame these situations mentally and they then become either negative or positive for us.

Let's use the example of your girlfriend or boyfriend leaving you. The normal framing of that would be as a tragically negative occurrence. It would generate correspondingly negative outcomes in your day-to-day life.



But what if you mentally reframed that same event and said, "Fabulous! They're gone! Now I can find someone who really appreciates a person with my qualities."

If that seems like a trite or silly delusion, you're very wrong. The difference in emotions and external manifestations between these two reactions to the same event are profound. It's the old story about people looking at a half glass of water. Some see it as half full, while others see it as half empty.

Some people frame circumstances and conditions in their minds to see all the good things that are there. Others—the negative ones—miss all the pleasures of what is really there, to gaze longingly and tragically at the one or two illusions that are missing.

This is *framing*, and it's an NLP skill that you can develop. You can control the way you see and react to circumstances, situations and people. If you can always frame in the positive mode, your success levels at whatever you're doing will rise dramatically.

Examine your beliefs

I'm not necessarily talking about religious beliefs here, but rather our assumptions about life, ourselves and the world in which we live.

Before Columbus, many otherwise successful people, who could have benefited greatly from intercontinental trade, never realized their success potential. They operated under the premise that the world was flat and that there were no other markets out there.

They were absolutely wrong, but their beliefs reduced their levels of success. Are your beliefs doing the same damage to you? Do you believe yourself to be inadequate or incapable in some areas of life? Are you not taking advantage of certain opportunities, because you believe you can't do it, or that the other person wouldn't respond favorably, or that it's wrong?

While your assumptions may be correct in some cases, you should consider re-examining them, because you may also be incorrect. That could really be holding you back from something great.

Without vision you'll perish

Have you heard about the technique of *visualization*? It's an NLP concept that has been proven successful by athletes, business professionals, dieters and a host of others who had goals they wished to achieve.

Visualization is based on the concept that the more consistently, precisely and vividly you mentally visualize yourself as already having achieved a specific situation, the more your subconscious mind will mobilize you to do all the things necessary to make that vision a reality.

It's been used by athletes to break records, by actors to give the greatest performances of their career, by business executives to consummate highly successful deals and by managers to develop cooperation among their subordinates and accomplish much higher levels of productivity.

Communication and NLP

You've probably heard, a million times, that communication is a two-way street. But did you ever think about the fact that it is also a two-directional street?

By that I mean that, while we are all aware of our dialogues with others, we are somewhat less cognizant of our communications with ourselves. Yet mastering these internal discussions is critical to our outward success.

If you're wondering how your internal dialogues are going, just look in the mirror. How do you dress, stand, sit? What are your standard facial expressions? Are you relaxed or tense? These physiological indicators are all expressions of your inward attitude about yourself, and how you are communicating with yourself.

Before you ever attempt to master communication with others, master it with yourself. Tell yourself how great you are and tell your subconscious to notify your face and the rest of your body.

Immediately knock off such self-destructive "I'm-too's" like "I'm too fat," "I'm too ugly," "I'm too stupid" and so on. Say nice things to yourself—how can you expect the world to have a higher opinion of you than you have yourself?

Communication and mirroring

NLP researchers have found some interesting links between our external representations and internal representations and these links have a powerful effect on our outcomes. What this translates into is that if we see a person who looks and acts a lot like we do, we tend to like them more, trust them more and want to associate with them more. So if you want people to feel that way about you, *mirror* them.

If you're trying to ask your boss for a raise and he or she is relaxed and leaning back in their chair, you do the same. If your boss leans forward pensively, assume the exact same posture. Don't mimic them, but use their same tone of voice. Use some of the same words.

What you are doing is building rapport and you will never accomplish anything of consequence with another person unless you have rapport.

Another thing to watch for is whether they represent things visually, auditorily, or kinesthetically. In other words do they talk about how things "look," or how they "sound" or how they "feel?" Present your concepts to them according to the sense they focus on and you'll realize a much greater level of rapport—and therefore success.

The NLP concept that I find the most fundamental yet powerful is modeling.

(continued on page 35)

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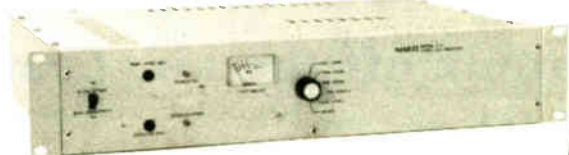
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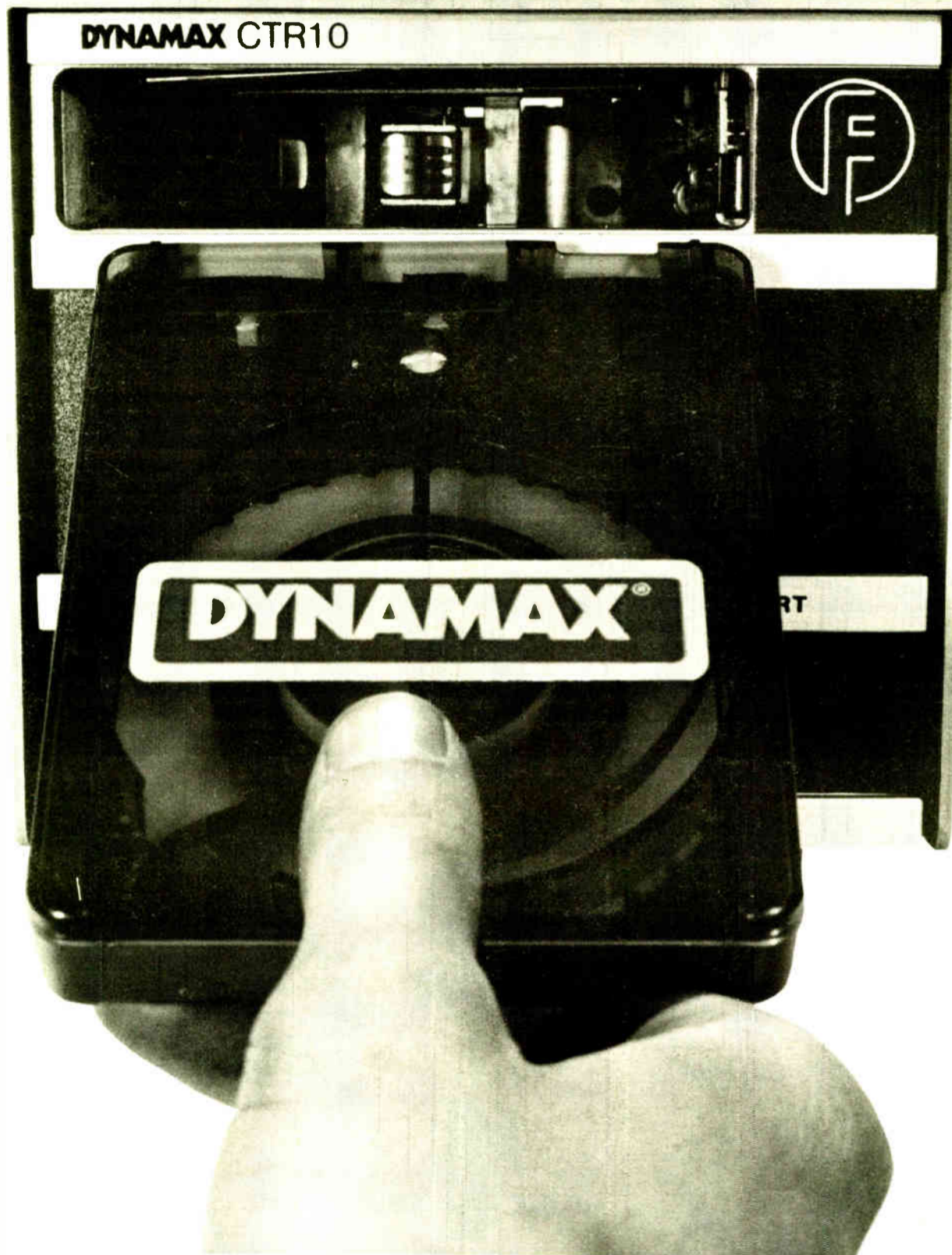
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PC to CD: DAT's Programming!

KBEE Links Computers To Digital Sources for Its Automation System

by Dee McVicker

Modesto CA On 28 August, KBEE-FM programming and PC programming were formally introduced. Except for a handful of anxious-looking human beings standing nearby, the only delegates giving the introductions were two PC computers, 21 compact disc players, four DAT machines and a digital pulse.

Radio and the personal computer had come to a totally new understanding of fully automated digital programming. And KBEE's GM, Tom Ehrman, was at last going to get a good night's sleep.

Ehrman had spent the previous months chipping away at a communications barrier. All around him, he noticed PC computers exchanging lively, electronic conversations with consumer and industrial products. Why, he wondered, couldn't broadcasting's more digitally-advanced source players become a part of this electronic dialogue with the PC?

Hands-free PC automation of DAT and CD players, as Ehrman envisioned it, was the most cost effective way to digi-

tomation.

After exchanging specifications and speculation, IGM and Radio Systems engineers returned to their booths and Ehrman and Stanley returned to the convention floor. All were relatively assured that the RS 1000 DAT and the IGM automation system would dovetail.

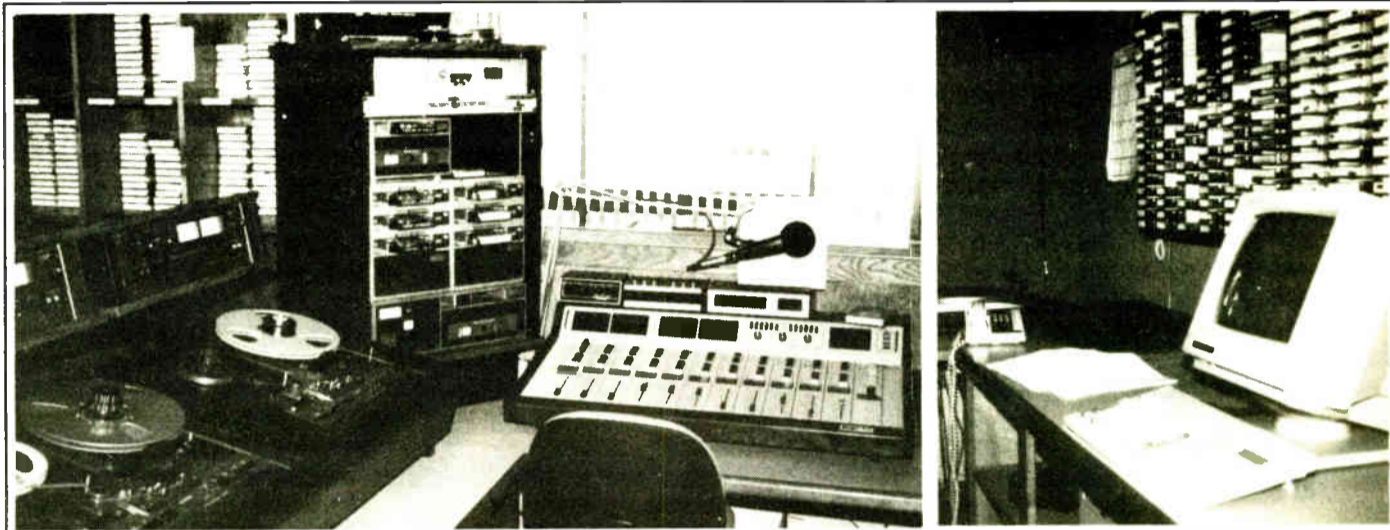
Meanwhile, a software vendor in Los Angeles was called upon by Ehrman to

troller (EC), required a different data buss strobe rate and protocol interface.

After changing the EPROM in the RS 1000's 8032 microprocessor to match IGM's requirements, the project encountered its second communications problem. Basically, said Tim Low, the station's CE, "the two machines (computers) wouldn't talk to each other."

While the IGM EC stepped to the next

are clocked by Bonneville and time marked in Pristine's playlist log. Although ideal for music sequencing, Pristine's method of clocking events did not communicate with IGM's method of stepping to the next event in response to an EOM command. In order for the two systems to hand off commercial and music load, a common communications link was needed.



KBEE's air studio, with tape library (far left, rear) is automated by the computer shown at right.

interface its scheduling and playback software to the IGM system and the Bonneville CD library.

Pristine Systems, relatively new to the world of broadcasting but conversant in the world of computer wares, entered the project. Its Pristine Music Manage-

ment Control System, marketed through BGM International, showed promise in sequencing the library with two software modules and two 16-terminal computer cards.

With these contacts made, Ehrman and Stanley had every reason to believe that full automation of CD and DAT players from two PC computers would work. Their plan entailed one computer dedicated to Pristine rotation and playback of the CD library and another computer dedicated to IGM overall studio management and commercial load.

"There's nothing to degrade the audio."

In total, they would end up with 21 six-pack Pioneer PDM 410 compact disc players interfaced directly to the Pristine computer for full library rotation, and four RS 1000 players that would interface to the IGM computer for the commercial load.

Communication problems
When the automation wares arrived at KBEE's studios in Modesto, two communication barriers immediately showed themselves. Of initial concern was the IGM and DAT interface; the two simply would not communicate.

Perplexed, both IGM and Radio Systems compared notes. It was soon discovered that a change in IGM's new automation brain, the Economical Con-

event in response to the traditional EOM command, Pristine saw the next event as something entirely different. "The Pristine system," explained Stanley, "works on elapsed time from the beginning of each event."

All 2500 or so songs in the CD library

The missing link proved to be a Metra-Byte card, inserted into Pristine's computer, that Pristine Systems software coded to receive and send a 5 V pulse.

With the two computers triggering commercial and programming control to

(continued on page 33)

FACILITIES SHOWCASE

tally handle the full music and commercial load of the station. With KBEE's easy listening format available on a Bonneville CD library, Ehrman didn't want to lose digital quality to a cart machine. He also wanted to be able to record commercials on digital DAT machines.

The problem, however, was in automating the hardware of CD and DAT players with what was currently on the software shelf. And the barrier, until 28 August, was a seemingly insignificant mediator called communications.

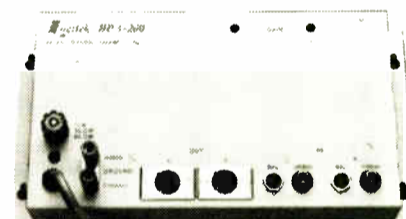
Automation round-up

At the 1989 NAB show, Ehrman wandered the convention floor with Jim Stanley, consulting engineer for KBEE and Price Communications. Somewhere in the vast expanse of the show was their automation system, but both quickly realized that not all of the system would be found at one booth—or even at the show.

On one side of the convention floor was IGM, an automation company that three years ago moved its automation software from mainframe computer to PC. Used primarily for automating satellite programming and other analog sources, Stanley and Ehrman wondered whether IGM's automation system would be receptive to DAT machines as well.

On another side of the convention floor was Radio Systems, a company that modifies Sony's R-DAT DTC 1000 for virtually every broadcast interface. An EPROM microprocessor, ingeniously programmed by Radio Systems and married with Sony's DAT to make the RS 1000, appeared to have the parallel data interface that was needed for IGM au-

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NAB Spotlights PCs in Radio

by Barry Mishkind

New Orleans LA Saturday afternoon at the recent NAB Radio '89 convention held here, the exhibits were closed but the sessions were still going strong. One included a demonstration and discussion on how engineers can get more value out of their personal computers.

Stan Salek of the NAB and Jay Trachman of Creeradio Services (a comedy service) explained what is out there to aid the engineer.

Trachman, the system operator, or SYSOP, of the broadcaster-oriented BP FORUM on CompuServe, gave an on-

line look at the service.

BP FORUM is actually three databases in one. There is a message section where messages, questions and problems can be placed and answers received from broadcasters all over the country. This can be of special value to engineers in more isolated locations where contact with other working techs is limited.

Questions answered

Trachman said that many times, not only different engineers, but representatives of manufacturers will check in and answer questions. This pool of experience is as near as a phone modem.

According to Trachman, John Reiser of the FCC, is another of the SYSOPs. Reiser posts actions by the Commission.

Even more instantaneous feedback is available on the real-time conferences that often run. A number of individuals can "converse" at the same time, allowing for extended discussions of various topics or problems.

Additionally, Trachman showed a section with a number of downloadable programs and files on FCC laws. Several SBE chapters also file their newsletters this way for anyone to receive.

Cost is moderate. The on-line charge from CompuServe is in the neighbor-

hood of \$6 to \$12 per hour, depending on the modem speed. Of course, the time charges can add up. Trachman indicated that downloading files and messages for reading later is one way to contain the cost of use.

Public domain

Salek gave a demonstration of several "public domain" programs available.

Many times, station engineers have to write their own programs or do without, as budget money is often not available to buy programs just for the engineering department. On the other hand, public domain software are programs made available to anyone at no cost.

Salek said that some programs come from manufacturers, such as a package distributed from Continental Electronics. Others come from suppliers like RF Specialties or services like Broadcast Data Services.

All of the packages contain several programs that will not only do the usual basic conversions, but calculate STL path signals, distances to antenna nulls, coverage predictions and more.

The program from BDS is terminate and stay resident (TSR). This feature allows the program to "pop up" over another application you are using and provide the information, then disappear.

Two other packages were mentioned as being available—one from Tom Osenkowsky and another, the Mini-NEC, which does an antenna system analysis.

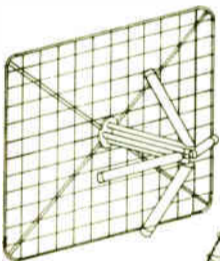
There have also been a number of small programs printed in industry publications, and many programs are passed around within SBE chapters. By checking out what is out there, the engineer can acquire some potent engineering tools at virtually no cost.

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



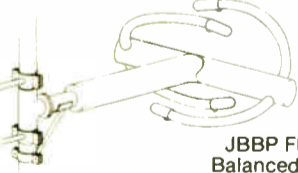
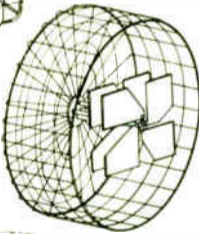
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How to Improve Your Communications Skills

by Barry Mishkind

New Orleans LA One of the last sessions at the NAB Radio '89 convention in New Orleans was perhaps the most important.

"Keys to Successful Communication" was presented by Judith Sheets Perkinson, of the Calumet Group, Inc.

Following up on a similar presentation last spring, Perkinson stressed that each individual in the station can contribute to better communication.

More than just listening

Perkinson started off by noting that "many public speaking classes begin by teaching people how to listen," creating the notion that what we are trying to accomplish is talking and listening.

Instead, the idea of communication was stressed as the goal. The difference was illustrated by a game of "telephone," in which a message was

passed through several people and the corrupted message compared with the original.

It is normal practice to assign blame for the missed message, Perkinson explained. That, however, does not solve the problem nor provide hope of improved communication in the future.

She said the real problem pointed out in the "telephone" game is that the message is really not considered important by the members of the chain.

Improving communication then is each person making it an important goal—both from an information standpoint as well as a personal standpoint.

Getting a point across

Tips to improve the transfer of information, according to Perkinson, include realizing that words mean

(continued on page 35)

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"The beacons were blown out of their sockets, but our transmitter barely blinked."

Robert LaFore knows all about lightning. As Chief Engineer for WQPW-FM "Power 96" in Valdosta, Georgia, he'd better: His 600 foot tower



WQPW'S 600 FT. TOWER

TAKES THEM WHENEVER THERE'S LIGHTNING.

is the tallest object for miles around. "We've been hit so hard the tower beacons were blown out of their sockets," he told us recently, "and so often that the lightning rod looks like someone's been beating chunks out of it with a sledgehammer. But so far our new Harris HT 20FM transmitter barely blinks at lightning. Occasionally we get a PA Plate Overload message, but that's it."

Robert also knows something about Harris reliability: Until they received a power increase to 50,000 Watts last year, WQPW had been on the air with a 3.5 kW Harris transmitter for thirteen years. "That transmitter was very good to us," Robert reports.

"Still is, in fact—it's our back-up now. Basically, we shopped around enough to be sure Harris could match or top the competition in both price and features: Things like Automatic Power Control for simple remote operation. Then we ordered a 20 kW HT 20FM transmitter."

About 45 days later WQPW's transmitter arrived (meanwhile, Robert supervised construction of a new transmitter building, tower and antenna). "We just took it out of the box and put it right on the air," he says. "Even the tuning movements were small. The installation went so smoothly, I told the factory 'You've got to do something—this transmitter's boring.'"

After a number of months of service, WQPW's HT 20FM remains just as "boring." Robert has only shut it down for routine monthly maintenance. "Even that is minimal," he told us. "I vacuum the cabinet out, check tube cooling, make sure nothing's overheating, and that's about it. Two or three times a week I do a meter check and log the readings. They hardly ever

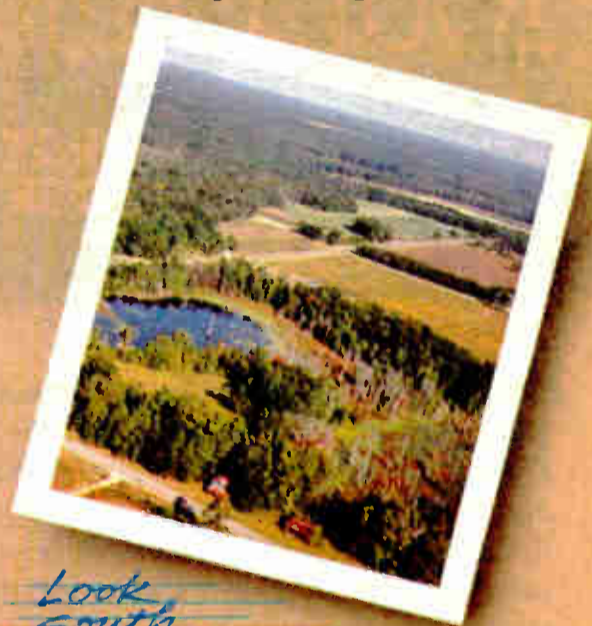
Chief Engineer Robert LaFore

WITH HIS NEW HARRIS HT 20FM 20 KW FM TRANSMITTER.



change. In fact, we're still using almost the same tuning numbers we got from the factory. And we're getting a very noticeable improvement in audio quality from our new Harris THE-1 exciter."

As you can tell, WQPW is very proud of their new transmitter. We're just as proud that



Look south

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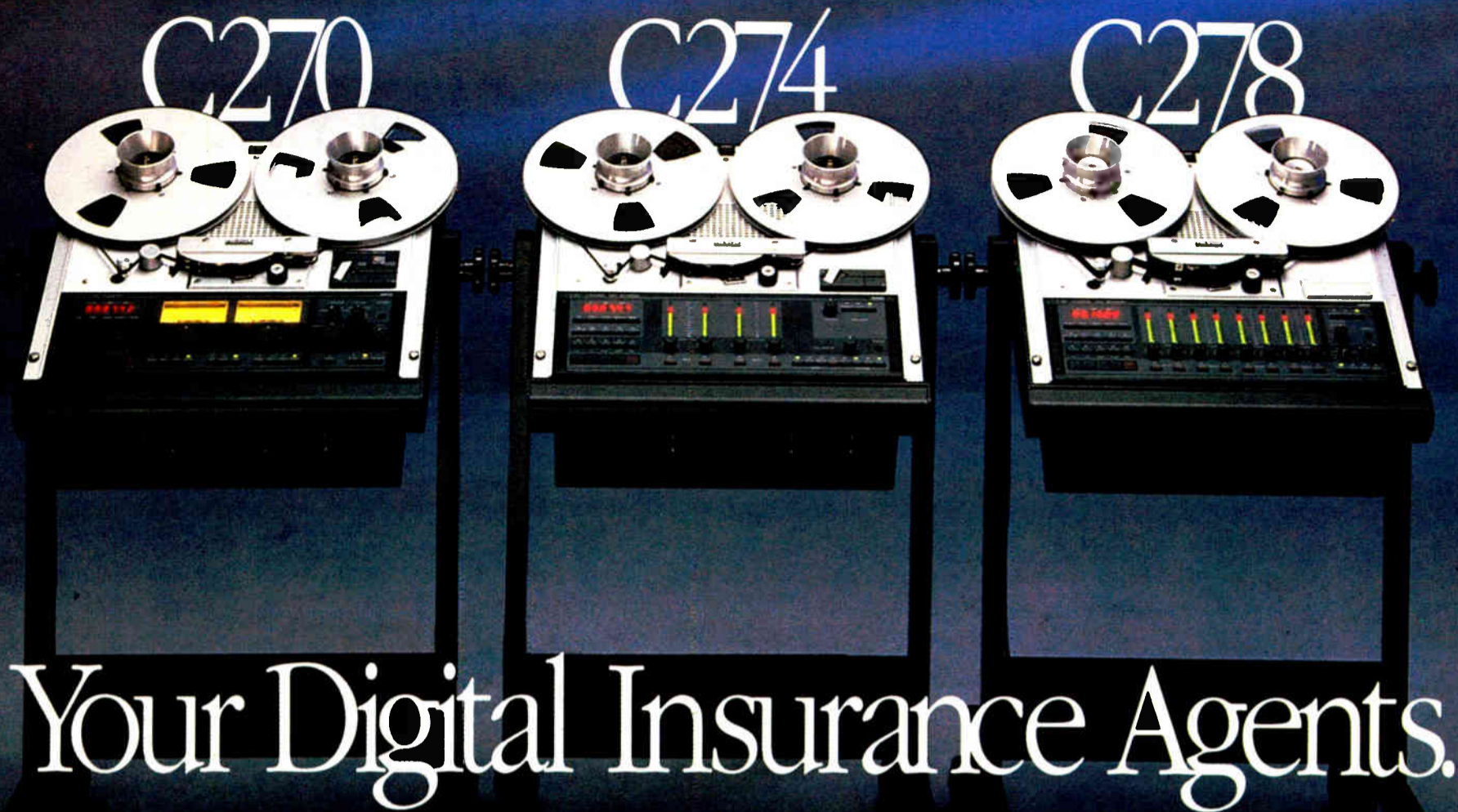
our HT 20FM is living up to their confidence in Harris engineering. But then, we expected it do exactly that from the moment it took shape on the drawing board.

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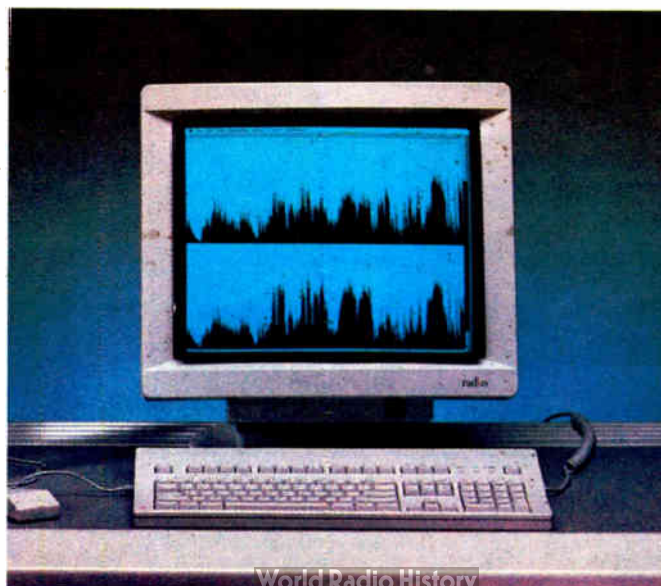
BEST BUY Compare the "street" price and performance of any C270 Series machine with the competition, and you'll find there *is* no competition. The die-cast deck plate and head block, the precision mechanics and a host of powerful features tell you any C270 Series machine will last as long as you need a reel-to-reel in this emerging era of digital workstations. And in the digital future, you'll need analog recorders that will sound good—for a long time. That's why your last reel-to-reel should be a Studer Revox.

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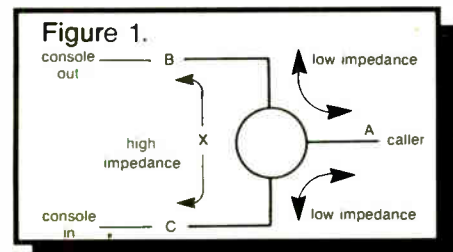
Adding Mix-Minus to Consoles

This Simple Procedure Yields a Circuit that Can Cost Less than \$10

by **Bill Higgs**

Louisville KY Welcome back to our series on restoring audio consoles. By now, you should have your refurbished console up and running. All the ICs are in place, the power supply puts out juice without smoking and the front panel is polished and bright. It is now the total equal of modern consoles, right?

Almost. Most older consoles were equipped to handle five studios, four control rooms, two output busses and the proverbial partridge in the pear tree. One thing they usually were not configured for is interfacing with the local telephone company.



Sure, many older RCA and Gates boards had talkback capability. Some even had the ability to run backhaul audio on the remote lines using some version of common mode (lots of hum, but it worked and saved an additional line).

Several articles have appeared recently extolling the virtues of using modified speakerphones and those devices are fine for limited or budget applications. I wrote one such article myself, and stand by my words. Wonderful gadgets, these.

For true two-way duplex telephone conversations, however, something more elegant is needed. This more elegant something is called a hybrid.

Understanding the hybrid

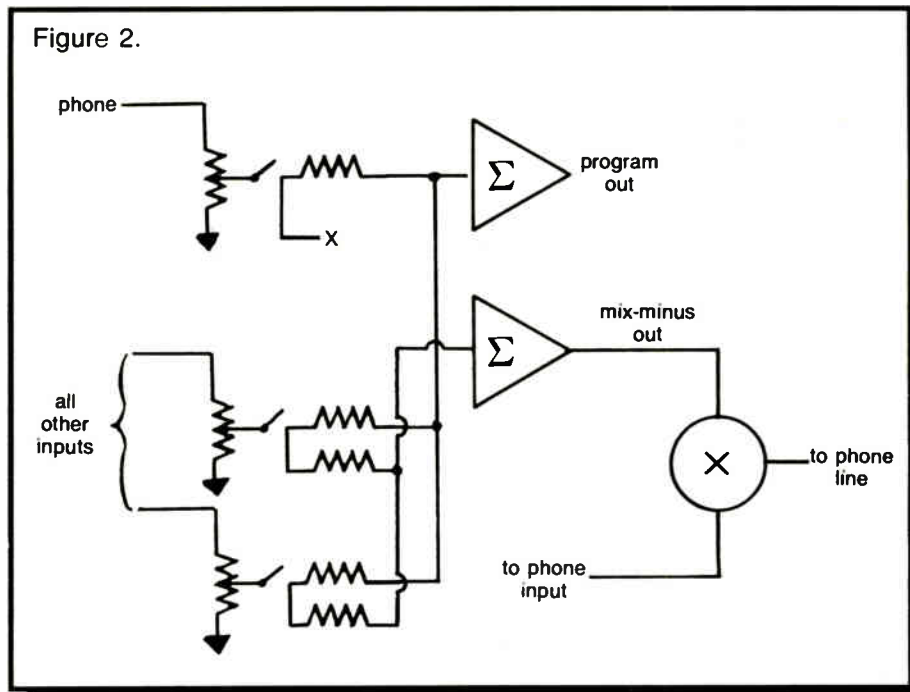
A hybrid is a three port device, as shown in Figure 1. The idea is to isolate ports B and C such that you do not get feedback and unwanted paths. If you

BOTTOMLINE BROADCASTER

were dealing with DC it would be easy. With AC it gets a bit trickier—diodes don't work on AC!

The technique is to use phasing to eliminate unwanted coupling. If a circuit is designed such that there is a 180° shift in the audio you wish to kill, then the audio disappears. All hybrids are adjusted for this null condition.

There are at least two ways of making a hybrid: transformer-based and all-electronic. Heath, Johnson and others used transformer systems for their "phone patch" units and many of these amateur radio devices have found their way into radio studios. For that matter, Ma Bell has used a form of hybrid circuitry in telephone sets for years to separate the send and receive circuits and avoid echo.



The contemporary approach is to use an electronic hybrid circuit. Several companies make these devices for broadcast use, either from discrete op-amps or ICs specially designed for the purpose. These interface units usually include equalization and limiting cir-

cuitry as well.

Forgive me; I digress. We were talking about consoles here, not telephone interfaces. What does this have to do with our board?

Hybrids require that they be fed from an audio source that does not contain

the caller's voice. Often a station will use a mic send only, taken from the preamplifier. This has disadvantages for on-air use.

First of all, it is confusing to the caller who is used to hearing all of the station's air audio. Think about it: the caller is listening to the radio—music, spots, and all—and calls in for the contest. He or she is put on hold (usually air audio) and then nothing when the phone is switched into the board. Then, he or she hears only the announcer. We have all heard the caller say, "Am I on the air?" (or worse).

Second, the operator usually has to push at least one more button to feed his or her voice to the caller. In the heat of battle, this is often forgotten. Hearing, "Hello . . . hello?" will alert you to this form of cockpit trouble.

The solution is to use what is called the mix-minus technique. This is to develop a feed that includes the entire program mix, *minus* the caller's voice.

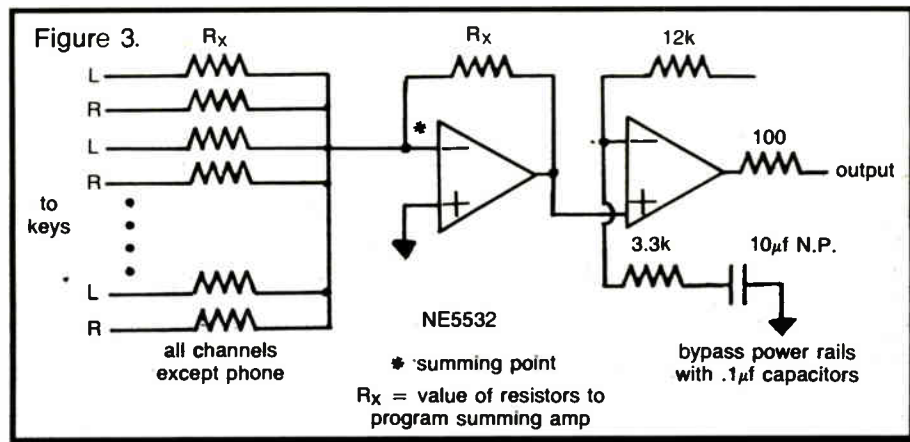
The mix-minus approach

I have seen several schemes of doing this that insert the caller's voice downstream from program audio—in Audiotronics consoles, for one. The other solution, and one easier to implement in an older console as a retrofit, is to build a separate mix-minus buss. A block diagram is shown in Figure 2.

A satisfactory mix-minus send can usually be built with a single IC. You will recognize part of the circuit in Figure 3 as the now-famous (infamous?) summing amplifier used in our console upgrade, although the circuit can be used with almost any board.

The circuit's output is unbalanced at about 0 dBm, since most interface devices will be placed physically close to the board. If you need a balanced output, add an additional NE5532 and use the line amplifier circuit described in an

(continued on page 35)



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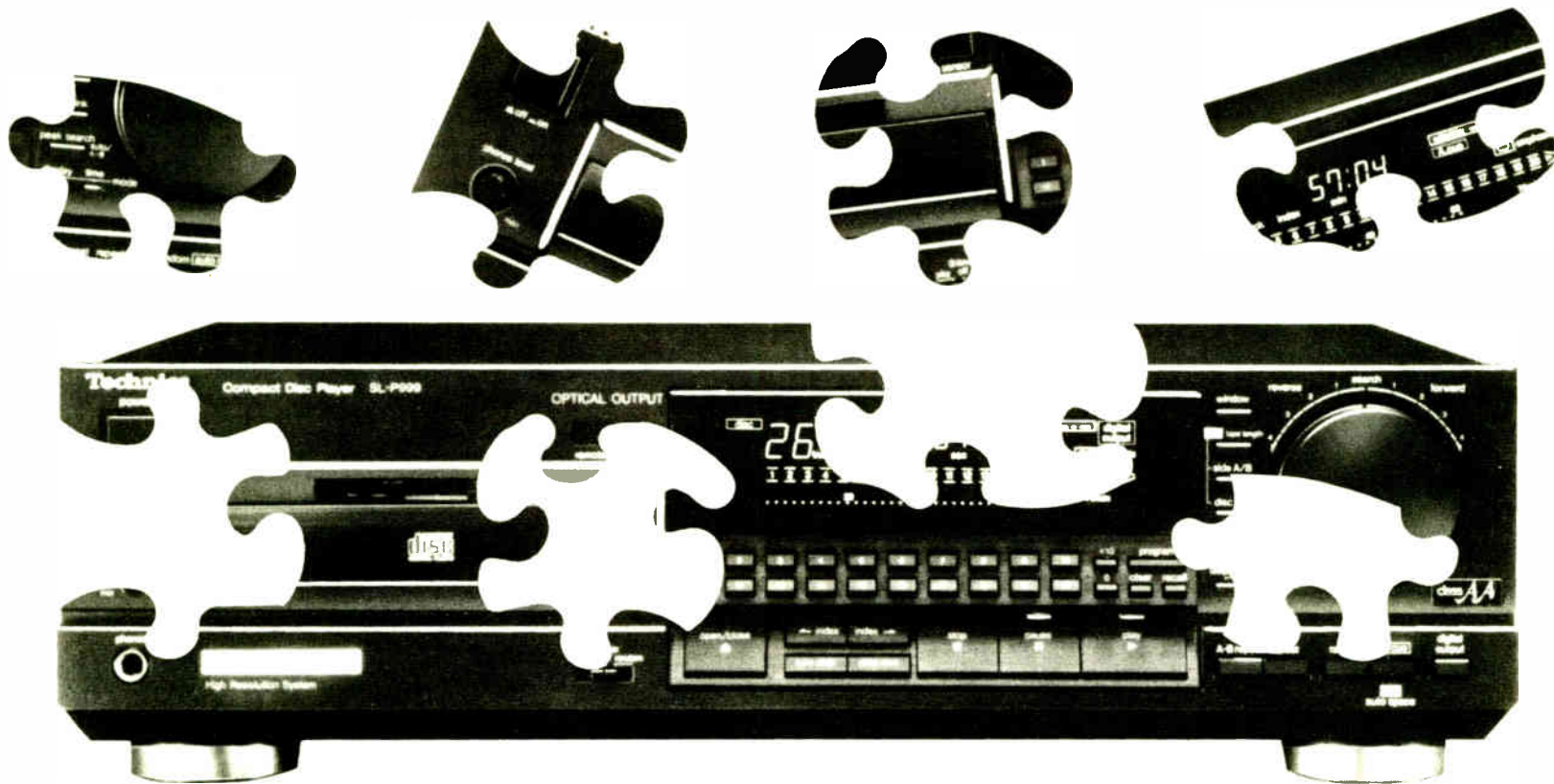
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Delving In-Depth into R-DAT

by Ty Ford

Baltimore MD Alright, I admit it!! Ever since the NAB convention in Lost Wages, I've been spending a lot of time dallying in the digital domain. After three or four years of tinkering with helical scan heads and U-matic-type tape transports, most of the major manufacturers have hit the market with their version of an R-DAT machine.

This is the first in a two-part series on R-DAT machines and technology. It was originally planned to be a single piece, but, as you may have already found, digital is not simply byte-sized analog.

The answer to the big question, "Why buy?" is not so easily answered, especially when you look at the price tag.

Once around the block

To date, thanks to Greg Lukens at Washington Professional Systems, I've test-driven the Tascam DA-50 (\$3999), Sony 2500 (down recently from \$2900 to \$2500) and Fostex D-20 (\$8000) R-DATs. I've also used the Victor R-DAT in conjunction with the AMS AudioFile for a "live to digital stereo" music session. The

PRODUCER'S FILE

lack of tape hiss and the increased dynamic range were simply striking.

On the down side, I've had problems with drop-out. Most of the testing was done on tape made by DIC. Unfortunately, I couldn't determine whether the drop-out was due to the tape or the various machines. I would have liked to test all of the machines again with other brands of tape, but there just wasn't enough time.

Another gripe I have is with the start-up lag of all the machines tested. Unlike a cart machine, which has a constant delay you can get used to, R-DAT transports combine a longer delay with the uncertainty of where the playback head will light on the tape.

Since you're likely to get audio anywhere within a revolution, consistent tight cueing is impossible. Starting a machine from the "Pause" mode reduces some of the lag time, but it is still disconcerting.

Finally, because most of these units are rack mounted, good remote controls are essential. The Tascam DA-50's remote pad, while of nice size and nicely laid out, was not very responsive. I had to either pound on the keys, or keep my finger on the button much longer than I wanted to. Several Tascam representatives said they had not had that experience. You be the judge.

The remotes for the Sony 2500 (one hard-wired, one wireless) looked like remote controls for TVs. They are a lot smaller than Tascam's. If you have an agile thumb, it works pretty well.

Deeper in DAT

Appreciating the lack of tape hiss and the increased dynamic range R-DAT provides eventually gave way to curiosity about standards and compatibility among the various machines.

Sample rates for R-DAT machines,

which currently seem settled at 32 kHz, 44.1 kHz and 48 kHz, are not the only variables. In addition, there are the various I/O formats: AES/EBU, SPDIF (from which EIAJ and optical are derived) and SDIF and JVC.

The first sixteen bits of each digital word are used for audio in all formats. The differences in the remaining bits of each sync word—which carries program number, error correction, copy prohibit and other proprietary codes—are what create compatibility problems.

That means while the audio you record on one machine will play back on

The lack of tape hiss and the increased dynamic range were simply striking.

another, the program numbers, error corrections, copy prohibit and other flags may not work.

While all manufacturers agree that standards would help (and such work is in progress), each feels compelled to nudge its way into the market. The two areas most in need of standardization are I/O ports and time code.

The current generation of machines has gotten around the I/O port question by offering multiple ports. The result is that the end user pays extra for the extra jacks and circuitry, so the manufacturer can cover at least several of the bases.

The Fostex D-20

The Fostex D-20 is the only stereo R-DAT machine on the market at this point that can lock to SMPTE time code. SMPTE time code itself is not laid on the tape; the lock is achieved by software that translates SMPTE into another form and records the translated information in the data stream on the R-DAT tape. The D-20 also records absolute time, something not all of the others do.

As of this date only the Fostex D-20 has input and output provisions for synchronizing sample rates of multiple machines. The Sony 2500 has a sync word output that allows it to be used as a master machine, but it doesn't have sync word input. It also doesn't record or playback SMPTE time code.

Without some sort of time base correction to synchronize the sample rate clocks in each machine, editing in the digital domain will not be possible.

The Fostex D-20 has several features, some of which are unique. It uses two record heads and two playback heads that allow it to perform seamless punching in and out. Its playback speed is ± 10 percent variable and has a "previous play" button to return you to the top of the cut you just started, all of which are very useful in real-life production applications.

Somewhat disconcerting was the fact that the correction and error lights stayed on when playing back material that had been recorded on other R-DAT machines. The lights were even more persistent after we added timecode to tracks previously recorded on the Sony. Fostex's Mark Cohen responded that the 1.21 software in the Fostex D-20 has been updated since then and that the prob-

lem has been corrected.

Also disconcerting was the lag in audio when starting up from a cued position. Several seconds of "manual offset" had to be figured in, and even then precise audio cueing was very tricky. Again Cohen's answer was that the newer software had corrected the problem.

Because the video-type tape transport is a lot more complicated than a standard reel-to-reel or cart machine transport, tight "on the fly" playback production is virtually impossible.

One of the most interesting aspects of the Fostex D-20 is the way it post-stripes

back decks called A, B and C. Cohen cautions that you need at least a 12" or larger screen because of the amount of data on the screen.

If SMPTE timecode based editing and/or digital editing are what you want, you'll have to pay the price for the Fostex D-20 or hope that the next generation of machines will have those features for less. My guess is they won't be that much less expensive.

Cohen, like many others, is waiting to see what standards may come out of the upcoming NHK meeting in Japan. If the consensus is for a standard other than that which Fostex now uses, Fostex is prepared to retrofit all of its machines. If no decision is made, Fostex will be one step closer to being the de facto standard.

Look for a serial port remote control for the D-20 showing at AES show this fall. In addition to remote control, it will place song IDs. Also look for an A/B roll edit system using two D-20s and a black box that will get you 999 song start IDs.

Varied rates and formats

In an attempt to cover all the bases, the Sony 2500 records at all three sample rates—32 kHz, 44.1 kHz and 48 kHz. The 2500 also supports the AES/EBU, SPDIF and SDIF I/O formats.

Although it reads 32 kHz with both
(continued on page 35)

FROM THE ALLIED TECHNICAL NOTEBOOK

HENRY PROUDLY ANNOUNCES THEIR NEW U.S.D.A.

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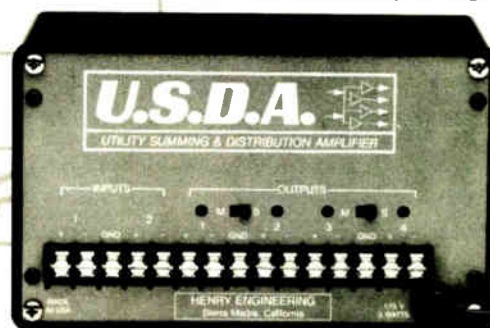
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FCC Plan May Help AM Coverage Area

Editor's note: Because of typographical errors in both the text and figures of Steve Crowley's 27 September column on AM coverage and received interference, the feature is here reprinted, with corrections, in its entirety. RW apologizes for any misapprehensions that may have arisen due to these errors.

by Steve Crowley

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

Many stations can't provide service to these new areas due to rules prohibiting overlap of their 0.5 mV/m contour with the 0.025 mV/m contour of another co-channel station. They would otherwise gladly accept some interference within areas of the newly expanded 0.5 mV/m contour, if it meant an overall improvement in service.

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

This is possible due to Section 73.37(b) of the FCC Rules. In essence, the rule states that interference may be received up to the 1 mV/m contour of those facili-

ties providing first service—either to a community or to a substantial portion of their service area.

This rule has worked well and has allowed the construction of facilities that are able to more efficiently serve the

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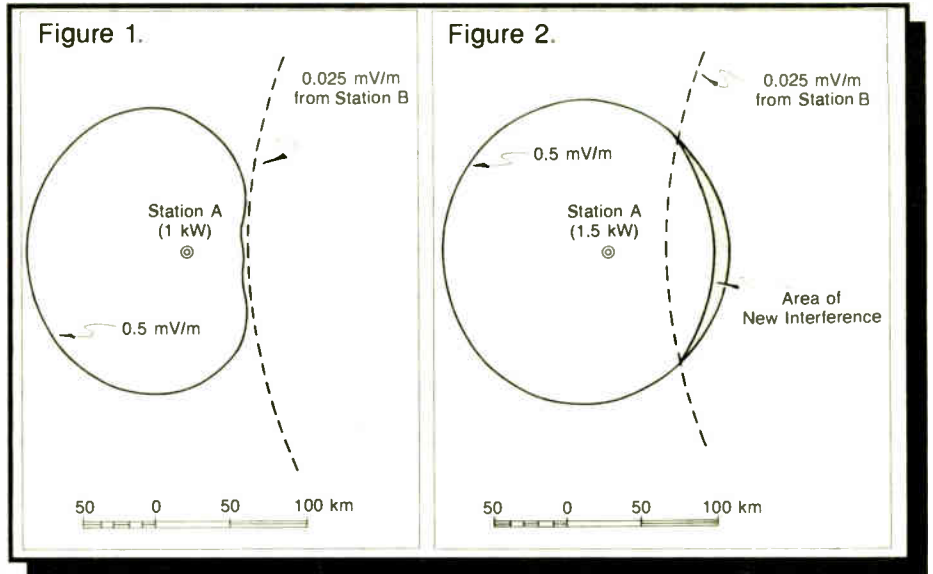
public. Many stations, of course, are not providing first service, and cannot take advantage of the rule's application.

Eliminating restrictions

This may be changed if the FCC adopts a rule proposed in Mass Media Docket 88-376. It would eliminate the restrictions of 73.37 (b) and allow any AM station to receive interference up to its 1 mV/m contour.

Anything involving interference sounds bad—in this case, it isn't. Though interference will be able to be received within the 0.5 mV/m contour, it will only occur in those areas not presently served by the station. No existing service will be lost.

Here's an example. In Figure 1, Station A is shown operating with 1 kW and a



suppressed pattern in order to avoid prohibited overlap of its 0.5 mV/m contour with the 0.025 mV/m contour of a co-channel Station B.

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

Not about negotiation

Note that the interference is in areas not presently served by the station. Though there is now interference within the 0.5 mV/m contour of the station, the service that is subject to interference will still be better than it was before.


The proposed rule is not about

negotiated interference. No agreements can be made to infringe on existing service areas. Full protection must be maintained to other facilities.

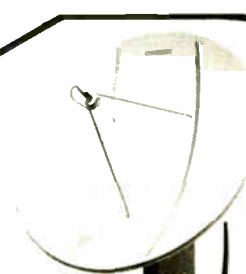
Some stations will not be able to take advantage of the new rule. This will be the case where the limiting factor is interference-caused instead of interference-received.

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

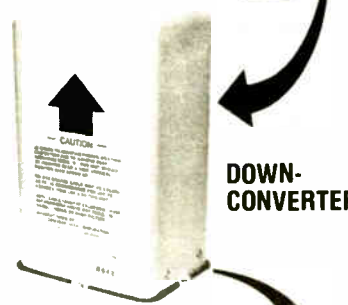
Steve Crowley is a registered professional engineer with the consulting firm of du Treil, Lundin & Rackley, Inc. He can be reached at 202-223-6700.



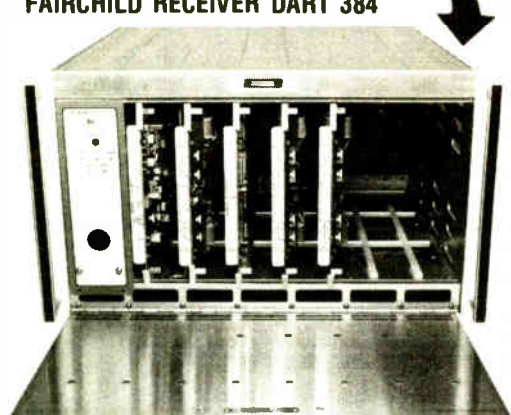
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California FM Automates in Full Digital

(continued from page 25)

each other through a common EOM command, full automation of CD and DAT players was no longer merely within reach—it was pioneered.

KBEE's pioneer automation system originates, and terminates, at the IGM/EC brain. As the overall manager and central program switcher, EC interfaces with the outside world through its input user menus and an output summing amplifier.

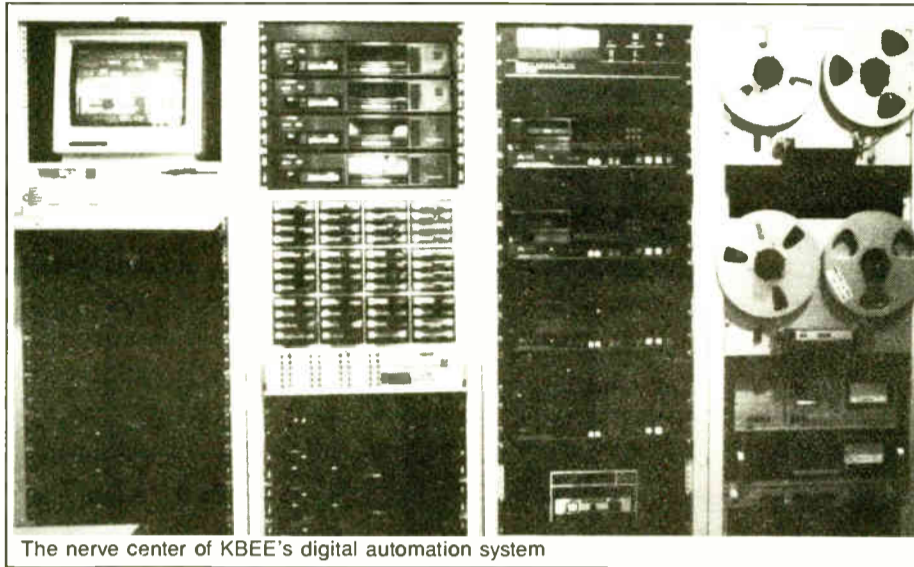
In addition to system management and cueing up commercials and music to go out over the air, EC manages full commercial and buffer source coming in from the four RS 1000s. Because of EC's ability to handle EOM commands between events, said Stanley, "we felt more secure letting the Pristine handle the music and letting the IGM handle the overall operation of the station and the commercial load."

Programming programming?

Pristine's playback module begins the quarter hour music segment with a hand-off EOM command from EC. Referencing its playlist log of compact disc location, track location and the duration of each song, the Pristine Music Management Control System counts down each event—or song—in the quarter hour segment.

When the quarter hour music segment completes its time cycle, Pristine trips control over to the IGM/EC and goes into

an auto pause. "Actually," said Pristine President Boyce Williams, "we got even fancier than that. When we trip the IGM off, we not only go into auto pause, but we go to the top of the next quarter hour segment."



The nerve center of KBEE's digital automation system

While Pristine is "parked" at the first song in the next quarter hour segment, an IGM automation sub-controller begins the commercial and/or buffer and liner break. The end of the break is denoted with an EOM command that signals Pristine's computer for another music segment.

Occasionally station automation is in-

errupted for live operator assist. "We can run the automation directly with processing, or bypass the studio (board), or we can move the automation system through the console," said Low. He explained that a SGC 800/8100A process-

to process."

Importing new commercials from the production room to the control room is also a semi-automated process. During the production day, new commercials are generated on a master RS 1000 recorder. To update the on-air RS 1000s, an evening operator transfers the recordings over a digital buss. "All he does," said Low, "is load the tapes up, push the buttons and walk away for two hours."

Walking away from the system for two, or quite feasibly 24, hours at a time was not the only milestone that KBEE had accomplished. By automating first-generation recordings in digital format, the station was able to make a giant leap forward in audio quality. "It really sounds clean," boasted Stanley. "There's nothing to degrade the audio."

For the most part, in its first month of operation, KBEE's hybrid automation system is showing no communication problems. The four DAT machines and 21 CD players appear to be carrying on a friendly dialogue with the hardware and software of the PCs.

The only communications quandary remaining, commented Pristine's Williams, is our own definition of programming. "Is that music programming, or computer programming?" he quipped.

■ ■ ■

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

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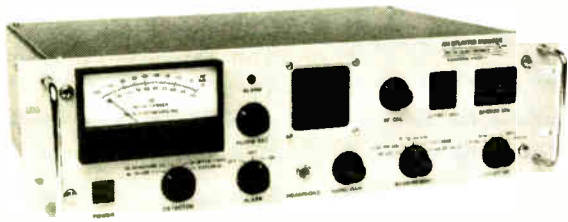
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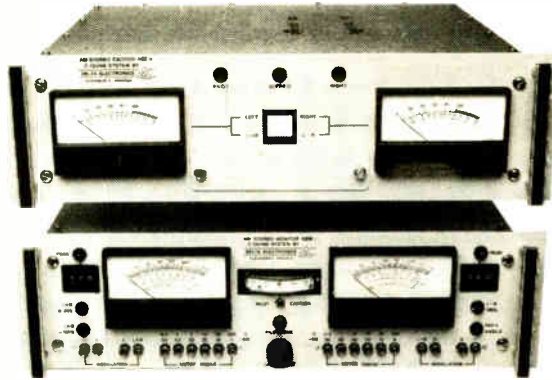
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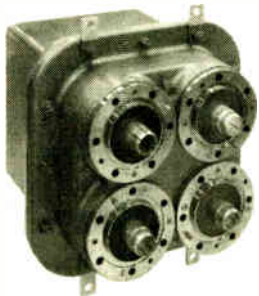
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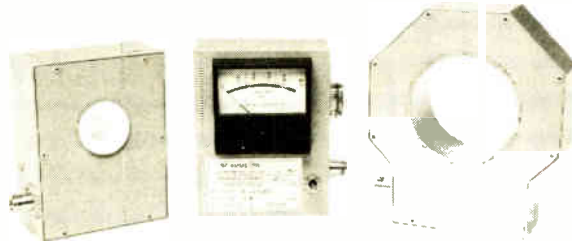
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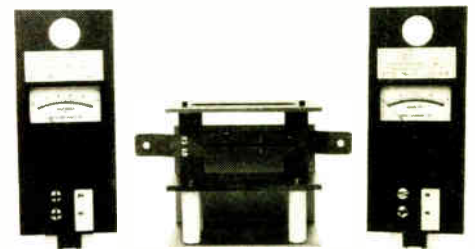
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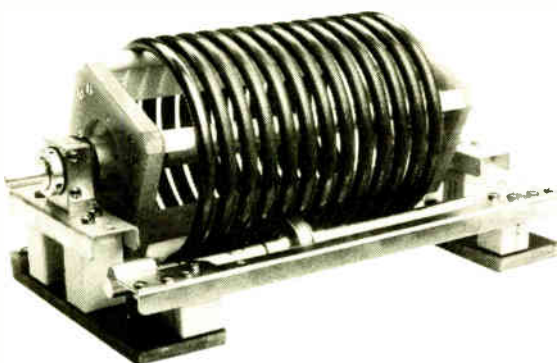
Coaxial Transfer Switches—These 1 5/8" and 3 1/8" motorized four port switches are designed to switch between antennas, transmitters, or dummy loads both quickly and efficiently. The switches can also be operated manually and are fully interlocked.



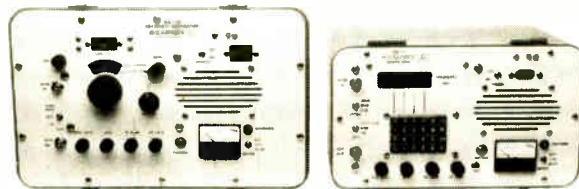
RF Ammeters and Sampling Toroids—Precision toroidal current transformers (TCTs) provide stable antenna monitor sampling while eliminating the problems associated with loops. TCTs also work well in supplying additional modulation monitor or test sample RF outputs. The transformer coupled ammeter (TCA)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



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



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Circle 51 On Reader Service Card

Unlocking the Secrets of Communication

(continued from page 26)

different things to different people, asking questions, verifying data, taking notes and giving feedback or indication of understanding.

Message senders were told that if they have to repeat themselves, to consider changing the words, as something is not being understood.

Fear was mentioned as a communication killer. Fear of error or fear of others

cuts off communication and kills the effectiveness of any organization.

Allowing time pressures to drive us to take short cuts in communication is also a problem, she pointed out. Pausing just for a moment will often be the key to success.

Perkinson also raised the question of "what closes ears and stops communication?"

Interrupting someone in the middle of their work, being overly complex, failing to come to the point, waiting until the last minute of the day, overly slow speech and excessive repetition were all mentioned.

On the positive side, the sender who tries to make the information important to the receiver, structuring the message

clearly, will likely get through.

A point of interest for engineers who are asked to justify requests for budget money was Perkinson's assertion that we "should avoid heavy documentation of reasons."

Get to the point

In order to produce good, communicative reports, Perkinson recommends "get to the point."

She cited four steps that contribute to successful reports. First, the findings, stated as basic facts in simple language. Second, the conclusion—what do you want to do?

Next, recommendations, followed by an appendix with the backup material, and then documentation of support data.

Similarly, in oral presentations, Perkinson said, as we've often heard, "Tell 'em what you'll tell 'em, tell 'em, and tell 'em what you told 'em."

For best results, covering memos should not be distributed until after the oral presentation, so as to prevent distraction from the presentation itself.

In all, this session pointed out that an engineer's lot can be greatly improved by paying nearly as much attention to the non-technical art of communication, as to nuts and bolts engineering concerns.

■ ■ ■

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

Home Brew Mix-Minus

(continued from page 29)

earlier column.

Stereo is not needed, of course. If for some reason the summing amplifier chip packs it in, ground the summing point while waiting for a replacement. Otherwise program stereo is compromised by quite a bit.

Possible problem area

One problem you may encounter is if the console you are using places the key switch after the series resistor instead of before it. You can either rewire the keys, or find a key switch with an extra contact on it.

By the way, the mix-minus buss can be added to either the program or audition side of the console, or both. I modified an LPB Citation with both and a switch to feed the hybrid from either output. As long as the jock remembered to flip the switch, the system worked fine.

Incidentally, there is no reason why an existing unused summing and line amplifier could not be used for the same thing. I have done this with an old Sparta with discrete transistors by using a spare amp card. An extra cue card could have been used as well.

Even if you buy all parts new, the mix-minus circuit should cost less than ten bucks, if you have ±12-15 V available. As the circuit causes a small amount of loading, you may want to tweak the program output levels back to normal.

■ ■ ■

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

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A Close Inspection of DAT Technology

(continued from page 31)

AES/EBU and SPDIF, it won't read 32 kHz in the SDIF format and won't record in SPDIF at 44.1 kHz. Sony has shown a SMPTE capable R-DAT in Japan.

The Sony 2500 automatically or manually records program ID numbers and the start markers can be changed after audio has been recorded.

Art Gonzales, product manager of DAT and microphones for Sony, advised me that a new portable R-DAT machine is available. The Sony TCD-D10 Pro, modeled after consumer version TCD-D10, offers the same sample rates as the 2500.

Improvements include a new CPU for tape tension and drum speed (a safeguard to keep it from eating your tape), dew and humidity indicators, battery display, balanced mic and line inputs, a backlit LCD display, a head hour meter and a monitor speaker.

Sony also came up with a multipin mini plug to allow for several different I/O formats. Batteries provide 1.5 hour

operation. The list price for the Sony TCD-D10 Pro is \$2900. Call Sony at 201-833-5200 for more information.

Predicting the future

You'll probably see R-DATs in commercial studios and video production facilities before you see them in most radio stations. The Fostex D-20, at \$8000, is thousands of dollars cheaper than the analog Sony 3/4" U-matic record/play video deck that normally serves as a synchronizable audio machine during audio playback in post production.

Commercial studios that need to remain "cutting edge" will also find room in their budgets. R-DAT will be a simple necessity for facilities that have already spent from \$85K to over \$200K on "tapeless" digital studio systems.

As long as radio commercial dubs are on 1/4" analog tape at 7 1/2 ips, and as long as analog cart machines reign supreme in production and air studios, any "digital benefit" from adding DAT will be mitigated.

We'll continue looking at DAT next time.

■ ■ ■

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

Using NLP


(continued from page 22)

In a nutshell, modeling says, "If you want the same results as another person, do the exact same things they do, with the exact same beliefs, internal communications and physiology, and you are guaranteed to get the same results."

If you decide to put these concepts to work for yourself, you will be deciding to be more successful. And like I said, "Success is a decision."

■ ■ ■

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



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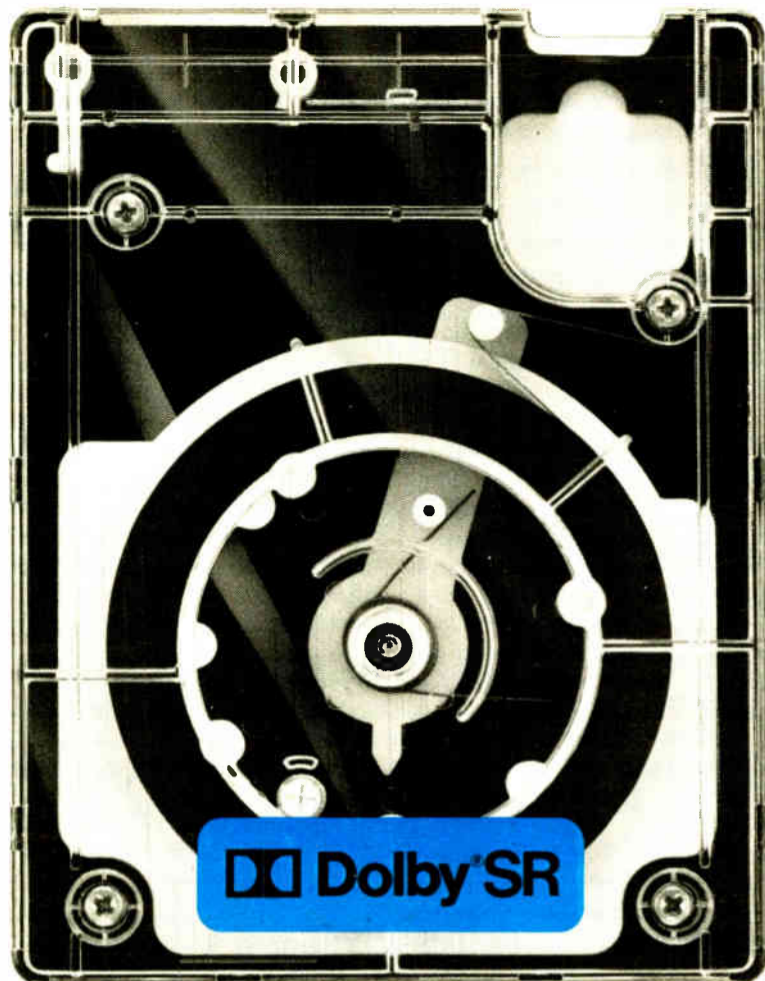
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There's no doubt that compact discs and other digital audio sources have helped to raise broadcast audio quality to new heights. And to some degree, almost all broadcasters have embraced this new technology.

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cials, spots, and jingles, carts are still tough to beat for convenience, ruggedness, and familiarity.

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BUYERS GUIDE

STL, Remote & Telco Equipment

QEI Gives WVLT the Edge

Model 400 Digital STL Lets Class A Compete With FM's Big Boys

by Joe Corcoran, Prog Dir WVLT-FM

Vineland NJ When you are in a competitive market that has megabucks Class B FM stations breathing down your neck, your own Class A had better have everything going for it. The time had come for WVLT to take its place as a leading contender in its quest for its share of the South Jersey radio market.

We dropped our satellite music service and opted to bring the hits home with crystal clear compact disc music and an aggressive on-air approach.

We upgraded our studio equipment and were impressed with how good the studio sounded. But sounding like everyone else just was not good enough—we needed an edge over the bigger stations. We read about the new QEI Model 400 CAT/Link digital T-1 STL and felt that it might be just the equipment we needed.

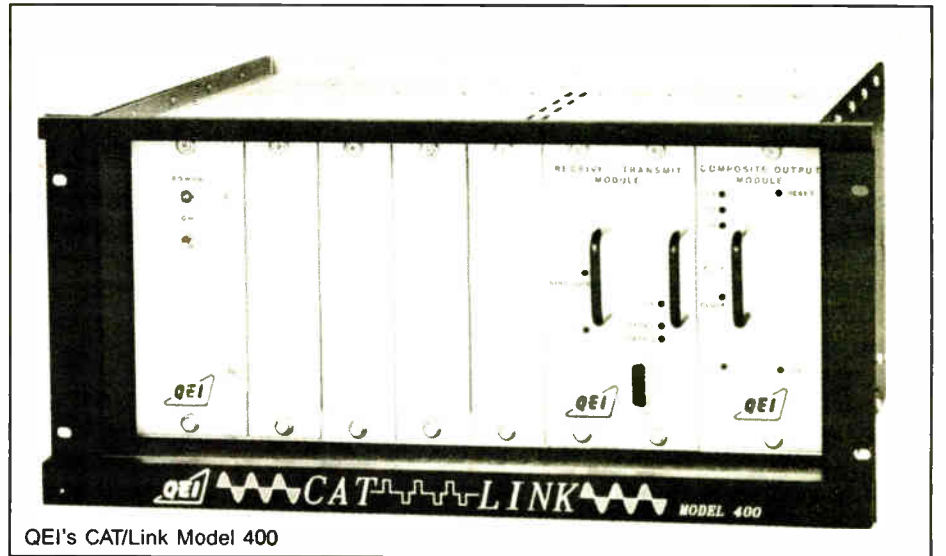
After a call to QEI, we were well on the way to having the first composite digital STL in the country. Within a few

hours the 1.544 million bps T-1 telco lines were on order and, to our surprise, they actually cost less than our 15 kHz lines while offering a great deal more signal capacity and audio performance (thanks to CAT/Link's digital encoding/decoding technology).

Installing the T-1

The installation of the T-1 line went right on schedule. As a test, we placed a call to New Jersey Bell's 800 trouble number to inquire about the status of the line. We were encouraged to receive a response on system status within minutes, rather than the normal hours involved in finding problems with analog lines.

QEI president Charles Haubrich and his digital design team showed up to put the system on the air. Within a few



QEI's CAT/Link Model 400

USER REPORT

minutes of installation, we were filling the airwaves with our new all-digital sound. The highs were so much cleaner, the bass had more punch and the station sounded louder than anyone on the dial!

Immediately, we were getting calls from our listeners saying how great the station sounded. The separation and phase problems associated with the old 15 kHz telephone lines had vanished, thanks to CAT/Link.

In addition, CAT/Link's improvements in bandwidth and dynamic range allowed us to set our audio processing exactly the way we wanted it, without limitations imposed by the system we were using to send our audio to the transmitter.

System allows expansion

The CAT/Link digital STL is a modular card frame system. This allows us to expand our communications link to include additional auxiliary channels of analog audio or data. We can send our SCA and AM audio, plus remote control signals, to the transmitter along with the composite signal.

Because the T-1 phone line is a bi-directional line, the system has the ability to bring as many as four audio or data channels from the transmitter site to our studio.

This feature will be great for backhauling our RPU channels from the receiver at the transmitter site. It will also work great if you have a satellite dish located

Editor's note: Joe Corcoran hosts WVLT's "Corcoran in the Morning" show and produces a weekly network radio show in Atlantic City.

For more information on CAT/Link, contact Jeff Detweiler at QEI: 609-728-2020, or circle Reader Service 20.

at the transmitter site and need to bring your network or music back to the studio.

If you are looking for a lower cost, higher quality alternative to the 950 MHz STL, the CAT/Link is a real performer. It has given WVLT's on-air sound the same digital quality that we get in the

studio, without any of the AFC overshoot that wastes valuable modulation.

The CAT/Link has been totally reliable and has had no problems working in the electrical field of our AM sister station. Despite a regional phone company strike, we had no problem at all with the T-1 line.

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Broadcasters Seek Phone Alternatives

by Richard Farrell

Falls Church VA Since phone company deregulation and the proliferation of "baby Bells" (BOCs) broadcasters have watched the phone services they were previously offered gradually dissipate.

Elimination of the 15 kHz equalization service, phone lines in general being less available and a lack of communication between broadcasters and phone company personnel (the two, it seems, are no longer able to speak the same language) contribute to the current state.

Broadcasters have since sought alternative modes of operation—microwave, STL and cellular phones to name a few. The question of whether changes in phone service have in any way driven changes in the equipment made available to broadcasters was put to several STL, remote and telco manufacturers.

Manufacturer reaction

"There has been a noticeable upgrading of the equipment that people are using for STL, RPU and phone use," concedes Bradley Broadcast Sales Manager Neil Glassman. "But whether that is driven by the way the phone company operates is hard to say."

"I think people are looking for new al-

ternatives," says Glassman. "There have been advances in equipment to bypass telephones. We did see a bit of a move away from land-line STL links to microwave links back at deregulation. However, with the next round of technology being offered by the various baby Bells for improved terrestrial services, it all may very well swing back the other way," he adds.

"Definitely so," is how Potomac Instruments' Vice President of Marketing Dave Harry answers the question. "We find that people using telephone lines are very much at the mercy of the local phone company," he says.

"It used to be that when you asked a phone company for a Bell 2003 phone line, for example, everybody knew what you were talking about. The local phone companies now have their own standards and may or may not recognize the old Bell tariffs and may or may not admit to those tariffs.

"And the burden of proof for a defective phone line," says Harry, "is now with the broadcaster."

Gary Crowder, Gentner's director of marketing and sales, broadcast division, agrees with Harry. "We used to be able to call up a telephone company and say, 'hey, this line is bad.' Now we have to

prove that it is bad," Crowder says.

"Certainly, it is one of the reasons we offer so many options—subcarriers, STLs and so forth" says Peter Burk, president of Burk Technology (formerly Advanced Microsystems). "The phone link was never really the preferred choice," he says, "but when it was cost effective, it was therefore the most logical way to do things."

Hallikainen & Friends President Harold Hallikainen suggests reasons for the current situation. "It is an awful lot

INDUSTRY ROUNDUP

of trouble for a telephone company to do all of the manual patching for something that you are only going to use for three hours," he says.

"The phone company," notes Hallikainen, "has this wonderful switching system where all of the patching is done from your end. But unfortunately it is only voice grade."

"For remote broadcast," says Hallikainen, "people are going to remote pickups, inter-city relays and dial-up lines. Dial-ups are great. And if you put a bandwidth expander on there you are able to get reasonable quality through."

What the future may hold

In all of these areas, some manufacturers feel that digital signal processing technology will offer new strides in the future.

"Digital signal processing is going to

provide us with a wealth of new products in a lot of areas. A large number of manufacturers are developing these products and we have only seen the tip of the iceberg," says Glassman.

And Crowder says that "digital signal processing and advanced technology have allowed us to go into the area of multi-line frequency extenders and automatically compensate for line equalization, group time delay and automatic line level adjustment."

"I think major changes are going to occur in the STL technology," offers Dave Harry. "It is going to be limitless. It can be network or a fiber optic link, a microwave link or maybe even a rented subcarrier on a cable broadcaster. We will see a use of all areas of communication between studio and transmitter."

Remote station monitoring

One new wrinkle in the cloth of remote applications has been the recent advent of a station monitoring service done via satellite that is now being offered by a company called Standard Broadcast Services. The service is called the National Supervisory Network (NSN).

In brief, the network offers to monitor a station during its off-hours. It promises to monitor, sample, control and record conditions of automation systems, transmitters and EBS systems via satellite.

Requiring only some sort of remote capability hardware at the station to which the NSN system could interface, the network has not been opposed by the FCC. Its chief appeal is that it helps

(continued on page 53)

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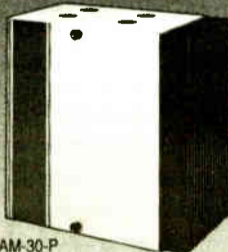
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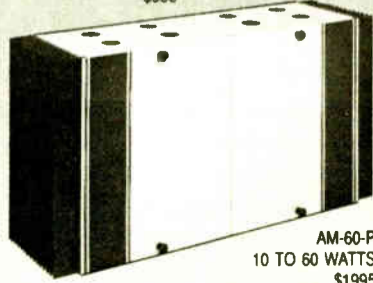
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World Radio History

Circle 8 On Reader Service Card

KING Selects Gentner Hybrid

by Paul Vandegrift, CE
KING-AM/FM

Seattle WA Radio means telephones. At KING we faced the challenge of supporting a format that evolved from all-news to all-talk, with 90% of programming on the phone.

The solution was to introduce a phone system that could change with the station's needs and would be easy for everyone to use and understand. Gentner's Telemix X fit the bill.

KING-AM introduced the 24-hour talk format about a year ago, causing demand on the phones to increase dramatically. Frequently, the system had to support two phone guests—pro and con on a particular issue—while listener interaction took place on a third line.

Used Telemix IXs

The station had been using a Gentner Telemix IX phone system with two internal hybrids that reliably achieved a null at 18 dB.

The Telemix IX hybrids worked reasonably well, with some limitations. Send audio—the mix-minus to the

with the increased null and cleaner caller audio. The callers were also happier, for we were able to send more mix-minus studio audio down the line.

The auto-nulling feature made life a lot easier. With auto-nulling, the hybrid first terminates and mutes the line, sends down a burst of white noise, nulls and

The hybrid can also be put into a port conference mode that operates at half duplex, like a speaker phone used in teleconferencing, to eliminate room acoustics and caller echo being sent down the line.

The front panel has two LEDs—labelled "send" and "caller"—that light

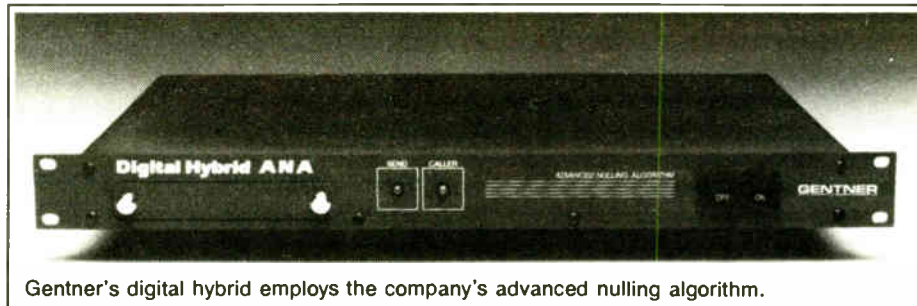
Also on the rear panel is a disconnecter containing all of the audio ins and outs, remote control and tally for most of the control functions.

Allows conferencing

The system phone lines are arranged with listener call-in lines routed to one hybrid and guest interview lines routed to the other. Hybrid outputs go to separate channels on the console for better mixing control.

By arranging the lines this way guests and listeners have full conferencing. This

(continued on page 53)



Gentner's digital hybrid employs the company's advanced nulling algorithm.

then un-mutes 300 ms later—all of which is microprocessor controlled.

The sophisticated digital processing of both send and receive signals yields low hybrid leakage, preventing studio microphone discoloration.

Panel functions

Front panel features include send and receive level adjustments and a 0-20 dB caller control (ducking) adjustment, which can be completely disabled via a dip switch (also on the front panel).

Other front panel option switches include auto answer enable and auto disconnect. A re-nulling and mute enable mutes the line and goes through the nulling process every time the loop current is dropped and reappears, as would be the case with a standard multiline set or Telemix IX used as the call director.

A momentary or sustained On/Off control switch is also available, depending on your call director's remote control configuration.

Send and receive audio processors are also optional, allowing maintenance of consistent send and receive levels.

when audio is present at either processor. These are useful for setting up uniform levels on more than one hybrid and for detecting the presence of too much "send" audio returning to the "caller" processor as a result of leakage.

The rear panel has modular jacks for single line, single set usage. There is also a mic/line selectable Main Send input, with gain controlled by the pot on the front panel and an Aux fixed line level input.

Useful inputs

Two send inputs are particularly useful when sending from two sources. The Aux Send can be used for sending mix-minus console audio while the Main Send is being used for the caller outputs of conferenced hybrids.

A Caller Out jack is available, which is front panel level-adjustable, as well as a Mix output that contains the Main Send and caller audio. This is useful when connecting two hybrids, conferencing and mixing the caller outputs together and sending only one mix-minus feed to the set of hybrids.

USER REPORT

caller—had to be kept low to lessen leakage. The null needed to be routinely adjusted (about once a month or so) to control drift.

Our decision to upgrade came in early 1988 when Gentner introduced its Digital Hybrid. The unit had attractive features such as 24 dB of auto nulling and digital signal processing. Two digital hybrids were purchased to replace the internal Telemix IX hybrids.

These interfaced easily with the Telemix IX call director and we were pleased

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Comrex Gear Key to KPRC Remote Shows

by Jon Bennett, CE
KPRC-AM

Houston TX When our engineering department was asked if we could broadcast from various locations in London, the search was underway to find the most cost effective and economic means, consistent with good broadcast quality. The first thing everyone thought of was satellite. Right.

USER REPORT

We would require a 7.5 kHz audio channel from a London uplink facility and equalized telecomm loops to each point of broadcast. The cost estimates began to resemble the national debt. There had to be a better way.

Comrex came through in its traditional manner of excellence. Lynn Distler of the company described the new STLX four-channel console package.

It uses the Dual Line Comrex encoding system with a third line return for the IFB communication. The matrix headphone selector provides for up to four headsets, with individual headphone level control. It also provides selectable IFB for the talent and local audio for the guest, or whatever the local situation calls for.

The console has four mic level input channels, two that are selectable line/mic level. The system also provides auxiliary In and Out audio for feeding a local PA system. It was just what we needed: compact—220 V/117 VAC—and even offering a battery pack option if needed.

That covered the remote end of the operation. Now for the studio.

We used three TCB2A couplers. With the STLX console and the RTLX decoder, we chose the LX-L auto leveling option, which made the system auto answering and auto leveling at the studio.

The challenge was met. The system was cost effective, of good quality, equivalent to a 7 kHz loop, compact and easy enough to operate. It was completely automatic on the station end.

Comrex made prompt delivery on the equipment. Setup and checkout was completed in a matter of hours.

Before taking off to the other side of the world, we decided to do a few local broadcasts. The results were exceptional

and the talent was pleased. Management was happy with the performance, and the cost.

We were off to London, England for 13 days! Three-hour broadcasts were scheduled for five different locations.

Upon arrival, I was met by a representative of British Telecomm, the telephone company of England. In no time, I was interfaced with three IFB circuits complete with dial tone. The telephone modular cables had been sent over in advance by British Telecomm. This enabled me to have our interface adapters ready for quick connection.

As you might expect, in a foreign country, the primary power was—oops!—220 VAC. Not to worry, a simple switch selection had my Comrex STLX on-line with the 220 VAC mains.

I was concerned about having the program producer set the balance of the two receive lines. The Dual Line Auto Leveling system by Comrex was so reliable that help was not required.

So with a list of broadcast locations in one hand, and a map in the other, the caravan was on the road.

The audio requirements were easily met with the four channels the STLX console provides. Using Electro-Voice RE11 microphones and Beyer headsets, setup was quick and without a hitch. Using the selectable line/mic level inputs on channels three and four, we were able to feed audio from the BBC and record interviews made earlier in the day. Management loved it.

In fact, with the exceptional success of the London broadcast, the promotion department announced a broadcast cruise through the inner passage of Alaska. Three of the five broadcast days would be at sea.

We had a little help from above on this project. Since the Comrex STLX has balanced 600 ohm line out audio, I simply used the console as an audio mixer and fed the satellite uplink equipment. With the headphone system so efficiently arranged, the IFB from the studio was a snap. Except for the delay on the return audio, which made a mix-minus return mandatory.

This summer, my assistant engineer, David Ainslie, experienced the flawless operation of the STLX system abroad. He enjoyed the rough duty of broadcasting for five days from Switzerland!

The quality of the broadcast was as-

(continued on page 47)

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WEBE-FM Praises MixMinus Plus

by **Chriss Scherer, CE**
WEBE-FM

Westport CT What kind of solution have you come up with for providing a mix-minus?

There are several ideas on how to go about providing a feed for that telephone hybrid or that cue return, but without going through the hassle of creating a second mix buss. The simplest way is to take the total program feed and then subtract the source that is not wanted.

If this is how you want to do it, you need to take a few op-amps and other small parts and put them all together to give you a unity gain output with at least 25 dB of null. You then need to house the entire science project in a neat fashion that is easy to use.

But before you sit down at the design table with a perf board and soldering iron, wait! Henry Engineering has a solution: the MixMinus Plus.

Another good idea

Henry Engineering has again brought another good idea to the market. The company that seems to thrive on making what used to be projects fabricated for that special need has taken the time to design and package the device that may solve your problem. The MixMinus Plus is the perfect interface for the con-

sole and phone hybrid to provide a convenient mix-minus.

Here at WEBE, we are using Autogram IC-10 consoles and Studer telephone hybrids. The problem is that the Studer hybrid requires an externally provided mix-minus and the Autogram console has no provision for a mix-minus.

The engineer that wired the studio originally fed the hybrid with a feed from the host's mic preamp.

USER REPORT

This is an easy solution, but a problem arises if there are ever guests that need to be heard by the caller. It sounds very unprofessional for the host to have to constantly repeat every answer given to the caller. The MixMinus Plus solved this problem in a very short time, with a minimum amount of effort from me.

The unit is housed in the usual Henry Engineering bakelite box and has a terminal strip for connections of the post fader caller, the program signal and the output for the hybrid feed. There is a recessed trim-pot for the null adjust and a power cord.

Included with the unit is an instruction sheet that explains the function and

installation, and also includes a schematic, a parts list and a component layout diagram. The actual parts used in MixMinus are few—32 are listed.

The function of the device is not that involved. The most important factor is that Henry is saving you the time of the design and construction. The actual process is performed by a differential amplifier. It is adding the inverted caller signal to the program signal.

Quick connection

It took me about five minutes to perform all the connections except the post fader caller output from the console, which took a few extra minutes because of the location of the pots in Autogram consoles.

As I mentioned earlier, only three connections are required for operation: a mono program feed (which most consoles have, or which can be added if necessary), the post fader caller feed and the mix-minus output to feed the hybrid.

The caller signal must be post fader, so that the nulling action is accomplished by bringing the caller up to the proper level. The caller feed must also be unbalanced. This is not a problem for most consoles.

The current MixMinus Plus also has a few improvements over the original version as well. The most noticeable is the wider input range for the caller signal.

The original had only a -10 dBm to -35 dBm range. Now the input range extends from -10 dBm down to -50 dBm; this divided into a -10 dBm to -35 dBm and a -25 dBm to -50 dBm input.

There is one screw terminal for either input and the unused input is grounded. I think this range can easily be handled by any console. The other improvement is the better nulling over the entire frequency band.

The Henry Engineering MixMinus Plus is a set-once-and-forget device. Typically a null of up to 35 dB or more can be expected, depending mainly on the phase shift introduced by the console.

A minimum null of 25 dB should easily be accomplished and the information sheet goes on to say that if any problems arise to call and the company will help.

When I called it was nice to be able to get the right answers right away, without having to be transferred to a service department. Henry Engineering's left hand knows what its right hand is doing.

Audio specs impress

It is important to note that the MixMinus Plus is not an actual hybrid, but a hybrid interface. It shows excellent specifications on the test bench as well. Even though a telephone line will only

(continued on page 54)

PUT YOUR PC ON LINE WITH THE NEW PC ACCESSIBLE MRC 1620 REMOTE CONTROL SYSTEM

As a broadcast engineer, you want to utilize the newest PC technology that will work intelligently and make your job as easy as possible. The Moseley MRC 1620 is the first intelligent, PC-accessible, integrated package that will do just that. This cost-effective system consists of a stand alone Remote Terminal that allows an optional Control Terminal or IBM PC with TaskMaster20 software to monitor and control remote facilities from dedicated and/or dial-up control points.

The MRC 1620

- Operates as a stand alone dial-up Remote Terminal or with standard studio Control Terminal.
- Dual communication ports at Control and Remote Terminal allow direct and dial-up access at either terminal.
- Comes standard with 32 relay isolated commands, 16 telemetry and 16 status channels with filtered terminal blocks.
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01 Plate Voltage	6.2	Watts	01 Transmitter	OK
02 Plate Current	7.25	Amperes	02 Filament	OK
03 Modulator Power	2.17	Watts	03 Power	OK
04 Drive Power	188.8	Watts	04 Transducer	OK
05 Reflected Power	15.8	Watts	05 Filament	OK
06 Filament	141	Watts	06 Power	OK
07 Plate Voltage	6.3	Watts	07 Transducer	OK
08 Plate Current	6.5	Amperes	08 Filament	OK
09 Plate Current	2.34	Amperes	09 Power	OK
10 Power Out	99.9	Watts	10 Transducer	OK
11 Reflected Power	51.8	Watts	11 Filament	OK
12 Inhibit Temp	20.5	Celsius	12 Power	OK
13 Exhaust Temp	43.5	Celsius	13 Transducer	OK
14 PC Power	219	Watts	14 Filament	OK
15 AC Power	387	Watts	15 Power	OK
16 AC Power	286	Watts	16 Transducer	OK

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Versatility Draws KAZY To Gentner's EFT-3000

by Ron Stephens, CE
KLZ-AM/KAZY-FM

Denver CO Every once in a while a piece of equipment comes along that really makes me happy. So it is with the Gentner EFT-3000 Frequency Extender, a three telephone line

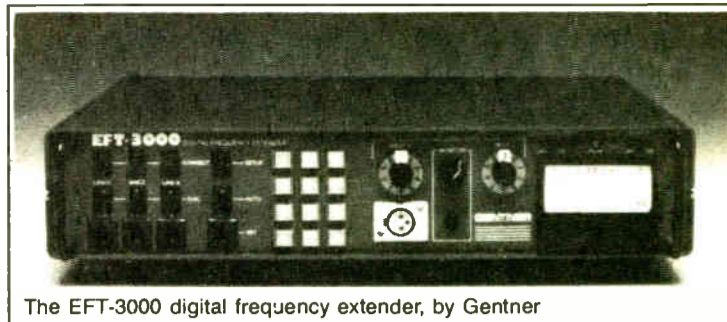
frequency extender consisting of two identical units.

Employing three standard dial-up phone lines, the unit provides a frequency response of 50 Hz to 7.5 kHz; employing two lines offers 50 Hz to 5 kHz; one line, 50 Hz to 2.5 kHz. This method of using from one to

three lines makes the unit very versatile and a joy to use for remote broadcasts.

Operation easy

Operation is straightforward. By simply following the instructions on the included quick reference sheet, anyone can set



The EFT-3000 digital frequency extender, by Gentner

up the unit in a few minutes. In our case the studio (receive) unit is left connected to three designated phone lines, and the AUTO LED is on.

In the receive mode the

AUTO LED flashes rapidly, in the transmit mode it glows steadily. The receive unit can be changed to transmit by following the instructions and using the built-in touch tone pad.

The transmit unit has the three designated phone num-

USER REPORT

bers programmed into its auto dialer memory. Upon arrival at the remote location, the unit is connected to the pre-installed phone lines and the memory dialer procedure is activated. The receive unit will automatically answer the lines.

Setup procedure

Once the unit has answered the lines the setup procedure is started. This procedure automatically equalizes each line, adjusts for differential line de-

The EFT-3000 is a high quality, well designed and useful piece of equipment.

lay and matches the levels between lines. This setup takes approximately 10 seconds.

The EFT-3000 has two inputs that can either be line or mic level, eliminating the need for an external mixer in most cases. Cue audio can be sent over the receive unit to the transmit unit by connecting the audio source to one of the input channels or the receive unit.

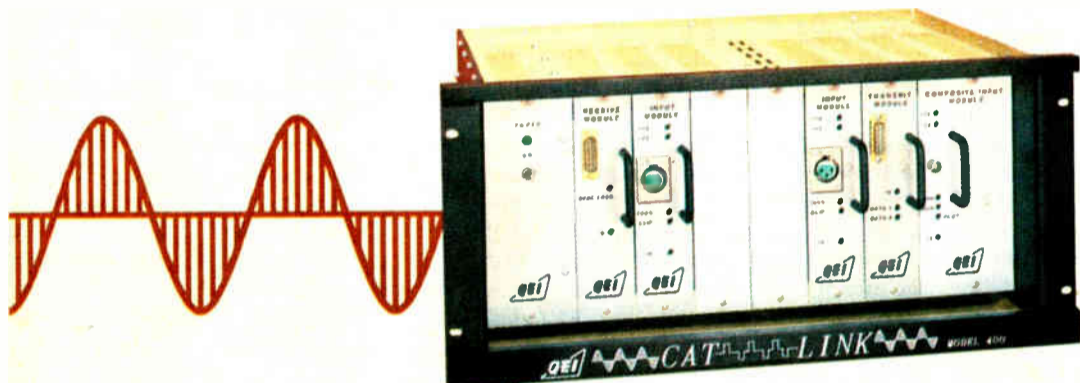
In our case we normally send mix-minus programming, except when the studio engineer wants to talk to the remote talent.

The EFT-3000 is a high quality, well designed and useful piece of equipment. The audio quality of this unit is excellent, and we have found that in most cases two lines are enough for broadcasting. The three lines enhance the audio for talent.

Also, the newest version of firmware allows you to adjust the band level of each of the three bands using the touch tone pad of the receive unit.

Editor's note: Ron Stephens may be reached at 303-759-5600.

For more information on the Gentner EFT-3000, contact Walt Lowery at 801-975-7200, or circle Reader Service 37.



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Circle 64 On Reader Service Card

AP on Assignment With the SmartAMP

by Paul S. Courson,
Anchor/Reporter
Associated Press Network News

Washington DC Shure is expanding its audio equipment line to include an RF amplifier for two-way radio equipment. The model is called SmartAMP.

SmartAMP amplifiers are about the size of a typical under-dash car radio, but can be mounted further under, say, on the bulkhead, or under the seat of the vehicle if space is at a premium.

Both VHF and UHF communications bands are targeted with various SmartAMP models. Models designated RF-V1 and RF-V2 cover the 150-160 MHz and 160-170 MHz segments respectively. And the RF-U1 and RF-U2 cover 450-460 MHz and 460-470 MHz.

Within those segments can be found frequencies allocated specifically for broadcast operations, as well as standard business and industrial radio frequency allocations.

Testing begins

Shure supplied me with an RF-V1 from its regular production line. A straightforward data sheet described operating parameters and provided some installation suggestions, but there

was no schematic. Such information, I am told by Shure, is presently being organized.

For the temporary testing purposes of this article, I left the amp in an out-of-the-way corner of the passenger footwell in a Honda Accord that is used as a news

USER REPORT

car. In that position I could monitor the LED status lights that would reveal any fault, as well as confirm that the power to the unit remained on.

Short circuit sensor

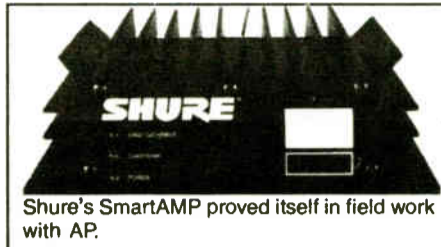
The amplifier, for starters, employs a module in its amplifier circuitry that senses an open or short circuit, thermal overload or a mismatched antenna.

When the module senses something wrong, it shuts the amplifier down. But an unusual feature in the Shure amplifier allows the two-way radio itself to continue operating at whatever its own output power level is rated. The fault circuit automatically resets if the problem can be fixed in the field.

It was time for the first transmit test. The

basic radio shows 28 W at its operating frequency, and the vehicle's antenna system measures a VSWR of 1.1 : 1.0. I have a choice of antennas that can be screwed onto the car's roof-mounted base—a quarter-wave or a base-loaded 5/8.

Initial testing with the quarter-wave



Shure's SmartAMP proved itself in field work with AP.

found dramatically increased signal level into a repeater located about 30 miles from the car's fixed position. Current draw (DC) of the amplifier was measured at about 13 amps, with RF power output at the amp measured at just over 90 W.

No significant difference in signal picked up by the repeater was noted with the 5/8, although the measured RF power rose slightly and DC current remained the same. This could represent the need for a slightly better antenna match. No insertion loss was noted in the level of the repeater's signal monitored in the car.

Without the amplifier, I had to jockey the car back and forth a few feet to get a signal that was full quieting into the repeater, the audio of which is sent back to the station. But *with* the amplifier, the signal from the car was reported full quieting from a variety of points at that location.

The low down

Testing in real time was next on the agenda. In town, there are environments conducive to using the physically com-

(continued on page 48)

TRUTH IN MODULATION



Since ModMinder® is a precision modulation monitor which counts peaks differently than the monitor you now have, there are no processing artifacts.

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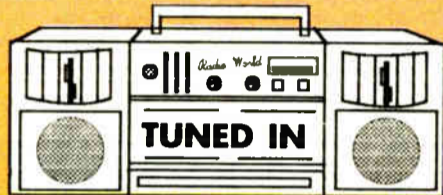
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People ... Harris Corporation has made the senior vice presidents in charge of its Semiconductor, Electronic Systems and Communications sectors the presidents of the respective sectors.

The new presidents are Jon E. Cornell for the Semiconductor sector, Phillip W. Farmer in the Electronic Systems sector and Guy W. Numann in Communications.

New dealers ... Studer Revox America recently announced the addition of two new full line dealers to its dealer network—**Audio Intervisual Design** in Los Angeles and **Pro Media** in El Sobrante, CA.

Audio Visual International is a sales, rental and consulting company for the pro audio industry whose clients include recording studios, record companies and film and television studios.

Pro Media serves professional users of sound, video and audio/visual equipment.

Exclusive distributor ... B&B Systems in Valencia, CA announced that **A/V Technology** of Newton Center, MA has been appointed exclusive distributor for the company's products both domestically and overseas. For more information, contact Bill Burnsed at 805-257-4853.



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Circle 55 On Reader Service Card

NSN Monitors Radio Stations by Satellite

by **Muffy Montemayor, GM**
Standard Broadcast Services

Avon CO Since the implementation of the National Supervisory Network (NSN) earlier this year, off-premises remote control via satellite is now a reality.

Offering an economical, FCC-legal alternative to local control for broadcasters across the country, the NSN system is built upon the proven reliability (99.995% better) of packet switching and interactive Ku-band VSAT (Very Small Aperture Terminal) technology.

TECHNOLOGY UPDATE

Across the USA, approximately 200 VSAT networks are on line, including the National Supervisory Network—the first and only interactive, Ku-band VSAT system developed specifically for broadcast industry remote control and monitoring.

Ku-band VSATs a natural

Because Ku-band VSATs have the ability to provide high speed data interconnections to and from almost any location without terrestrial interference, frequency coordination problems or cumbersome hardware installations, they are a natural choice for use in broadcast applications.

NSN combines VSATs with X.25 packet switching to establish virtual circuits with client stations. A virtual circuit is a bi-directional association between the two locations across a Packet Switching Network (PSN). In a PSN, client data is broken into discrete blocks, or packets, which contain user information plus source and destination addresses.

At the client station, an 80286-based computer connects directly to the Moseley MRC-1600 CRT option port, the Burk Technology (formerly Advanced Microdynamics) TC-8 and ARC-16 RS-232 options, the Gentner VRC line and other manufacturers' serial data ports.

For co-located stations, NSN has a 16-channel A-to-D card to connect the computer with on-site station equipment. Another computer card and a relay panel are used to connect to the Emergency Broadcast System.

Uses X.25 protocol

This computer runs NSN software and an X.25 Packet Assembler/Disassembler (PAD) to act as an interpreter between

the station's equipment and the satellite system.

The X.25 International Packet Data Standard is an internationally defined method of connecting a computer system to a PSN. This X.25 PAD establishes the virtual circuit with NSN, assembles outbound serial data into packets and disassembles inbound packets into serial data.

The X.25 protocol was selected by the National Supervisory Network because it offers the security and instills the confidence of a data link that is as error-free as technology allows. The use of X.25 helps make differences in remote control units and other local internal hardware completely transparent to the NSN command center.

Unlike dial-up or leased lines, a virtual circuit does not represent a physical connection between client stations and the NSN command center, but is instead a logical communications path.

The use of X.25 with Ku-band VSATs allows NSN to maintain virtual circuits with thousands of client stations simultaneously, giving the equivalent of a dedicated line to each at all times. Data between the client station and the NSN command center travels at 56,000 bps, ensuring efficient response times regardless of distance.

The NSN command center is a custom designed facility staffed by competent technicians familiar with broadcast operations. All NSN computer, satellite and power systems are state of the art and fully redundant.

Fixed point duty operators

Command center personnel log on as they become fixed control point duty operators for each station on the network. The operator, an experienced, fully trained engineer, monitors and controls all station functions, ensuring that all pieces of equipment are operating within the individual parameters established by each station's CE.

(continued on page 48)

THIS PRODUCTION ASSISTANT WILL NEVER ASK FOR TIME OFF.

Twenty-four hours a day, seven days a week. That's the kind of dedicated service you can expect from the new 3030 quarter inch recorder from Tascam.

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From its proprietary heads, offering extended headroom and quieter recording, to its built-in dbx type I professional noise reduction, the 3030 delivers sound you can count on, time after time.

Whether you're fine-tuning for a particular kind of tape, or just matching previous recordings, you'll appreciate the 3030's choice of on-air or production-quality tape speeds, and the switchable print levels.

Split second cueing decisions are no problem, thanks to micro-touch pushbuttons, while Auto Cue Mark, Duplesync, and Tape-Run-Time counter simplify your spot production. Mic inputs make direct voice-overs a breeze.

And with balanced and unbalanced inputs/outputs, the rack-mountable 3030 slips easily into any existing system.

Contact us or visit your Tascam dealer for more information about the 3030. It turns out, good help isn't hard to find after all.

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Broadcasters Benefit From Part 94 Band

by Rick Neace
Marti Electronics

Cleburne TX All broadcast engineers are familiar with broadcast auxiliary communications provided under Part 74 of the FCC rules. In recent years, however, we have seen demand exceed availability of Part 74 frequencies for aural STL, TSL and RPU around the larger cities.

SPECIAL REPORT

The situation is far from hopeless, however. Many frequencies are available to broadcasters for various uses in the Private Operational-Fixed Microwave Service (Part 94).

This service has 18 frequency bands from 928 MHz to 40 GHz. We feel that the 928 to 960 MHz and the 21.2 GHz to 23.6 GHz bands are of special interest to radio broadcasters because of the availability of cost effective equipment in those areas.

Relatively low cost 23 GHz equipment has found applications in digital and analog STL, TSL and Inter-City Relay. Full 16-bit PCM can easily be handled within the video bandwidth of this equipment. Path lengths and reliability are somewhat limited by rain attenuation, prompting some 23 GHz users to provide backup communications.

928-960 MHz band

Few broadcast engineers are aware of the great potential of the 928-960 MHz Part 94 frequencies for broadcast related communications.

Radio and television stations qualify under Part 94.9, with the exception cited in 94.9 (b)(2)(i): "The facilities may be used to transmit program material from one location to another, provided that the operational-fixed frequencies do not serve as the final link in the chain of distribution of the program material to

broadcast stations."

Maximum bandwidths of 25, 50, 100 and 200 kHz are available in this band, but are licensed based upon a supplemental exhibit justifying need.

An example of a Part 94, 928-960 MHz link in use by broadcasters would be first hop of stereo STL relay. The first hop is done on Part 94 and the final hop on Part 74. This avoids STL frequency coordination problems in the city.

Many stations have given up on the "P" channels in the 450-455 MHz RPU band and have installed interference free data links on Part 94, 928-960 MHz frequencies. The 200 kHz channels will carry several multiplexed data channels.

Over the past several years Marti has supplied multichannel links with up to five channels of data and 7.5 kHz high quality compacted audio (RPU backhaul and network feeds).

Satellite downlink receivers are often located in outlying areas to avoid interference. Getting satellite audio from the downlink receivers to the studio is being done on Part 94 frequencies.

Getting equipment authorization

Part 94 license applications must specify: transmitters that have been tested and FCC authorized for operation on required Part 94 frequencies; emission designators and stability.

License application for station authorization in the private operational fixed microwave service is made on FCC Form 402.

The procedure is much more complicated than Part 74. Certified supplemental showings of frequency coordination and interference analysis pursuant to the applicable rules sections in Part 94 must accompany the application.

Because of the time and extensive database required for coordination, have your favorite frequency search firm do this work and file the application for you.

♦ ♦ ♦

Editor's note: Rick Neace can be reached at Marti Electronics: 817-645-9163.

KPRC Applauds Comrex

(continued from page 40)

tounding to say the least. The quality rivaled that of some local 8 kHz loops. We now have GUS, The Incredible Broadcast Machine. A 31-foot custom broadcast bus.

It has a COMREX STLX system on board, in addition to the RF links. How else could GUS broadcast for five rough days from places such as Sea World, The River Walk and The Alamo in San Antonio?

So far this year, KPRC Radio has had over 70 remote broadcast events. With the savings realized by using dial-up circuits, we have more than paid for the cost of the STLX Comrex system.

Now, from the I-wish-I-had-it department. Comrex needs to provide a head-phone connector so the engineer can monitor the return IFB line. When all four headsets are in use, you are in trouble. During station breaks, the pro-

ducer is usually asking questions on the IFB line. The engineer, in this case, has to grab a mic to answer.

Maybe a PTT headset-mic connector would solve the problem. A built-in touch tone telset would be welcome, eliminating the telset we have to carry along.

We are very pleased with the equipment selection we made. Comrex builds a well engineered, quality product. The technical support is exceptional.

Who knows where we will go next. Maybe Down Under, or a cruise down the Amazon. I have to go now. GUS the bus is waiting for me.

♦ ♦ ♦

Editor's note: Jon Bennett has worked in broadcasting for 25 years, the last four with KPRC. He may be reached at: 713-771-4631.

For more information on the STLX, contact Lynn Distler at: 508-263-1800, or circle Reader Service 60.

WE'VE MADE DEAD AIR A DEAD ISSUE.

There are worse things in radio than dead air. But not many.

And if your CD players aren't built to resist tracking errors, you could find yourself listening to some very embarrassing silence.

Not with the new CD-701 from Tascam. Its unique disc clamping system is a technological triumph that virtually eliminates disc vibration. So you never hear the awful hush that means a tracking error has occurred.

What you do hear is the finest sounding CD unit you can buy, with the same proprietary "ZD Circuitry" praised by two of Japan's top audio magazines* for eliminating low-level digital distortion.

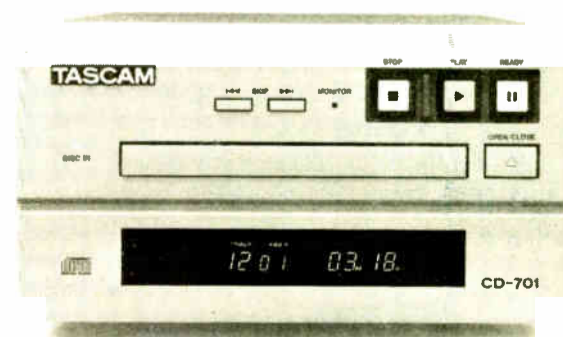
Then there's the optional RC-701 Remote Control with Auto Cue so you can cue to the music instead of the track (for even less dead air). Or you can add the Ram Buffer for true, instantaneous startup.

And with four times oversampling and 16-bit D/A converters in an extra-rugged chassis, the CD-701 is superbly designed for the broadcast environment.

Can a CD player really deliver this kind of performance, track after track, disc after disc? Only if it's a Tascam.

Contact us or visit your Tascam dealer for more information about the CD-701. And take the sounds of silence off your playlist.

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*Radio Technology Component Grand Prix '88, CD Division, Stereo Sound Component of the Year (1988) & Best Buy (1988)

SmartAMP is AP's Shure Winner

(continued from page 44)

compact quarter-wave antenna, including low parking garages and areas of low visual profile associated with certain news gathering situations.

The 5/8, being a "gain" antenna, could still be deployed in weak-signal cases, although, since it is mounted on the roof, it is exposed to physical trauma because of its added height.

With the amplifier in place, the signal advantage of using the 5/8 was reduced to that of further cutting any mobile flutter. It was no longer the make-or-break antenna; the amplifier was making the difference instead.

Other testing included a high fidelity transmission from a Marti unit, a portable 25 W model set up on a broadcast-dedicated channel. Shure's data sheet warns against any prolonged transmissions, specifying a 50% duty cycle and reminding that the unit is "not intended for continuous duty."

But in field reports involving about a minute of air time, the SmartAMP seemed to have no difficulty handling the load. I did manage to get the thermal sensor to trip, but that was with a key-down duration of several minutes, followed by some push-to-talk conversation. The appropriate LED promptly lit up, the amp shut down and the basic transmitter was left to do the job on its own.

Signal sensing

The RF-V1 uses signal sensing—as do all amps in the series—to key the amplifier. Relay switching is used to go from

transmit to receive, providing an audible backup way to discern whether the amp is working. The clicks, it should be noted, are mechanically and electronically quiet. No particular RF spike is produced.

With an RF-sensing trigger for the amplifier, there is a chance the unit could be keyed by stray RF at or near the frequency of operation. But in testing, by placing the Marti on-air directly into a second antenna, there was no false trigger in the Shure.

Since the amplifier is meant to be powered up at all times, it raises the question of stand-by current draw. A call to Shure produced an answer not found in the supplied Data Sheet. The amp's logic circuit and power indicator LED are said to draw less than 15 mA—about what a vehicle's clock might draw. Cars used often would therefore have no dead battery problems.

For occasional use, it might be wise to switch the DC power line. And since it is prudent to use the least amount

of power needed to get an adequate signal, switching the amp off if not needed may also improve relations with other stations on the crowded STL frequencies.

(In this case, the amp has a flow-through feature that is a nice bonus—no RF jumpering is needed to place the amp in or out of line.)

Shure has made a nice package with its SmartAMP series. The amplifier's retail price is just over \$400.

■ ■ ■

Editor's note: Paul Courson may be reached at: 202-955-7250.

For more information on the SmartAMP, contact John Phelan at Shure: 312-866-2540, or circle Reader Service 19.

Satellite Monitors Station Operation

(continued from page 45)

Transmitter and other readings from client stations are automatically logged in both the NSN computers and the client site computer every thirty minutes. Client station alarms are sent to NSN immediately, regardless of the regular reading transmission cycle.

In the event of multiple or simultaneous alarms, the command center computer allocates incoming data to its numerous operator terminals using a priority system designated by the client stations themselves.

Handling EBS alarms

The only exceptions to this are Emergency Broadcast System (EBS) alarms: they are always assigned the highest priority the system allows. Local station engineers cannot change this assignment. In the event of an EBS alarm, the NSN

duty operator is notified immediately through the satellite, while the computer dials the command center via a redundant telephone line.

In the event of an EBS alarm, the operator has the following menu of functions for each site: listen to local CPCS EBS station audio; place a station's program audio on our monitor line; activate a local EBS tone encoder; and start a local EBS alert or test cart.

Operators must also: place local CPCS audio feed on a station's air feed; go on the air live from our Command Center (for live announcements or to replay recorded CPCS information); reset normal program audio feed to air; reset the EBS receiver/decoder after an alert or test; and test the dial-out system to "spot check" lo-


cal audio or any portion of the system.

The interactive character of the system allows not only message traffic to and from the command center, but also between members of station groups via sub-networking. Sub-networking gives the ability to exchange messages, files and data directly between stations via satellite.

National Supervisory Network uses today's interactive satellite network technology, packet switching techniques and computers to augment the years of experience present on the NSN staff.


■ ■ ■

For more information on the National Supervisory Network, call the author at 800-345-VSAT(800-345-8728), or circle Reader Service 58.




CRL SPOTLIGHT

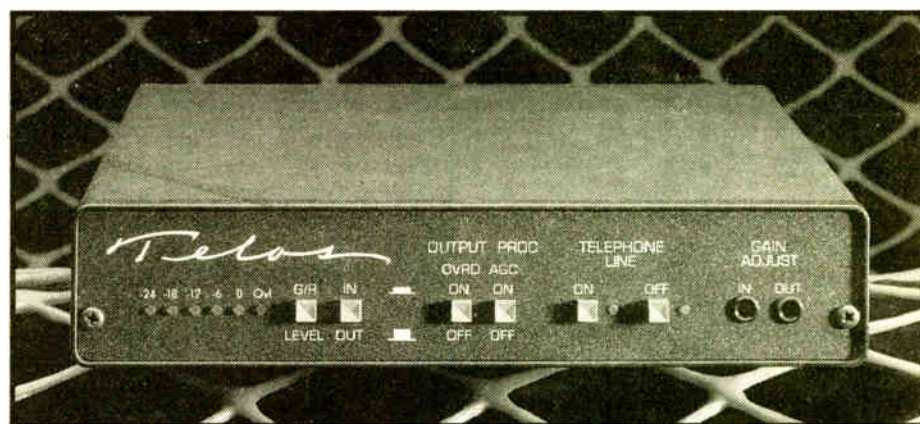
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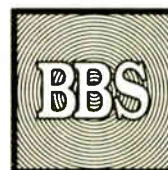


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Where Service and Engineering Make The Difference

WRC Gives Nod to Telos One

by Marty Sacks, CE
WRC-AM/WGAY-FM

Washington DC The subject of this user report is the Telos One digital hybrid, designed for airing telephone calls in a broadcast environment.

Talk radio WRC originally chose the unit to be used in newly constructed news edit stations. By the time we received them, however (they were ordered at NAB 1989 and had not gone into production yet), we decided to use these units to back up the primary on-air telephone system.

Began with Telos 100

Being very conscious of the quickly changing state of the art of digital hybrids (largely a result of significant improvements in digital signal processing ICs), and in a never-ending effort to improve the quality of our on-air telephone system, we converted to Telos 100 hybrids.

USER REPORT

In tests, we found that the 100 had superior trans-hybrid loss performance and overall quality of its caller audio. We were quite impressed with what we heard, given the large metropolitan area our station serves and the rather diverse mix of telephone instruments currently in use by many of our listeners.

We continued to test various software revisions designed to speed and improve the quality of nulls as they were offered by each manufacturer and found that the Telos 100 was still the unit to beat.

(I would be extremely remiss in not pointing out here that Bill Gillman and Chris Clark at Gentner were instrumental in providing modifications to the operating software of our Telemix call directors to allow them to interface with the Telos hardware.)

Being all-talk and thus having no music to play when something goes wrong with the on-air phone system, we have always felt strongly about the need for an adequate back-up to the existing call director/hybrid system in order to reduce the on-air impact of a system failure.

For the first few months, we utilized the modern iteration of the famous AT&T speakerphone, modified for on-air use. We then created a duplicate to the on-air system in the production room, which has thankfully never been used except for pre-recorded interviews.

When the Telos One became available, we decided to construct a dedicated back-up to the on-air system, which we could, in addition to the obvious use, also utilize as a test bed for future experimentation of this type.

Although we have had the unit a very short amount of time, we have already been impressed by the number of features, considering the small size of the package (it can either stand alone or two Telos Ones can be mounted side by side in a 1 3/4" rackmount).

Features impress

Consider the following standard features. The unit costs under \$1000 (the top-end Telos unit costs over two thou-

sand). Trans-hybrid loss is in excess of 40 dB (within 8 dB of the Telos 100). It offers an on-board AGC/downward noise expander and caller ducking (as far as I am concerned, this is the top feature of the unit with the exception of the excellent isolation provided by the hybrid).

Auxiliary mix output (a sum of caller send and return audio that can be sent to a tape machine to ease the recording of a two-way conversation) is available. Also, there is a built-in mic preamp for additional flexibility, a feature I find particularly useful when doing bench testing.

Free software upgrades are offered over the life of the unit with the return of the old EPROMS (since many of the features in this unit are implemented in the digital domain, upgrades are usually limited to changing EPROMS).

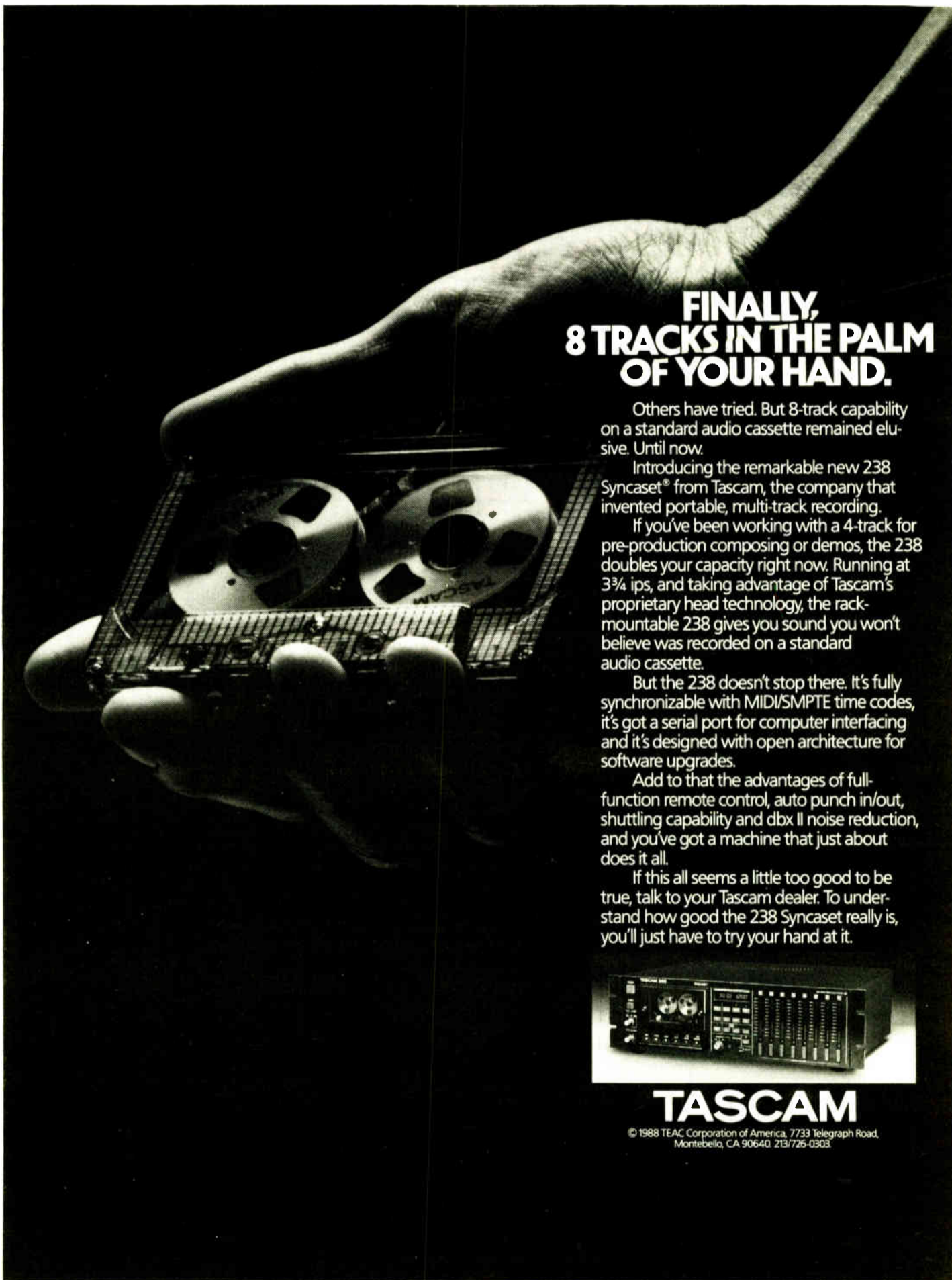
It is a pretty solid value, even before you consider the excellent support that Steve Church, Telos founder and former radio station chief engineer, and his crew are famous for nationwide.

The Telos One units went in and set up smoothly. We found subtle differences between the clarity and noise/distortion levels when comparing the 100

and the One, which are likely accounted for by the use of a different codec (originally designed for telephone company use) on the One, since most of the other parts in the One are the same as those used in the 100.

Minor drawback

We found a minor irritation that you might keep in mind. It would be handy to have the ability to give the unit a constant closure (rather than the momentary one it currently requires) for ON/OFF control without building up a "black (continued on page 54)



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Others have tried. But 8-track capability on a standard audio cassette remained elusive. Until now.


Introducing the remarkable new 238 Syncaset® from Tascam, the company that invented portable, multi-track recording.

If you've been working with a 4-track for pre-production composing or demos, the 238 doubles your capacity right now. Running at 3 3/4 ips, and taking advantage of Tascam's proprietary head technology, the rack-mountable 238 gives you sound you won't believe was recorded on a standard audio cassette.

But the 238 doesn't stop there. It's fully synchronizable with MIDI/SMPTE time codes, it's got a serial port for computer interfacing and it's designed with open architecture for software upgrades.

Add to that the advantages of full-function remote control, auto punch in/out, shuttling capability and dbx II noise reduction, and you've got a machine that just about does it all.

If this all seems a little too good to be true, talk to your Tascam dealer. To understand how good the 238 Syncaset really is, you'll just have to try your hand at it.



TASCAM

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Examining T-1 Phone Circuits

by Roger L. Shaw, Product Mgr
INTRAPLEX, Inc.

Littleton MA T-1, also called DS1, is a type of transmission system that Bell Laboratories developed in the early 1960s which has been in continuous use, with improvements, ever since. It is a digital transmission technique that multiplexes 24 voice circuits into a high-speed data stream.

A POTS (Plain Old Telephone System) T-1 requires two data streams: one for transmit and one for receive, thus making it full duplex. Today, the T-1 service can transport not only voice but digital

SPECIAL REPORT

audio, data and digitized video, which makes it one of the most versatile systems available.

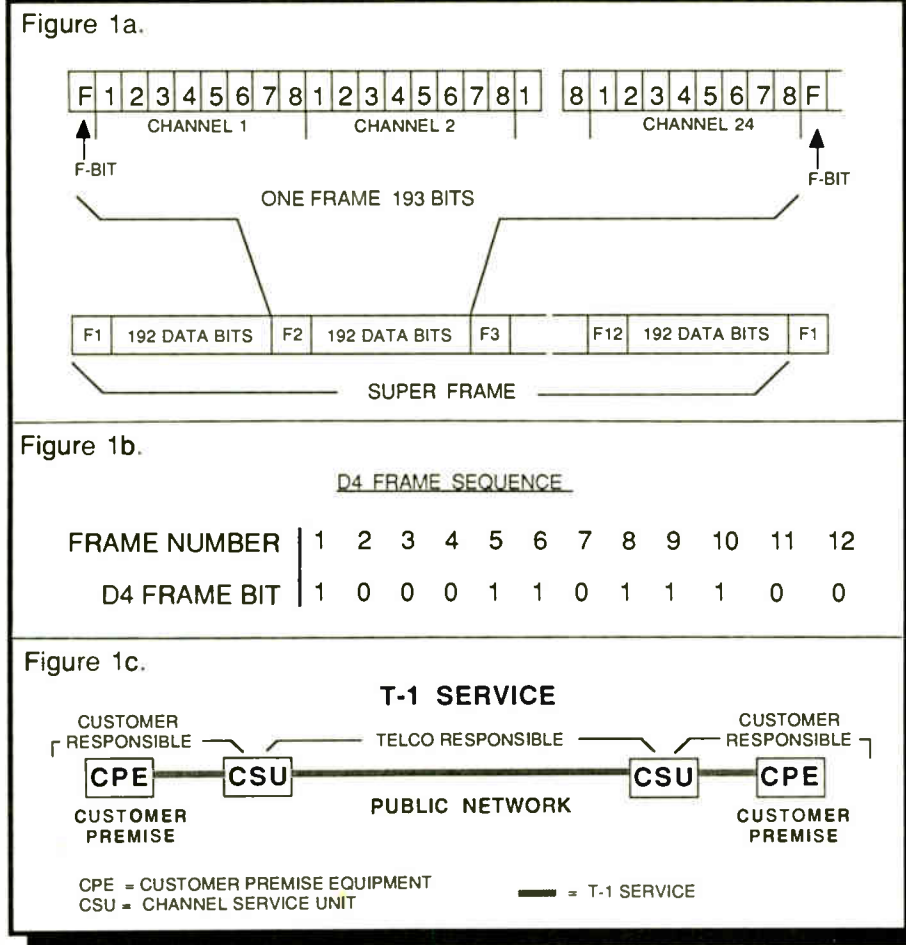
The "speed," or bit rate, of the T-1 circuit is 1.544 million bits per second (bps). Each voice circuit requires 64,000 bps, thus for 24 channels of voice, the data rate is 24 times 64,000, which equals 1.536 million bps.

T-1 framing pattern

T-1 systems have a framing pattern that adds 8000 bps, achieving the 1.544 million bps rate. (See Figure 1a.) The terms "super frame" and "D4 frame" tend to be used interchangeably and define the same format.

The frame bit is followed by groups of eight bits for each channel, with channels numbered one through 24. Channels are defined as DS0, the lowest level of the digital signal hierarchy, and are 64,000 bps.

The frame bit pattern is necessary to synchronize the data and locate channels. Each T-1 frame consists of a frame



bit and 24 eight-bit channels, for a total of 193 bits.

The Super Frame consists of twelve frames and defines the entire D4 frame length after which the frame pattern repeats. Figures 1a and 1b show the super frame and the framing pattern.

D4 is the most common framing format used in today's networks. It is the fourth major update of the T-1 system framing. Framing formats started with D1 and have progressed to the current D4.

The Extended Super Frame (ESF) is a new format now being deployed in some

networks. The ESF format is 24 frames in length and is similar to the D4 format with an F-bit at the beginning of each frame. In the ESF format the F-bits are used for a data link, framing and an error detection code.

Codec conversion

Each voice circuit is converted from the analog input to the digital format by a device called a codec (a contraction of the words coder and decoder). The device, which is an integrated circuit, takes the analog input and converts it into an eight-bit digital output.

Each eight-bit sample is converted at the rate of 8000 times per second. Therefore, the eight-bits×8000 samples is the 64,000 bps for each voice circuit or DS0.

The T-1 signal is used in all types of transmission systems, including satellite, fiber optics, copper wire and microwave radio. T-1 service is normally leased from the local telephone company, which provides the service from point to point.

The telephone company is responsible for the circuit from the CSU (Channel Service Unit; see Figure 1c) at the first customer location to the CSU at the other. The CSU is a device the telephone company requires at each end of the circuit to terminate the T-1 signal and provide testing capability.

Keep alive

The CSU will also provide a "keep alive signal" to the Telco network should the customer's equipment fail or be removed. The customer is responsible for the circuit from the CSU at each end to his or her T-1 equipment.

The T-1 circuit is the backbone of the public telephone system today and is also the basis of the coming ISDNs (Integrated Services Digital Networks) of the future. A T-1 circuit is reasonably priced today and the trend for the future should be for prices to decrease.

Roger Shaw may be reached at: 508-486-3722.

BUYERS BRIEF

Moseley Associates has announced its new MRC 1620 Dial Access System. The system consists of a remote terminal that allows an optional control terminal or IBM PC with Taskmaster software to monitor and control a remote facility from both dedicated and/or dial-up control points.



The MRC 1620's remote control terminal offers such features as a Telco STL/TSL communication port, RS-232 connection for direct or dial-up PC connection, 32 relay isolated command outputs, 16 status inputs and 16 analog inputs.

The unit's control terminal also features the Telco STL/TSL port and the RS-232 connection as well as a front panel LED display of all 16 status channels and a digital telemetry meter.

The Taskmaster software offers PC connection to the MRC 1620 control or remote terminal and allows remote setup of the MRC 1620 via the PC.

For more information on the MRC 1620, contact Dave Chancey at Moseley: 808-968-9621, or circle Reader Service 79.

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SPECTRUM

LEONARD FELDMAN

EVERYTHING IN MODULATION

A few weeks ago, I had a chance to visit the transmitter sites of two of New York City's better classical music FM stations: WQXR-FM and the municipal public radio station, WNYC-FM. My host was Eric Small, president and co-owner of Modulation Sciences, a company that has been supplying signal processing gear to radio and TV stations for quite a few years. As a long-time fan of FM radio, I couldn't resist the temptation to crawl around atop the Empire State Building, where WQXR's transmitter is housed, and atop the 110-story World Trade Center, the "home" of four of the city's

in 1983, in order to get Type Approval, a modulation monitor had to flash if 10 consecutive cycles of 10 kHz exceeded 100% modulation. This meant that the response time of the peak flasher had to be 1,000 μ S, or 1 mS. Also, in the automatic transmitter system rules of the same era, the maximum number of overmodulation events permitted per minute was 10. Small discovered that virtually all modulation monitors made before and after the 1983 FCC deregulation had peak flash indicators that operated in one cycle of 10 kHz or less, which translates to a response time of 100 μ S or less. Apparently,

ModMinder ignored brief (less than 1-mS) spikes, which have no impact on occupied bandwidth. As Small explained, one way to describe ModMinder is as a device that allows reducing the apparent ratio of peak-to-average modulation. This improvement can be used to increase the number of peaks allowed through (reduce the amount of signal processing or compression), increase the average modulation (make it louder), or do a bit of each. For lightly processed classical music stations, the difference amounted to as much as 5 dB. Very heavily processed stations showed less than 1 dB of difference.



FM station transmitters, including that of WNYC-FM.

My purpose was to watch an experiment Small was about to conduct—an experiment that he felt could free FM stations from the need to employ vast amounts of compression.

It's no secret that most stations, to remain competitive, must try to sound as loud as—or, in some cases, louder than—their competitors. In playing the "louder than the next guy" game, the only way stations can accomplish their goal without exceeding modulation limits imposed by the FCC "way back when" is to limit dynamic range. I know of at least one station in New York City that compresses so heavily that their average dynamic range, monitored over a period of several days, was no more than about 6 dB! And this, in the era of digital Compact Discs, no less! Well, if a station's format is nothing but hard rock, perhaps that's not too serious, but if a station's format calls for classical, jazz, or other forms of pop music, that kind of compression can make music sound lifeless.

What Eric Small set out to prove with his newly designed modulation monitor, the ModMinder, was that most, if not all stations were actually using more compression than necessary, simply because their modulation meters were providing false indications of overmodulation. Before the deregulation of modulation monitors by the FCC,

makers of this equipment must have felt that faster was more conservative, or that it was easier to design a fast peak detector than a slower one.

While deregulation opened the door for slowing down the response times of peak flashers, most modulation monitor manufacturers continued to play it safe, providing peak flasher response times that were much faster than they needed to be. The result: Stations had to either back off too much on their modulation levels or introduce more compression than was needed in order to remain competitively "loud."

In stereo TV, modulation must be set exactly to the reference level of the dbx L-R noise reduction encoder which forms a part of the MTS stereo TV system. In the course of trying to resolve TV audio modulation problems, Small and his engineers discovered just how overly fast most peak flashers responded. Once they slowed down such flashers to meet the old FCC spec of 10 cycles of 10 kHz, most of the TV overmodulation problems vanished. It was then that they became curious as to what effect the 1-mS response time would have on typical stereo modulation.

With a prototype monitor having a 1-mS response time, they monitored various off-air signals using a high-quality tuner. On some stations, the prototype ModMinder indicated as much as 5 dB below the "standard" modulation monitors. This was because the Mod-

but even stations that used moderately heavy processing were able to show an improvement in loudness of almost 2 dB by merely adjusting total modulation using the ModMinder. No changes in the adjustment of the processing equipment had to be made.

At both stations we visited, the engineers were surprised to find how much difference the ModMinder made when used in place of their current peak-modulation meters. In one case, there was a difference of about 20% in peak modulation indications. (The ModMinder never showed higher than 80% modulation readings with the other meter adjusted to flash and limit at what it "thought" were 100% modulation peaks.) The second station visited had been operating even more conservatively, with the ModMinder indicating no more than around 75% peak modulation while the conventional meter showed peaks of 100%.

ModMinder holds the promise of combining maximum loudness—and, hence, better S/N ratios—with greatest quality. Stations that have suffered a competitive loss because they refused to "nail the processing to the wall," as Eric Small puts it, can now maintain maximum loudness without overprocessing, and heavily processed stations now have an alternative that could enhance their competitive position without further squashing and squeezing!

AUDIO/OCTOBER 1989

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Circle 89 On Reader Service Card
World Radio History

KBSU Upgrades to Gentner VRC-2000

by Tim McCartney, Dir Eng
KBSU-FM

Boise ID In 1989, Gentner Electronics Corporation introduced its improved Model VRC-1000 remote control unit, the VRC-2000.

The company's new version 3 firmware improves upon the earlier products by offering a series of options aimed at greater efficiency, more flexibility and additional security.

While the basic design of earlier models is retained (32 command, 16 metering and 16 status channels), several new features are added.

Real-time clock

A real-time clock now drives a total of 64 time-of-day commands, providing considerable room for imaginative use. The commands can also be used to control muting features. A common use is for the VRC-2000 to be programmed to call the studio if the transmitter falls out of the 90-105% power range.

At sign-off, however, such an alarm feature needs to be muted. This is accomplished using a programmed mute function matched by a command and status channel wired together.

The updated firmware also provides

for alarms to be addressed to all or just one specific telephone number for any metering or status channel. For example, if the studio operator should be advised of an out-of-tolerance power level condition, the studio phone number is so programmed.

Or if the station's engineer wants to know of a condition such as high VSWR or a power outage, then the engineer's number can be so programmed for that specific alarm only.

USER REPORT

Three different sets of access codes enable varied levels of entry into the system. One allows meter readings only, another accesses readings and commands, while the third adds in programming. Normally, the studio operator has access to readings and commands but not programming, which is reserved for the engineer.

Its automatic logging can simplify operations, particularly if a single control point operates several transmitters. The typical setup is for a VRC-2000 to be programmed to periodically call a com-

puter in the studio to report selected readings, and deliver the data to a printer.

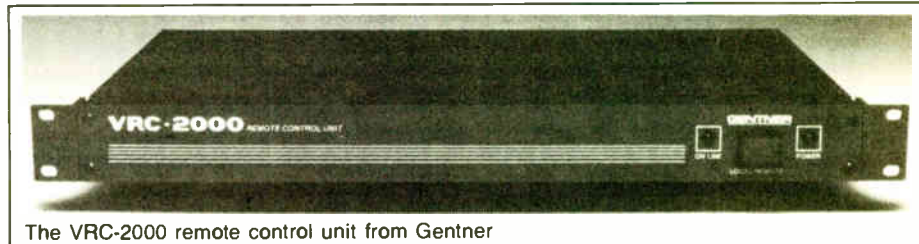
If alarm conditions occur, a call to the studio operator is then initiated or else some sort of alarm system is arranged with the computer.

The system actually offers four methods of reporting alarms. First there is the phone voice method, probably the most commonly used. It calls a programmed telephone number and the

A 30-second time saver such as this is especially helpful when trying to get into the system to immediately correct an emergency problem.

System accessories

A number of accessories support and interface the system. Several interconnection devices deliver the main unit to and from the outside world. Among the options are command relay panels, which convert the unit's open collector



The VRC-2000 remote control unit from Gentner

digi-talker explains the alarm condition. Second is the phone modem method, in which a phone call downloads an RS-232 feed into a computer.

The third alarm method is for the radio voice to provide an actual audio feed at the back of the VRC-2000, which can then be backhauled to the studio via an SCA or TSL. Fourth, the radio modem uses the SCA or TSL system to provide an RS-232 feed to be sent back to the studio for downloading into a computer.

Alarm reporting is more efficient in the version 3 firmware. Instead of listening to an alarm report at length, the digi-talker briefly announces that an alarm is pending. The operator can then decide whether or not to call up the full alarm report.

control system to isolated relays. Also available are screwdriver or punchblock systems, compatible with command, metering and status channels.

A failsafe unit can be configured to provide positive transmitter carrier control, independent of the dial-up system. When the unit senses loss of program audio for a pre-determined and consecutive period of time, it changes states on a set of contacts.

The contact can then be used to remove carrier from the transmitter. A sample of program audio, in advance of the exciter audio input, is required to operate the failsafe unit.

A standard feature with every VRC-2000 now is to provide a surge protector

(continued on page 54)

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Digital Hybrid Scores High Marks at KING

(continued from page 39)

eliminates doubling up on one hybrid, the equivalent of "button mashing" or double-terminating the two calls, which makes it harder for the callers to hear each other and harder for the hybrid to null to both lines.

The new talk format placed increasing demands on the system. Often, talk shows featured two phone guests, plus listener interaction on a third line, which meant doubling one hybrid.

The digital hybrids performed admirably, but delivering good, consistent nulls when doubling up worked only about 95% of the time. And there were still some complaints about the low level, since for every dB increase in send level there is a dB increase in hybrid leakage (or a dB decrease in hybrid null).

It was time to re-evaluate the phone system—again! We decided to stay with Gentner because of its excellent cus-

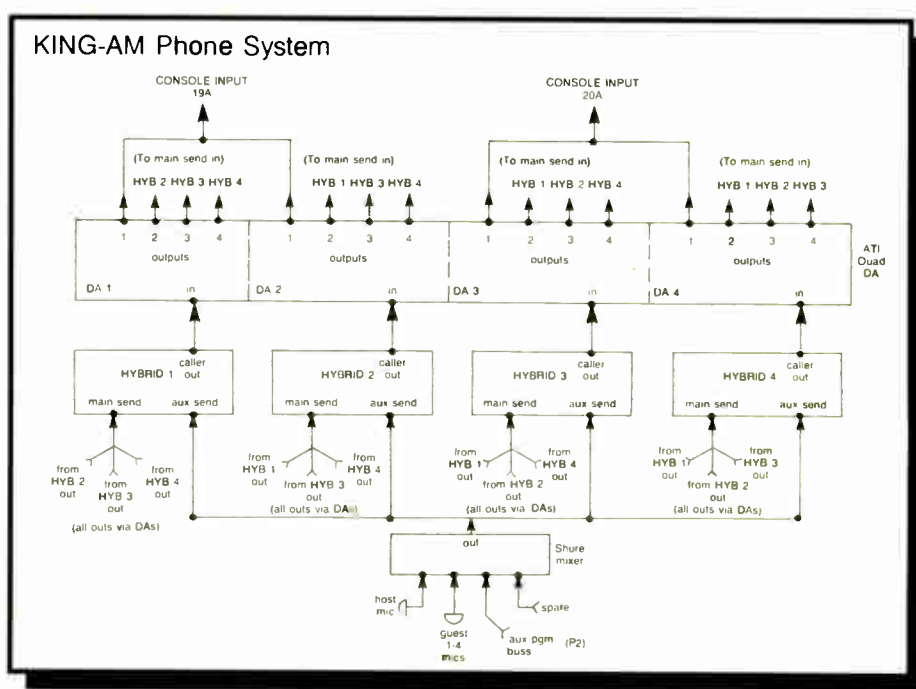
tomers assistance and support, especially by Gentner Chief Engineer Bill Gilman. We bought two Telemix X call directors, which support two digital hybrids each, along with two more digital hybrids, for a total of four.

Isolate caller outputs

In order for the hybrids to hear each other, the caller outputs must feed DAs to isolate the individual caller outputs. The ATI quad DA works perfectly for this, with its first outputs going to the console inputs, and the other three feeding the main send input of the other three hybrids. This configuration gives wonderful control of all the audio.

To avoid tying up four console channels, the two units associated with the listener call director were routed to one pot, and the two hybrids on the guest lines went to another.

Six months after this system was installed, Gentner announced a new



Phone Options Probed

(continued from page 38)

to save on the cost of paying someone to monitor a station around the clock, as required by the FCC.

Howard Hallikainen's DRC190 system is at present planned to operate alongside the NSN equipment, should a broadcaster with the DRC190 so desire. "You could possibly end up with better performance using NSN because its operators are trained and watching your transmitter," says Hallikainen.

EBS reaction time

"It is different, but not necessarily better," says Glassman. And some have expressed reservations about NSN's ability to respond quickly to EBS warnings that may occur at multiple stations in a region simultaneously (a hurricane, for

example, knocking out several stations). Such stations will incur FCC fines if they do not respond as they are required to.

This notion is quickly rebutted by Burk, whose remote control equipment works with the NSN gear. "They are very thoroughly and capably handling the EBS problems," he says. "They have it so thoroughly covered that it is probably more ably covered than what a less trained person right at the site could manage."

It is probably still too early to tell how NSN will fare, but if it can deliver as promised, it presents at the very least an intriguing alternative for the broadcaster.

"Besides," adds Burk, "with satellite, how much does it matter whether you are ten blocks or a thousand miles away?"

generation of digital hybrids offering an improved null of 35 dB.

In the past, the current system would have been pronounced obsolete and budgets would have been drawn up for a new unit down the road. Not in this case.

State of the art

Gentner had wisely put all the nulling program circuitry on three EPROMs, so an upgrade to the more advanced

technology was simple. We bought the new chips, and *voila!* State of the art in about five minutes per unit. We can also be assured that these digital hybrids will be the state of the art in hybrid technology for years to come.

Editor's note: Paul Vandegrift may be reached at 206-448-3635.

For more information, contact Gary Crowder at Gentner: 801-975-7200, or circle Reader Service 18.

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Gentner Develops New Remote

(continued from page 52)

that protects the unit from telephone line spikes. This should be complemented by some form of surge protection from the AC power source as well.

The BSU Radio Network lost an entire VRC-1000 board—some \$400 in damages—a couple of years ago during a mountain lightning storm. Since the addition of the surge protection, problems have been few and minor.

Also available is a battery backup unit that keeps the VRC-2000 in operation during a power outage. When the unit loses power, it does not answer incoming phone calls. However, the memory

of programs or alarm conditions is protected by an internal battery.

Problem solving

One problem noted in our use of three of these units is their response when any metering channel DC voltage exceeds 10 V. The system will start calling out programmed numbers and announce a "metering system failure."

An attempt at clamping a suspicious DC source to 10 V using a zener diode failed when the semiconductor shorted. Generally, a removal of the excess voltage allows the unit to return to normal operation.

However, on a few occasions, a total reset was necessary, which involves removing AC power and disconnecting the internal battery. Thus, all of the programs are lost. Proper DC sample voltages not exceeding 10 V, therefore, are essential.

The actual act of programming the metering channels is quite time consuming. In order to calibrate remote readings to those of the transmitter, it becomes necessary occasionally to reprogram the calibration constant, which converts the DC voltage sample into the desired numerical reading, such as "100% power forward."

One way to interrupt the programming of a channel once the needed correction is made is to introduce an error by programming an "or" when the unit expects a digit. Thus, time is saved.

The BSU Radio Network has two of the VRC-1000 models and one of the new 2000 units with version 3 firmware. All have offered an unprecedented amount of control for engineering personnel. This situation is considerably enhanced by the updated model, which offers many thoughtful additions to the overall basic design.

■ ■ ■

Editor's note: Tim McCartney has recently relocated to Minnesota and can be reached at: 218-751-1680.

For more information on the Gentner VRC-2000, contact Gary Crowder at: 801-975-7200, or circle Reader Service 17.

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MixMinus Wows WEBE

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pass 300 Hz to 3000 Hz, the MixMinus Plus is a ruler flat 20 Hz to 4000 Hz and shows a gradual roll-off up to 20,000 Hz, where it is only down 2 dB from the 1000 Hz reference.

If the MixMinus Plus is used from a cue return feed, then that audio specification is impressive. Your cue audio is only limited by the carrier. (See Figure 1) I also checked the depth of nulling performed by the unit. I used a tone generator set at 0 dBm on the PGM input, and then bridged this same source into an 18 dB pad into the Caller A input.

I did not use a transformer externally, so that I would be sure to be measuring the MixMinus Plus and not introducing additional phase errors. A null 28 dB down from the PGM signal was easily accomplished and Figure 2 shows how flat the nulling is over the bandwidth.

At 20,000 Hz it was only off by 1.5 dB! Again, this shows that the MixMinus Plus can easily be used outside the telephone application with which it is associated.

If you have a situation where a mix-minus is required, the Henry Engineering MixMinus Plus could be the way to get it. It has performed well for me at WEBE and given me what I needed without having to scrap the existing (read: paid-for) equipment—and in a minimum amount of time.

■ ■ ■

Editor's note: Chriss Scherer is CE, third baseman, power forward and lead guitarist at WEBE. His background is music and recording, having graduated from the University of Miami's Music Engineering Technology program in 1987. He may be

reached at: 203-853-9108.

For more information on the Henry Engineering mix-minus, contact Hank Landsberg at 818-355-3656, or circle Reader Service 38.

Telos One

(continued from page 49)

box." This would be ideal for the smaller station (which may find this technology affordable for the first time) with older consoles and key type program/audition switches.

I guess you can tell that I am pretty impressed by this box if that is all I have to complain about! Telos also offers an optional plug-in auto answer board for \$50, and will at some point make available an interface to allow the hybrid access to the necessary audio paths via the telephone handset cord when interfacing the unit.

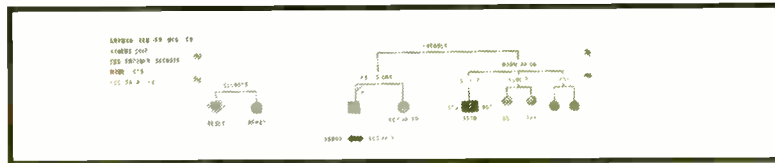
For those of you in the market for a telephone interface, there are many excellent choices available for analog as well as digital technology. Call up your broadcast equipment distributor and try a number of different hybrids on approval. If you decide to use the Telos One, I feel that you will be very impressed with the unit.

■ ■ ■

Editor's note: Marty Sacks was previously studio supervisor at WPGC-AM/FM, also in Washington, DC. He enjoys aviation, computers and, most of all, being a husband and father.

For more information on the Telos One, contact Steve Church at 216-241-7225, or circle Reader Service 40.

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For those interested in more advanced techniques, the SP-6 employs a powerful talent monitor section designed to rapidly call up live mic and track combinations, making difficult punch-ins a breeze. Standard SP-6 input channel equalizers are more comprehensive than

those supplied as optional items on competing products, allowing much greater creative freedom. Input channel auxiliary send sections are designed to be the most versatile in the industry, providing 4 different auxiliary buses to allow digital delay, reverb, talent foldback, and mix-minus feeds. Stereo input channels can provide either mono or stereo effects sends. Even more, the SP-6 has 4 auxiliary effects return inputs that allow effects to be recorded onto the multitrack or sent to the monitor buses.

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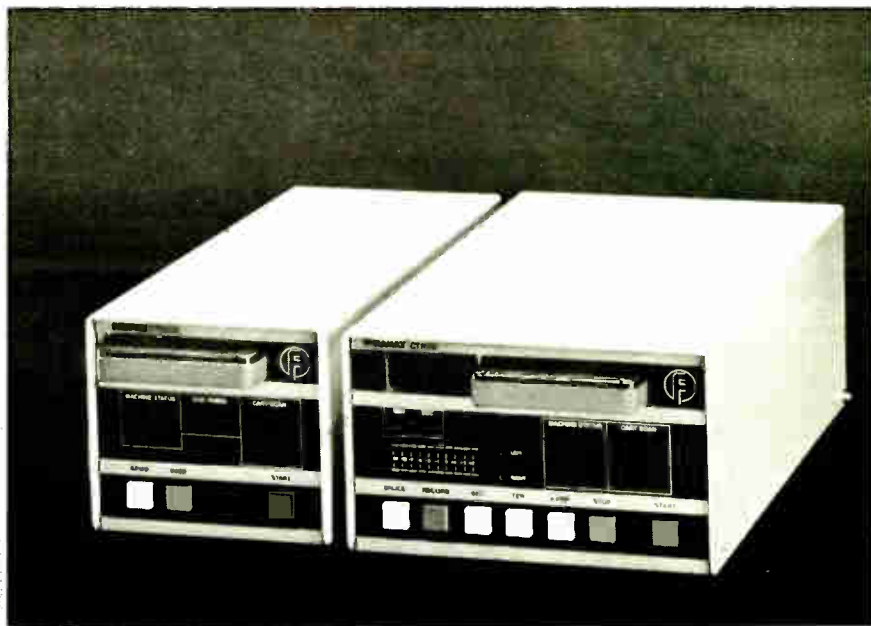
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