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See pages 35 to 46

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SBE Turnout Light But Good

Companies Say Traffic Sparse, Quality High

by Alan Carter

Denver CO ... Attendance at the third annual Society of Broadcast Engineers (SBE) national convention was not what some exhibitors hoped for, but many reported they made good contacts for sales.

The key phrase exhibitors used to describe attendance during the show held here 22-25 September was "quality but not enough quantity."

Attendance excluding exhibitors totaled 1874, according to SBE figures. Of that, 646 were admitted with guest passes. Exhibitor registration was 503 for the more than 400 companies represented in the show. (The Rocky Moun-

tain Film & Video Expo held jointly with the SBE show reported registering 920 people for the exhibits.)

Comparing SBE registration this year with that of 1987, attendance dropped by a little more than 300 from the approximate 2200.

The SBE convention also included 31 technical sessions addressing issues such as AM improveme. and digital technology, the expanded AM band, and audio processing and the NRSC standard.

SBE President Jack McKain, in an interview during the convention, said he was pleased with the evolution of the national show.

A spot demographic check of preliminary registration indicated the show drew "heavy" local traffic and attendees from all states except the Northeast, according to McKain. He attributed the lack of people from the Northeast to the



SBE exhibitors said they developed good sales leads, despite somewhat thin crowds.

EPA Monitoring PCBs

by Charles Taylor

Washington DC ... The Environmental Protection Agency (EPA) isn't fooling around with its enforcement beginning 1 October of a 1985 directive restricting the presence of polychlorinated biphenyls, or PCBs, in large and small high-voltage broadcast capacitors.

A station found in noncompliance could face fines as high as \$25,000 a day in addition to mandatory cleanup costs, which can run into six figures. Other options include jail sentences and public apologies in full-page newspaper ads.

PCBs are present in most pre-1980 radio and TV transmitter power transformers and high-voltage capacitors. They most commonly were used as insulating oil in some capacitors and as heat-transfer fluids.

The EPA directive states that large and small high-voltage PCB capacitors are prohibited in a station unless the equipment is off limits to the general public, is open only to authorized personnel and is contained in an enclosed room, according to Ralph Justus with NAB's Science & Technology department. Where the equipment is present, appropriate signs must be posted.

The EPA already requires equipment marking, record keeping, quarterly inspections and registration with local fire department personnel, Justus said.

While the EPA apparently won't exert a great deal of effort to enforce broadcasters' compliance, the threat of EPA disciplinary action in the face of non-compliance should be incentive enough, he said, aside from environmental concern. The agency does have the right to inspect a station.

"It's important that all stations get up to speed with the regulations," Justus said. "One thing that we're particularly concerned about is proper disposal. Broadcasters can most effectively organize this at the local level by encouraging a number of stations to get together and dispose of the PCB equipment col-

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concurrent IEEE conference in Washington, DC, and Radio '88 that was held the previous week in Washington.

McKain said he had "some very spirited feedback" on the show from exhibitors indicating they were "happy and satisfied" with the traffic.

This was the first show SBE organized under the direction of a show management firm, a process McKain said would continue. He also said the society may hire a publicist for next year's show planned in Kansas City.

Among exhibitors interviewed, Jampro's Alex Perchevitch said the show was more successful for him than Radio '88. He found more people "really talking

(continued on page 2)

FCC Clears Up Remote Rules

Washington DC ... The FCC issued a clarification last month to rules pertaining to broadcast station transmitter remote control operations, specifically addressing dial-up remotes.

Dial-up remote control equipment allows authorized personnel to take transmitter readings and make changes in operation from any telephone.

However, engineers complained that the rules were vague about the use of telephone line remote control. The FCC does require that a specified operator have final control of the transmitter and Emergency Broadcast System (EBS) monitoring.

Among the points addressed in the clarification, the Commission noted that when a dial-up telephone circuit is used for transmitter remote control, the station licensee must ensure that the dial-up circuit remains available at all times for the exclusive use of the duty operator.

As an alternative, the station can provide a means for the operator to interrupt or preempt any other telephone access to the remote control equipment at the transmitter.

The clarification also stated that the station licensee may employ a method, independent of the basic dial-up circuit, that enables the duty operator to turn the transmitter off.

Possible methods include, the FCC suggested, the use of interruptions to program audio, a second dial-up circuit, microwave studio-to-transmitter links (STLs) or continuous radio frequency cueing and control.

The clarification stated that dial-up telephone circuits, dedicated telephone circuits, special remote pickup unit (RPU) cue and control or microwave channels, and other systems are acceptable for metering, adjustments and control of

(continued on page 3)

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Attendance Down at SBE Show

(continued from page 1)

about things." But he added, "I didn't expect there to be a whole lot of folks."

Gary Crowder of Gentner Electronics said the company made "good quality contacts" but called them "sparse." Looking to next year's convention, Crowder expected better attendance, adding that Denver may not have been a good location to draw people.

Bill Ammons of CRL also did not think Denver was a good location and expected Kansas City to draw more people. Even though he thought attendance was not sufficient, Ammons said he made "some good quality leads."

Jack Williams of Pacific Recorders & Engineering was another who said the number of attendees was down but the people there were talking seriously with his company's representatives. He

praised SBE for scheduling less conflict between exhibit floor hours and engineering sessions.

Williams said the two-hour opening

"It was quieter than we had hoped for. The quality is great, but the quantity leaves something to be desired."

reception needs to be organized to attract more people, and if attendance overall does not increase, SBE needs to reconsider keeping the exhibit hall open for three hours on the last day.

Neil Glassman of Bradley Broadcast was disappointed that the show did not

seem to draw a "significant national audience."

"It was quieter than we had hoped for," Glassman said. "The quality is great, but the quantity leaves something to be desired."

Harrison's Martin Burns said he made "several good solid leads." But he doesn't expect to have a booth in Kansas City; rather he will work through booths of Harrison's dealers.

Art Constantine of Fidelipac Corp. said even though the traffic was "incredibly low . . . we in fact made sales and influenced future sales."

Eric Small of Modulation Sciences said he was disappointed in the lack of turnout from California. Based on the attendance in Denver, after being in St. Louis for the previous two years, Small characterized the convention as a "super regional show."

Class A FMs Encouraged

Washington DC . . . Class A FM broadcasters showed a "very significant demonstration of support" at Radio '88 for a proposed across-the-board power hike for Class As, according to an attorney representing the group.

The New Jersey Class A Broadcasters Association sponsored a suite during the radio show at which the group demonstrated with a computer simulation how the power hike would affect individual stations.

The FCC issued a proposed rule making, under Docket MM 88-375, in July that would allow Class A FMs to increase their power from 3000 to 6000 W.

It asked for comments on whether the increase should apply across the board or only for those that can meet increased separation distances, as the NAB has suggested. Comments are due 22 November and reply comments 22 December.

"Almost without exception, (those at the suite) were supportive," said Ken Keane, a Washington attorney with Wilner & Scheiner who represents the New Jersey group.

Robert McAllan, president of Press Broadcasting and a Class A owner in the New Jersey Group, also was encouraged by contact at the convention.

"I do know that every Class A that came through (the suite) indicated they would take advantage (of the power increase)," McAllan said.

McAllan stood by the New Jersey group's original position that the hike should be across the board. "We think it is vitally important that all Class A broadcasters have the right to share in any power increase," McAllan said.

In its opposition to the New Jersey proposal, the NAB argued increased separation distance requirements are necessary to reduce the effect of the power increase in existing stations.

He said it is not the New Jersey group's intent to create a new class of broadcasters.

McAllan predicted a "fairly good showing" from Class A stations in the comment filings.

Neither McAllan nor Keane would reveal specific plans the New Jersey group has for garnering support before the filing deadline.

Keane said the New Jersey group encourages all Class A broadcasters to file comments with the Commission in favor of the across-the-board power increase.

"We are asking Class As to make their voice heard," Keane said.

For information on Docket MM88-375 from the FCC, contact Jay Jackson at 202-632-9660.

NEWS BRIEFS

NAB Staffers Join ATTC

Washington DC . . . Two members of NAB's Science & Technology department are leaving to join the industry's Advanced Television Test Center (ATTC).

Ed Williams, who is director, broadcast systems engineering, and Ben Crutchfield, who is director, special engineering projects, will start work for the ATTC in mid to late October, according to ATTC Executive Director Peter Fannon.

Williams will oversee transmission and propagation testing for advanced television development, Fannon said. Crutchfield will work on the development of the test center's testing program. Crutchfield is chairman of the FCC's Advisory Committee on Advanced Television Service Working Party for ATS Evaluation and Testing.

The departure of Williams and Crutchfield leaves three openings in NAB's Science and Technology depart-

ment. NAB Chief Scientist Tom Keller recently left to work with Broadcast Technology Partners (BTP) on FMX promotion.

NAB Science & Technology VP Michael Rau said he is aggressively interviewing to fill the slots. He said one of the positions would focus on radio, the second on television and the third be devoted to a mixture of convention, lab and government relations work.

Westwood, WNEW-AM Sign

New York NY . . . Westwood One has signed a definitive agreement with Sillerman Acquisition Corp. for acquisition of 50% interest and operating control of WNEW-AM.

Westwood One will begin operating the station upon completion of FCC and other regulatory approvals, and completion of Sillerman's acquisition of Metropolitan Broadcasting.

The companies entered into a letter of intention on 28 June. According to the

terms of the proposed partnership agreement, Westwood One will become managing partner and have operational control of the station.

WCBM Returns to Airwaves

Baltimore MD . . . WCBM, which ran into financial undoing earlier this year, returned to the air 28 August under the guidance of a court-appointed receiver.

The AM station went dark in May and was assigned a receiver to bring it back on the air, entertain bids and settle debts. The FCC ordered that the station return to the air by 15 September.

The station is airing an oldies format and has 10 on staff, eight of whom were employed by the station before its May shutdown.

According to GM Bob Bloom, three bids have been made for WCBM, and Bennett Gilbert Gaines, the receiver, is currently negotiating with the offerers.

Bloom did not know who had put in bids nor how much they offered.

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Felker Defends Interference Plan

by Alan Carter

Denver CO ... FCC Mass Media Bureau Chief Alex Felker during the Society of Broadcast Engineers (SBE) convention here in September defended a Commission proposal that would allow stations to accept interference as part of negotiated agreements.

Recognizing opposition broadcasters have heaped on the idea, Felker, however, said allowing broadcasters to negotiate interference arrangements is "a way of letting the real world impinge upon the assignment process."

Through a policy of negotiated interference, Felker said stations could account better for local conditions, rather than under existing circumstances where blanket policies are set forth. The Commission, he added, would consider the

applications as major modifications and be the final arbitrator.

Broadcasters have not taken to the idea too kindly. Many argue that one problem in broadcasting is unwanted interference, and approving arrangements that allow for interference is not the proper way to proceed.

But Felker maintained that adjusting coverage area by mutual agreement might actually help the interference situation. "What AM really needs is some slight weeding out of stations," Felker said. "Maybe by allowing licensees to reach agreements and weed out some of these less viable stations, it's a way of improving quality," Felker said.

The Mass Media Bureau chief reasoned that the Commission has tried to strike a balance between quantity and quality, and negotiated interference

may be a way to improve the quality.

Felker acknowledged the strong opposition which has surfaced against the idea, and said that the term "negotiated interference" might have been a poor choice to describe an idea he feels could benefit many stations.

In context of the AM band expansion from 1605 to 1705 kHz, Felker said the Commission faces the same quality and quantity tradeoffs.

Whatever approaches are approved in establishing the expanded band—more daytimers, more clear-channel stations, national licensing—Felker said it was an opportune time to develop new ideas.

"It's a new band, there are no receivers out there yet. We've got to think expansively, we've got to think creatively," he said.

IEEE Focuses on Key Issues

by Charles Taylor

Washington DC ... About 150 participants shared views on topics ranging from boosters to low-loss AM antennas at the 38th annual Institute of Electrical and Electronic Engineers (IEEE) Broadcast Symposium here 22-23 September.

Attendance at the seminar rivaled past years, an accomplishment in view of the symposium's scheduling between both NAB's Radio '88 in Washington and the Society of Broadcast Engineers conference in Denver.

Five papers were presented at the conference, including a study on "Practical Considerations for the Implementation of a Reliable Synchronous FM Booster," by Ed Anthony with Broadcast Electronics Inc.

One issue Anthony addressed was various methods to interconnect the studio, main transmitter site and booster site.

At the booster station, a way must be found to transmit the station program material, either in the form of composite stereo, or discrete left and right channels, he said. Some form of frequency locking information must

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FCC Clarifies Dial-up Remote Rules

(continued from page 1)
broadcast station operations.

The FCC further noted that authorized personnel including the chief operator may obtain technical data and adjust the transmission system by telephone from any location. However, the document added, this does not negate the requirement that stations have a designated operator on duty at a fixed position.

Jim McNally, acting chief of the FCC engineering policy branch, said the clarification spelled out the conditions under which dial-up remotes can be used.

"It says essentially that broadcasters either have to have the line dedicated solely for the use of a control operator or they have to have some alternative path to the transmitter that they can use to get in if they need to," McNally said.

John Leonard, president, Gentner Electronics RF Product Division, a company that manufactures dial-up remote systems, said the company is pleased with the clarification because it tells broadcasters how they can operate, as opposed to the original ruling that only told broadcasters what they could not do in relation to dial-ups.

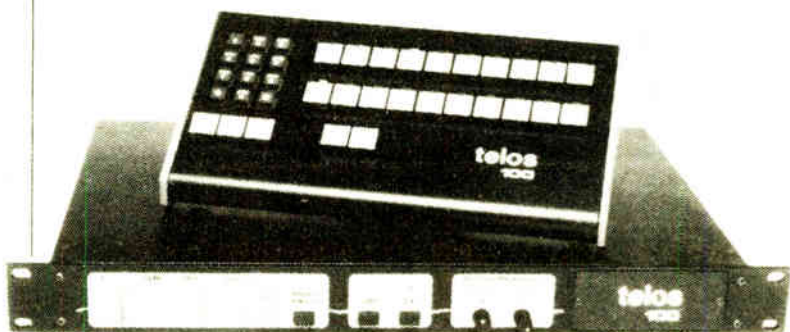
Leonard said hardware cannot provide a fail-safe measure to ensure the telephone line is always available. "You ensure a dial-up circuit being available by the way you install equipment and manage a system," Leonard said.

For information on the clarification, which is FCC listing 88-194 4460, contact Jim McNally at the Commission, 202-632-9660.

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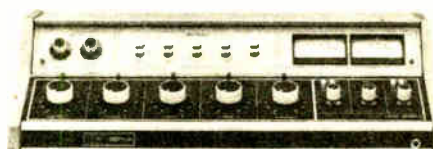
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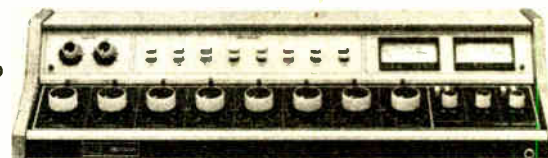
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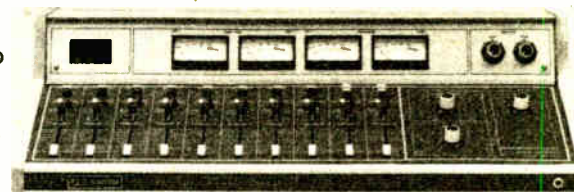
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Lost in a Convention Whirlwind

by Judith Gross

Falls Church VA ... If it's Friday, this must be Denver. Or are we still in DC?

After two conventions in ten days it's nearly impossible to keep the sequence of events straight. Let's see, did I meet the owner of this business card at Radio '88, or was it out in Denver at the SBE? It's all a great big blur.

The close timing of the two shows didn't have exactly disastrous results for either, but it's interesting to note the contrasts between the two.

Radio '88's east coast location helped lure some of the major players in engineering, the group managers and such,

while the western venue of the SBE attracted from every locale except the northeast.

Lots of companies were at both shows, which made for hectic set-up and tear down. Gentner played it smart and cloned its booth so one could make it out to Colorado while the other traveled back to Salt Lake City from DC.

☆☆☆

So now the question comes, could there be a way to combine the two, or parts of the two shows, to avoid having engineers and companies choose, or shell out the bucks for both?

Well, the NAB's fall show still attracts

mainly programming and management types and draws around 5000 or more. It also sports glitzier elements, such as the radio networks wooing affiliates, and the city of choice has to be able to accommodate the larger number of attendees and offer some glamour, which can translate to expensive hotels and such.

The SBE, on the other hand, purposely tries to keep costs down for attendees and draws about a third of the numbers who attend the NAB's gathering. The idea there is to pick a venue with less expensive hotels in a central location of the country.

Then there are the exhibitors, some of

of lights and placing green bills and silver coins upon green felt tables to be swiftly whisked away. Please Gandar, the fall shows are enough without looking so far ahead to the next spring's NAB!

☆☆☆

Heard some great radio in Denver while at the SBE show. The idea of "progressive" formats, or what we used to think of as progressive, is not dead out in the Rockies, I'm happy to report.

Also listened to KHOW-AM, Fred Baumgartner's station, playing music in stereo. It sounded terrific, and I especially liked the station's promotional tag line, "Songs you don't hear on FM."

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whom want to show their wares to engineers only, but many of whom need to reach the GM or PD or talk to all three.

And don't forget that the NAB's radio show is for radio only while the SBE convention includes both radio and TV. What to do?

Well there has been lots of chatter about all of this recently, on all sides, and a plethora of compromises has surfaced.

One exhibitor said why not combine the two shows ... either put them both together or choose a common locale and share an exhibit hall.

Another favors a compromise: take the NAB's engineering seminars and move them to the SBE convention, restoring the NAB's fall show for programming and management.

Sounds like a workable solution. The NAB doesn't try to spread itself too thin among industry factions, it gets a guaranteed enthusiastic audience for its engineering seminars, the SBE has an extra draw for its convention and gets the added boost of NAB endorsement.

Well the SBE seems to like the idea of some kind of joint venture here; they've already talked over some possibilities with NAB Science & Technology VP Michael Rau, who says he's open to ideas as well.

What's next? Stay tuned.

☆☆☆

In spite of the sparse attendance, the seminars and exhibits at the SBE show had lots to offer. Tell you all about it next issue.

Meanwhile, just thought you'd like to meet Gandar, the wizard conjured up by the NAB at Radio '88 to let us know what radio's future has in store.

He really didn't have much to say about the future of the technology, no great predictions for DAT or digital transmission and such.

But he looked into his crystal ball and saw large numbers of people wearing little plastic badges flocking to a desert city



Speaking of AM stereo, WNBC, one of the first stations to go stereo (but not promote it too well) is switching from Kahn ISB to C-QUAM, now that Emmis has the reigns.

And Chrysler must believe in AM stereo, because the company is discontinuing mono AM radios. From now on, it will be AM and FM both in stereo all the way.

Target Tuning made a good showing at Radio '88. The Moonachie, NJ company (just had to squeeze that city in somehow) reports that AM stereo TTs are in production.

Simulcasting may become a way of life for Infinity Broadcasting. No, not AM and FM, but between cities. First they simulcasted bad-boy-shock-jock Howard Stern's morning show on New York City's K-Rock (WXRK-FM) into the city of Brotherly Love (WSYP-FM, Philadelphia).

Now the Washington DC area (where Stern got his start) will be treated to Stern's raunchy style on WBMW-FM. Just thought I'd remind you, Howard, the FCC Commissioners live around here. And they tune into radio every now and then.

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

OPINION

Harris Plus Allied . . . What It Really Means

by Roy M. Ridge

Richmond IN . . . When anything happens in an industry that changes the status quo, it's natural for people to ask "How are the changes going to affect me?"

There are two questions that always seem to come up about Harris' acquisition of Allied Broadcast Equipment. But the order in which they're posed often changes, depending on who's asking. If I'm talking to a customer, he'll usually ask:

"Why are you changing something that works?" and "How are the changes brought about by the Harris acquisition of Allied going to affect the industry?"

If it's a manufacturer, the order of the questions is usually reversed.

Regardless of the order, they're fair questions, coming from the two groups of people who are most important to our business, suppliers and customers. And they deserve a direct answer.

No, we're not going to tell you that things won't change at all. We *will* change, but then—and this is important—we *always* have.

One of the key reasons for our own success is the fact is that Allied has continued to evolve and change as the radio industry has grown and changed. Many of the services we offer today, and

many of the products we sell, didn't exist two years ago. Yes, change is always risky, but not to change is riskier.

What the Harris/Allied combination gives us are the resources to manage change in a way which I sincerely feel will be not only good for us, but beneficial for the industry as a whole.

It gives Allied something we really needed to fully serve our customers—a broad-based line of transmitters and RF products, including advanced technology, high efficiency transmitters that nobody else has equalled.

Harris has truly impressive engineering capabilities. And as part of Harris, which has a

strong commitment to field service and 24-hour technical assistance, we have the people and resources to serve all of our customers better.

From a business standpoint, the merging of resources also made great sense for us in addressing the international market—and this will certainly benefit many of the manufacturers we represent as well. Everybody wins.

Some of the rumors of "big" changes really just amount to "fine-tuning," which will make things run smoother for both companies. For example, you'll find it easier and faster to reach your Harris salesperson, because he's now reachable through the Allied toll-free telephone network.

But I can also honestly tell customers and manufacturers alike that some things are not going to change. Before the acquisition, you could call Allied and choose from any of over a dozen suppliers of broadcast consoles and mixers. You still can. And before the acquisition, you could place an order with a Harris field salesperson, or call your local Allied office. You still can.

We've been very successful as radio's "supermarket" of products, and Harris has no intention of tampering with our success formula. Allied is absolutely not going to become a "one-brand" shop.

In fact, the trend in businesses today is going the other way. For example, did you know that you can walk into Sears today and see brands like RCA, Sony and Panasonic alongside Kenmore? Well, we're putting the finishing touches on Allied's 1989 Catalog right now, and I can tell you it will offer more products from more suppliers than ever before.

So while Harris and Allied are together, we're also going to retain our individuality. Harris Broadcast will still be manufacturing in Quincy, and we at Allied will still be right here in Richmond and in the regional offices, working to build our business by serving the radio industry the best way we know how.

Roy Ridge is the founder and president of Allied Broadcast Equipment. Allied's toll free number is 800-622-0022

Guest Editorial

Now that Radio '88 is behind us, it's time for the NAB to reevaluate it's fall radio show.

The radio convention has become an amalgamation of sales, programming, management and a smattering of engineering which has evolved largely as the result of historical and political concerns:

Originally the NAB held a programming and management show, then added engineering after its merger with the NRBA.

Now the NAB is caught in the trap of having two shows for radio: it's spring show which is engineering-oriented and shared with TV, and the fall show, which is trying to appeal to all factions of the radio industry.

As long as the spring show continues to grow and remains attractive to engineers and technical equipment exhibitors, the fall show will always be unable to attract the numbers of exhibitors and attendees needed to make it a huge success.

The NAB is faced with two alternatives. It can build up the fall convention and make it radio's greatest show.

Or it can wind down the radio show and put its efforts elsewhere.

If it decides that the fall show is worth the effort, the NAB should turn to the idea of splitting off radio from its spring show and having two conventions: one for TV and a separate one for radio.

An annual, radio-only convention for engineering, management, programming and sales held on a major scale each fall would surely attract a large number of attendees and exhibitors from all over the world.

There are exhibitors who would chose to participate in both the radio and TV shows and others who could target the faction of the industry most desirable to them.

The other alternative is to downgrade the fall show via compromise with other groups such as the SBE, relinquishing the engineering seminars or other aspects. If the NAB doesn't want to make a wholehearted commitment to a radio-only convention, this second choice might be best for the industry in the long run.

But all signs from the past two fall radio conventions point to the need for a change. Perhaps it's time the radio industry had it's own full-fledged, major convention.

—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.

More on translators

Dear RW:

Of late, there has been much written about the alleged abuse of translators but very little has been printed about the underlying causes of the problem. Presently, the FCC is considering rule changes intended to resolve the issue. I think that this is an appropriate time to shed some light on a major factor that has contributed to the proliferation of FM translators.

Complaints of competition from translators seem to be most prevalent in the Southwest, and the Tucson market is cited as a prime example of abuse. Tucson is rather unique in that half this metro area of 600,000 presently has no FM broadcasting station above 99.5 Mhz on the dial. The entire upper half of the FM band is presently unused except for translators! Clearly, this is a spectacularly inefficient use of available spectrum.

A major cause of this inefficiency is a 1972 treaty between the U.S. and Mexico. This treaty set aside dozens of valuable channels for use in Mexican border towns that are simply too small and impoverished to support the facilities that have been reserved for them. Examples: Sasabe, Sonora (pop. 5,000) has four reserved channels. Naco (pop. 5,000) also has four. Sonora (pop. 12,000) has five, and Nogales (pop. 160,000) has eight. Of these 21 allocations, only three are on the

air. What's worse, not only are these unused channels going to waste but their adjacent channels must also be protected.

When it was enacted, this treaty undoubtedly had the wholehearted support of American broadcasters who realized that giving all this spectrum to Mexico would minimize future competition on our side of the border.

The translators came into being to satisfy public demand for additional sources of programming. Translators are a loophole in the treaty in that they need not protect Mexican stations that don't exist.

The solution to the problem is to renegotiate the treaty with Mexico and allow these unused channels to be placed into service by broadcasting stations instead of translators. Possibly, American broadcasters could use the Mexican allocations until such time as Mexican broadcasters claim them. If the channels ever are used by Mexico, the American stations could directionalize away from the border. Not only would this plan permit many new stations to be operated but it would allow existing stations to upgrade their facilities. The listening public would benefit from California to Texas.

The status quo benefits nobody except present station owners who dislike competition.

Paul S. Lotsof, Manager
KAVV (FM)
Benson, AZ

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

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CONVENTION COVERAGE

Radio '88: Ups and Downs

by Alan Carter

Washington DC ... It wasn't the worst of times, but it wasn't the best of times for the radio industry at Radio '88.

A record 6,529 broadcasters came to the nation's capital 14-17 September for the NAB's annual fall radio convention.

Sessions focused on AM and FM technical improvements, new listenership surveys and regulatory issues for management, programming, sales and engineering.

More than 180 exhibitors, of which about 40 were manufacturers and distributors of equipment, set up shop in 37,000 square feet of floor space.

While there were ups, there were also downs.

Not quite ready

The much touted and awaited "ultimate radio" promised for the show was not finished. The design by New York consulting engineer Richard Sequerra was minus a working AM band and continuous tuning feature.

However, work on the radio that will have the latest technological developments such as FMX, NRSC and AM stereo continues.

Radio broadcasters also used the convention to rally forces for challenges both AMers and FMers face in the coming months.

A large contingent went to Congress lobbying for radio-only legislation, an idea to separate radio and TV issues in regulatory moves.

While such a move could receive a positive response on Capitol Hill, several representatives taking part in a panel discussion warned that issues such as the Fairness Doctrine or programming could be tied together in a legislative package.

FCC Chairman Dennis Patrick and NAB President and CEO Eddie Fritts, in a one-on-one session, addressed ownership rules and the renewal process.

Patrick aired his frustration at AM's disadvantage to FM because broadcasters can own an AM and FM but not two AMs. Patrick also asked for help from broadcasters in the Commission's move to clean up the comparative renewal process and remove application abuses.

Who's listening

In the area of listenership, broadcasters may have not heard exactly what they would have liked—especially in the AM arena. A national survey conducted by Bill Moyes of The Research Group found that AM has a tough battle to overcome listeners' habits of listening to FM and their perception that FM has better sound and programming.

And according to the study, "AM stereo" may be the wrong terminology to use on air. Apparently listeners do not believe AM can be in stereo, the study reported. To the average Joe and Joan listener, AM and stereo are a contradiction of terms.

The survey suggested AM broadcasters with stereo capabilities may be

better off promoting their sound with the frequency, along the lines of "Stereo 1330."

With a booth to promote AM stereo, Don Wilson, engineering manager for AM stereo broadcasting for Motorola, said the move by Chrysler to discontinue monophonic AM radio was a significant step for AM stereo. Beginning in 1989, Chrysler will feature only AM stereo/FM stereo using Motorola's C-QUAM system.

Wilson said it will take an industry-wide effort to sell AM stereo to the public. He said it would take customers asking for AM stereo receivers to get retailers to encourage manufacturers to make the radios.

On another technological front, Broadcast Technology Partners (BTP) was promoting its FMX FM stereo coverage extension system. Tom Keller, a consultant with BTP and a co-developer of FMX, was available to explain the system to broadcasters. Keller said broadcasters were responding positively.

Among equipment manufacturers and distributors with exhibits, there was a

seemingly reserved feeling of optimism.

While exhibitors reported light traffic, many said those they met with were talking business.



(From left) Patricia Diaz Dennis, Alex Felker, Al Martine and Gary Bruce listen to Ron Frizzell at NAB's Radio '88 AM rally.

"There are people out generally looking to buy," said Harrison Broadcast Products Manager Martin Burns.

Radio Systems Sales Engineer Paul McLane said he found people at the show were there "to make decisions to buy."

Radio Systems President Dan Braverman said since many broadcasters present were programmers and managers, he found it a good opportunity to promote his DAT products.

Fidelipac marketing VP Art Constan-

tine also noted that Radio '88 is an opportunity to reach managers and owners, whom he called the "financial decision makers."

Tim Schwieger, Broadcast Supply West (BSW) Marketing VP, said while he expected engineering traffic to be light at Radio '88, he was pleased with his contact with programmers and managers. To address that market, he displayed consoles and audio effects.

For the following week's SBE convention where the audience would be engineers only, Schwieger said BSW intended to display "the most technical gizmos you can imagine."

At the Northeast Broadcast Labs booth, sales manager Criss Onan said the company had seen a lot of people that don't attend the spring NAB convention. He noted a resurgence in clients who want systems installed as opposed to those who have staff engineers do the work.

Still some problems

While many exhibitors highlighted the positive in answering questions about the show, some expressed their discontent.

"They've got to get the smaller market guys in here," said Bill Ammon, who is in charge of radio marketing for CRL. He said the "fluff and frills" door prize giveaways offered by NAB were not enough to draw people onto the convention

(continued on page 9)

Digital Will Change Radio, Experts Say

by Charles Taylor

Washington DC ... Attendees of Radio '88's Digital Radio Station Seminar heard not only about how the new technology can be utilized today, but about how its future applications might soon change many dominant elements of station operation.

Close to 80 engineers participated in the eight-hour session which included seven speakers and a panel covering topics ranging from digital storage and editing/production to the use of DAT and CD.

Frank Sullivan with New England Digital in White River Junction, VT, outlined a future radio station that utilizes digital technology for storage, studio editing, production and special effects.

In the near future, Sullivan said, all music, news, commercials jingles and effects could be digitally formatted and available through an audio library.

"I envision a disk jockey sitting at a touch screen accessing the material that all the digital suites—production, news and editing—have put together



Charles Bates (l), Mike Sirkis, Steve Bellinger, Rick Cruz and NAB's Stan Salek discuss digital inroads in radio.

on a central audio store," Sullivan said. "Computers will be an integral part of the digital radio station. Bits and bytes will replace vinyl and tape."

The system, he said, will provide instant access to a large central data base, and allow the sonic benefits of high-quality digital audio, unheard-of speed and with editing, an end to the cut and splice era.

"It will be a non-destructive editing environment," Sullivan said. "Safety copies won't be necessary and all can be reviewed and altered any number of times without destroying the original audio. You'll be able to edit down as fine as 1/100,000th of a second."

Digital storage

Digital storage was also discussed in the seminar, by James Tucker with Broadcast Electronics Inc., who outlined a "perfect storage device wish list."

"I'd like to tell you I'm here to in-

troduce a new storage device. Unfortunately, I'm not," he said. "The right storage device isn't really here yet."

Tucker's ultimate storage machine would allow instant access to individual stored cuts, forward and reverse jog for locating positions, "cut and paste" capability for editing, durability and the ability to record at real time, he said. It also would include a removable component, such as a disk or tape, to allow unlimited storage.

Tucker also outlined the pros and cons of CD and DAT as storage media.

CD allows for high storage volume, low cost to produce large quantities and fast access to tracks, however, is not recordable and is subject to mechanical failures with its spinning disk drive, he said.

DAT's low cost and writable format *(continued on page 10)*

Products Track Industry Trends

Washington DC ... The NAB's fall radio show is not usually a time for major technical product introductions. But Radio '88 became the exception to this rule when several companies chose the convention to unveil new gear.

Some 181 companies exhibited at the show and about 40 were technical equipment vendors. The mid-Atlantic location



lured several companies who normally don't exhibit at this convention.

There was also no evidence that the Society of Broadcast Engineers convention, held less than one week later in Denver, kept exhibitors from attending either show.

Digital, that buzzword of the industry over the last few years, was again the focus of many product introductions and enhancements.

The NAB held a digital seminar for engineers concurrently with the convention, and its large attendance was ample proof that interest in the new technology has not waned.

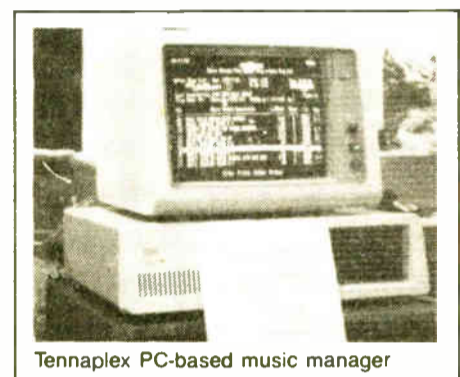
Although engineering attendance was not high (only 160 registered as engineers) many of those who did attend

were engineering group managers and directors of engineering at stations in nearby major markets such as New York and Philadelphia.

Digital leads the way

Harris Corp., still immersed in publicity over its recent acquisition of Allied Broadcast Equipment, sported a Harris-Allied sign at its booth.

The company surprised the industry with the introduction of its DX-50, the 50 kW extension of its digitally modulated transmitters for AM. There was a module from the DX-50 at the show while work continues on the first production model, already sold to KFBK, the Group

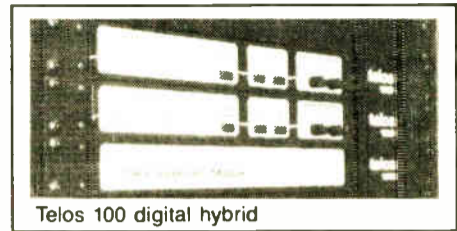


W station in Sacramento.

Harris also unveiled a new line of transmitters for FM, three from the HT series, available in power levels from 3.5 kW to 35 kW. Each one features a single, high efficiency tetrode in a standard quarter-wave cavity and each features Harris' solid state FM exciter, THE-1, introduced at the NAB's spring show.

Another strong, yet unusual, showing

in the digital category came from New England Digital, which has been trying to market its Synclavier and Direct-to-Disk systems to radio stations.



Los Angeles' KIIS-FM has been using a Synclavier and providing input as to its potential for radio use. Up until recently the cost of the hard-disk based system has been prohibitive for most stations, but NED has plans to scale down a version specifically for radio station use.

Best of the rest

The majority of other product introductions at Radio '88 reflect varying trends in the industry.

Omega International has been responding to changes in the rules governing synchronous repeaters for FM and had information and products for stations interested in making use of high powered boosters.

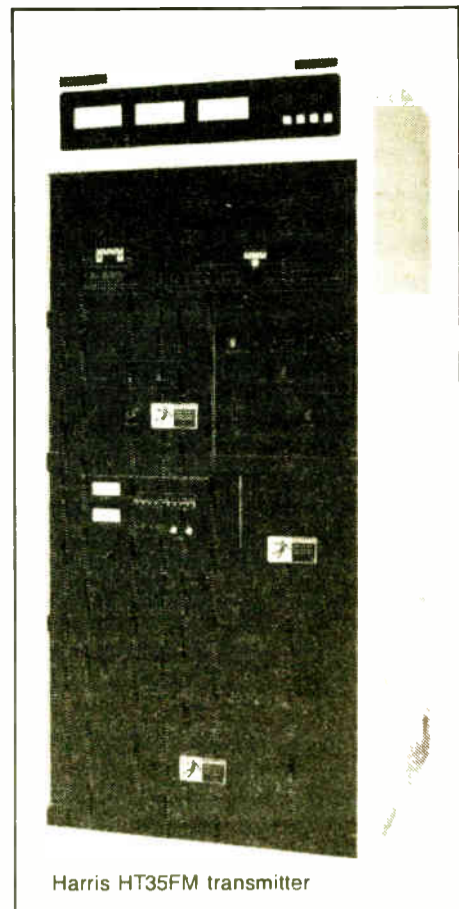
Studer showed its A730 CD player, a pro model incorporating improvements over past professional offerings and benefiting from Studer's partnership with Philips.

Tennaplex, in addition to showing its usual line of antennas, deviated with a product designed to manage music libraries by computer.

The software system and driver can control libraries on CD, DAT, hard disk or any combination of those, and programming parameters as well as a music data base can be programmed in. The system works on IBM or compatible PCs.

Delta, which has been the first to respond to broadcasters' needs to monitor the NRSC standard, showed prototypes of two devices in the hopes of getting feedback from engineers.

One is a stereo noise generator to create the USASI pulsed noise testing the NRSC signal requires; the other is a preemphasis monitor so stations can insure compliance of their audio with the



standard. Delta previously introduced a splatter monitor, also designed to help stations conform to the NRSC standard.

Eventide introduced broadcast features and effects to its Ultra Harmonizer which was unveiled earlier this year.

Allied had the first showing of the Finial laser turntable, which plays vinyl records with a laser beam.

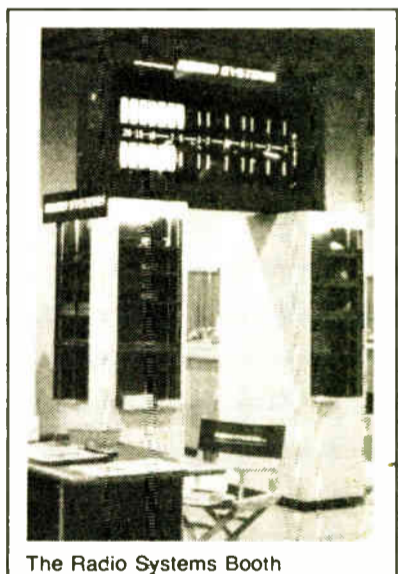
CRL showed a revamped AM receiver featuring wide bandwidth, C-QUAM stereo and NRSC deemphasis. The company also introduced an FM/TV monaural audio processor.

Harrison unveiled a new console, the AP-100, or "air personality" model.

Texar's processing equipment was displayed in the Gentner booth, with Gentner's recent acquisition of the processing company.

Bradley Broadcast featured the Telos 100 digital hybrid and also showed a portable Sony DAT player for professional use.

And Motorola AM stereo announced that Chrysler has decided all of its cars manufactured from this point will have C-QUAM AM stereo in them, with mono AM radios being discontinued.



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AM Losing to FM on Many Fronts

by Alan Carter

Washington DC . . . The fact is the average listener to radio in the US is pretty picky when it comes to switching that dial from FM to AM.

Two NAB surveys on AM reviewed at Radio '88 showed that AM broadcasters have an across-the-board battle in programming, sound quality and lifestyle if they are going to hold their own with FM.

When it comes to AM vs. FM, listeners choose FM by habit, because the programming is perceived as superior and because the sound quality is better, according to results from a survey of 1800 listeners conducted nationwide by The Research Group of Colorado Springs, CO.

A second study conducted by the Chicago-based research firm of B. Angell & Associates, and this summer submitted by the NAB as part of its comments on the FCC's comprehensive review of AM technical standards, found current interference protection contours are

Radio '88

(continued from page 7)
floor.

Neil Glassman of Bradley Broadcast Sales said he had hoped more engineers would be at Radio '88, but the staff was able to spend more time talking with individuals.

Auditronics Executive VP Steve Sage said he didn't come to Radio '88 with high expectations and said therefore that the show had been "positive" in that regard.

Sage, as several other exhibitors suggested, thought the exhibits should be open for two full days rather than two and one-half days. The half day was a waste of time, he said.

Still concerned about NAB's policy for guest passes at the radio show where exhibitors are given a limited number based on the square footage of booth space, Sage said guest passes should be issued in the same manner as at the spring convention. They are sold at a minimum price. "That worked well," he said. "You don't have to pay for it unless it's used."

At first NAB was not going to issue guest passes at Radio '88 but changed its position when some exhibitors complained. In the place of guest passes, NAB issued \$50 discounts exhibitors could distribute.

But Pacific Recorders and Engineering Jack Williams said NAB came up with "too little too late."

Without a guest pass or a discount, it cost \$100 to get on the Radio '88 exhibit floor only.

sufficient for co-channel AM stations but woefully inadequate for adjacent channels.

The study also concluded that listeners generally accept much less interference on talk segments than they do on music, and interference tolerance can vary according to the type of music a station plays.

What's AM?

To listeners, AM radio is weather, news and then music, said Bill Moyes, president of The Research Group.

Compare those findings to FM, and there is a different story. The word is music for FM and listeners know what music to find on which stations, he said.

"(Listeners) know what's at 101 in their market and what's at 102 and 94," Moyes said. "There's a corresponding lack of knowledge for many people . . . about what's on different places on the AM dial."

Moyes said listeners just don't like what they hear or how they hear AM radio.

"The first hurdle, or barrier, we have is programming . . . and for every person that is different," Moyes said. "You've got to have programming that (listeners) like or you don't get anywhere."

Listeners also want good quality sound, which Moyes suggested could be accomplished by tackling three fronts:

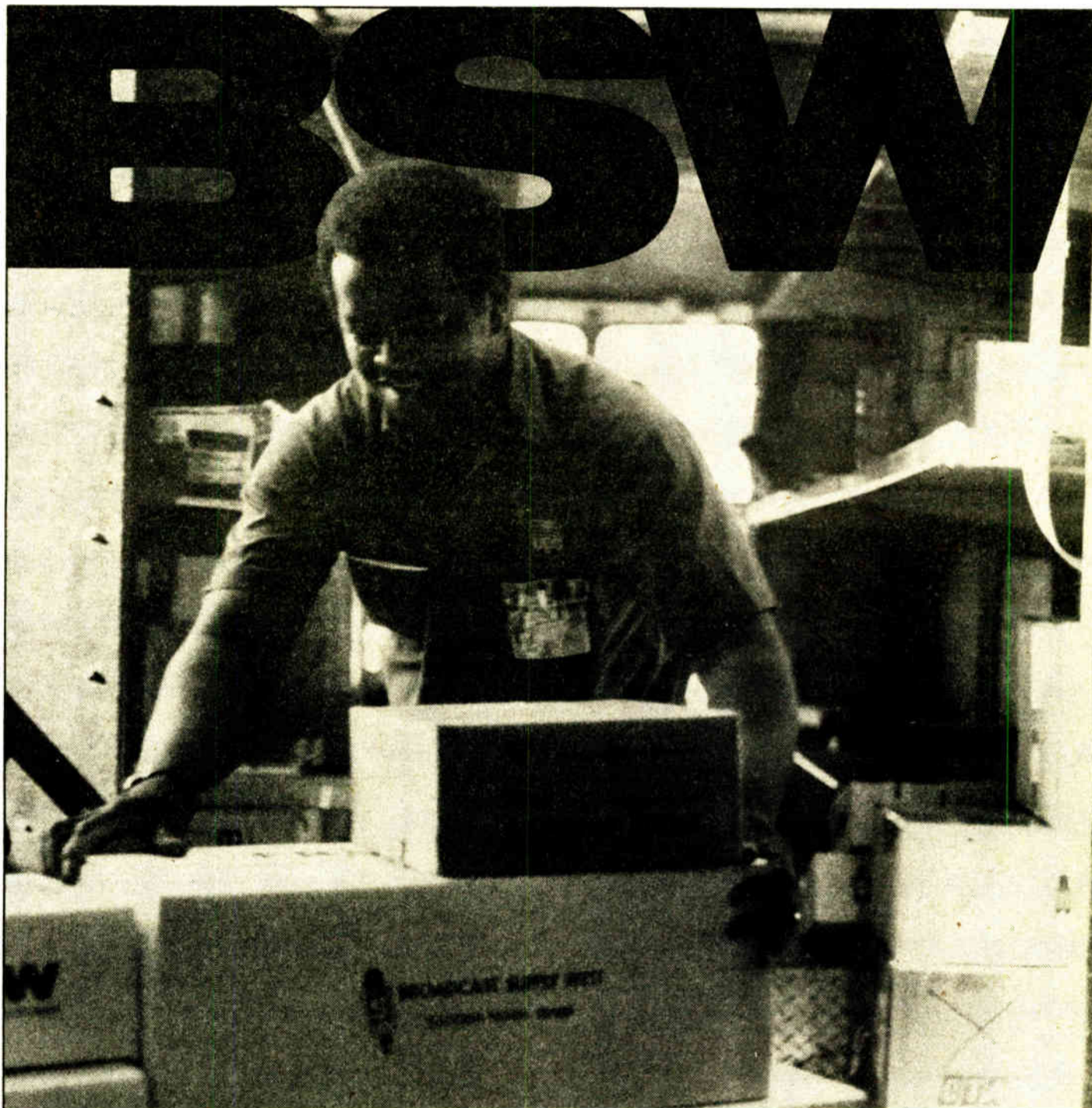
transmission, interference and receiver reception.

Even AM stereo is a problem, the survey found. Listeners think of AM and stereo as a contradiction of terms. "AM is saying one whole thing to them about poor quality and stereo is saying all the good things," Moyes explained.

The finding on stereo perception suggests, Moyes said, that stereo on AM may have to be marketed differently from stereo on FM. Rather than saying "AM stereo," the right wording may be stereo and the station frequency or call letters, he added.

A final "barrier" Moyes said AM has to overcome is that listeners have grown to like FM and turn to it by habit. When habit and satisfaction are high, the competition has a tough battle to wage, he said.

(continued on page 10)



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Circle Reader Service 21 on Page 34

Circle Reader Service 44 on Page 34

Seminar Tackles Digital in Radio

(continued from page 7)

are plusses, while its fragility is a disadvantage.

DAT/CD equipment

Dick Wagner with Concept Productions in Roseville, CA., led a discussion on DAT/CD equipment and automation uses. Included was a comprehensive comparison of DAT with other transmission sources.

First, he outlined the disadvantages of using DAT for airplay: its lack of cuing accuracy, lack of a wired remote and the mass of controls on a DAT's front panel, making its use impractical for live studios. Also, he noted that the two second time required to start the machine's drum rotating and lock onto the track is inconvenient.

Advantages of the format, he said, include the smaller size of the DAT tape in comparison to a cassette or 10½" reel-to-reel tape; and the DAT's better frequency response with no tape hiss and no base error.

Compared to the CD, Wagner said DAT offered a more protected, easier to handle package. However, he noted the DAT is slower to cue and required periodic head replacement.

Over the hard disk, Wagner gave preference to DAT based on price. Typically, DAT costs between \$1500 and \$2000, and \$10 for a two-hour tape. Hard

disk drives range between \$8000 and 10,000, he said.

"Hard disk, however, has instant access, very unique editing capabilities and seems to be ideally suited at this time to production room use and for commercial storage," he said.

In DAT versus half-inch beta, Wagner said that DAT takes less pre-roll time and the tape package is smaller, but DAT has less storage: two hours against half-inch beta's three hours.

8 mm stacks up

Still, three hours storage doesn't stack up against Wagner's final digital equipment comparison, 8 mm, which offers 12 hours capability.

The format also offers better frequency response, he said, faster cuing, and "the deck itself is more easily adaptable to random access." But he also noted 8 mm's biggest disadvantage, its tendency for tape dropout.

Despite the advances that digital is bringing to stations, its applications won't simplify everything. The conversion from analog to digital will likely be a slow, deliberate process for most stations, according to Skip Pizzi with National Public Radio, who spoke on digital interconnection and communications.

Studio wiring requirements, for example, currently require AC power, audio and remote control hook-ups at most sta-

tions. A digital station will require a more complicated hook-up that includes AC power, analog audio, digital audio/electrical, digital audio/optical, transport, electronics and synchronization control capability.

But despite the increased wiring requirements, a number of stations already have begun making an entry into more than just airing music over digital equipment. In the seminar's final session, a panel described how digital is being used to its current fullest potential already.

Rick Cruz with WQIO in Mt. Vernon, OH, who claimed his station was the first on the continent to use DAT on the air, said the station employs four DAT machines for music, commercials and promotions.

Steve Bellinger with WJZ Radio/Systemation in Decatur, IL, praised the 8 mm format as the cheapest convenient storage facility. He figured that 300 songs stored on a single 8 mm tape (20-hour tape) cost about 3 cents a song.

In comparison, DAT's typical tape would hold 40 songs at an average of 35

cents a song; reel-to-reel averages 15 songs at 40 cents a song with no random access; cart offers one song per tape for about \$6; and hard disk two songs at \$25 per song. CD might offer two desirable songs on a pre-recorded disk at about \$8 per song.

Charlie Bates with ITC/3M, discussed the company's digital cart machine, which he said offers an accepted, practical format with the new advantage of digital quality.

Presentations within the digital radio station seminar also were led by Richard Cabot of Audio Precision in Beaverton, OR, on digital basics; Nick Richards of Harris Corp. in Quincy, IL, on digital AM transmitters; and Robert Zavrel of Digital R.F. Solutions in Santa Clara, CA, on proposed digital FM transmitter equipment.

Zavrel explained the use of numeric oscillators, which use digital technologies to improve performance over other oscillators, to modulate FM signals.

He outlined his company's NCMO™—number controlled modulated oscillator—approach to direct digital synthesis which he noted could result in a completely digital FM broadcast system, by providing digital performance all the way through the transmitter.

Studies Reveal AM's Woes

(continued from page 9)

"The future of music programming in AM radio is not dead, but it has to be approached in the right way from a strategic standpoint," Moyes said. "Alternative formats really hold some sensible victories, and we need to start thinking of those victories as sustainable victories."

Moyes, who owns AM and FM stations, said broadcasters with AMs should go after winnable victories.

He suggested looking at the age groups listening to AM when considering a new format.

The survey found that almost 60% of all listeners 55-64 listen to AM, with a steady decline to only 21.4% of those 12-17.

Moyes said an ideal target market would be listeners over 25 and, in particular, those over 35 because these are the groups AMers could best nurture and bring back to the band for the long-term.

"That's where you see the most peo-

ple in the church that you can preach to and bring home the victory," Moyes said.

Inside radio

From the inside looking out, another study—of radio programmers—commissioned by NAB found 90% of this group believes radio stations sound too much alike.

Conducted by Jon Perikhal and John Oakes of Joint Communications, Toronto, programmers also predicted a drop in listeners' loyalty because they are pressured for time and are becoming much more selective.

How do radio programmers think they can keep their ratings? Give them more promotion money, according to the survey.

Of more than 500 surveyed, 30% said a larger promotion budget would make their jobs easier; 26% said they needed more audience research information; 9% wanted more off-air promotion marketing, and 4% needed more time to get their jobs done.

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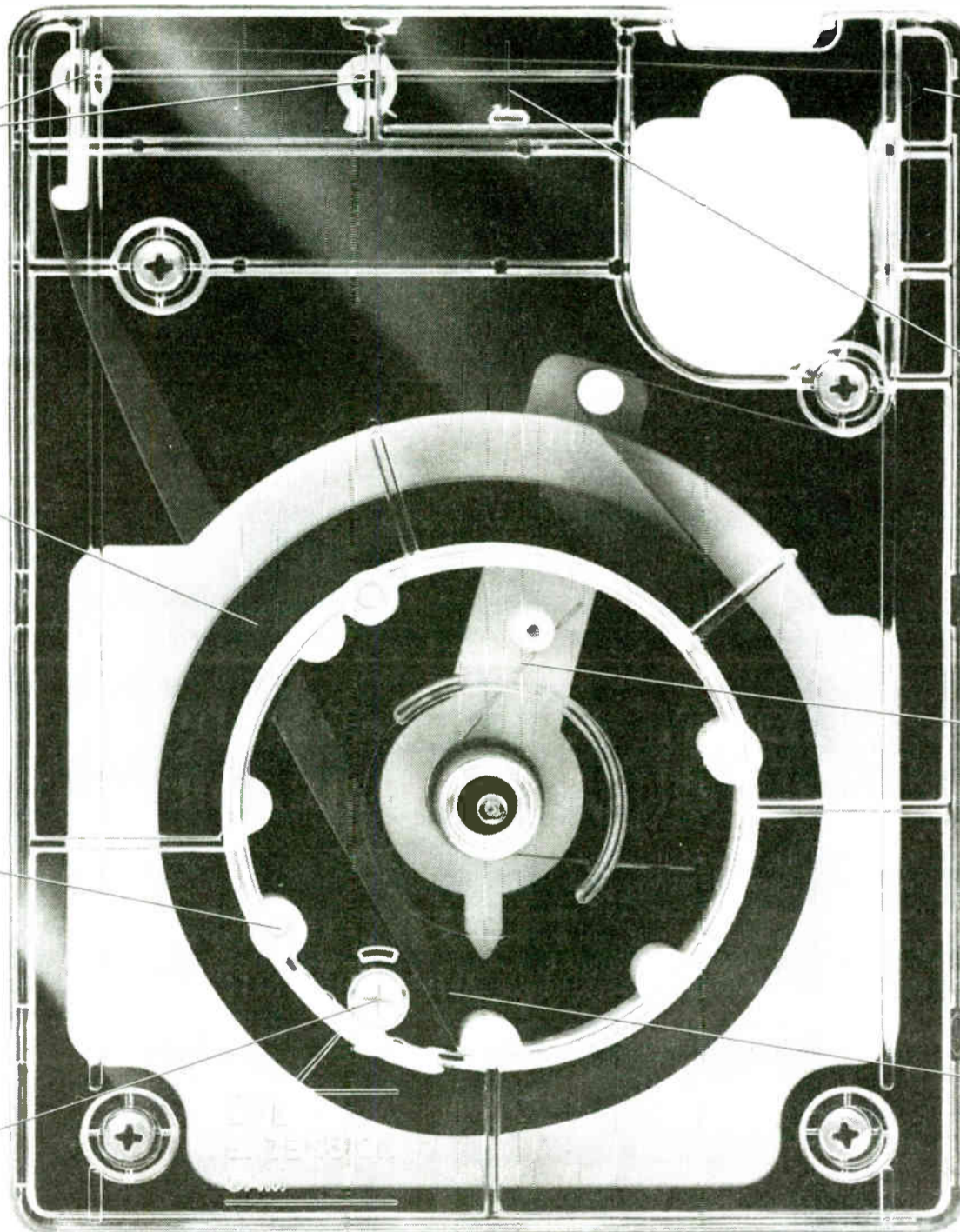
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Hassinger Speaks On AM Technical Action

by Alan Carter

Washington DC ... With several efforts underway designed to improve technical standards for AM, broadcasters at Radio '88 were briefed on where efforts stand at the FCC and industry-wide.

Bill Hassinger, assistant chief for engineering in the FCC's Mass Media Bureau, wasn't hesitant to say AM doesn't sound good and to place the blame across the board.

"We've got too many signals, there's perhaps too much power over their air at certain times, the signals are over-

processed, the receivers are about as bad as you can build one, the service areas are irregular—and that's not very conducive to a steady audience," he said.

Broadcasters have succeeded in creating an AM service, he continued, that has lost its attractiveness to the audience.

But Hassinger said broadcasters must ask themselves where do we go from the current situation, and what are they going to do about it.

Possible solutions

The FCC will issue proposed rule makings "fairly soon" based on the agency's notice of inquiry on AM tech-

nical standards, Hassinger said. "We are going to move on AM improvements in the technical area," he added.

Of particular concern, Hassinger noted, is "grandfathering" existing stations immune to new changes.

"I don't think we are going to get anywhere if we have to follow along that path," he said. "It's going to take 50 to 100 years to get out of the problems (under that policy), and I'm not sure that AM is going to survive all that long."

On another area related to the improvements that became part of the FCC technical review, the NRSC preemphasis and RF emission standard seem to be on a fast track moving through the FCC, according to Charles Morgan, VP engineering for Susquehanna Radio Corp. and chairman of the NRSC.

The FCC issued a proposed rule making to make the NRSC standard mandatory, following a NAB petition. Com-

ments are due 22 November with reply comments due 22 December.

Help on the way

Morgan called the NRSC standard for preemphasis the "key" to get stations to limit out of band emission.

As for receivers with NRSC capability, Morgan said they are "slow in coming." He said manufacturers reportedly have NRSC capability in some receivers but haven't installed the software. He also said production models may be out next year.

In another area, consulting engineer Wally Johnson briefed broadcasters on proposed expanded AM band for 1605 to 1705 kHz for which a proposed rule making is expected from the FCC. Broadcasters have filed comments on how to allocate the band, generally rejecting a Commission proposal to create national licensees.

Growth in PC Use by Engineers

by Charles Taylor

Washington DC ... Consultant Karl Lahm doesn't enjoy drawing technical configurations.

"If I try to draw with pencil and paper, I end up with lead smeared all over the paper. If I try to use ink, I end up with the ink all over myself," said the president of the consulting firm Karl D. Lahm & Associates.

Lahm's woes have ended now, thanks to one of the several two- and three-dimensional personal computer software programs currently available, which he said are capable of handling 90% of the drawing applicable to a radio station.

Increasingly, the personal computer is becoming a useful tool for broadcasters, with applications ranging from illustrating directional antennas to deriving station spreadsheets.

The Radio '88 session, "PCs for Engineering Applications," allowed several engineers to demonstrate how they have used various computer programs to not only hasten certain tasks, but for innovating ideas.

Stan Salek, staff engineer at NAB and the session moderator, first demonstrated a software package, DFDP (Digital Filter Design Program demo disk), available free from Atlanta Signal Processors, that is capable of designing electronic filters, both analog and digital.

Salek utilized two pieces of software to design a seventh-order elliptical low-pass filter, which corresponds to the NRSC standard.

He also showed Micro-Cap 2 from Spectrum Software, which further aids filter design.

Tom Osenkowsky, an engineer at WLAD in Danbury, CT and also a consultant, showed in his demonstration that "a computer can handle very simple problems such as calculating reactance or it can get into very complicated matters such as array tune-up and network design."

He hypothesized, "For a frequency of 1470 kHz, I have a number of standard and nonstandard values of capacitors and inductors and their reactance at the
(continued on page 14)

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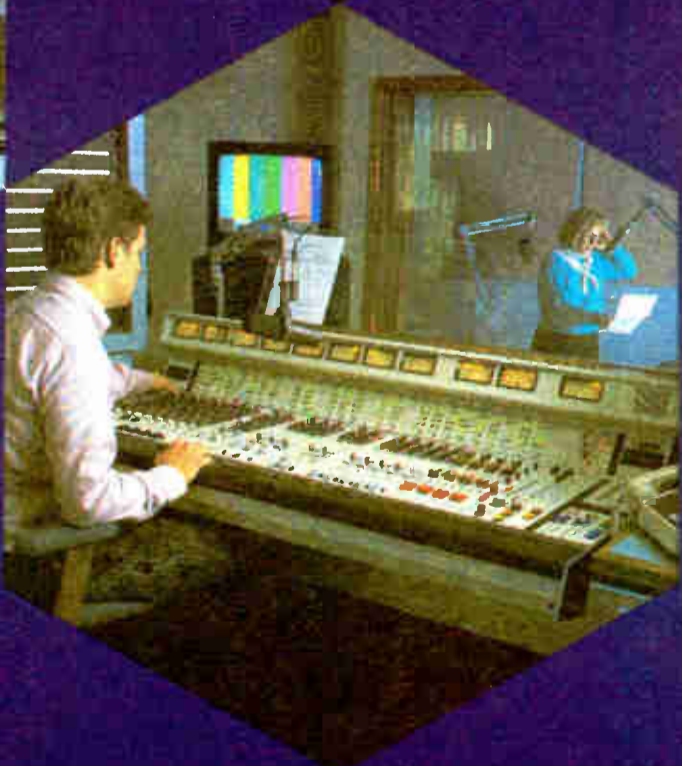
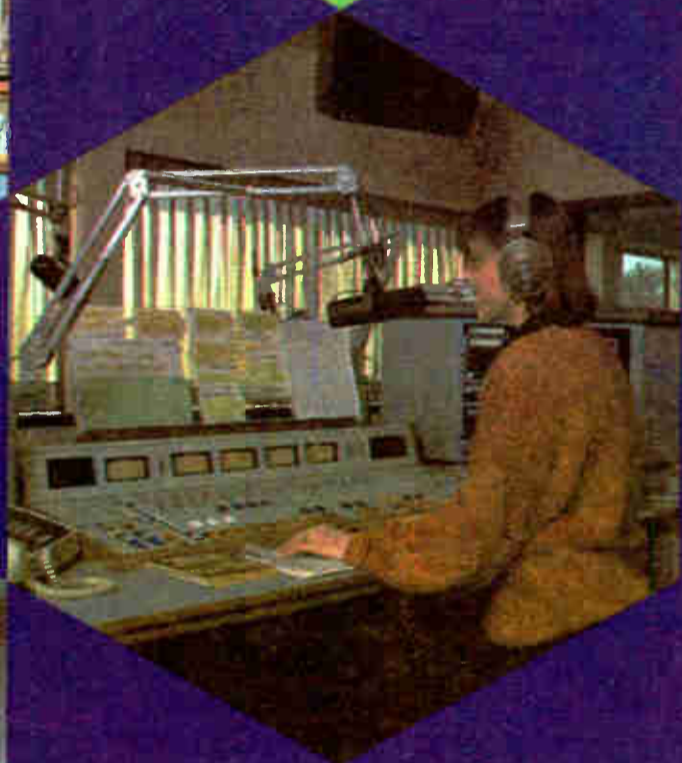
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EPA Gets Tough on PCB Violators

(continued from page 1)

lectively through a licensed agent. It costs them one tenth of what it would cost them individually."

According to Terry Hollenberg, a radio field service supervisor with Harris Corp., a lot of PCB-laced broadcast equipment—both primary and standby—remains in the marketplace.

Still, he said, "A lot of stations are replacing the PCB-bearing components and going through the proper disposal of them. Some of the capacitors cost a couple hundred dollars, and I've heard figures of \$1500 and up for disposal."

APTUS, a waste removal company, has removed a substantial amount of PCB ca-

pacitor banks and PCB-bearing transformers from radio and TV stations, though no rush has surrounded this latest EPA deadline, according to company official John Henschel.

"This has been a phased-in program beginning in 1978, and in a lot of cases, radio and TV stations are caught under earlier phasing programs, so a majority of it has already been taken care of," Henschel said.

Glynn Walden, engineering group manager for Group W Radio AM stations, said all of the company's 13 AM and FM stations have had PCBs removed from equipment at a cost of about \$5000 per outlet.

"We just didn't want to be bothered

with record keeping and all that stuff," he said. "We wanted the PCBs out of the workplace because the consequences of failing to do so are too high. They add up too quickly.

"Even so, I'm willing to bet that 90 percent of the stations haven't done a thing about PCBs," Walden said. "There are a lot of stations that just can't afford to (have them removed); these little radio stations that don't even have engineers."

Walden added that despite a recent policy of deregulation in government agencies, stations seem to be facing more regulatory burdens in areas such as RFR and hazardous waste.

"Stations are cutting back their

budgets for engineering, and yet they are faced with new government agencies looking over our shoulders. We're all of a sudden having to learn these names like Dykanol and Pyranol that we've never had to learn before," said Walden.

Such a fact is of little consequence to the EPA, however. According to the NAB's Justus, eventually all PCB equipment will have to be disposed of, so "it's better taken care of sooner than later from the continued liability question caused by a fire or a leak or a transformer blowup. Then they're faced with the extraordinary clean-up expenses."

The next step from the EPA will come a year from now, when transformers containing PCBs will be prohibited—unless a station installs specific electrical protection equipment designed to prevent a blowup.

The NAB Science & Technology department offers a free packet about PCB regulations. For more information, call 429-5341.

Engineering Goes to PCs

(continued from page 12)

particular frequency. It's a lot simpler using a hard-printed version of this in the field if you're out at an ATU (Antenna Tuning Unit), and you want to know if a particular coil will work. If you're redesigning an ATU or a phaser, something like this is a lot simpler than using a hand calculator."

Lahm also demonstrated a sample station budget analysis, which included a history of expenses on local telephone use and an FCC news release service subscription. He used the program to demonstrate how spending can be traced month by month.

He also described the use of a PC for wiring documentation.

"I hate to draw all of my wiring documentation. With the data base system, you can key in a minimal amount of information, you can key what the ultimate source of a signal is, you can calculate where the wire is connected to, what wire number, where it goes, what it's connected to and what the ultimate load is," Lahm said.

John Reiser of the FCC described applications of a PC for spreadsheet capabilities. He also discussed its use for various filter designs, matching networks, and line losses and transmission line problems.

Finally, he observed, "I feel like I'm preaching to the choir here because I'm sure a lot of you are familiar with computer applications at the station."

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Sequerra Radio Reactions Mixed

by Charles Taylor

Washington DC ... Some radio engineers remain optimistic about the future of the "ultimate" Sequerra-designed radio, despite a lackluster unveiling at NAB's Radio '88 convention.

The incomplete radio also violated the NAB's contract with Richard Sequerra Associates.

The contract called for completion of three prototypes by August. The single model that debuted at Radio '88 was missing several anticipated technical features, leaving the NAB waving a balloon that hadn't yet been fully inflated.

Michael Rau, VP of NAB Science and technology, said the organization hasn't decided how to handle the violation.

When completed, the radio is intended to introduce to the marketplace a number of technical features not available in one receiver, including AM stereo, continuous tuning, FMX noise reduction, NRSC deemphasis, AM noise blanking and the AM expanded band.

One prototype will employ decoding for C-QUAM AM stereo, one for Kahn stereo and one for both.

Potential still looks good

Engineers who attended the Radio '88 conference generally felt that while the unveiling was disappointing, it will not affect the receiver's potential in the marketplace.

"It's unfortunate that the debut

worked out the way it did, but that's just fate. It's common knowledge that prototypes sometimes have their infant mortality problems," said John Marino, VP of engineering for NewCity Communications.

Added Glynn Walden, engineering group manager for Group W AM stations, "I feel bad that the radio wasn't ready. I especially feel sorry for the people at NAB in Science & Technology who were worried crazy about the thing for the whole convention. But I think that in the long run (Sequerra) is going to deliver a great radio. He's a very bright guy."

Marino also maintained faith in Sequerra. "If there's anyone out there who can do a good job on the thing, Sequerra's the one," he said. "I don't think there will be any problem with the introduction of the radio or the eventual licensing of the circuitry to other consumer manufacturers."

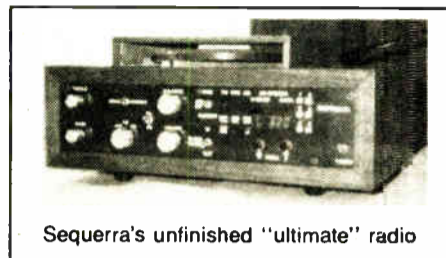
One of the NAB's main purposes in sponsoring the design of the radio is to offer its circuitry to receiver makers in hopes that they will employ the technology into their systems, thus sophisticating the industry.

Not convinced

Still, not all are convinced that the "ultimate" radio is enough to entice manufacturers. According to Eb Tingley, VP of engineering for the Electronic Industries Association, there first must be

some changes in broadcasting.

"If manufacturers see an opportunity to market a product, you can bet that they'll be there. The real basic problem is that manufacturers don't have the incentive to market a receiver of this quality," he said. "It would take a real radi-



Sequerra's unfinished "ultimate" radio

cal change in AM broadcasting. There are still very few stations that are broadcasting in stereo, for instance. That's probably the biggest problem."

For the NAB, however, the first priority is getting a working model of the Sequerra radio, which still has bugs left to work out, according to Rau.

"I think that there were some problems with the circuit board that Sequerra had designed and built for the receiver itself," Rau explained, adding "there were no problems when it was in breadboard form and was in a much larger physical construction, but when he attempted to shrink it into the box of the receiver, a number of problems reared their ugly heads."

As far as the malfunctioning continuous tuning feature, Rau noted, "There

was a decision point in August where he knew he would not be able to come up with any receiver had he tried to do the continuous tuning feature by Radio '88, so he took a short cut and put a more commonly available tuning chip into the receiver."

Still, "the chips work, the circuits work, the AM blanker—all that stuff is operational," Rau said.

Might be penalized

But because the system was not complete in August as stated in the contract, the NAB might penalize Sequerra.

NAB already has paid Sequerra \$37,500 of a total \$50,000—\$25,000 for the completed design and \$12,500 for the three receiver prototypes. The remaining \$12,500 was to be due upon completion of the receivers in August.

"We haven't decided how we're going to handle the situation. There might be some penalty to compensate us for the difficulty we experienced in the last couple weeks trying to get the receivers built," Rau said. "But assuming we get all three receivers built in an operational format, I'm sure Sequerra is going to be paid."

Rau had no estimate of a new completion date, but said that NAB hopes to show the receiver at the CES show in Las Vegas in January and to make it available for state meetings.

For more information, contact Michael Rau at 202-429-5346.

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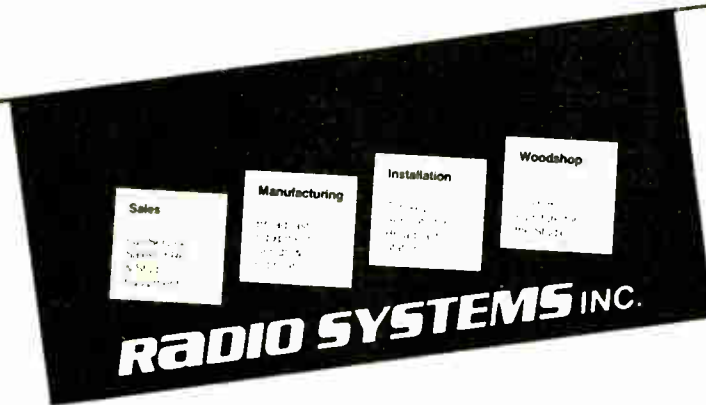
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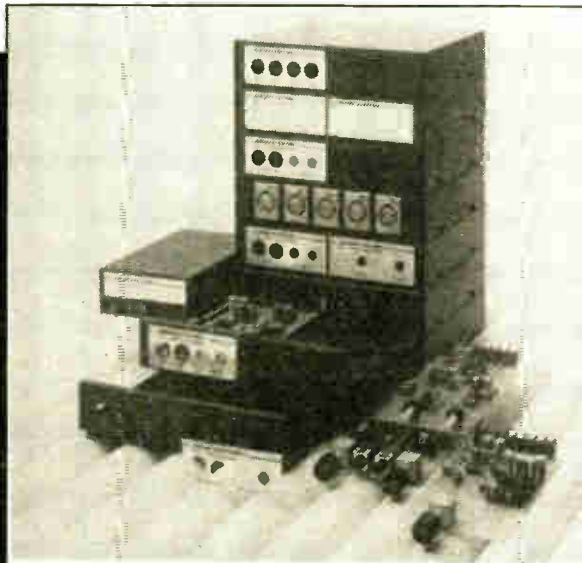
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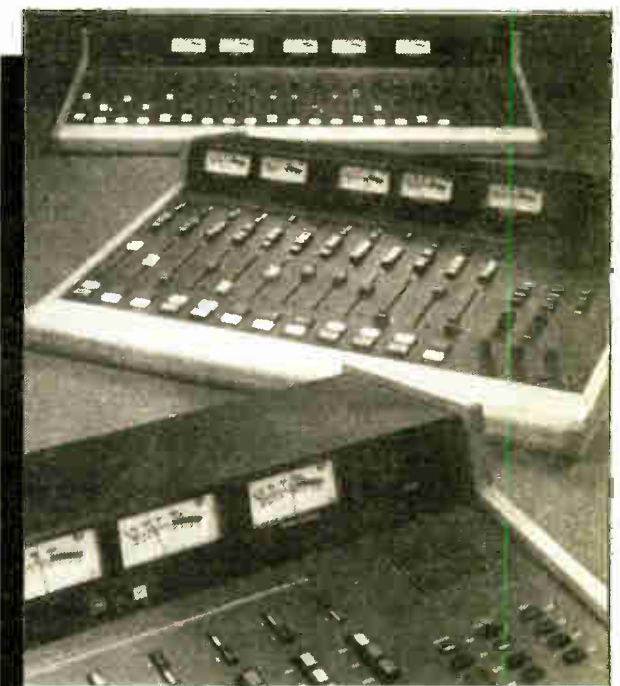
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NAB FM Panels Stress Transmission Quality

by Charles Taylor

Washington DC ... Today's radio listeners are sophisticated, demanding and selective in choosing a medium for news, information and entertainment.

Because of this, it is necessary for broadcasters to pay more attention than ever to improving the technical quality of transmission. That was the message at two Radio '88 sessions on FM improvement.

In panels on "FM Technical Improvement" and "FM Directional Antennas," methods of avoiding potential pitfalls of technology and best utilizing that knowledge were discussed.

Don Lockett with National Public Radio, moderator of the technical improvement session, qualified the scope of discussions by noting that in the near future many of the day's relevant issues will be altered by digital transmission.

But, he added, "Until we see implementation of a fully digitized form of FM transmission, the sonic advantages of FM will be challenged by the traditional rumblings associated with transmitting, propagating and receiving an FM signal with minimal degradation."

Some of the specific issues covered in the first session were receiver reception, the implementation of FM boosters and multipath problems.

Receiver reception foes

Receiver designer Richard Sequerra of Richard Sequerra Associates, addressed

problems with receiver reception, saying that some of their biggest foes aren't broadcasting-related, but instead relate to high-level signal handling capability, such as those from computers, garage door openers and telephone answering machines.

"The garbage is so great that it interferes with all radio reception at all frequencies," he said. "The amount of RF pollution has grown geometrically."

As a result, he said, consumers expect less, prompting engineers to put in less effort.

"Consumers don't expect (radio) to sound as great as a record at home, or a DAT machine. They expect it to sound like a radio. And this is one of the problems we have; engineers who are designing this say, 'Look, it's good enough. You can't hear any better.'

"Given these things, the engineer isn't going to do the best job."

FM boosters

Ed Anthony, FM exciter project engineer with Broadcast Electronics Inc., in Quincy, IL, centered discussion around practical considerations for the implementation of reliable synchronous FM boosters.

With recent changes in FCC rules allowing an increase in booster power from 10 watts to 20% of the maximum permissible ERP for the class of station, a surge of interest has been created in the broadcast medium, he said.

It also, however, has led to new

challenges for broadcasters, such as widened interference zones over traditional boosters, adequate signal ratios and the need to synchronize carrier frequencies.

One problem that now can occur with modulated carriers is time delay equalization, Anthony said. Any two signals with time delay between them can be completely cancelled at any modulation frequency where the time delay frequency is equal to 180° or multiples of 180°.

"This is immediately alarming because it only takes 7.5 μ seconds of delay to cancel a 67 kHz subcarrier; or 26.3 μ seconds delay will cancel your stereo pilot light completely and a 38 kHz subcarrier."

"Consumers don't expect (radio) to sound as great as a record at home, or a DAT machine."

A delay of this magnitude often is produced by low pass filters as found in STL receivers, he said.

Deviation calibration

Interference from boosters also can be related to deviation calibration. If both modulators are not carefully aligned, interference will occur, said Anthony.

Multipath reception problems were addressed by Tom Rucktenwald with Broadcast Technology Partners in Greenwich, CT. The problem often is provoked by the quality of receiver with which one is tuning in a station, he said.

IF filtering, which influences receiver selectivity and distortion factors, is one element that can affect multipath. Rucktenwald also discussed AGC, which controls the level and limiting of the signal in the IF to composite signal conversion.

One way to maximize receiver reception, he said, involves quality input to the exciter.

"The program source should be as clean as possible from noise and rumble, and you may want to provide some sort of band limiting and filtering on

there," he said. "Unwanted signals often waste power and they provide another signal source for intermodulation under multipath conditions."

Transmitter optimization for incidental carrier amplitude modulation and FMX are other ways to improve reception, according to Rucktenwald, who is working toward marketing of the system through BTP.

Rucktenwald said FMX offers quieter stereo, better stereo separation in car radios and reduced multipath distortion at a cost of about \$1800.

FM directional antennas

Included in the Radio '88 session on FM technical improvement was a discussion by Charles Morgan, VP of engineering for Susquehanna Radio Corp., on the pros and cons of the installation of directional antennas for FM.

The use of DAs for short-spaced FMs is the subject of a current FCC rule making.

Morgan, who favors limited-use directional antennas, noted that "the main problem concerning their widespread use is that proper safeguards in the design of these systems be put into place, and the fact that we do not get into using them for allocation," he said.

One of the best safeguards is installation of a panel antenna with total shielding, he said, which will make the tower transparent.

"You can design it and build it upon your tower at (a manufacturer's) test range, and at that point you should be able to totally alter the structure—put in more cross beams, put in more transmission lines, do anything you want to electrically remove the structure from the design of the pattern—and have nothing happen," Morgan said.

Morgan also recommended site inspections once tower transparency has allegedly been established.

The directional antenna seminar also included a discussion of the FCC's current proposed rule making on directional antennas by Robert du Triel of du Triel, Lundin & Rackley; and comments from antenna manufacturers Tennaplex, ERI and Shively.

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Circle Reader Service 4 on Page 34

IEEE Targets Radio Topics

(continued from page 3) also be present.

The most flexible interconnection is the use of a radio link, such as a composite STL between the main transmitter and the booster, Anthony said.

"This method has several advantages, including high-quality transmission, reliability, total signal control and economy," he noted. "It is also capable of transmitting the frequency reference signal with the composite stereo via subcarrier."

Anthony offered dedicated phone lines as perhaps the only option when frequency allocations for a radio link are not available. They are, however, expensive and beyond the technical control of an engineer, he said.

They also are difficult to equalize adequately, and maintaining good phase relationship between both lines in stereo can be burdensome, he said. "However, it is a viable alternative, and in fact a good percentage of AM stereo stations are currently using equalized phone lines for discrete left and right channel stereo."

Short antennas for AM

Carl Smith, owner of Carl Smith Electronics, reviewed short antennas and how to improve their performance. Smith's own short low-loss AM antenna was installed at KVOK in Alaska in 1974 and remains in good service.

This type of antenna is most useful for stand-by service, Smith explained, but with modifications using top loading, low-loss loading inductances and an insulated counterpoise, performance can be "quite acceptable" for general usage.

Top loading increases radiation resistance and lowers the base input capacitive reactance. It also raises the current loop on the tower and by adding a low-loss inductance at the top of the tower, the current loop is raised still higher on the tower, he said.

Low-loss inductance at the tower's peak can be achieved by insulating a suitable conductor inside the tower and shorting it to the tower to stimulate a short-circuited coaxial line with the open-end inner conductor connected to the top loading hat at the top of the tower.

To minimize ground losses, an insulated counterpoise can be used, according to Smith.

FM combiners

William Cordell of Spectrum Engineering Co., spoke on the advantages of selecting appropriate high-power FM combiners and how to go about it.

Cordell's association with combined stations includes One Sheel Plaza, an ERI installation built in the early 1970s. It was the first eight-station, high-power FM combined facility and

includes a bandpass branch-type system that handled 8 kW to 20 kW stations.

He noted that the primary motivation for combiners is to save money.

"If there are three or more FM stations wishing to combine together, the rule of thumb is that money will be saved. In this combined approach, operational dollars are also saved," he said.

Once a station configuration is established, which usually is the

most difficult task in combining, simultaneous equations of engineering design, construction and cost must be determined. Normally, cost should be figured at about \$50,000 per station module, Cordell said.

After, the positive results of such a configuration should become evident. They include: a bandpass combiner system with good insertion loss, good isolation, excellent group delay and excellent group delay bandwidth.

T.R. Garlington with Voice of America addressed an automated broadcast signal monitoring system, based on the agency's recently constructed 12' by 6' horizontal dipole curtain array antenna near Delano, CA.

The antenna is to be used for operational broadcasting and experimental studies and according to Garlington is capable of broadband operation over virtually all shortwave broadcast frequencies, beam slewing in the horizontal and vertical planes and beam forming.

Garlington presented numerous features of the system as

well as a detailed description of its elements. He also outlined future applications, which included capabilities extending into the real time processing of IF, AGC and audio signals, as well as for adaptive response to external events in the signal environment.

Finally, Carlos Pantsios with the electrical engineering department of University Simon Bolivar in Venezuela, and Frederico Pantsios with Radio Caracas Television, also in Venezuela, presented a paper on computer analysis of vertical radiation patterns of dipole panel array antennas.

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- Most complete variety of logic interfaces ever offered are available standard.
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Circle Reader Service 25 on Page 34

World Radio History

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Program Highlights

TUESDAY, OCTOBER 18

9:15 am Introduction and Welcome
 9:30 Back to Basics
 10:15 Towards Greater Potential in Technical Management
 11:00 An Overview of the Realities of Analog and Digital Audio
 12:00 pm Luncheon—FMX and HDTV Report
 2:00 to Equipment Exhibits Open
 8:00 Talk with the Federal Communications Commission
 3:00 Reception
 4:30 Let's Talk About Maintaining Your Outside Transmitting Facilities
 8:45 An Analysis of Multipath

WEDNESDAY, OCTOBER 19

8:30 am More About Digital Modulation
 9:15 Radiation Interference Measurements Using the Fly-Over Method

WEDNESDAY (contd.)

12:00 to Equipment Exhibits Open
 8:00 pm A Discussion of Measured Long Term Pattern Characteristics of a Critical 4-Tower Array
 3:15 An AM Mega Station Operation Utilizing Adjacent 50 kW Transmitters with Synchronized Audio Side Bands
 4:30 Reception
 8:00 Planning and Designing with Efficiency in Mind
 8:45 Practical Considerations for Implementation of a Reliable Synchronous FM Booster
 9:30 Engineering Forum: An Hour of Technical Give and Take

THURSDAY, OCTOBER 20

12:00 p.m. Luncheon—Fiber Optics for Broadcast and Codec Applications
 2:00 Adjournment

Engineering Forum Set for Madison

Madison WI ... The 34th annual Broadcasting Engineering and Telecommunications Seminar will be held here 18 to 20 October.

Included will be 22 various sessions or panels, and more than 35 equipment exhibits.

The seminar, according to Don Borchert, director of engineering at WHA Radio and Television in Madison, will offer engineers a forum to gain new information, share experiences and exchange ideas.

"While management attempts to cope with and utilize the new technical advancements, engineers strive to establish standards, system capability and direction," he said. "These are exciting and challenging times. We are on the threshold of a new decade and a new century."

Specific sessions will include: "Back to Basics," by Donald Markley, a consulting engineer in Peoria, IL; "Toward Greater Potential in Technical Management," by Timothy McCartney from KBSU from Boise (ID) State University; and "Practical Considerations for Implementation of a Reliable Synchronous FM Booster," by Ed Anthony with Broad-

cast Electronics.

A panel discussion will cover "An Overview of the Realities of Analog and Digital Audio," while Thomas Keller, co-developer of the FMX system and consultant to Broadcast Technology Partners is scheduled to present an FMX report. FCC representatives from Chicago; St. Paul, MN; and Kansas City, KS, will head up "A Talk with the Federal Communications Commission."

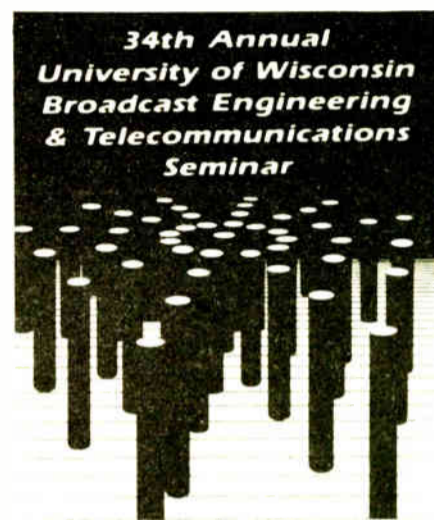
Multipath will be discussed by James Addie of WFMT in Chicago; fiber optics will be covered by Andy McCaskey of Grass Valley Group.

A discussion of "Measured Long-Term Pattern Characteristics of a Critical 4-Tower Array," will be led by Vern Killion of KRVN in Lexington, NE.

An engineering forum, "An Hour of Technical Give and Take," also will be included.

Cost of the seminar is \$135, which includes program materials, meals and receptions.

For more information on the Broadcast Engineering and Telecommunications Seminar, contact Don Borchert at 608-263-2157.



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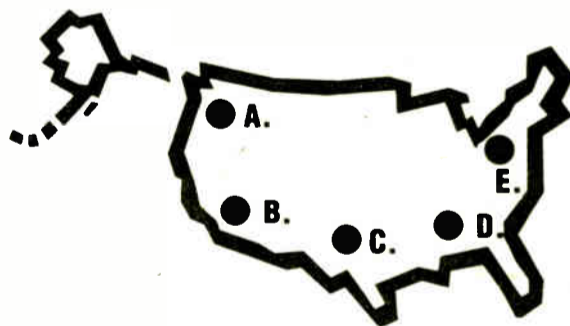


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Circle Reader Service 34 on Page 34

Getting the Perfect Vocal Take

by Ty Ford

Baltimore MD ... In addition to the *Producer's File* column, voice work, copywriting and production, I've recently been working on a project which teaches people (most of whom are not in radio) how to use their voices for commercials and narrations.

Unlike the many NAB convention seminars I have given in which program directors and a few production directors take the information back to the airstaff, this project is different because I work directly with people and their voices.

The people who decide to invest their time and money in this course do so because they have been told, or are of the opinion that, they have good speaking voices. Most of them do.

Because they haven't been in radio, they haven't acquired any of the bad affectations like the uvulan swirl of the CHR "Puker" or female sexual hyperbole "Big O" deliveries.

The original course, five hours of working with 20 to 30 people, makes it impossible to work one-on-one with any individual long enough to give more than a general awareness of the mental and physical skills.

After several classes, the students began asking for more. We have responded with an additional five hour course with no more than five students.

Four pieces of copy (narration, medium sell, hard sell and simple donut insert) are recorded by each student. At the end of each class the students receive a demo of their work as well as ideas on how to market their new skills.

Professional quality?

There are several questions which came up at the first sessions. For instance, "How come some radio and TV commercials sound so bad? Even I can sound *that* good."

While some of the commercials in question turned out to be those in which a client does the voice work, a great number of them were station produced spots.

The scariest thing was that after the introductory and second sessions, most of the people sounded as good as many of the announcer-produced spots in Washington DC—a top 20 market!

Of course the students didn't have to do anything as demanding as an airshift, but that's not the point. The point is, when the average public can do an equal or better job of doing commercial voice work and narrations it's time to wake up

and smell the head cleaner.

The ability to do good (not necessarily great, but good) production used to be a prerequisite for getting a job in radio. Its time has come again.

Producer's File

Why isn't staff production better than it is? Wouldn't better production make a better sounding radio station? Wouldn't better production cause fewer listeners to tune out? Isn't it time the PD got out from behind the computer terminal and did something about it?

Instead of being taken out to lunch by

the record promoters, spend lunch with somebody on your airstaff working on production. This means you buy the lunch.

Make it a party, don't go in unprepared. Pick up a copy of *How To Win Friends and Influence People* in paperback and read it before you start.

Also know what you're listening for and how to verbalize it. Good communication is the key to success. Be reasonable by accepting limitations, but be aware that most people need help in pushing past their own limitations.

Only as good as the read

Remember that good production starts with a good read. All the bells and whistles in the world can't disguise a bad read. Be aware that a good read is the result of mental and physical coordination.

Physically, the eyes must pick the words off of the page in phrases or thoughts instead of individual words. The concept is similar to that of speed reading.

Getting the eye-to-mouth link working properly takes some practice. Once it's learned the next step is showing where breaths may be taken so they don't interrupt the copy. Most staffers at stations should have these basics down, but your part timers may need help.

The mental part is the most difficult to work with because the results of controlling the mind are not as obvious as those of controlling the body.

Learning to listen is as important as learning to speak. Being able to detect **(continued on page 31)**

Improving On Telco Line Quality

by Bill Higgs

Louisville KY ... I have never decided whether telco is friend or foe. On the one hand, the new dedicated loop rates place remotes seemingly out of the question for many small stations.

On the other hand, RPU is equally expensive and therefore prohibitive. The choice often comes down to whether or not a dial-up line can be made to do the job.

BottomLine Broadcaster

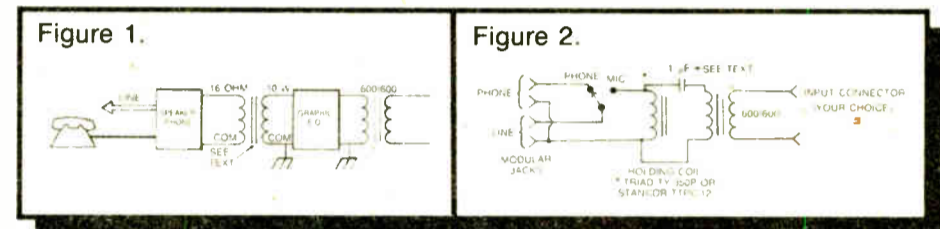
The purist in me cringes. Do a remote on a 3 kHz line? After all, didn't I just spend all last night tweaking the frequency response of the exciter? The fidelity of a dial-up reminds me of the drive-thru at the local burger emporium: all the bandwidth of a car horn.

Actually, standard telephone audio can sound better than you think. With a little attention to detail, it can sound almost decent.

"Limiting" factors

Local telephone companies have made significant improvements in recent years. Electronic switching, fiber optics and other gee-whiz gadgetry have become standard equipment in most areas. The result of this upgrading is that most of the classic limiting factors of the telephone system can be circumvented.

Two factors within the system must be considered. The first of these is line length. As a telephone pair becomes longer, it begins to act more and more



like a low-pass filter.

This is due to the series inductance of the line and the parallel capacitance. Dry loops exhibit the same problem. Compensation is usually made by an active or passive line equalizer.

The other problem is the instrument itself, specifically the carbon transmitter element.

(Want a "quick and dirty" telephone effect for spots? Use a telephone transmitter in series with a 9 volt battery. Couple to the board input with a .1 mfd capacitor. Sounds as lousy as the regular telco system!)

Several manufacturers offer electronic or passive hybrid equipment which provide excellent performance. These units are designed for full two-way mix-minus

operation and often include limiting and equalization as well.

They work great for two-ways on the air or for talk shows, but tend to be more expensive than many can justify for the occasional remote. Is there a cheaper way?

The capacitor-to-the-pair-phone-off-the-hook approach has been tried in numerous stations, including mine and found wanting. As my station carries several church remotes over dial-up lines, a better but cost-effective way had to be found.

One afternoon as I was strolling through a local discount store, I spotted a small imported speakerphone unit. Somewhat smaller than standard telco **(continued on page 29)**

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Battling Signal Artifacts

by Thomas Vernon

Harrisburg PA . . . Many stations only check their signal for harmonic and spurious radiation when it's proof time. As the radio spectrum becomes more crowded, however, greater awareness of the problem and its solution may be necessary.

Spurious signals are sometimes created by the presence of two (or more) signals being combined in a non-linear device. Even if your station is performing within specs, the Commission may at some point require additional harmonic suppression if your signal interferes with

another service.

The first step in tracking down harmonic radiation problems is determining whether the harmonics originate within or outside the transmitter. This is easily accomplished by switching the transmitter into a dummy load.

Station Sketches

If the harmonics remain, look for troubles inside the transmitter. A misadjusted output network, or one with components out of tolerance is the most likely cause.

Visually inspect the output network, looking for lightning damage and loose or corroded contact points. Check the tuning chart that came with the transmit-

ter and make sure that capacitors and inductors are as they should be for your frequency.

Go through the tuning procedure from scratch, observing harmonics as you go. It might be that the transmitter was never input properly.

Transmitters with harmonic resonators may need to have 2F and 3F traps readjusted periodically. Misadjusted traps can degrade transmitter efficiency by as much as 10%.

There may be instances where the transmitter's harmonics are within specs but coincide with another channel being used in your area. Additional suppression

Figure 1. A pi network has been traditionally used in the output of AM transmitters. On many transmitters the inductors are fixed, and the capacitors are variable elements.

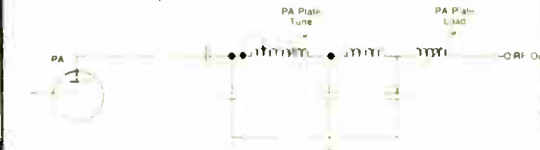
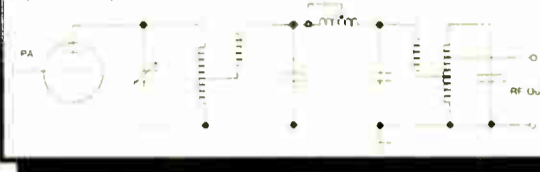


Figure 2. The bandpass filter provides superior harmonic and spurious suppression, as well as improved sideband performance.



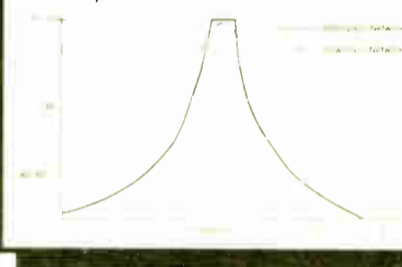
may then be necessary.

Harmonic suppression actually begins with the PA tank circuit, which is designed to pass fundamental frequency, and attenuates all others.

If the ratio of inductance to capacity in the tank circuit is decreased, attenuation of unwanted frequencies is improved but at the expense of increased power loss at the fundamental frequency.

In older transmitters a pi net usually follows the tank circuit, as shown in Figure 1. It attenuates all frequencies from the second harmonic up, but does little

Figure 3. A graphical comparison of lowpass and bandpass filter networks.



to reduce spurious below the resonant frequency.

In many newer transmitter designs, the tried and true pi net has been replaced by some form of bandpass network. A four-node network is illustrated in Figure 2.

This network offers the advantages of attenuation of unwanted frequencies both above and below the resonant frequency, along with a broader bandpass for improved sideband performance. The characteristics of the pi (lowpass) and bandpass network are compared in Figure 3.

Since transmitters with a lowpass network are more vulnerable to spurious signal ingress it's worth looking at reducing unwanted signals in these devices although the principals are somewhat universal.

Among the simplest filters that can be devised to reduce harmonics or spurious signals are shown in Figures 4a and b.

Adjustment for proper attenuation is critical, and is best accomplished with a grid dip meter. Attenuation of 25 dB is easily obtainable. The mounting should be for minimum coupling to other network elements.

If two frequencies need to be attenuated both of these circuits can be used. For signals that are very strong or spaced closer than 5% a filter with more than one resonant section is usually necessary.

If you've established that a spurious signal is not entering via the antenna, check the audio, power and control circuits. Two often overlooked culprits are the frequency and modulation monitor connections. If they're matched and grounded properly there should be no problems here.

But in the real world we sometimes find long, unterminated lengths of coax connected to the transmitter's "freq
(continued on page 29)

RADIO Classics

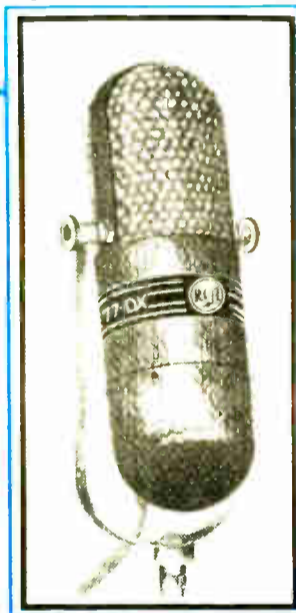
What makes a *Radio Classic*? Timeless design, flawless performance, outstanding value, and above all — bullet-proof reliability. Because, in radio, we don't coddle our classics.

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

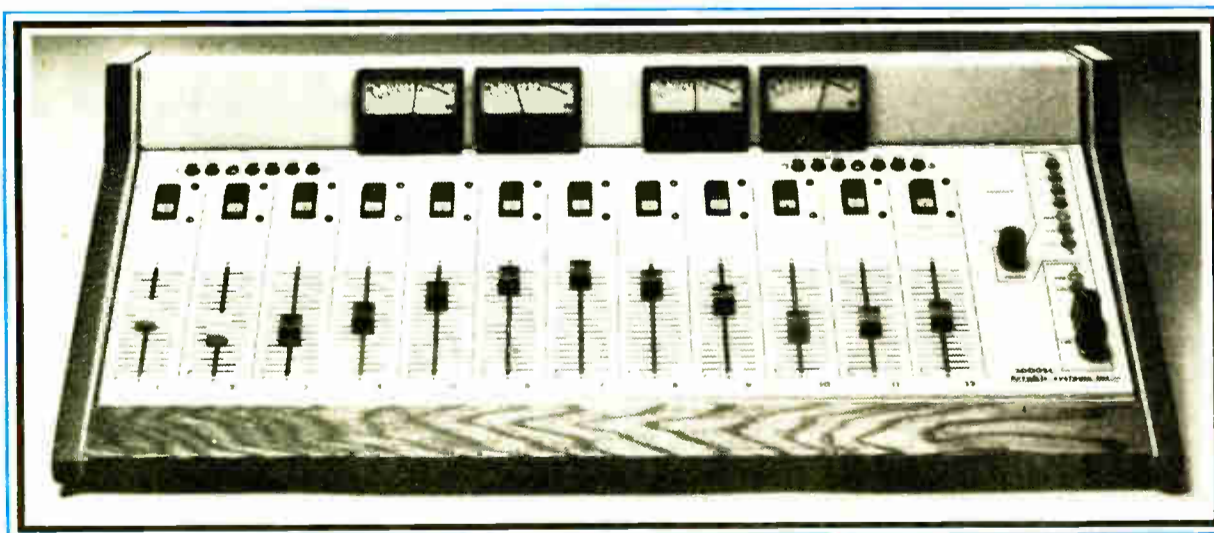


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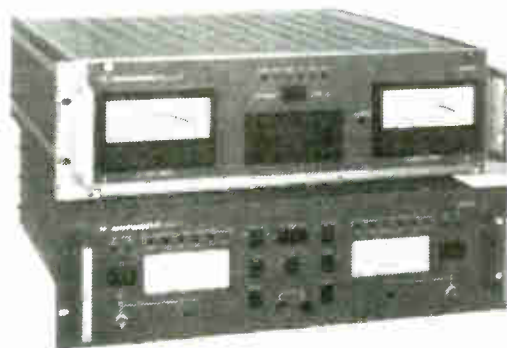
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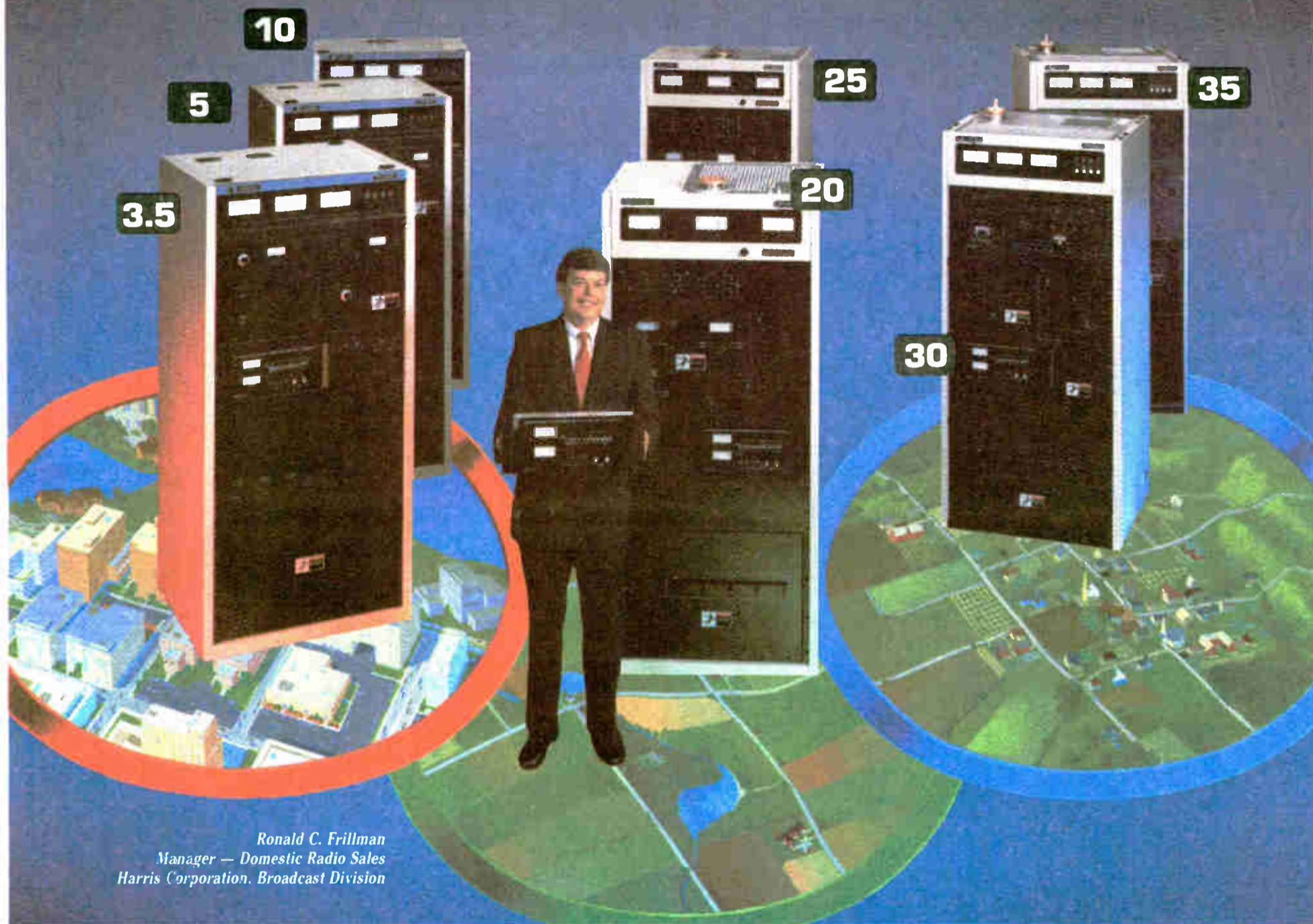


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Practical Concerns of Audio Router Design

by Fred Baumgartner

Part II of II

Denver CO ... When considering an audio switcher it's important to look at design approaches.

The internal structure of a switcher can be one of three basic designs, which are reflected mostly in cost. The simplest is the mono X-Y.

Signals enter a number of X channels and a series of electronic switches on the Y busses control which X the Y output sees. For stereo an identical X-Y operates in step for the other channel. This is referred to as two level.

Another approach is the stereo X-Y. Here the matrix is one level. A mono occupies only one X input. A stereo occupies two X inputs. A stereo connection then is made by turning on the switch between two separate Xs and two separate Ys (X1-Y1, X2-Y2).

A stereo load on a mono source connects two Ys to one X (X1-Y1, X1-Y2). The biggest problem arises when a stereo source is needed by a mono load. Either the load sees only left or right or a stereo output is taken and summed together.

The infinite matrix does things a bit better. Here any load can not only see any input, but can see several inputs simultaneously.

Built mostly for intercom type switches, these routers can mix any number of inputs to one output port. Cost, electrical performance and control are often not suitable for an on-air switcher.

The desired matrix design depends on such factors as the ratio of stereo to mono inputs. The two dimensional matrix simplifies control programming but is overkill for a large quantity of mono inputs. The infinite matrix seems more suited to communications.

Expanding switcher utility

Most of us can not afford a router with the total capacity we may need. But we can stretch both the inputs and the outputs through two methods.

In the case of inputs an upstream patch bay or selector switch can reduce the number of inputs by allowing selection of rarely used input sources to feed the router as needed.

This assumes that one knows when one will need a source and can communicate what selected inputs are on the routers.

Either printing a series of updated router guides or having a system that allows alpha-numeric labels to be programmed works nicely. If the controllers are pushbutton, relabeling the buttons gets tedious fast.

In the case of output ports, a downstream selector can work. For example, a series of small switchers ahead of a tape machine can allow it to select between several router ports. And the local board program, audition, etc., frees a port that might have been tied only to the tape machine.

Another approach is to parallel several items to each output port. A studio might have four ports that it can access. Each port goes to a separate pot on the board and to a tape machine and a cart recorder.

With some thought the four ports can serve the entire needs of the studio without the expense and problems associated with a second level of switching.

Putting several studios on a single output port also works but with the risk that there are too few ports available and that one may have a port switched away by another studio just when it is needed.

Programming departments have a way of applying pressure to expand the inputs and outputs if the system is overloaded. Directing this pressure to the budgeting

process sometimes works better than a lone engineer saying "we need more."

Routers on the market

The majority of routers available for radio are made for TV but minus the video level (these are normally three level routers of which you need one or two).

The controls tend to reflect the permanence of TV station design: a single master X-Y with numeric remotes. So it's back to publishing router guides every time you change an input. They almost always reflect TVs "unity" gain structure and need amps and pads on the inputs.

One of the more straightforward is made by Di-tech. A 32x24 two-level stereo runs about \$27,5000 with simple thumbwheel remote controls.

BTS (a joint company of Phillips and

Bosch) offers well-built but higher cost TV routers in an audio only configuration.

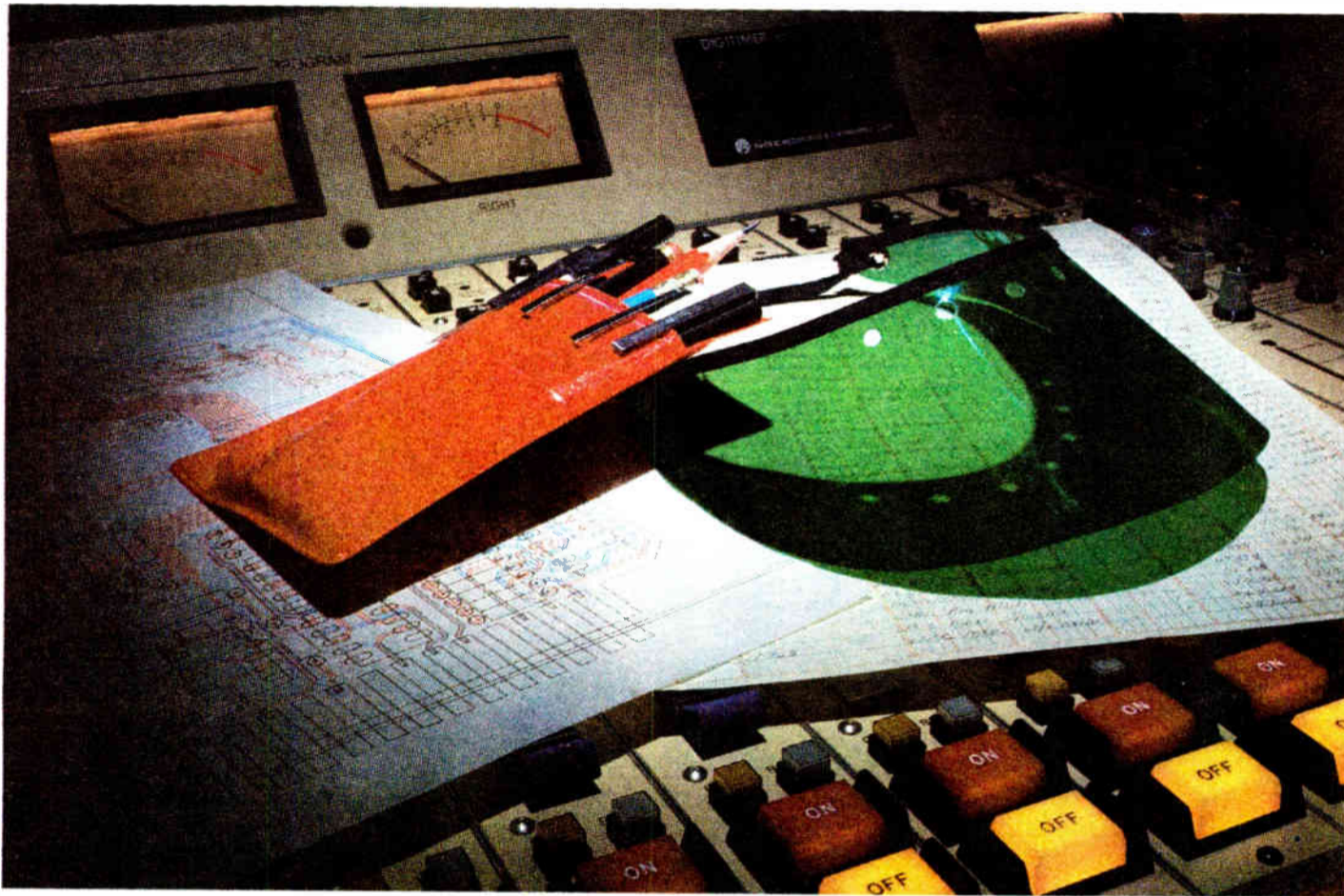
Image Video sells their 6200 audio matrix alone at about \$55,000 for a 60x32 matrix.

One infinite matrix system is the ROH that sells for about \$15.25 per cross point. Controls are available for the ARMS 7000 by using a PC type computer.

Moseley offers a versatile system. Using a PC and menu driven scheduler, it can switch on time or external cues. The matrix costs about \$8000 for a 16x16, one level. It can be configured in two levels if desired.

Designed to interface with GPIB, RS232, etc., it is well suited for automation or integration into another system

(continued on page 26)



Designed. Then priced.

Not vice-versa.

Other manufacturers set price goals, then commit their designers to create products to fit the price. Worse still, their prices must leave room for dealer profits.

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Your Station: Under the Lens

What the FCC Looks for When It Comes Calling

by Lee Freshwater

Part II of II

Flat Rock NC ... Last time we looked at how a station can prepare for that dreaded event: a visit from an FCC field inspector.

Now that the preparations are completed and the inspector is standing at the door, what can a station expect?

First, inspectors will be looking over the transmitting area very carefully. They will check on EBS equipment, transmitters and associated wiring, and metering. They will also check the general condition of the station wiring to see if any danger exists.

They will ask about the transmitter interlock and remote control fail-safe system, and may even ask you how the fail-

safe is wired. If you do have remote control, they will check to see how your meters at the studio compare with the transmitter.

If you have an AM directional array, you may not be required to take field measurements on a regular basis. However you must insure that monitor points are within tolerance. The inspector will

Contract Engineering

want to drive to the points and take measurements. Make sure you know where they are.

When the inspector has completed his tasks, is the time for you to sit down and review every finding. Listen closely and start making plans to correct any discrepancies.

The FOB employs a tiered enforcement sanction program for the violation of rules contained in Parts 73 and 74.

A Notice of Radio Station Conditions (FCC Form 790) may be issued for technical matters which at the time of the inspection were not violations, but have a high probability of becoming violations if left uncorrected.

A good example would be if your tower needed painting but is not to the point of being a violation. You may also receive a 790 for very minor violations that have little potential for adverse effects upon others or upon signal quality.

Form 790 is like a "warning ticket." You need not reply to the Commission but it expects you to remedy these problems.

An Official Notice of Violation (FCC Form 793) will be issued for technical rule violations considered more serious than those for which a 790 would be issued. In my experience with inspectors, the more impressed they are with your operation, the more likely they are to issue a 790 than a 793.

If your logs are neat, all entries are

made properly and you have made a concerted effort to maintain a clean operation, the odds are that an inspector will overlook the minor things. Anyone can forget to log an EBS test once in their life.

But if everything's a mess, and the inspector gets the feeling that you haven't "levelled," watch out.

I once knew an engineer who asked the inspector to issue a 790. It seems he had been trying to get the towers painted for years, but the owners didn't see the need for the expense.

The inspector said that everything else looked so good, he wouldn't issue a citation for the towers. The engineer explained the situation to the inspector. He issued the "warning ticket"—and I finally got the towers painted.

The FOB inspects several areas of station operations and has prepared several memorandums on the subject. They deal with areas of safety, interference-harm (actual/potential), service quality, administrative and non-technical.

The Commission considers many factors in its rules which relate to safety, and

(continued on page 32)

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Routers' Role in Radio

(continued from page 25)

for audio follow video, dubbing, control of transmission audio blocks, machine control or whatever.

Designed for radio

ITC offers a radio only version. This single level router is heavy on internal control. A system with 48 inputs (each stereo input uses two) and 32 outputs (each stereo uses two) and four controllers runs about \$26,000.

The normal controller reads out in alpha-numerics, includes a scroll feature to scan the available inputs and time programable "salvos" of commands to semi automate regular switching.

ITC introduced two new items for this family at the NAB show. First is machine control where a single rack panel contains 16 dry contacts with status LEDs. A 16-button controller was also introduced. The 16 backlit buttons are soft-

ware assigned to switch output ports or facilitate machine control.

Gentner, Adrienne, Logitek, AVA all make audio only mini-routers. These are eight to ten inputs to one output. Most are not remotable, some are switches or relays and entirely passive.

Tiny routers can expand the utility of larger routers or the number of inputs available to tape machines or board pots.

Five years ago it would have been difficult to find a router for a radio station. I predict that economics will dictate that any station running more than two studios and straight music will have a router in five years.

Fred Baumgartner is engineering manager at Legacy Broadcasting's Denver stations KHOW/KSYX. He was formerly CE at WIBA, Madison, WI, and ACE at KWGN-TV, Denver. He can be reached at 303-694-6300.

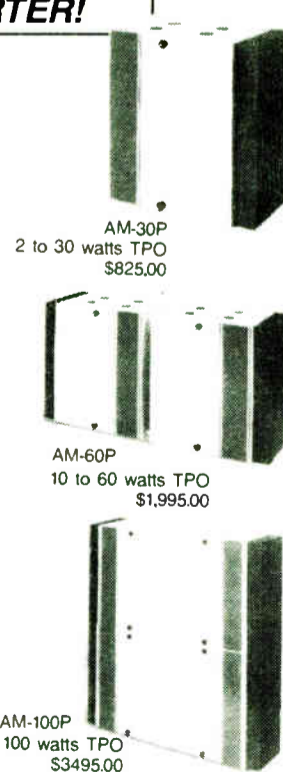
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Considering Component Safety

by Tom Osenkowsky

Brookfield CT . . . The actual values of required voltage and current component rating for a typical ATU or phasor network can be surprising.

Mica transmitting capacitors are current rated in terms of amperes at 1 MHz. In order to convert the maximum rating to your frequency, Equation 1 must be used.

This month, we will examine how and why components must be overrated in order to maintain a safety factor.

Figure 1 shows a typical Tee network, in this case connected to a 225' tower operating at 1490 kHz. The voltages and currents are unmodulated values.

Once we calculate the quiescent voltage and current values, the task of determining the actual operating values begins.

In choosing the practical value of a component, we must first consider that the carrier is usually modulated. With

Table 1

Phase Shift	E1	I1	E2	I2	E3	I3
- 50	80	4.47	1355	4.88	610	3.97
- 90	205	4.47	1458	4.88	1110	6.62
- 120	366	4.47	1611	4.88	1302	8.1

Note: A .001 uf shunt capacitor was employed in each design.

A Fourier analysis of a square wave taken out to the 10th harmonic, plus 125% square wave modulation reveals a practical rating current factor of 1.60. That is up from our 1.225 mentioned earlier.

So an unmodulated 10 amp rating has suddenly jumped up to a required 16 amp rating. But wait, there's more!

Before we move on, we must now consider the required voltage ratings. If we consider 125% positive peak modula-

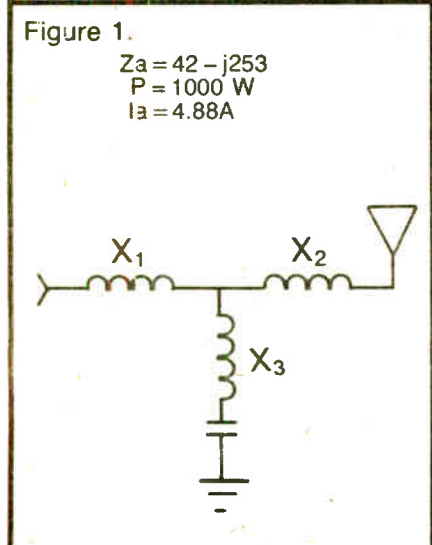
tion, the quiescent value must have an overrating factor of 2.25.

Now, we must bear in mind that we are dealing with peak values, not RMS values. So, another 1.414 gets thrown in. Our actual overrating for voltage is now 3.19.

Beyond modulation

Up to now, we have compensated for modulation only. Considerable difference has been shown between 125% square wave modulation and zero modulation. We have also considered **(continued on page 31)**

Equation 1.
Current Rating @Fc =
 $CR@1 \text{ MHz} \cdot \sqrt{F \text{ MHz}}$



100% sine wave modulation, an additional 50% of power is added to the carrier.

Remember that question on your old FCC First Ticket test . . . the antenna current will rise 22.5% under 100% modulation?

That is a first consideration, a correction factor of 1.225 times the unmodulated current rating.

Additional factor

A closer look at the actual modulation envelope of a typical AM installation will usually reveal 125% positive peak modulation and clipped audio (i.e. square wave modulation).

Since the duty cycle of a square wave is greater than that of a sine wave, additional overrating is necessary.



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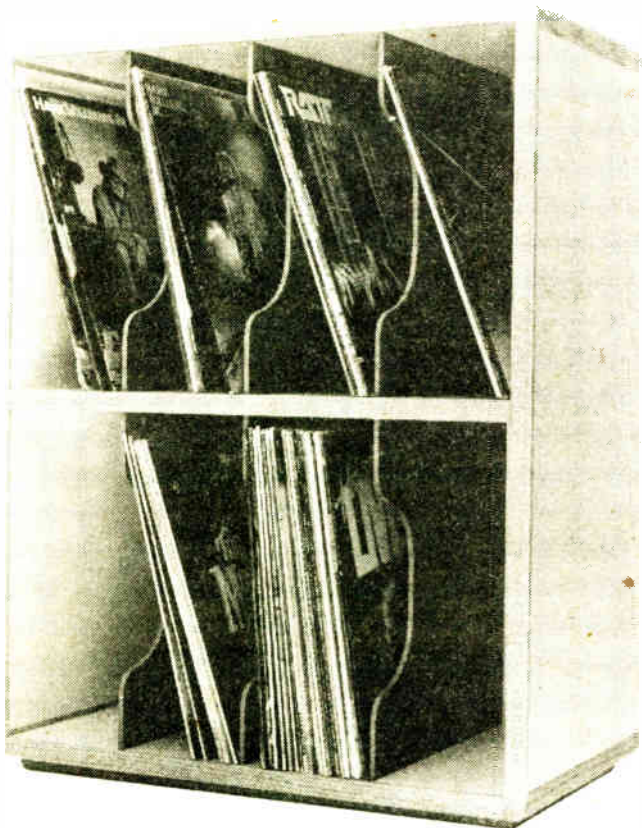
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Record Racks

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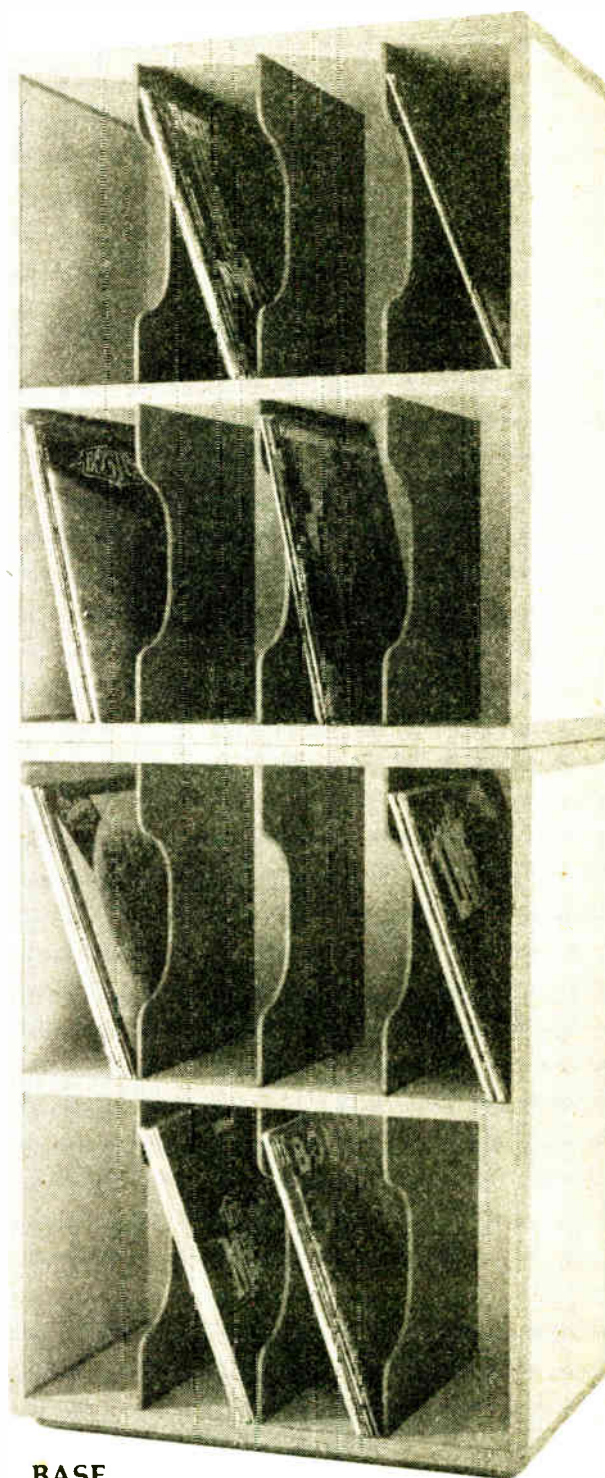
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Tweaking Telco Lines

(continued from page 21)

units, it had a volume control, on/off and muting buttons, jacks for both line and phone and best of all was self-powered.

A quick glance at the rather sketchy instructions (written in Taiwan-English) suggested that with a few modifications it might well do the job. The price was \$14.95 each, a figure after the GM's heart. I bought two.

Figure 1 shows the hookup. The speaker was removed, and the audio was fed to the 16 ohm tap of an inexpensive PA line transformer. The other side of the transformer at the 10 W tap is then approximately 600 ohms. Note that this isolation is necessary as the entire speakerphone board floats along with the telco line.

I routed the output of this transformer

through one side of a consumer-type graphic equalizer and then through a 600/600 repeat coil into the console. It may look like a Rube Goldberg arrangement, but the little gadget works like a charm.

Fidelity and distortion levels look good and equalization can provide surprisingly flat response on local calls. For those worried about durability, the speakerphone has been in use daily for over two years now without a failure.

The other half

It is also necessary to consider the other end of the system. Figure 2 shows a circuit we have also used for a couple of years. The unit is built up in a small

plastic box with a double telephone jack mounted on the panel.

Make sure that the capacitor is paper rather than electrolytic. If you wish, there is no reason why the circuit cannot be built up of miniature components within a standard telephone.

A small line amp or remote mixer provides the input, as about 0 dBm is required. Operation is simple: flip the switch to "phone" to talk on the phone or to call the station; flip to "mixer" to use the microphone. One helpful hint: A noise-cancelling or amplified handset is invaluable in noisy locations such as fairs or celebrations.

As usual, a brief caveat is required. In many areas, calls between different central offices are carried via a carrier system. When this is done, the audio bandwidth is artificially limited in order to accommodate a larger number of

callers.

Attempts to equalize this type of call either hits a brick wall at just above voice frequencies or results in cross talk. If the first two digits of both telephone numbers are the same, this will probably not be a problem.

One correction needs to be made to last month's column. Due to a typo, the NE5534 was listed as a dual op-amp. The NE5534 is a single version. The NE5532 should have been listed as the dual replacement. Also of note, Signetics manufactures a quad high-performance op-amp, the NE5514.

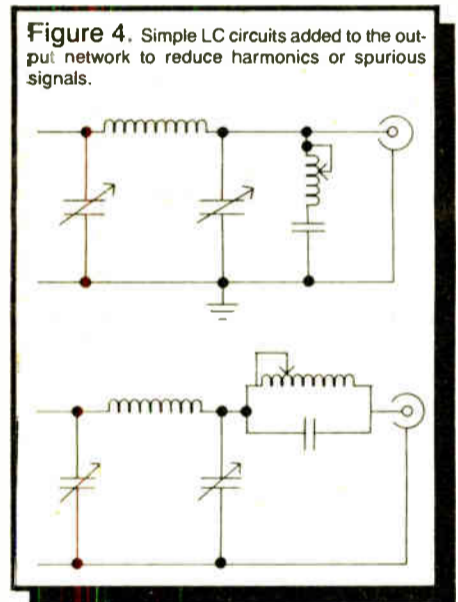
Bill Higgs has been CE for WXLN/WFIA for six years and has also done station consulting work. He has a Ph.D. in Theology which helps explain his patience with small market radio. He can be reached at 502-583-4811.

Attacking Artifacts

(continued from page 22)

mon" jack (remember frequency monitors?)—strange relay circuits with no real concern for impedance matching—designed to switch monitors to the auxiliary transmitter, along with other odd things.

The RF feedback path is sometimes identified as the entry point for an in-



terfering spurious signal, particularly if the frequency is not too distant from the operating frequency of the transmitter.

Installing traps made from small receiving components, such as those shown in Figure 4, will usually take care of the problem.

Spurious signals can be generated outside the transmitter when two or more emissions are combined in a non-linear device. Often the source is located some distance from the transmitter involved.

Non-linear devices include corroded guy wires, ground radials or antenna sections, large metallic objects such as barbed wire fences, corroded metal roofs or old plumbing. A tube or transistor in the receiver where the interference is observed can also act as a non-linear device.

To track down this type of problem, you'll need the right test equipment. This includes a grip dip meter, field strength meter, and a spectrum analyzer.

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



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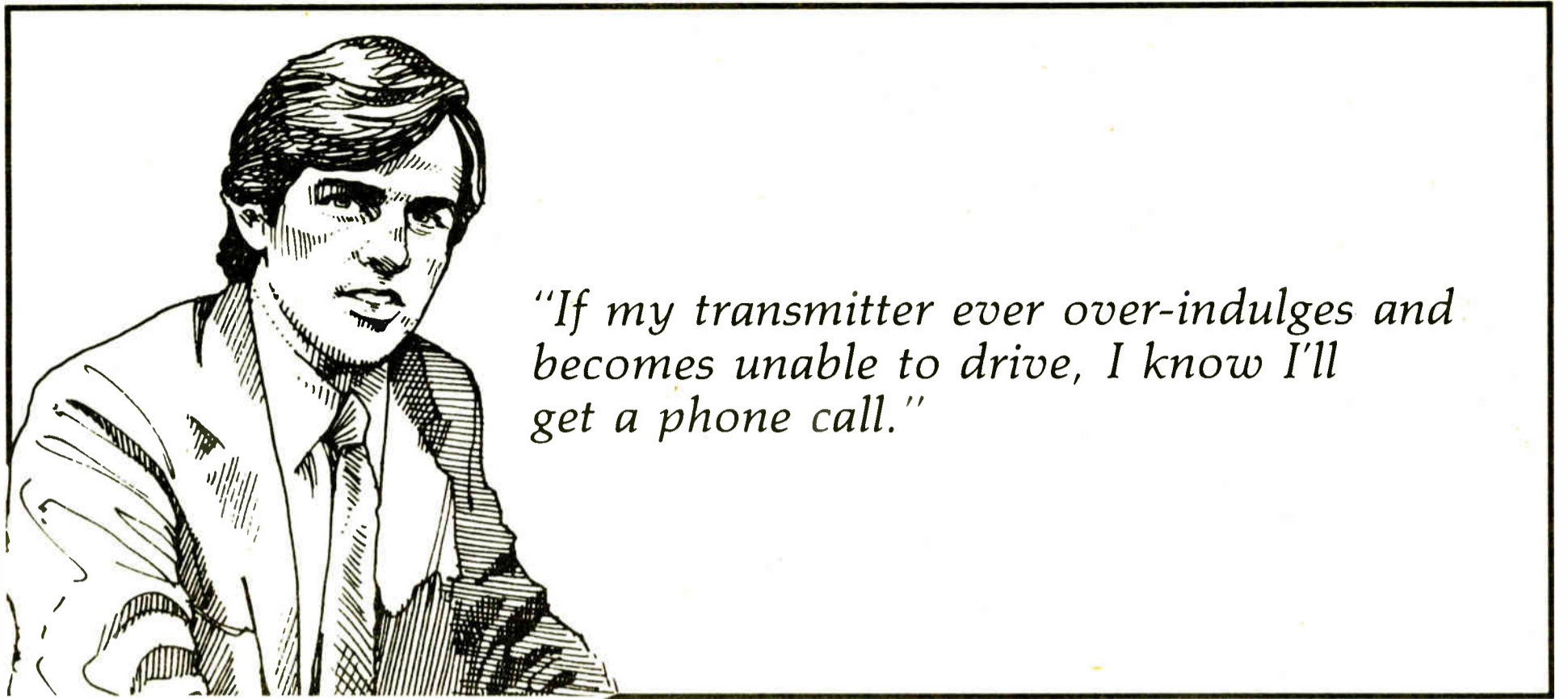
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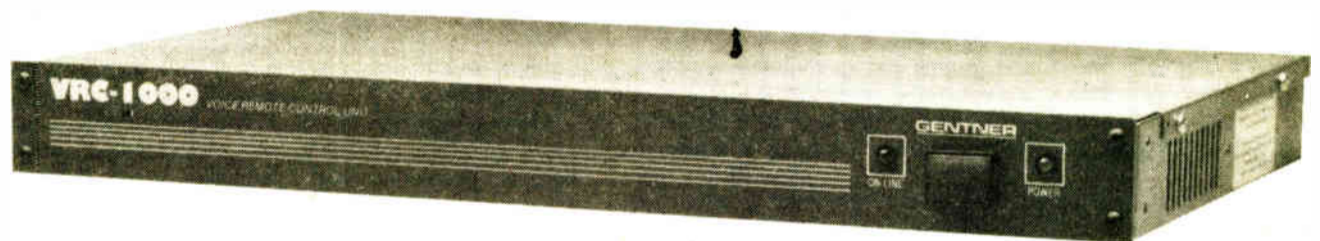
"If my transmitter ever over-indulges and becomes unable to drive, I know I'll get a phone call."

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Good Ads Start with Good Reads

(continued from page 21)

"liftoff is essential in telling the difference between a fair read and a good one.

It happens when as intently as you try to listen, your mind does a liftoff and starts thinking about your last vacation, your next appointment or nothing at all. Sometimes the lapse lasts for a few seconds, sometimes for the entire script.

Usually you write it off to boring copy, low blood sugar or the need for a good night's rest.

As mundane as some copy may be, when liftoff occurs in your own mind it is also likely to occur in the mind of the listener.

Listening for liftoff

Because I spend equal amounts of time doing voice work and recording others, I have developed a few listening tricks that should help you identify liftoff and prevent it.

The strength of any copy depends on the script and the reader's ability to render the writer's words and thoughts into cogent speech.

Hopefully the writer you chose is comfortable writing for the spoken word. The spoken word differs from the written word in many ways, but there is one major difference. Unlike written words, spoken words have to come out of someone's mouth.

If you don't think about how the

words will sound when spoken, you can end up with an ad full of ungainly phrases and word junctures that become an obstacle course for the talent.

To prevent ugly scripts from compromising your production, read the lines out loud. When you hit a pothole simply rearrange the words or make substitutions to improve the flow.

Also know that each person usually has a few of his or her own unique problem sounds. Working around these problems will make it easier on both you and them.

Once more, with feeling

One of the main causes of liftoff is cold reading or seeing the copy for the first time as it is read. The result is a professionally modulated read which superficially sounds good, but may lack intent. Explaining the thought behind the copy can greatly increase the quality of the performance.

Even if you're not an experienced director, there are a few things you can do to make the session more successful.

First explain by whom the final piece will be seen or heard. Discuss tone and attitude. Be open to questions.

As a performer, if there are parts that don't make sense when I pre-read the script, I ask for clarification. Word processor glitches, overlooked syntax and grammar errors and specialized trade language

are the most common problems.

If you're using music, let the talent hear it. There are a lot of timing, energy and projection level cues contained in the music. In fact, recording the voice with the music is the best way to get a solid integral soundtrack.

Don't expect a talent to read your mind. While it's a mark of professional courtesy to allow a certain amount of interpretation, be prepared to direct the read. If you have trouble explaining what you want, try reading the line to communicate your thoughts.

Before you ask for a different read, let the talent hear the playback. As strange as it may seem, their attention is more focused on speaking than listening during recording. Playback also lets you point out specific areas you want changed.

If you're in a session with clients on one side and the talent on the other, keep the intercom open as you discuss the work with others in the control room so they can hear the comments. (It's a good idea to tell everyone in the control room you're going to do this to prevent unnecessary comments from being made).

Avoiding disaster

Nightmare sessions occur when your acceptability window for the read is unreasonably small, when you have chosen the wrong talent or when you are experiencing deadline stress. Nightmare sessions can also occur when too many people become directors.

Most of the time nightmare sessions can be avoided by planning. The best cure for a session which appears to be turning into a nightmare is a sense of humor and a five minute break.

The last, and most important thing to remember (other than keeping your sense of humor) is how to listen. Start by closing your eyes as you listen. The elimination of visual input to the brain allows you to concentrate more on the aural.

As the reader's focus wanes, either because the intent is drifting or the script is unclear, you can actually feel a lifting

sensation.

Some visualize the phenomenon as the feeling that occurs just as an airplane lifts off the runway. Picture the talent as the airplane and the runway as the script. When the two separate the read may sound superficially correct, but the talent has lost contact with the script.

Before you condemn any part of the read because of suspected liftoff, listen to it several times with your eyes closed. A bad pepperoni pizza for lunch can make you think you hear a liftoff on the first listen that disappears on subsequent listens.

If you have any questions, or better yet any ideas you'd like to pass along, I'm as close as your phone or MCI mailbox.

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

Overrating Components

(continued from page 27)

our frequency when choosing a mica capacitor.

Thus far two assumptions have been made. First, no additional safety factor has been added. Second, we assume the quiescent values to be correct. These values were based on a design value of phase shift for our network.

Let's look at Figure 2. Here are three different values of phase shift for the same ATU.

An engineer armed with just an OIB has an almost infinite number of coil combinations with which to produce 50+j0 at carrier, thus disregarding the network phase shift.

Can this happen in a DA? After all, we know the phases because we have an antenna monitor, right? Yes, but those phases are all referenced to one of the towers. Consider a two tower DA.

One ATU has a design phase shift of -60°, the other, tower #2, -72°. If tower #1 were misadjusted to -90°, we could compensate by cranking the difference into tower #2. Our antenna monitor would read the same; the net system phasing would remain the same.

But consider what has happened to the network voltages and currents. They have all changed! Excessive losses in the network could lead to a lower pattern RMS and the temptation to crank the phasor to bring up the MPs.

Now the drive point impedances change and line mismatch sets in. A vicious circle sets in. The point to be made is that a safety factor must also be thrown in to compensate for VSWR, drift due to icing, lightning, etc.

A point to consider about mica capacitors. While some might quote an old rule of thumb, a G1 is good up to 1 kW, a G2 up to 5 kW, etc. it is important to realize that for differing

amounts of capacity, a G1 is not always a G1.

The capacitor's physical size does not mean the same voltage and current rating. If you sub a cap value, look at the ratings. They are different.

Next time, we'll consider some of the math behind the networks.

Tom Osenkowsky is a radio engineering consultant and president of MASTER Software, and a regular RW columnist. He can be reached at 203-775-3060.

AM BROADCASTING - HIGH FIDELITY Are these terms mutually exclusive?

YES NO DON'T KNOW

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

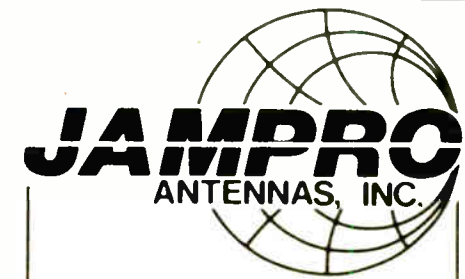
Potomac has developed the SMR-11 Synthesized Monitor Receiver which will let you hear and measure the quality of your transmitted AM signal ... perhaps for the first time. Features include: Crystal Stability; 60 dB Signal to Noise Ratio; Audio Frequency Response ± 0.5 dB, 20 Hz to 8 kHz; Total Harmonic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



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Circle Reader Service 35 on Page 34



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Circle Reader Service 8 on Page 34

Getting Through an FCC Visit

(continued from page 26)

the fines vary on the violation. If all the tower lights are out and the FAA not notified within 30 minutes as required there is a \$2000 fine.

If a majority of tower lights are out and/or there is the loss of top flashing beacon and you did not notify the FAA within 30 minutes, the fine is \$1000.

For tower lights not observed at least least once every 24 hours the penalty is \$500, and for temporary warning lights not present/operational during construction it is \$1000.

For a tower not properly painted, for example, not the required color bands there is a \$750 fine.

If there is high RF voltage at antenna base, if the hot base at the antenna tower is not enclosed or there is a damaged fence allowing entry the fine is \$1000.

You would be fined \$750 for high voltage equipment not protected as to prevent injury to operating personnel or for damaged interlock and exposed wiring.

A failure to conduct EBS tests would get a \$300 fine and if the EBS monitor receiver and/or tone generator was not operating or not installed it would be a \$1000 fine.

Interference-Harm Actual/Potential

There are several things the inspector will be looking for in the way of interference. Overpower operation, frequency tolerance, excessive modulation resulting in interference and spurious and/or harmonic emission might result in a \$1000-2000 fine.

And even with the advances in remote equipment, failure to cease operation by remote control when a malfunction occurs in the remote control system would net at \$300 penalty.

It could cost you \$300 for failing to ensure correct calibration of remote antenna base, common point and extension meters, for instance if meter readings are grossly out of tolerance from licensed parameters.

If the base and sample currents of your

AM directional system are grossly out of tolerance from licensed parameters you could be fined as much as \$600-1500.

If you operate non-directional when a directional is required or fail to change power at sunset or sunrise for extended periods of time there is a \$1000 fine.

And for stations operating under PSA the penalties are \$1000 for operating 50% over licensed power or for operating one half hour or longer after the station was required to sign off.

As far as the quality of service, the

ner and at the times specified—\$500.

- Failure to have available the EBS checklist and/or authenticator list—\$300.

- Defective meters or improper scale/range, all powers—\$300.

- Failure to have available a copy of the most recent antenna resistance or common point impedance measurements—\$500.

- Station and/or operator licenses not posted—\$200.

- Failure to designate a chief operator—\$500.

Overpower operation, frequency tolerance, excessive modulation resulting in interference and spurious and/or harmonic emission might result in a \$1000-2000 fine.

FCC will fine a station \$550 for violations concerning FM stereo parameters; SCA parameters; AM performance measurements and excessive AM or FM modulation.

Administrative and non-technical

Finally, the Commission looks at many non-technical areas to determine compliance. Here is a list of violations and fines in this area:

- Failure to have or maintain a complete public inspection file—\$300.

- Failure to have a licensed operator on duty—\$200.

- Willful or repeatedly incorrect log entries, such as tower lights logged as on when they were not functioning—\$1000.

- Failure to properly log tower light information—\$300.

- AM stations operating without a Commission approved sample system—\$600.

- Failure to perform weekly EBS tests as required—\$300.

- Repeated failure to reply with assurance of correction/repair for violations listed on Notices of Apparent Liability—\$1000.

- Failure to identify station in a man-

Information required for the public file would make a good article on its own. The NAB, NRBA and FCC have issued various reports and articles on this subject. In addition, many small market radio publications can keep you abreast on these areas.

When the judgement comes

If you receive an FCC Violation Notice now is the time to act. You only have ten days to respond. Hopefully, you have already corrected all the problems. Unless they were serious you should be OK.

When you respond to the notice explain why the violation occurred and the steps taken not only to correct it but to insure that it doesn't happen again. Above all, be honest with your reply, just like you were with the inspector.

During the many inspections at various stations, we have had a chance to view management's reaction to an inspection. Managers should remember that an FCC inspector is an engineer and speaks the engineer's language.

The inspector doesn't want to be impressed with sales figures and how your company is doing. My best advice for

the manager is to let the engineer handle the bulk of the inspection.

Your engineer is nervous enough and needs to concentrate on talking to the inspector. A CE really doesn't need the boss looking over the shoulder during the inspection.

Remember, this is what you pay your engineer for. If he or she can't be trusted to handle the situation, get another engineer.

Following the inspection managers should sit in on the review meeting with the inspector. After the inspector leaves, sit down with your engineer and listen.

Learn what should be done before any violation arrives, then authorize the engineer to make the repairs or changes. Your station may not be fined—if everything is taken care of immediately.

Never too cautious

We are asked many times if you can "over-do" rules and regulations. Our answer is always NO.

Deregulation does not mean less rules and regulations but more responsibility to the licensees to maintain their own operations.


We suggest to stations that they continue to observe many of the old rules pertaining to transmitter/maintenance logs, proofs of performance and operator tests. It gives us an indication of how the equipment is operating.

If the operators are properly trained to recognize potential problems, they can either be corrected or shut down before major damage is done.

Many times a problem and solution can be diagnosed over the phone. With an experienced and properly trained operator this can save the engineers a trip to the station and save the owner a large emergency repair bill.

In addition, a properly maintained operation will impress an inspector, thus making life easier for all of us.

Lee Freshwater is a partner in Blue Ridge Consultants and can be reached at 704-693-1642.



FCC Database

FM SERVICES

- Directory - Updated weekly
- Channel studies/searches
- ALS (Area-to-Locate Study) showing allowable transmitter site
- Terrain Retrieval, FAA & FCC Towers, Population Counts
- FCC Research, contact name, phone, address
- By mail or online 24-hr access
- Educational FM interference studies
- NCE-FM/TV ch. 6 interference area & population analysis

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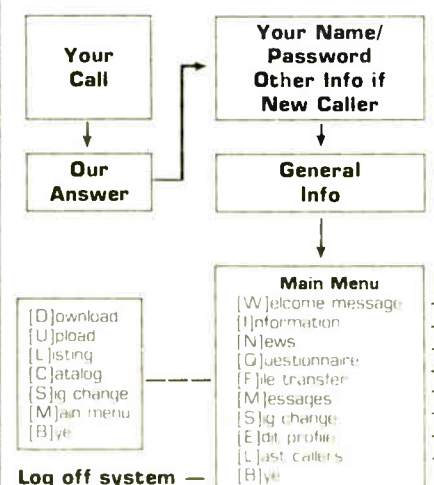
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Kidd

COMMUNICATIONS

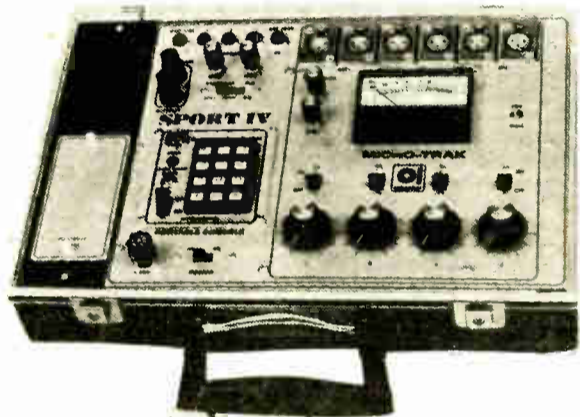
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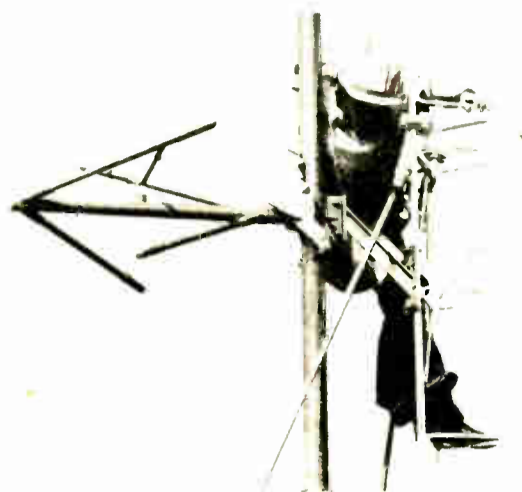
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Ampex Reel Duplicating System \$2,000.00
Audi-Cord TDS-6 Twin Play Stereo (2) \$1,050.00 ea
UMC Splice Finder/Eraser New (3) 550.00 ea
ITC FB-1 Phone Interface New, list \$160.00 75.00 ea
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100 Second		
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4.5 Minute		
5.5 Minute		
7.5 Minute	4.25	6.45
10.5 Minute		

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Radio World Marketplace

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



Stereo polarity tracer

The SPT-1 Stereo Polarity Tracer from FM Systems allows signal polarity to be tracked without a reference channel.

Polarity can be traced through transformers, amplifiers and microwave subcarriers.

For information, call Frank McClatchie at FM Systems: 714-979-3355, or circle Reader Service 68.



AM/FM signal generator

Leader Instruments Corp. has announced the Model 3220 AM/FM synthesized RF signal generator. The unit has a frequency range from 100 kHz to 1.3 GHz with ± 1 ppm accuracy.

RF output units are selectable between dB μ or dBm with a range of +13 to -133 dBm and 0.1 dB resolution. Four preset levels can be set for commonly used test levels.

A user-friendly program/data entry keypad facilitates programming for semi-automatic operation.

For information, call Joseph Fisher at Leader: 516-231-6900, or circle Reader Service 61.

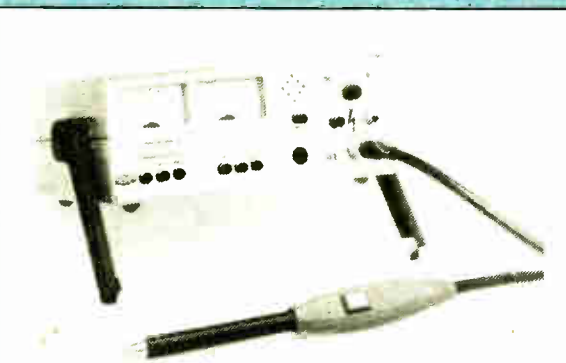


DAT recorder/player

The new Harris Model XD-001UH DAT recorder/playback unit is available with optional wired remote control. The remote allows access to any cut on a cassette.

High speed music search is accessible from the front panel, and the unit also offers a tape scan which enables preview of the first eight seconds of each cut on a tape. High speed cue/review and timer recording and playback are also included.

For information, contact Martha Rapp at Harris: 217-222-8200, or circle Reader Service 63.



Insulation tester

RE Instruments Corp. is representing the Danbridge JP15 portable hi-pot insulation tester. The JP15 is suitable for testing coaxial cable of TV and radio broadcast antennas.

Features of the JP15 include a built-in speaker for audible indication of breakdown, in addition to meters. The current meter has three voltage ranges: 1 μ A, 10 μ A and 100 μ A.

For information, call Steve Watts at RE Instruments: 216-871-7617, or circle Reader Service 65.



Coaxial cable

Cablewave Systems has introduced the HCC Flexwell air dielectric 50 Ω coaxial cable with a tubular center conductor. The Flexwell cable has been designed for medium-power applications up to 5 GHz.

The continuous copper tubular center conductor makes the Flexwell cable lighter than cable with solid copper or copper clad aluminum center.

For information, call Al Criscuolo at Cablewave: 203-239-3311, or circle Reader Service 64.

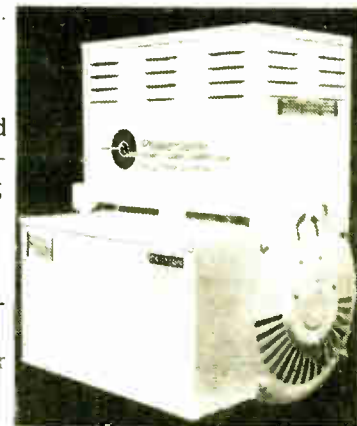
Rotary phase converter

Kay Industries' new T-Series Phasemaster rotary phase converter is designed for use with broadcast transmitters.

The Phasemaster features a load range control to match the converter output to actual transmitter load. It converts a single-phase supply to an output similar to utility provided 3-phase service.

The unit also provides immediate power availability, and short-term ride-through during voltage dips.

For information, call Larry Katz at Kay Industries: 800-348-5257, or circle Reader Service 67.



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007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
016	036	056	076	096
017	037	057	077	097
018	038	058	078	098
019	039	059	079	099
020	040	060	080	100

Sales Call Service

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

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

BUYERS GUIDE

STL, Remote & Telco Equipment

WASK Remotes with Comrex PLX

by George H. Williamson, CE
WASK-AM/FM

Lafayette IN . . . At WASK/K105 we are now using the Comrex PLX micro with a cellular telephone for many of our broadcast remotes.

For many years, our station used remote transmitters in the VHF band. For distance remotes such as sports, we used telephone lines.

As time went on, problems came up in our area. The VHF band was getting congested, and we were beginning to experience a lot of interference. We were also starting to do more remotes which went beyond our remote transmitter range.

Because of the escalation of the installation fees, we were doing away with our dedicated lines and using more dial-up lines, sacrificing quality.

Clearly we needed an alternative for our remote broadcasting.

Cellular phones

With the cellular telephone system beginning to make its way into the industry, we thought it might be a good alter-

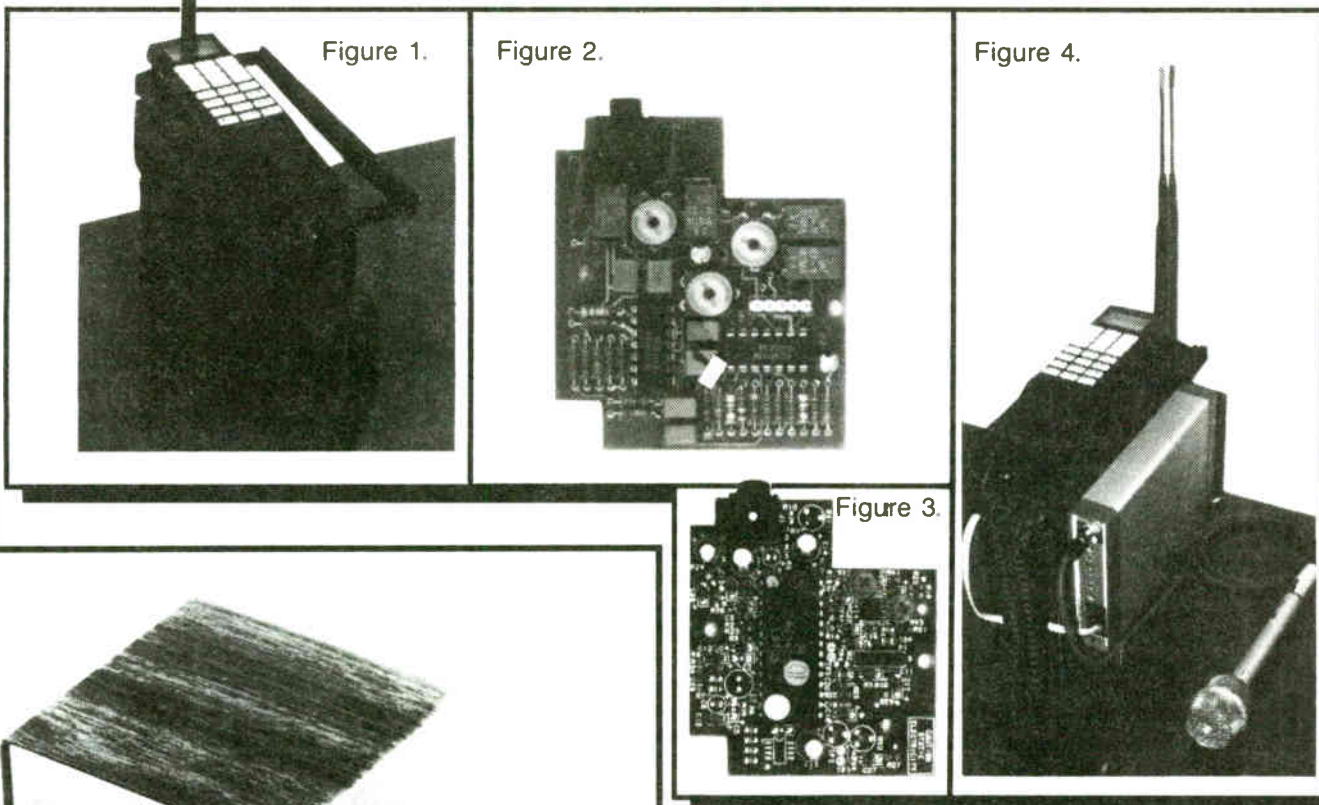
native. As we analyzed the cellular system, we asked ourselves: How could we obtain better quality from it? This is where the Comrex system came into the picture.

Since 1976 when Comrex equipment was introduced, stations across the country have been using it on their telephone lines. In the past we've had the opportunity to use Comrex equipment and were impressed with it. We began to wonder, could we interface the Com-

cally to the Mitsubishi by using velcro material, shown in Figure 4. The complete system can be carried in the Comrex PLX road case (shown in Figure 5).

We have purchased two complete Comrex systems. At the studio, we are using the TH-X Model. The TH-X is a complete telephone line management system containing all of the circuitry needed to interface a telephone line with your broadcast audio facilities.

User Report



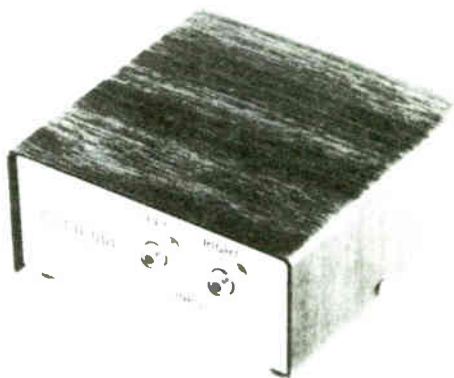
Line management

The TH-X includes a telephone coupler which will connect to any PABX, an excellent hybrid, an auto-answer system which may be programmed to automatically pick up the telephone line only if the proper number of rings is received, an AGC that is designed to set levels only when the caller audio is present, a frequency extension encoder and decoder, and dual isolated "cart start" circuits which provide contact closures whenever the auto-answer system picks up the line.

A send limiter prevents excessive levels from getting to the line

and band pass filters reject the extraneous noises often encountered on telephone lines. A tone generator and bal-

(continued on page 46)



CD-1 INTERFACE AMPLIFIER

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rex system through the cellular phone system?

We contacted Comrex Corporation. They informed us that they had been doing research and had just come out with the Comrex PLX micro for the cellular phone.

Our goal was to interface the PLX micro with our cellular phones as simply as possible and with the least amount of equipment.

Interfacing the PLX

The cellular phones we purchased were Mitsubishi 555Ts, shown in Figure 1. Through the combined efforts of John Cheney of Comrex, Jim Miller of Access Communications and WASK, we started our project.

Since we were not using the hands-free module on the 555Ts, shown in Figure 2, John Cheney said that Comrex was willing to design a replacement module that would enable the Comrex PLX micro to plug directly into the cellular phone.

With this module design, shown in Figure 3, we were able to interface the two units beautifully without another external interface box.

Our main objective of simplicity seemed to have been met. We were able to attach the Comrex PLX micro physi-

BUYERS GUIDE INDEX

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Gentner Simplifies Auto-Logging

by Lloyd Berg, CE
WDAE-AM/WUSA-FM

Tampa FL ... I believe that automatic logging is one of the most important uses of computer technology in the broadcast station.

Automatic logging guarantees accurate readings—made on time—with no “fudged” entries. Many automatic loggers will also alarm and print any out-of-tolerance conditions whenever they occur.

Unfortunately, few AMs have installed automatic logging because of one small but previously insurmountable technical

problem: the good, simple and relatively inexpensive remote controls aren't “smart” enough to “push” the correct buttons on a directional antenna monitor a second or two before it takes and logs each directional parameter.

At WDAE I wanted to replace an existing and unreliable \$10,000-plus goliath of a remote control, retaining automatic logging with a simple Moseley 1600 that I already had on the shelf.

Interfaces to any remote control

It was at about this time that an obscure little advertisement for a new product from the Gentner RF Products

company caught my eye.

The ad was for a new device called an Antenna Monitor Interface (AMI). Gentner was introducing it as an accessory to its remote control equipment.

While it was sold as an interface unit designed to allow a Potomac or Delta directional antenna monitor to be interfaced to the Gentner VRC-1000 remote control, a quick call to the factory revealed that it should work with any brand of remote control.

It sounded like the perfect solution to my problem, so I purchased one.

After looking it over and reading the instruction book, it seemed that the

one rack unit black box could be installed in a single day. And, making life even easier, it came with an interface cable already made up for the Potomac AM-91.

But if you have a Delta AMM-1 it will come with the appropriate cable and edge connector.

The AMI is transparent, so there is no calibration! The sample voltage that comes in is the sample voltage that is held and output. There really is no intelligence to the box; no “brain” is there to get scrambled.

The box itself is simple and contains four things: 24 separate sample-hold circuits (enough for a 12 tower array); switches (enough to allow day, critical hours (if used) and night tower configurations); a timer circuit that sequentially triggers (electrically pushes the appropriate tower button and takes the reading) every four seconds to 64 minutes—user programmable by DIP switches; and a power supply.

Outside world interfacing

Outside world interfacing is straightforward. Just connect the supplied interconnect cable to the “remote” connector on your AM antenna monitor.

User Report

Fan out and connect the raw end of the interconnect cable wires to the metering inputs of your remote control.

Find a point in your phasor, time clock or remote control that will supply a momentary or continuous “ground” on one of three appropriate wires for switching between day, critical hours and night operation.

Then set DIP switches for each tower used in each of your patterns, set DIP switches for Potomac or Delta, and set DIP switches for frequency of updating (four minutes to 124 minutes).

All the outputs are always present, so the actual remote control that you use can read and log any and all values at any time. Finally, set DIP switches for delay between tower selection and sample (two seconds to 31 seconds).

Although most directional AMs have between two and six towers, the Gentner AMI can handle up to 12 towers. The unused positions can either be ignored or used to interface to a relay activated Delta RF sample-detector for non-DA base current or other RF current monitoring purposes.

The performance of Gentner's AMI was exactly what I had hoped for. It worked right out of the box once the remote switch was pushed on our Potomac AM-19. The new remote control system with auto logging performs flawlessly.

For WDAE, mating Gentner's new Antenna Monitor Interface to a simple, inexpensive, compact and high quality remote control gives us improved reliability, improved transmitter logging and improved technical information—all at reduced maintenance time and expense.

I only wish it had been available five years ago.

Editor's note: Lloyd Berg serves on the NAB Advisory Board and is chairman of the Tampa chapter of the SBE. He is also an amateur radio shortwave operator. He may be reached at 813-289-0455.

For more information on the Gentner AMI, contact Gary Crowder at Gentner Electronics Corporation: 801-268-1117.

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THE WHEATSTONE SP-6 AUDIO CONSOLE lets production people quickly accomplish 8 and 16-track work, yet easily handle routine transfers and dubbing operations. With its unique track monitor section it can facilitate simultaneous stereo mixdown during the multi-track live session — almost halving typical production time cycles. Input channels are laid out just like an air console, with machine starts below the channel fader, so staff familiar with on-air consoles can quickly become comfortable in the production environment.

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.

The SP-6 provides independent headphone, control room and studio monitor feeds, as well as stereo cue/solo. Control room and studio mute and tally functions are independently dipswitch selectable on individual input channels. Additional studio modules may be ordered to accommodate larger, multi-studio installations. The SP-6 may be configured with any combination of mono and stereo input modules, in mainframe sizes ranging from 16 to 32 or more inputs. The console is available in either an 8-track production format or a 4 stereo subgroup TV master control configuration. So why not profit from Wheatstone's experience and reputation? Call us today and learn more.



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CPU Passes Voyager Group Tests

by Carl W. Davis, VP Eng
The Voyager Group

Raleigh NC . . . Several months ago, the Voyager Group began looking for alternatives to using conventional 450 MHz RPU equipment. Our search was motivated by the desire to avoid the high costs associated with putting standard RPU service into effect at two of our stations.

Because of their locations, WWMG-FM in Charlotte, NC and WRDU-FM in Raleigh, NC would have required the additional expense of tower space and a repeater system in order to provide acceptable coverage.

We were inclined to believe that one answer would be to use or adapt existing cellular telephone service to our needs, so we began to experiment with that concept.

We initially used a basic cellular phone for remotes, with mixed results. A home-made interface to allow the use of a broadcast mic was an improvement, but getting to the proper point within the cellular phone circuitry was a problem.

Schematics for the phone are difficult to come by, and there are physical problems with trying to get external audio into some models. Results were mixed with this configuration. It was an improvement, but low frequency response was still poor.

On the phone

As a result, I called Neal Davis (no relation) of Broadcast Services and asked if anyone offered an interface for a cellular phone so that we didn't have to reinvent the wheel.

It just so happened that his company

was completing plans for marketing its Cellular Production Unit (CPU) package. He asked if the Voyager stations would test the package and of course I said yes.

The Voyager Group put the CPU system to work in three markets, experimenting with various configurations

User Report

and testing the system under typical broadcast conditions. We were very pleased with the results, so much so that we have permanently installed the package in two of our giant boom boxes.

At the heart of the Cellular Production Unit system is an interface box which physically connects between the cellular phone handset and the cellular transceiver.

The interface cable, which comes with the CPU package, varies from phone to phone. If your station has three different brands of cellular phone, all you need are three different cables and a single interface unit.

The CPU system has two other connections. A standard RJ-11 modular phone jack is used to feed audio from an audio mixer into the interface. This scheme is perfect for inserting frequency extenders. There is also a miniplug monitor output for connection to a headphone amp.

The list of benefits of the CPU package is a long one. Primarily, no FCC licensing is required, and there is no coordination of frequencies as with an RPU.

An acceptable cellular signal is availa-

ble in many locations where an RPU will not operate. Since everything simply plugs together, it is easy to use and easy to set up, especially for non-technical personnel. You can use the cellular phone separately when you are not doing a remote.

It offers complete mobility with a battery powered phone; you are not tied to AC power or a vehicle. On the bottom line, the Cellular Production Unit system looks great. The worst case operational cost would be about \$18 per hour and equipment costs are over 30% less than comparable RPU equipment.

Modular system

The features that impressed me most were the system's modularity, which allows you to leave your tools in your tool box; easily available headphone monitoring; and excellent quality for voice work, particularly when used with a frequency extender.

Nothing in this business is perfect and the CPU package is no exception. It is obviously not suitable for music, stereo or any application demanding broadband audio.

I would highly recommend it for sports, news, boom boxes and wireless interviews. Other applications are under development by Broadcast Services, which include use with portable fax machines and lap-top computers.

I am sure the list of applications for the Cellular Production Unit will grow. Its usefulness is limited only by human imagination.

Editor's note: Carl Davis can be reached at 919-781-7333.

For more information on the CPU package, contact Neal Davis at Broadcast Services: 919-934-6869.

BUYERS BRIEFS

Advanced Micro-Dynamics' ARC-16 16-channel transmitter remote control allows control of one or more transmitters from the studio, by telephone or a combination of both.

The transmitter unit includes: a 32-character display, values displayed with user-selected labels and units and an option to add a dedicated studio control unit, dial-up telephone control or both.

The controller also contains a 32-character LCD which gives clear-text prompts to guide the operator.

A Digital Speech Unit allows control by telephone and may be used in addition to the studio controller, or as the only control. Readings are announced by a digitally recorded human voice.

Other ARC-16 features include a modular design for control of multiple transmitter sites from a single location, use of multiple control locations, or the addition of a redundant control/metering link.

For more information, contact Peter Burk at Advanced Micro-Dynamics: 508-433-8877.

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R451 Boosts KIIS Traffic Reports

by Jeremy R. Burnham, Spec Proj Eng
KIIS-AM/FM

Los Angeles CA ... Since switching to narrowband FM three years ago, the KIIS traffic helicopter radio system has changed very little. The transceivers in use in the aircraft, on the mountain top and at the studio in Hollywood have served us adequately.

User Report

There has always been a desire, however, to increase the area served by the traffic reporter as well as to improve the audio quality of the radio system.

Complete coverage of the entire Los Angeles area with one UHF receiver is a virtual impossibility due to the mountainous terrain and the distances involved, even with a receiver located on Mt. Wilson, Southern California's prime communication complex.

The KIIS traffic reporter has compensated for this problem by flying to known good transmission areas to report on freeway conditions, sometimes at the expense of remaining over the traffic congestion.

A search for improved coverage

A solution often discussed was the use of several receivers scattered over the

metropolitan area with an electronic "voting system" to choose the one with the best reception.

But this would involve investment in a considerable amount of new equipment, the leasing of space on prime mountain top locations and the ongoing monthly expense of telco audio circuits from each location to the studio.

A more practical solution to increased coverage came with the purchase of the Hamtronics R451 UHF FM Receiver. This

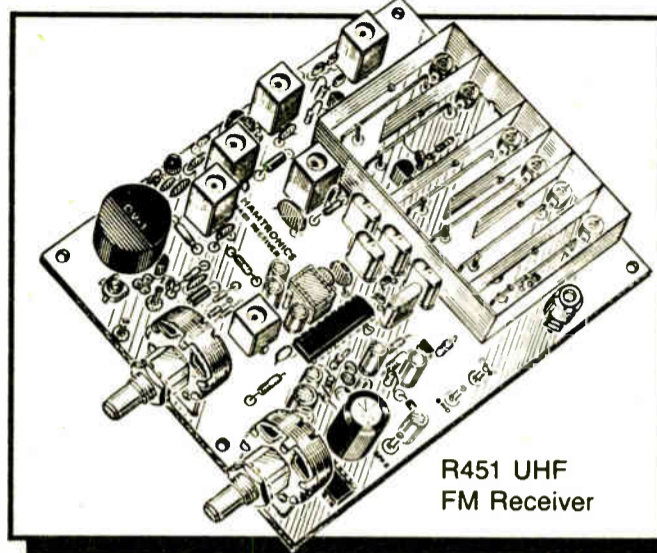
Wow! The helicopter was in the next county and was coming in, inside our semi-RF-proof building, as clearly as if it were overhead.

unit comes highly recommended by professionals in the field of two-way radio systems and amateur radio operators involved in maintaining repeaters.

The price of the receiver was temptingly low. But the feeling was that, if nothing else, our engineering staff could experiment with the various internal filters and possibly increase the au-

dio quality of the helicopter reception.

We determined that the audio band-



R451 UHF FM Receiver

width was restricted more in the receiver than in the transmitter.

The R451 package

KIIS purchased the R451 Receiver package, which includes the HRA-460 Helical Resonator Amplifier and the crystal—all wired, tuned and tested for \$248. The optional OV-1 crystal oven sells for \$25 and comes installed when ordered with the receiver.

We also ordered the A16 RF Tight Box for an additional \$20 because of the ex-

treme fields encountered at our transmitter site.

After assembling the receiver system in the shop, I started listening for the traffic reports, not actually expecting to hear much. The antenna I was using consisted of a 6" piece of copper wire sticking out of the rear connector.

Wow! The helicopter was in the next county and was coming in, inside our semi-RF-proof building, as clearly as if it were overhead. The performance was far superior to that of our current receiver which enjoyed a connection to an antenna on the roof.

After the initial shock of the almost unbelievable sensitivity of the R451, I made recordings to compare the audio quality of the Hamtronics versus the on-line receiver.

The Hamtronics exhibited a fuller low end, a crisper upper range and far better overall clarity. Also, an annoying buzz which I had attributed to TV sync energy picked up by the previous receiver
(continued on page 46)

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And your budgets.

TASCAM

Marti Dual STL Allows Backup

by Dennis J. Martin, CE
KOLA-FM/KMET-AM

Los Angeles CA ... High-cost, low-reliability telephone lines used to convey programming from the studio to the transmitter are continuing to decline in number across the country. Increases in line costs, coupled with poor—or unavailable—repair service, have forced many broadcasters to abandon leased lines in favor of studio-to-transmitter (STL) microwave links.

User Report

Owned by the station and maintained by station personnel, STLs by nature circumvent many of the problems associated with public utilities.

When selecting a stereo STL, though, the buyer is confronted with one key question that greatly affects performance and reliability: "composite" or "dual-channel?"

Composite vs. dual-channel

In a composite system, the stereo generator is located at the studio, which feeds a single STL transmitter. At the transmitter site, the output of a single STL receiver connects to the input of the transmitter (exciter).

A dual-channel STL system is different in that the stereo generator is located at the transmitter. Thus, two STL transmitters feed separate left and right channel signals to two STL receivers at the transmitter site.

Importantly, a dual system offers this inherent backup provision: if one transmitter or receiver fails, you're still on the air (in mono), while you'd be off the air using a composite system.

In addition, dual-channel systems typically offer better selectivity, and readily accept lower received signal strengths than their composite counterparts for corresponding SNR. Better sen-

sitivity allows longer path lengths or the use of smaller, less costly antennas.

Better fidelity

Fidelity-oriented broadcasters are also looking to dual-channel systems to meet the rigorous demands of the digital era.

Dual STLs excel in their ability to minimize audio degradation and deliver the full 80 dB separation of compact discs to the input terminals of the stereo generator. And to obtain truly outstanding performance, a compander form of noise reduction can be added to a dual STL.

Although both systems offer advantages and disadvantages, we at KOLA

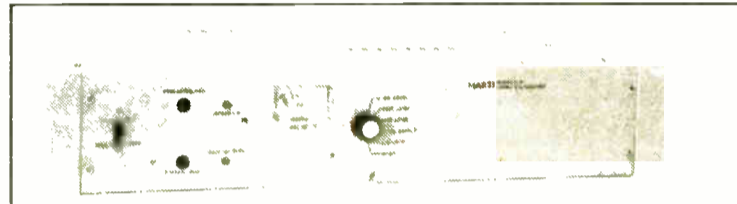
The multimeter can be switched to read modulation level, subcarrier injection level, DC power supply voltage, PA current, RF Drive 1 and RF Drive 2.

The R-10 receiver

The Marti R-10 is the companion receiver to the STL-10 transmitter. Housed in the same 3½" high rack mount chassis, the receiver requires only 14 μ V for a 60 dB SNR which is achieved by using a GaAsFET LNA.

Since the receiver relies on a 200 kHz phase linear IF filter, rejection of adjacent channel interference is excellent while assuring impressive demodulated subcarrier results.

Audio output is adjustable to +10 dBm and is user selectable as a 600 ohm transformer or electronically bal-



The Marti R-10 STL Receiver

felt that a dual-channel STL would best meet our objectives and budget constraints. After a survey of the marketplace, we selected the Marti STL-10/R-10 STL system.

Description

The STL-10 is a 10 W transmitter that uses a low distortion, direct FM modulator to achieve its excellent performance characteristics.

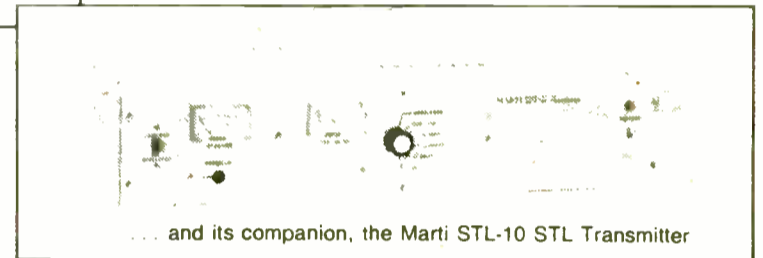
Carrier deviation at 100% modulation is ± 50 kHz. Nominal audio input is +8 dBm into a 600 ohm differential amplifier. An unbalanced input is also available on a BNC connector. Each transmitter is designed to accept two subcarriers, allowing a dual system to handle a total of four subcarriers.

The STL-10 provides two front panel meters for diagnostics: a switchable forward/reflected power meter, calibrated in watts; and a multimeter.

anced source. An unbalanced output is available on a BNC connector. And like the transmitter, two BNC connectors are provided for subcarrier outputs.

On the front panel of the receiver, a 10 dB RF attenuate switch helps prevent receiver overload from extremely strong signals. A switchable meter reads RF signal level, audio output level, subcarrier output level, DC power supply voltage, LO (local oscillator) level and mixer level. Two LEDs display power on and squelch status.

In the transmitter and receiver, the user can select 0, 25, 50 or 75 μ s pre-/deemphasis. Since our STL system is preceded by a wideband limiter that does not anticipate the effects of preem-



... and its companion, the Marti STL-10 STL Transmitter

dom necessary.

The two channels are normally offset by ± 125 kHz from the nominal channel frequency, still occupying a single STL channel like a composite system.

Narrowband operation

But unlike a composite link, the Marti STL-10/R-10 can be configured for the new FCC narrowband operation. By offsetting the carriers ± 50 kHz instead of ± 125 kHz, four channels can be transmitted in the 500 kHz bandwidth of a single STL frequency channel.

In a typical installation, two STL-10 transmitters feed a Marti HRC-10 transmitter combiner. The HRC-10 in effect "mixes" the output of the two transmitters so that a single coax cable and antenna may be used.

At the receive end, a single antenna and coax cable feed a Marti MTS-1 splitter. The MTS-1 "splits" the single output of the antenna to two outputs, one for each receiver.

For a fully redundant system, two antennas and separate coax cables can be installed at each end.

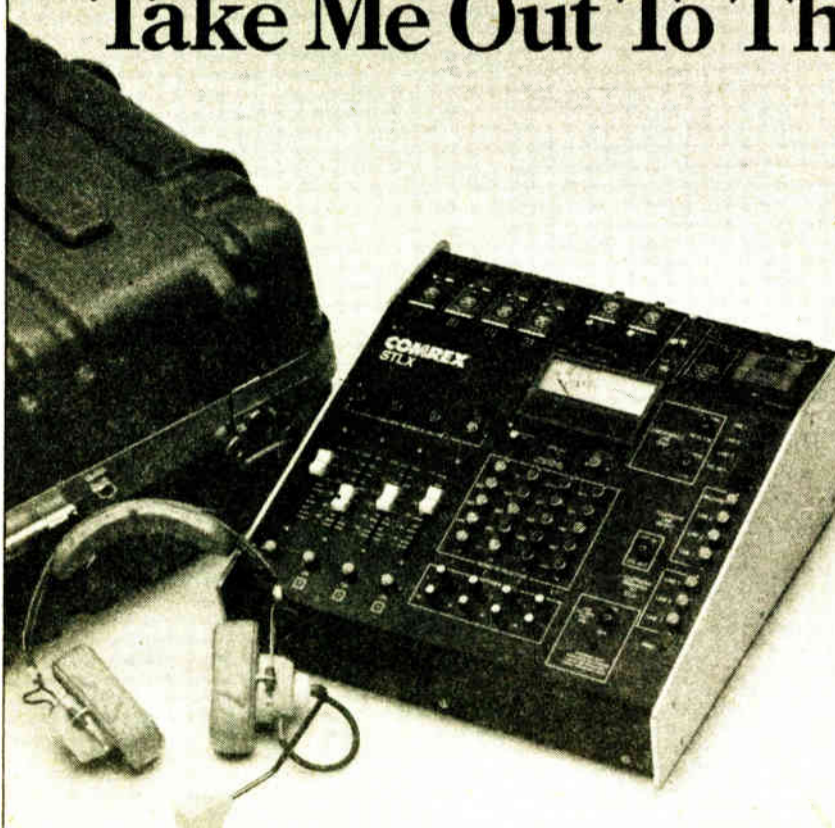
Both the Marti STL-10 transmitter and R-10 receiver can be operated from a 12 V battery, allowing continuous operation during the start-up period of a standby generator.

For this application, you may want to consider the Marti UPS-12 Uninterruptible Power Supply. Besides sensing AC power failure and switching to the battery, the UPS12 recharges the battery after return of AC power, then provides a "keep-alive" trickle charge.

Editor's note: Dennis J. Martin is DE for House of Music in Costa Mesa, CA, a consulting engineer and a freelance writer. He is a member of the SBE and AES, and may be reached at 714-684-9992.

For more information about the STL-10 and R-10, contact Selene Nix at Marti: 817-645-9163.

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For more information on how Comrex can help your road games, call or write Comrex Corporation, 65 Nonset Path, Acton, MA 01720 (508) 263-1800. TWX 710-347-1049. FAX (508) 635-0401. 1-800-237-1776.

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TFT a Sound Value for KJAZ

by Doug Irwin, CE
KJAZ-FM

San Francisco CA ... When I began performing engineering duties at KJAZ in October of 1987, one of the first things I noticed was that the station had an STL that suffered from fading, co-channel interference and sound quality inferior to that of our competition.

The system was composed of a TFT 7700 composite transmitter and an older receiver made by another manufacturer in the mid 1970s. I attributed the sound quality problems to the receiver.

The fading was caused by, and the co-channel interference worsened by, the actual path, which literally looks between two buildings in the financial district of San Francisco.

Dual mono STL

I felt that a dual mono (or discrete) STL system would solve most of the problems.

The co-channel interference would be diminished or eliminated because we would no longer be on the frequency of the offending transmitter; the sound quality would be improved because of the modern design of contemporary STL systems and the fading problem would be lessened because narrowband receivers need much less signal for reasonable quieting.

Also, with a dual mono system one has a 100% backup system, albeit mono, that is under 24-hour test. If I opted to

simply replace the composite receiver with a new one, I would have had to use the old one as my backup. I deemed this to be undesirable.

I contacted TFT and requested a loaner system for 951.375 MHz (125 kHz below the original composite frequency of 951.5 MHz) which would become the left channel in my dual mono scheme. The system arrived in about three weeks.

Putting it to the test

My first test of the system was to make sure that there was no interference from the other local 951.5 MHz composite

User Report

transmitter. Early one morning I took KJAZ off the air and replaced the composite system with the mono system.

I added a 6 dB coaxial attenuator to simulate the loss of both the transmitter combiner and receive power divider that would be experienced in the complete dual mono installation.

To my relief, I heard no interference from the output of the receiver. I noted the received signal level and put the composite system back on the air.

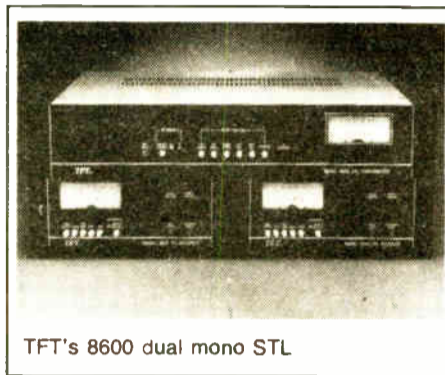
The next step was to set the system up on the bench for a series of other tests.

Unfortunately, I do not have a calibrated RF attenuator, so I ran the transmitter into a dummy load and placed the receiver antenna at the appropriate location

near the dummy load so that the receive level indication matched what I had measured over the STL path.

Figure 1 shows THD+N versus frequency. The TFT spec is simply 0.2% @ 1 kHz. Figure 2 shows deviation versus THD+N at 400 Hz. Figure 3 shows a test run through the built-in 39 kHz mux channel (at the 150 μ V level).

The sound quality of the TFT 8600 system is very good. I used a Studer A725 for my listening test source material and performed an A/B comparison test between the CD output and the 8600 receiver output.



TFT's 8600 dual mono STL

The only difference that I could perceive was a higher noise floor in the output of the receiver (as expected) and a slight decrease in the clarity of the very high frequencies in the source material. The latter might be attributed to the slightly higher noise floor.

Square wave tests showed that the system does not suffer from ringing of un-

acceptable tilt. I also tested the system with dbx noise reduction on line and the results were excellent. (I plan on testing the Dolby SR system next—these kinds of noise reduction schemes are not practical over composite systems).

A sound value

I am a believer in the old adage: "You get what you pay for." The TFT 8600 system is inexpensive and I had my doubts that a high quality dual mono system could be sold for around \$8000.

However, the system is well built. An inspection of the interior of the units showed that the quality of the PC board construction was high, the assembly and internal cabling done carefully.

I noted a few minor problems. The particular transmitter that I had could not be mounted in the rack—the hole spacing was just slightly off.

The transmitter output meter read 7.0 W continually, although actual power was 6.0 W, which sagged to 5.6 W as the unit heated up. The mux deviation meter did not indicate while I used the mux channel.

The bottom line, though, is this: I ordered the entire system. The TFT 8600 system turned out to be the solution to the KJAZ STL problem and with this system in place I can get on to my next project.

Editor's note: Doug Irwin is Assistant Chief Engineer of KSAN/KNEW, San Francisco, and moonlights (literally) as CE of KJAZ. He can be reached at 415-254-7628.

For more information on the TFT 8600, contact Jesse Maxenchs at TFT: 408-727-5942.

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Which figures, since the CD-501 is not an adapted consumer deck, but a highly-engineered system that's built for broadcast. Nothing else offers its combination of professional features, including 19" rack-mountability, balanced outputs, and a hard-wired remote that lets you completely control and program either of two decks in any mode.

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Moseley 1600 Setups Are a Plus with WCUZ

by Tom Bosscher, ACE
WCUZ-AM/FM

Grand Rapids MI ... Reliability is the most important consideration when you are looking for a remote control for a station. If the remote control fails, the transmitter fails and it's usually a long drive to correct the problem.

So when we decided to replace an older remote control at our FM station, we looked at the alternatives and decided on the Moseley 1600.

The flexibility of use of different links was an important factor in our choice. At

WCUZ-FM, the remote control signal is sent to the transmitter via a 140 kHz subcarrier on the composite STL (a Moseley 606C).

The return data is fed to a Moseley TRL-1 telemetry link, which requires audio frequency information. At a contract station, we send the data to the transmitter the same way; the backhaul is on a 92 kHz subcarrier on the station's carrier, which is simply plugged into the exciter.

The Moseley allows your choice of all of these options just by plugging in the right module or jumper. Field changing

of the subcarrier card's frequency is also available.

Analog telemetry channels

The 1600 has 16 analog telemetry channels. These are all referenced chassis ground and you are not limited to a straight linear readout of the sample.

Choices are given: the standard linear, direct mV, linear with a reference point, power (log) or indirect.

The indirect choice is clever, as it multiplies the sample you are on by the one just in front of it, and then, by a fixed factor, comes up with, say, 100%.

If you put your plate sample on position #2 and your plate current on #3, put your plate sample on #4 again and set up the indirect power reading. The 1600

will track the two samples and give you a solid indication of what's going on.

At WCUZ-FM we then run the transmitter reflectometer sample to another position to act as a reference point. It sure does beat the slide rule!

One special note should be made: You can set up any analog channel to give an alarm condition if the sample is too high or too low.

Next are the 16 channels of status. I believe that status monitoring helps

the non-engineer board announcer keep a closer eye on the transmitter, because it's very easy to notice a status light between meter readings as opposed to catching something on the next go around.

On our FM installation we have the status lights configured to come on *only* when there is an abnormal situation. Conditions such as generator on line, aux tx files on, antenna switch on aux, power utility not here, etc. will light the proper lamp.

So when there are problems, it is now very easy to ask the announcer what

User Report

The CRT is handy when there is a problem and the board operator is, perhaps, a little thin on smarts.

light is on. The status lamps can be set up to light with normal or inverted logic. You can set up the alarm to be used for rising, falling, high or low logic conditions.

An optional CRT

One very useful option for the 1600 is the CRT. This gives you a monitor and keyboard to view and control the 1600. Displayed are the 16 analog channels under whatever labels you wish to call them, and the 16 status channels with labels for both on and off conditions.

The CRT is handy when there is a problem and the board operator is, perhaps, a little thin on smarts. Just have him read down the columns of data and status.

At our station, I have programmed the 1600 CRT display to show any status position that is not normal. So with one look at the status channels we can see what needs to be checked.

But the best part of the 1600 and its CRT option is that there are no EPROMs that need to be configured for your site. All setup data is stored by both the transmitter and the studio unit. In the event of a power failure both units will be back within a short bit of time, with all the custom configuration for your site.

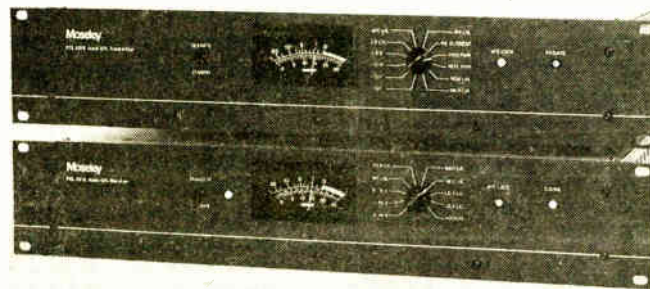
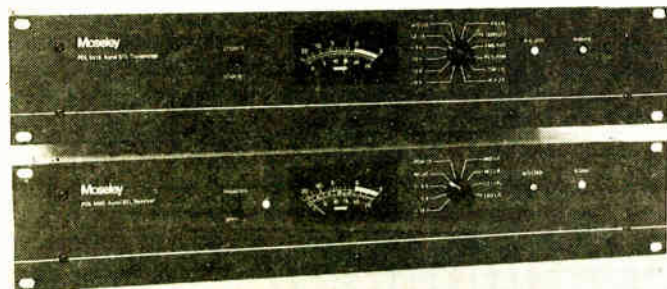
We do not have the printer option installed at our locations, but all the printer headers and column words can be set up by you at your location. We went ahead and plugged a printer into the 1600 and the printout looks impressive.

In addition, you can have an analog channel's upper and lower limits enabled and disabled by any channel's status. This allows you to ignore the lower power limit for the aux transmitter when it is not on line.

Wiring

One perplexing situation in which you might find yourself with 16 analog inputs, 16 status, 16 raise and 16 lower re-
(continued on page 46)

Introducing The most innovative pair of STLs on the market.



- Frequency Agile
- Excellent Selectivity
- Switchable Monaural/Composite Operation
- Comprehensive Metering
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The PCL 6020 and 6030 Studio-Transmitter Links blend technology and innovative design to provide a reliable, high-performance alternative to leased telephone lines.

The PCL 6000 Series STLs feature transparent audio, excellent selectivity, built-in receiver transfer circuitry, extensive front-panel metering, and frequency agility.

Now, you can select monaural or composite operation from a single system in the field. Receiver IF bandwidth can be set in the field or in the factory for 100 to 500 kHz channel spacing.

PCL 6010 Transmitter

The 6010 Transmitter is common to the 6020 and 6030 systems, and uses direct modulation techniques. FM frequency modulation is converted to final output through an up converter mixer. For long STL paths, a 15-watt transmitter power output is available as an option.

PCL 6020 System

The dual conversion PCL 6020 Receiver uses an FM quadrature detector to provide maximum fidelity. Use the PCL 6020 to replace an older STL, such as the PCL-505 for a 10 dB improvement in SNR and stereo separation.

PCL 6030 System

The PCL 6030 system offers the highest performance in hostile RF environments. The triple conversion PCL 6030 Receiver uses a digital pulse counting discriminator to provide the transparent audio necessary with aggressive processing techniques.

Call Moseley Marketing for more information, and for all your STL needs.

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Monroe: Control at Your Fingers

by Roland L. Phillips, App Eng
Monroe Electronics

Lyndonville NY ... With the increasing use of dial-up units for remote control broadcast transmitters, continued manual operation has become cumbersome. Today's dial-up remotes are very sophisticated, requiring the operator to look up or remember command codes.

A Monroe Model 6006 Central Controller, with an IBM PC-compatible computer, gives an engineer the option of manual or automatic control of remote sites.

The 6006 can control and monitor up to 99 remote sites via a standard dial-up telephone line and the use of high-speed DTMF.

Its software permits control from the keyboard, formatted storage, display and printing of status information and versatile sorting of files by site.

User-configurable screens present plain English displays of status information. Analog information generated by analog card-equipped remote units is automatically converted into desired engineering units.

This, in conjunction with a Model 6005 Remote Control system (which has eight control relays, eight digital inputs, a 60-event timer, alarm callback on input status change and an optional analog card with eight differential inputs) gives the engineer control of the remote transmitter.

Control relays can be configured to

control the transmitter's main power; the antenna load: main or dummy; preset power levels: high, post sunset and nighttime as well as increasing or decreasing power levels via an external motor drive.

Digital and analog inputs

Digital and analog inputs on the model 6005 are used to monitor control points and voltages at the remote transmitter site. If an input is enabled to callback on

Technology Update

a change of status and a change of state takes place, the 6005 will auto-dial the first telephone number stored in memory.

This callback can then be answered by personnel or automatically by the Central Controller. If the Central Controller answers the incoming call it can automatically acknowledge the call-in, log it on a hard copy and return the remote control to its normal non-alarm condition.

This mode of monitoring, having the remote unit and the Central Controller work automatically may be very useful to engineers.

They could, for example, have present power levels controlled by the remote's

real time clock and the callbacks for power level change automatically acknowledged and logged by the Central Controller.

The advantages to using a Central Controller over manual operation include: the ability to generate plain English labels for control and monitor points at a remote site; station data files created for each remote site; station normals determined for controls and monitor points at each remote site; station programming



created, viewed or modified; and printer phrasing creation or modification.

Plain English labelling permits the programmer to label points that correspond to the actual points on the remote site. An example would be "Main Transmitter Power ON."

The programmer would label the appropriate relay with "Main Transmitter Power" and "On" for the response when the remote's relay is energized. Responses can be labelled for the four

conditions of each relay output or input.

Station data files contain the remote site's address, telephone number, access code and whether polling, access code or auto acknowledgement of callback are enabled or disabled. Also contained in the station data file are screens generated for plain English labels and responses.

Alarm conditions

Within the station data files, station normals are set to the conditions which can be recognized as normal by the Central Controller for a station's outputs and inputs when the remote calls in with a status report.

These conditions are used by the Central Controller to determine whether an input is in an alarm condition. With this type of setup the remote unit can be enabled for callback on any change of state, but the Central Controller determines if the change is really an alarm condition.

To view a remote's stored program parameters, you use the Central Controller to call out and request a program dump. This will present all program parameters along with time commands.

Usually engineers must call out to the remote site and send touch-tone commands to operate and monitor the remote.

And with the need for more and more dial-up units in the broadcasting field the Central Controller becomes very cost effective, giving engineers more time for things other than going to the telephone and accessing the remote unit, waiting for it to speak English or beep.

Editor's note: For more information, contact the author at 716-765-2254.

Raise your standards.



To understand the superiority of the Tascam ATR-60/2N, begin with the heads: no other 2-track production recorder has heads that can provide sync response fully equal to repro response—an advantage that allows you to save time by making critical audio decisions without rewinding.

Next, look at its direct-drive reel motors, its PLL servo capstan, and its 3-motor servo controlled tape handling system—all factors that lead to the ultimate in fast, accurate, and stress-free tape handling.

Finally, consider that the ATR-60/2N gives you all this and more, hour after hour, year after year.

Then call or write today about the Tascam ATR-60/2N. And take your broadcasting to a higher level.

TASCAM

□ TUNED IN □

New Directions . . . As you probably already have heard, **Gentner Electronics** has acquired **Texar, Inc.** All Texar operations have been moved to Gentner's Salt Lake City facility; the Texar Monroeville, PA office will be permanently closed.

According to Gary Crowder, Gentner's director of marketing and sales, Broadcast Audio Division, former Texar owner and president Glen Clark will be working as advisor/consultant with Gentner "for a few months."

President Russ Gentner says that the recent purchase "establishes Gentner as an important force in the audio processing domain," and adds that the company will be introducing several new Texar products in the near future. By the way, Gentner's new address is 1825 Research Way, Salt Lake City, UT 84119. The phone number is 801-975-7200.

People . . . Of course, the industry is abuzz with **Harris'** acquisition of **Allied Broadcast**. In the midst of all that, Allied has announced that **Cal Vandegrift**, who recently began his ninth year with the company, is moving to its Los Angeles office. Incidentally, Allied's new toll-free number to reach its offices anywhere in the US is 800-622-0022.

And a familiar name has surfaced at

Studer Revox America. **Tore Nordahl**, formerly of **Mitsubishi Pro Audio** has been named VP and general manager in charge of operations as of 1 October.

Of Special Note . . . At Radio '88, **Integrated Media Systems** was busy marketing its **Dyaxis** digital audio system and new **MacMix** software. The Dyaxis allows you to record, retrieve, edit, mix and process sound with the mere touch of a finger. With the addition of **MacMix** (using a Macintosh computer) you can do precise sound edits with the click of a mouse. VP of Marketing **Gerry Kearby** says the relatively low cost of the system makes it affordable to even small sized operations.

Those of you interested in the status of the elusive recordable CD may be interested in knowing that the introduction of **Tandy Corp.'s THOR (Tandy, High-Density Optical Recording) System** is planned in the next 18-24 months. Tandy's director of marketing, **Michael Grubbs**, says that THOR is the only system which will be fully compatible with existing CD players. Planned price for the erasable CD will be \$500.

If you have industry/equipment news to report, send it to **Radio World Buyers Guide**, PO Box 1214, Falls Church, VA 22041.

Continental Monitors WETA's On-Air Signal

by Joe Davis, CE
WETA-FM

Washington DC . . . All chief engineers have been through some variation of the following scenario.

You're driving along, casually listening to your station when suddenly, static fills the radio and your heart jumps as you realize the station is off the air.

Seconds pass as you hope it is a momentary overload or power failure, but the station stays off. Finally, three or four minutes after the station went down, it comes back on.

When you finally find a phone and call the announcer, your eyes bulge as he explains: "Well gee, we went off when I was out of the studio, and when I got in there I couldn't remember the procedure to turn on the standby and then I kept pressing buttons until it came on."

Emergency control

Enter the Continental 377D-2 transmitter controller. The 377D-2 monitors an on-air transmitter. In the event the trans-

User Report

mitter fails and does not return to the air within a preset time delay, it will switch a standby transmitter to the antenna and turn it on.

All this can take place before the announcer perks up and says "Holy headphones, we're off the air!"

Please understand, I have always taken a great deal of time to educate the air staff about emergency procedures. Simple, step-by-step instructions are prominently posted at the remote control.

Still, announcers are famous for panicking or freezing when the transmitter drops off. The better maintained stations generally do not have many transmitter failures to begin with. Subsequently, the air staff is not always familiar with the act of actually switching on an auxiliary transmitter.

The 377D-2 is a complete interface between the control circuits of two transmitters, a coaxial switch, dummy load and remote control system. It also takes an RF sample from each transmitter to sense RF power output. It can be used in either main/auxiliary or main/alternate main setups.

How it works

The controller switches one of two transmitters to the antenna. The transmitter not selected to the antenna typically feeds a dummy load. There is logic for the dummy load's cooling interlock to satisfy the standby transmitter's external interlock input.

AM or FM transmitters can be controlled by the 377D-2. Included with it is a coaxial switch interface panel. A different version of the interface panel is used for AM solenoid type switches as opposed to the FM motor-driven coaxial switch.

There are only six buttons on the controller, so operation is very simple. The buttons are arranged in pairs.

One pair is the Plate On/Plate Off but-

tons. Plate On turns on whichever transmitter is currently selected to the antenna; Plate Off will turn off both transmitters.

The Xmtr 1/Xmtr 2 buttons enable manual selection of the alternate transmitter by turning off the on-air transmitter, changing the coaxial switch and turning on the selected transmitter.

An auto button switches the standby transmitter to the antenna and turns it on in the event of a failure of the main, while its companion manual mode defeats this automatic changeover. (Internal jumpers allow the Plate On command to simultaneously set the unit in Auto, and the Plate Off command can also select Manual.)

Transmitter status

Status LEDs and lamps on the front show the coax switch position, plate on/off status of each transmitter, and auto or manual condition. In addition, the transmitter select button lamps will flash if there is an interlock problem preventing safe turn on. All controls and indicators are easily connected to a remote control system.

There is no microprocessor to lock up. Inside the 377D-2 you will find a PC board with TTL logic and hefty driver

The (Continental) controller switches one of two transmitters to the antenna.

transistors. Relays connect to transmitter control inputs. Internal Ni-Cad batteries keep the circuit board on line during a power failure.

Installation can take awhile, as the 377D-2 is connected to both transmitters, a coax switch, dummy load and remote control.

When installed, the next step is to set the time delays and RF levels to your needs. The RF samples not only let the automatic switch take place, they also keep the coaxial switch from changing until the RF output has actually decayed.

If you install a 377D-2 to work with a newer Continental FM transmitter, here is a hint: The transmitter's front panel external interlock LED can indicate that interlock is OK, when actually it is not and the transmitter will not come on.

It seems that there is enough current available through the unlit Plate On lamp of the 377D-2 to feed into the control circuits of the transmitter and illuminate the interlock LED. Adding a diode in the transmitter will eliminate this problem, however.

The 377D-2 has been around for a number of years, but it is not familiar to many engineers. I expect Continental could sell many more if they marketed more aggressively. Continental also makes automatic exciter switchers and a switcher for combined transmitter operation.

Editor's note: Joe Davis may be reached at 703-998-2790.

For more information on the 377D-2, contact Walt Rice at Continental: 214-381-7161.

HOW MUCH OF YOUR CD MUSIC REACHES YOUR AUDIENCE?

If your STL is "composite," you could be losing 30 db of stereo separation and one-third the dynamic range of CD's before your signal reaches your FM transmitter!

If the weak link in your audio chain is a "composite" STL, then take a look at the benefits of the **MARTI STL-10 scpc stereo system**. This system achieves a noise floor of near -80 dB at a fraction of the receiver signal strength required by "composite" STL's, and the stereo separation is the noise floor! Also you receive the extra dividend of the inherent interference rejection and backup reliability of an scpc system.

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WKSZ Takes Requests with Telos

by Douglas W. Fearn, CE
WKSZ-FM

Media PA . . . For years our air studio had little need for a telephone interface—until, that is, an all-request oldies show was added to our weekend schedule. During this program virtually all of the audio was done live while the disc jockey was on the telephone with a caller.

At first we used a standard telephone interface unit, but it soon became apparent that something better was needed. The amount of DJ audio appearing in the telephone output was intolerably high and the adjustment of the hybrid null was a compromise, especially with the 800 lines we used for the show.

To minimize the leakage in the hybrid, the level sent to the caller had to be kept quite low, which hindered communication because some callers could not hear the DJ clearly. Some calls were good, but others were unusable.

After a little research, I concluded that stations using Telos' digital hybrids were all pleased with the results. We arranged to have a Telos 100 delivered to us for evaluation.

Telos makes two digital hybrids: the Model 10, designed for multiline use, particularly with key sets; and the Model 100, for applications that had either a sin-

gle line or an electronic phone system providing a single line output.

We chose the Model 100 for use with our AT&T Merlin telephone system. The 100 also had somewhat better specs than the older Model 10.

User Report

True digital audio

Many electronic devices boast of being "digital" these days, even home appliances. But the Telos 100 Digital Hybrid is truly a digital device.

The caller audio is converted to digital and processed as a digital signal before being converted back to analog. Automatic gain control, noise gating, equalization and the hybrid functions are all done in the digital domain. The audio is sampled at a 16 kHz rate, with a full 16 bits of resolution.

And, as in most better digital audio devices, 2x oversampling is used in the D-to-A conversion to make the filtering side effects less obvious.

As each call is picked up, a 400 msec burst of white noise is sent down the phone line. The burst is used by the Telos circuitry to analyze the impedance of the phone line in use and to null the hybrid for that line.

During this time, the audio output to the studio equipment is muted, which will also mute any pops or clicks generated by phone system switching.

This burst of noise is not very obvious

to the caller, and when I listened to it I didn't find it at all distracting or annoying. In addition, the unit analyzes the line during the conversation and continues to fine-tune the hybrid.

The results are amazing. With a decent telephone, a caller can sound nearly "studio-mic" in quality, while the announcer's microphone feed to the caller is quite loud and easy for them to hear.

. . . as in most better digital audio devices, 2x oversampling is used in the D-to-A conversion to make the filtering side effects less obvious.

The amount of DJ feedthrough in the caller's audio is also very low—over 40 dB down, according to the Telos specs.

Installation was fairly simple. The basic connections are easy: XLR connectors are provided for the send and caller audio. Two caller audio outputs are provided, each with a level control.

The telephone line connects to a standard modular jack (with another jack for a telephone instrument loop-through, if desired). We use one output to feed a

reel-to-reel machine; the other goes to a console input.

Remote switching

Remote on/off switching was more complicated, however. The Telos requires a momentary closure at the beginning of each call to tell the unit to re-adapt. In our situation, all phone calls are taped, so a console on/off button isn't necessary.

I have tried to find a reliable pulse in the Merlin telephone (or in the AT&T General Purpose Adapter we use to extract an output of the phone line selected), but have had no luck so far.

So for the time being, a small push-button in a box next to the telephone must be pressed at the beginning of each call, an inconvenience that I hope to remedy soon.

But even when a call is picked up without the noise pulse being sent, the Telos adapts to the new line adequately within a few words.

Since only a portion of most of the calls are actually aired, this works out pretty well. In counterpoint, however, when no line is selected, the Telos "hunts" for an adjustment and is way off by the time a line is finally present.

Setup adjustments are few and simple. A coarse null, the desired amount of caller expansion (which reduces the caller level when he or she is not talk-

(continued on page 46)

10 years from now, it'll still be the standard.

The undisputed standard for broadcast cassette decks has always been the Tascam 122B. But that standard has just been surpassed.

Presenting the 3-head Tascam 122MKII. Its leadership is founded upon features such as Tascam's Cobalt Amorphous tape head technology. Plus a choice of built-in Dolby systems: not just B and C, but also HX-Pro, for virtually perfect high-end frequency response.

More than any comparable deck, it maintains constant tape speed and tension, thanks to a tape handling system that includes Tascam's Hysteresis Tension Servo Control.

And when it comes to handling, the 122MKII is the complete professional tool, with cue and review functions (manual cue), balanced XLR +4dBm inputs and outputs, and rack-mountability.

Call or write for more information about the 122MKII. Get it now, and use it for decades.

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TASCAM



Circle Reader Service 15 on Page 34

KIIS Helicopter Goes Hamtronic

(continued from page 39)
ceiver was no longer evident.

Next, I installed the receiver at our FM transmitter site on Mt. Wilson where it feeds a 5 kHz telco line to the studio. Upon running program tests with the helicopter "pushing the envelope," I was again extremely pleased with the coverage area, which now includes Los Angeles, Orange, San Bernardino and Riverside counties.

Complete circuit documentation is included with the Hamtronics unit, while a phone call to the company brings full technical support.

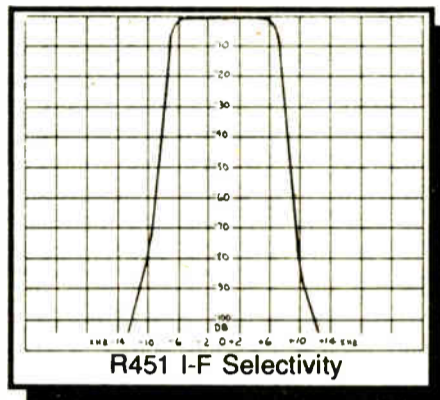
The receiver, despite its open construction and small size (4" x 5" circuit board) is very rugged. The quality of the construction is first-rate and the circuit design is practical and straightforward.

It is intended for use in repeaters where a strong transmit signal is normally 600 kHz away and the output of nearby reverse-split repeater transmitters

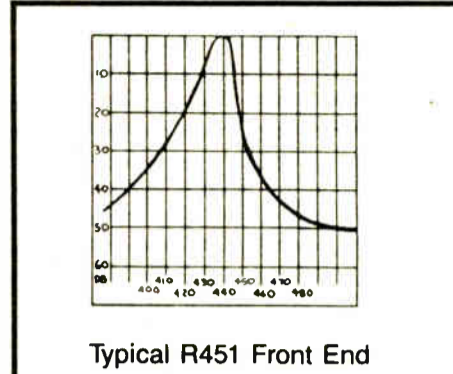
can be a mere 15 kHz removed.

The sensitivity is specified at 0.25 μ V. With the addition of the optional HRA-460 Helical Resonator/Amplifier the sensitivity can be increased to 0.15 μ V.

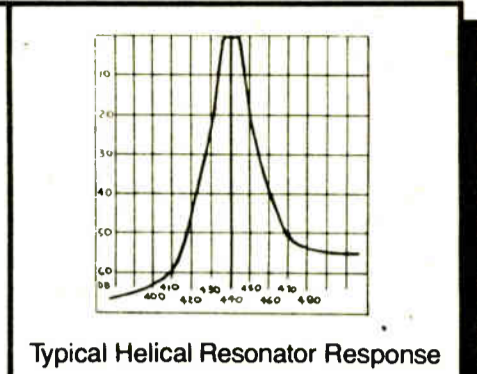
By itself, the receiver has a selectivity of slightly more than ± 6 kHz and is down 100 dB at ± 12 kHz. The addition of the HRA-460 makes the skirts even steeper and provides additional protection from intermod and cross-band interference.



Two IF filters are included, an eight-pole crystal filter at 10.7 MHz and a wide-band ceramic filter in the second IF centered at 455 kHz. The AFC operates over a range of ± 10 kHz and may be defeated if desired.



Typical R451 Front End



Typical Helical Resonator Response

The on-board LM-380 audio power amplifier will provide up to 2 W into an 8-ohm speaker. It will load into a transformer driving a 600-ohm balanced line. Power from an external supply, 13.6 VDC at 150 mA, is specified. Our circuit is driven with a stiff 12 V source.

The Hamtronics receiver may not be ideal where time, a work bench and some technical know-how are unavailable. Some additional construction is necessary—mounting it in a suitable enclosure, supplying power and interfacing the output to something such as a speaker, phone line or console.

Numerous options are available from the company, however. For good signal situations, the helical resonator may be ordered without the amplifier.

If the receiver is not located near other transmitters, the resonator may not be needed at all. For \$50 less, the receiver comes as a kit. For \$100 more, it can be ordered fully mounted in an RF-proof enclosure.

It is a pleasure to acquire a piece of equipment which is well built, well designed and works right out of the box. The Hamtronics receiver did just that and it exceeded all of my expectations for performance.

Editor's note: Jeremy R. Burnham has been with KIIS since 1975. He can be reached at 213-466-8381.

For more information on the R451 UHF FM Receiver, contact Hamtronics Inc. at 716-392-9430.

Moseley's Remote Unit

(continued from page 42)
lays, however, is what to do with all of the wiring.

We solved that problem by taking 25-pair telephone extension cables, cutting them in half and wiring them to the back panel of the 1600.

To this end, a very nice thought by somebody at Moseley is the "capture"-type barrier strips; you just slide the wire under and tighten down the screw.

What could possibly need improving with the 1600? Not much, but the LED readout display is rather small and the alarm buzzer goes off too quickly when a diagnostic check of the A-to-D converters momentarily doesn't line up.

These matters aside, however, the Moseley 1600 Remote Control proves to be a strong controller for a station's remote transmitter. With its many setup options, decided by the engineer, it is a very flexible device.

Editor's note: Tom Bosscher has been in the radio broadcast business for 12 years, the last 5 years at WCUZ-FM, and is vice chairman of the Grand Rapids Chapter of the SBE. He may be reached at 616-451-2551.

For more information on the Moseley 1600, contact Maryanne Wasielewski at Moseley Associates: 805-968-9621.

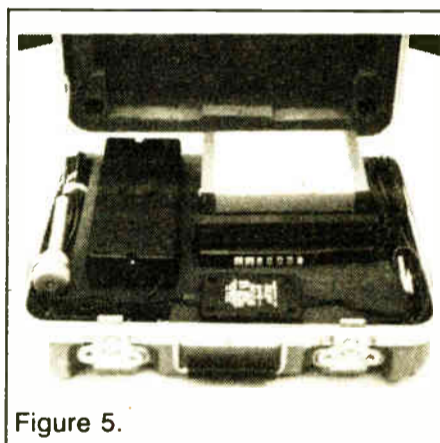


Figure 5.

WASK Puts Comrex PLX to Work on Remotes

(continued from page 35)
ance indicator will let you balance the hybrid without having to bring along anything more than a screwdriver.

Anytime we at WASK/K105 install new equipment, we first check to see if the equipment is free of RF interference. Our FM ERP is 50 kW, and a 20 kW transmitter is only a few feet from our control rooms. We were subsequently pleased to

find the Comrex equipment completely free of any RF.

Repeated success

We are presently putting our Comrex/Cellular system to heavy use. We have already broadcast the Indiana and Kentucky Basketball High School All-stars and although we feared we might have some dropouts, everything was a success.

Our farm director broadcasts farm reports from all of the surrounding 4-H county fairs and the Indiana State Fair. And we are broadcasting high school football through the system. In all cases we have obtained excellent results.

We can also see a great expense reduction on remotes by the cellular system, especially when we are broadcasting a one-time event.

We can see many more possibilities in the future, and are planning to interface our news department computers to our farm director's computer via the cellular.

This way, the latest farm markets can then be fed to his computer before he goes on the air from his remote location, regardless of what city he will be in, as long as a cellular system is located in that city.

We are pleased to be using the Cellular/Comrex as an alternative in remote broadcasting. There is a great future for this method.

Editor's note: George H. Williamson has been in broadcasting for 33 years—28 years with WASK as CE. He may be reached at 317-447-2186.

For more information on the Comrex PLX micro, contact Lynn Distler at Comrex: 617-263-1800.

Telos Hybrid Wows WKSZ

(continued from page 45)
ing) and the degree of override (caller ducking) are all set.

These last two adjustments are made with front panel knobs and are so easy to understand and use that we have encouraged the operators to experiment with the settings.

Three LED meters on the front panel

indicate the audio input level, the amount of gain reduction on input or output and the audio output levels (switchable between the two outputs).

Clear instructions

The Telos manual is excellent. In these days, when "unscrew when remove cover" is typical of the language used even in manuals for professional equipment, it is refreshing to find a book that is not only written in standard English but is also entertaining and highly informative.

A very comprehensive section on telephone systems theory is included in the manual, which is the first such explanation that I have ever read that actually made sense.

The Telos 100 has vastly improved the sound of our all-request oldies show—not only on the air but also in the callers' minds, since they can now hear the DJ on the phone much better.

Editor's note: Doug Fearn is a frequent contributor to RW. He may be reached at 215-565-8900.

For more information on the Telos 100, contact Steve Church at Telos: 216-241-7225.

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Model CEB Encoder-Decoder	\$475
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