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# Radio World<sup>®</sup>

Buyers Guide  
FM Transmitters,  
Exciters & SCA  
See pages 33 to 47

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## Duopoly Restrictions Eased

by Alan Carter

Washington DC ... Radio station owners now can own two AMs or two FMs closer together.

FCC Commissioners voted unanimously 27 October to relax the "duopoly" rule that prohibited common ownership of two or more commercial AMs or FMs whose 1 mV/m contour overlap. The Commission reduced the overlap restriction to the 5 mV/m contour for AM and to 3.16 mV/m for FM.

The action stemmed from a notice issued in January 1987 when the FCC sought comment on amending the duopoly rule and "one-to-a-market" rule, which restricts an owner to one AM-FM combination, or one TV station or one daily newspaper in a market. The

Commission did not act on the one-to-a-market section.

In separate action, the FCC also deleted the cross-interest policy as it applies to consulting positions, joint ventures, time brokerage arrangements, and advertising agencies. But the Commission issued a proposed rulemaking questioning cross-interest as it applies to key employees and people who, for example, are limited partners or non-voting stockholders.

### Flexibility

In supporting the change in the duopoly rule, the Commissioners focused on the increase of new stations in all sized markets, which they said offer a great diversity of program choices.

"I think it does more accurately reflect

real listening patterns," Commissioner Patricia Dennis said. "I'm told that about 80 to 85 percent of the audience appears to be in the principle city contour, and

therefore shrinking the contours will not affect what local listeners actually hear."

There is no "negative impact on diversity" *(continued on page 3)*

## FCC Urged to Reform Renewal Procedures

Washington DC ... Comments filed on the comparative license renewal process are urging the FCC to make extensive changes in hopes of eliminating the potential for abuses.

The Commission launched a review of the process after allegations of legal extortion and claims that competing applications are frequently filed only to obtain a payoff surfaced.

Group W which owns 15 stations, called for a prohibition on any payments between competing applicants in exchange for withdrawing an application.

"This would weed out both blackmailers and speculators ...," Group W argued. "If a strong public interest showing were made, the Commission could always consider waiving the rule when necessary."

### Stricter guidelines

Group W also recommended that the FCC tighten its filing and procedural requirements "to deter challenges which are not bona fide and may be designed solely to receive a settlement payment."

The group owner said that before the Commission grants a comparative hearing, it should determine whether the challenger is qualified to be a Commission licensee.

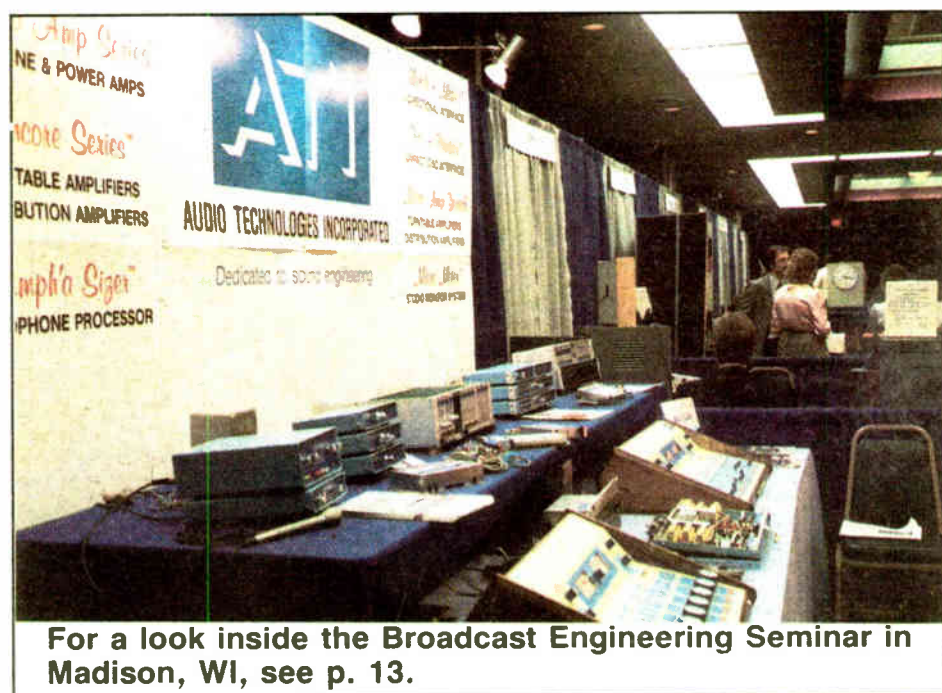
In a comparative hearing, Group W recommended that the FCC clarify its standards for granting renewal expectancy and give them greater weight. "Group W supports a standard which would consider the reasonableness of the licensee's judgment in programming to meet the needs and interests of its community," Group W stated.

CBS, owner of 18 radio stations, said

the Commission should limit settlements "to the challenger's legitimate and prudent expenses."

The network also asked the FCC to amend the comparative application to require additional information, specifically financial qualifications, ownership and claimed integration benefits.

*(continued on page 12)*



For a look inside the Broadcast Engineering Seminar in Madison, WI, see p. 13.

## Engineers' Skills Queried

by Denise Kearns

Denver CO ... A survey of broadcast engineers on technical aptitude among their colleagues found high degrees of

perceived weaknesses in microprocessing and digital technology—two of the key areas in today's radio equipment.

Of almost 110 radio engineers responding to the survey, about 80% assessed "experienced" broadcast engineers' ability to work with microprocessors as a high deficiency. Lack of knowledge in digital technology was recognized by approximately 60% as a point of concern.

The survey of radio and TV engineers who are members of the Society of Broadcast Engineers, was conducted by David Harris, a professor of electronic engineering at Purdue University. Findings were discussed in a session at SBE's national convention in September in Denver.

Nearly 50% of the AM/FM broadcast engineers who participated in the survey had a minimum of 10 years experience. More than 30% had been in the business 20 or more years.

The object of the survey was to discern the strengths and weaknesses of practicing engineers, as well as their educational background. Perceived requirements for new broadcast engineers also were sought.

### Areas of concern

Other key weaknesses cited, but not to the degree of microprocessing and digital technology, included microwave, antennas, math and recordkeeping.

In general comments, engineers *(continued on page 14)*



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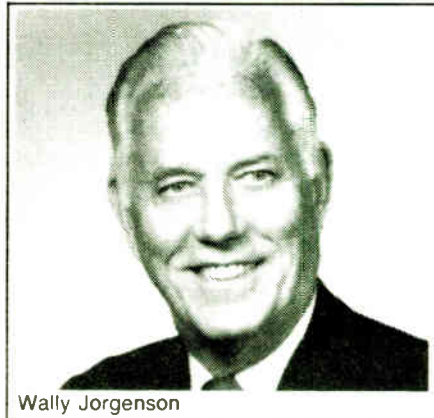


## NEWS BRIEFS

### NAB Chairman Retires

Charlotte NC ... NAB Joint Board Chairman Wally Jorgenson retired as president of Jefferson-Pilot Communications Co. effective 1 November.

Jorgenson, 65, was president of the broadcast group and communications company for nearly 11 years. Jefferson-



Wally Jorgenson

Pilot's holdings include WQXI AM-FM, Atlanta; KYGO AM-FM, Denver; KSON AM-FM, San Diego; WNWS-AM and WLYF-FM, Miami; WBT-AM and WBCY-FM, Charlotte.

Replacing Jorgenson will be Executive VP James G. Babb, who joined Jefferson-Pilot in 1956. Babb began as a publicity supervisor and has served in a variety of sales and management positions in Jefferson-Pilot radio, TV and Jefferson-Pilot Teleproductions.

### NAB Radio Engineers

New York NY ... With NBC network having sold NBC Radio to Westwood One, there apparently is an overabundance of technical and operational people.

A reported 140 NABET members had until 10 November to accept or reject a voluntary buyout offered by the network in October.

An NBC spokesman attributed the network's divestiture of its radio operations, and the remainder of activity expected in this election year, as justification for the buyouts.

The buyout includes outplacement services, career retraining and 100% tuition funding, regardless of an employee's tenure at NBC. Tenure was used to determine financial compensation, which ranged to a full year of pay for employees with 20 years or more service.

### "Ultimate Radio"

Long Island NY ... "It's coming along."

That's how radio designer Richard Sequerra responded when asked where development of the NAB's "ultimate radio" stands. Design of the radio that incorporates AM stereo, FM stereo, continuous tuning, NRSC and FMX—to name just a few perks—was delayed from its expected debut in September at Radio '88.

Sequerra was expected to deliver the radio to NAB by 26 October, according to NAB staff engineer Stan Salek.

Sequerra declined to discuss the issue any further with RW. "You guys are just doing a gossip column ...," he said before abruptly concluding the conversation and referring questions to NAB.

Salek said one of the last delays was in obtaining continuous tuning circuitry, which has been accomplished.

### NAB Engineering Awards

Washington DC ... The NAB is accepting nominations for the Engineering Achievement Awards that will be presented during the NAB annual convention, 29 April-2 May in Las Vegas.

To qualify, a candidate must have made a contribution that has measurably advanced the state of the art of broadcast engineering. A contribution may include an invention, the development of new techniques, leadership in broadcast engineering issues, or the dissemination of technical knowledge and literature.

Nominations should be sent to NAB's Science and Technology Department, 1771 N St., N.W., Washington, DC, 20036 by 1 December. For additional information call 202-429-5346.

# RAC Drafts AM Band Recommendations

by Charles Taylor

Washington DC ... Hoping to give the FCC some priorities on AM technical improvements, two subgroups of the Radio Advisory Committee (RAC) have drafted a report containing specific recommendations for the Commission's comprehensive review of the band.

Among issues the technical and allocations subgroups addressed are emission limitations, nighttime RSS interference calculations, first-adjacent channel groundwave interference and application of new technical rules.

The report grew out of discussions in September by members of the two subgroups that a tremendous amount of useful information has been compiled on AM technical improvements under Docket 87-267, however, it had yet to be coordinated into any useful form.

The groups expected to present the report to the full RAC at the end of October for approval before being sent to the Commission.

"The changes recommended in this report are entirely possible, practical and will have a very positive impact on the viability of AM without introducing 'remedies' which will increase interference or decrease the technical quality of the service," the draft report noted.

### A beginning

First, the preliminary report suggested incorporating the NRSC audio and complementary RF emission standard into the FCC rules so stations complying with the audio portion, dubbed NRSC-1, would be assumed to be in compliance with the emission requirement, NRSC-2. Stations would be required to have NRSC-1 equipment operating by 1 January 1990.

Two years later, the report stated, stations would be required to meet all specifications of the revised emission limitation as proposed by the FCC. The

NAB is seeking evidence to validate the presumptive compliance consideration.

"This method would effect a rapid and noticeable AM technical improvement and at the same time provide the uniformity that radio receiver manufacturers have been seeking," the subgroup's report stated.

With the NRSC-1 audio standard in place, stations then would have ample time to analyze and make equipment acquisitions and corrections necessary to fully comply with the RF emission standard, it added.

The subgroups also supported modification of the existing 0 dB protection ratio of stations on adjacent frequencies, which it said has become unrealistic and inadequate.

Based on information from two technical studies commissioned by the NAB—"AM Technical Assignment Criteria—An Examination of Issues Raised in MM Docket No. 87-267" by Harrison Klein, and "AM Radio Interference Study" by B. Angell & Associates—the group recommended a protection ratio of at least 16 dB for new or major changed assignments in the AM band. The same was recommended for all assignments in the expanded AM band, from 1610 to 1700.

### Replace exclusion rule

The subgroups also supported replacing the current 50% exclusion rule with a 25% rule, which they said would yield a more realistic assessment of actual interference suffered by AM stations. Also, the change would better protect existing stations from "creeping interference," which the report said was singled out by several commenters, and would allow reasonable flexibility for facilities changes.

The subgroups took a strong stance on stations that suspend on-air operation and recommended FCC rules be revised to require that licenses be surrendered if a station is off the air for more than 60 days.

"In many cases, long suspensions of operation by AM stations are the result of the forces of the marketplace acting to 'weed out' technically inferior, non-viable facilities," the draft stated. "Although these stations themselves pro-

(continued on page 31)

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# FCC Relaxes Its Duopoly Policy

## Overlap Restrictions for AM and FM Contours Have Been Reduced

(continued from page 1)

sity, which is the bedrock principle of the Communications Act," she added.

Chairman Dennis Patrick said he believed any losses in diversity are outweighed by the benefits of "eliminating an effective discrimination against AM because the present rules do effectively discriminate against AM in terms of the strength and clarity of the signal . . ."

He also said the relaxation would provide "substantial economies" by the opportunity to own stations closer together.

### An opportunity

One station owner, Ron Frizzell, president and GM of WLAM-AM, Lewiston, ME, said the change will give him a better opportunity to operate a station in Portland, ME, 35 miles away.

With WLAM at 1470, Frizzell bought WJBQ at 1590 in Portland. But when he wanted to move the station to 870 to achieve better service, Commission rules required a highly directional antenna because of the overlap at the 1 mV/m contour. With the directional antenna pattern, he said many of the benefits of moving to 870 were eliminated.

Under the new rules, Frizzell said he and other owners in similar situations will be allowed to achieve a much greater service area.

"I think it is excellent news for AM,"

he said. "It might allow some AM stations to upgrade . . . or cause those people really interested in AM to buy another AM close by and really fight to make it a success."

### Helps local service

The NAB also supported the FCC action. "These changes will give broadcasters in many communities the opportunity to apply stronger resources in maintaining local service," NAB Joint

Board Chairman Wallace Jorgenson said in a prepared statement.

Communications attorney Ken Keane of Wilner & Scheiner in Washington said the action is another example of the FCC's "less-is-better approach" and would provide a "modest stimulus" in station sales.

On the cross-interest policy, the Commission stated that the policy was designed to ensure "arm's length transactions" between stations in the same

service and in the same market. It was expanded to cover cross-service situations—radio to newspapers for example—and to promote diversity.

But the FCC argued that "the plethora of media services," which it stated resulted in more diversity, "strongly undercuts any underlying need to continue to examine the relationships deleted by this decision."

For information on either issue, contact the FCC at 202-632-5050.

# NAB Cites Lobbying Successes

by Charles Taylor

Washington DC . . . The NAB proclaimed victories for the broadcasting industry during the 100th Congress on transfer tax legislation and forest use fees and promised continued lobbying for license renewal reform on Capitol Hill.

At a briefing 25 October with NAB executives, chief lobbyist Jim May said the association tracked between 60 and 70 pieces of legislation and presented testimony 18 times during the 100th Congress.

Fifteen issues were resolved in favor of the NAB's stance, one was a defeat and eight were unresolved, he said.

### Forest fees

One area of victory concerned a move by the Forest Service to increase fees for broadcasters to use public land for towers and antennas. Pressure from eight sena-

tors and the NAB prompted a delay in the implementation pending hearings in the next Congress.

The delay and a previously granted extension in the comment period of the fees allowed most broadcasters a one-year grace period before possible action is instigated, the NAB said.

The NAB also saw itself as a winner regarding transfer tax legislation, which sought to impose a 2% to 5% tax on license transfers and to establish a trust fund for public broadcasting.

NAB strongly opposed the measures, which were defeated in December.

An undecided issue that the NAB will continue to pay attention to is license

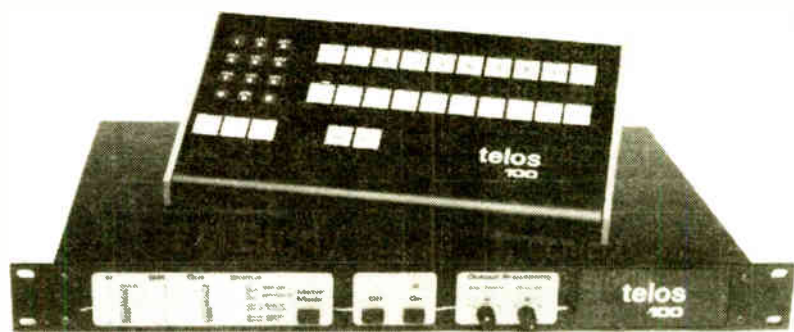
renewal reform.

NAB said despite efforts to negotiate industry-wide license renewal reform legislation, the "price tag" for such legislation was too high. That price tag was Congress' insistence in tying such reform to a reintroduction of the fairness doctrine.

### Radio only

But the association said that it laid the groundwork for introduction and consideration of radio-only renewal reform legislation during the 101st Congress. It marked the first time NAB has acted on behalf of radio-only legislation.

(continued on page 8)



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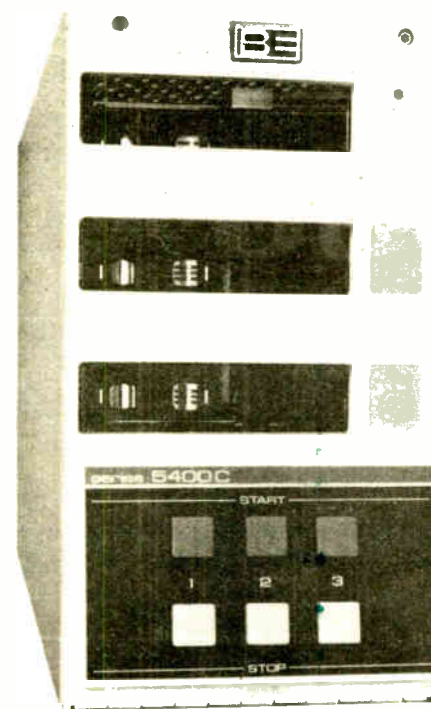
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# Bolts and a Few Nuts in Madison

by Judith Gross

Falls Church VA . . . The leaves had all turned color, the sign in front of the Holiday Inn bid a warm welcome and the weather was brrrrrisk in Madison, Wisconsin for the Broadcast Engineering and Telecommunications seminar.

There were fewer attendees than in some past years, but as Don Borchert pointed out, it was a very attentive group. Sometimes the concentration during the presentations was so intense you could have heard the proverbial pin drop.

This conference, like the other industry events this fall, is re-examining its objectives and trying to peer into the

crystal ball to see what lies ahead.

Does the seminar last too many days? Should it be held somewhere besides Madison? Should it be more focused? Should it be consolidated with any of the other meetings/conventions?

Generally, the engineers I chatted with like the Madison locale and like rubbing elbows and sharing a beer or a coffee with their colleagues.

Especially fun was the "nuts and bolts" session, you know, the forum for exchange of problems and solutions. Mark Durenberger did a great job as emcee—didja ever think of being a talk show or game show host Mark?

He really kept things moving. Ed An-

thony from Broadcast Electronics kicked off a discussion on AM synchronous noise, or ICAM, as we've been calling it ever since our contest results.

There was some moaning and groan-



ing about EBS, which very few folks are really satisfied with. Mr. Durenberger took a second to point out that if you turn your SBE button upside down it spells EBS. Hmmm. A secret



Getting down to basics in "nuts and bolts" discussion.

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you know that his company is not to be confused with an entirely different Access in Texas which merely rents the gear.

Jim's Access sells cellular equipment which many stations are using in remotes these days (see *Buyers Guide*, 15 October RW). You

can call him at 414-453-6210.

Michael Zahn, whose column *Radio Zahn* appears in *The Milwaukee Journal* tells me about an interesting use of stereo on WQFM's morning show.

Seems the morning man tells a dirty joke on the air each day, and when he gets to the punchline, they pan it so that if you tune your receiver to the right you get the off-color quip, but if you tune to the left you get a Bible passage.

I think Arbitron or somebody should put a question in their diaries asking who tunes to which channel so we can determine if Milwaukee is a city of saints or sinners.

Of course if you're listening in mono, like I do on my clock radio when I get up in the morning, all you hear is the garbled mix of the two, the Bible quote and the dirty joke (does that mean I don't have to go to confession?).

Another innovative use of new, if not high, tech comes from the Big Apple's K-Rock (WXRK). The classic rock station is now having listeners fax their requests, jokes, stories and comments to the station.

Caught one of the peacock network's new shows, *Midnight Caller*, about an ex-cop turned radio talk show host. When he met another character on the show who announced her station's call letters, he asked "AM or FM?"

"FM, of course," the lady replied. Without batting an eye our hero informed her, "Oh, I never listen to FM." (And I don't usually watch that other medium unless it's a show about radio.)

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



# OPINION

## READERS FORUM

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

### No home AM models

Dear RW:

Excuse me, but am I the only one who finds the criticisms of the AM section of Richard Sequerra's "Ultimate Radio" a bit naive? (*Earwaves* 1 October RW)

"First off, it's a tabletop model... don't most AM listeners listen in cars these days?" etc.

If the people who listen in cars don't listen at home, it most likely is caused by the extremely poor quality sound that present home AM receivers provide.

For AM to survive, it must attract everyone—home listeners as well as car-listeners; anything else will just slow the decline temporarily.

Personally, I'm still upset that I can't find a decent, affordable (non-car) AM receiver, stereo or not. And I wish Sequerra luck in finishing the project.

Richard Wagoner  
Technical Consultant  
KLA (UCLA)  
Los Angeles, CA

### No creative solutions

Dear RW:

We radio people are without doubt our own worst enemies. We just run it "forever" without one shred of improve-

ment—AM—and cry when listeners go elsewhere.

We ignore the lessons of how other struggling spectrum entities—UHF-TV—solved their identity/tuning problems (congressional influence).

We refuse to adapt to change: "stereo won't help AM;" "the continuous band radio won't help AM;" "nothing will help;" "woe is us!"

We cling to the belief help must be immediate: "Best bets are formats aimed at over 35."

Let's wake up, folks! Older folks are the easiest target for AM radio: but when that audience starts dying off, there won't be any replacements!

There is *no* quick fix to 40 years of deterioration. If what I read are the most creative and best concepts our industry has to offer, we're in much worse shape than I ever thought possible!

David J. Shepherd, GM  
KSTV-AM/FM  
Stephenville, TX

### AM survival strategies

Dear RW:

I have just finished reading the 1 October issue of *Radio World* for the fifth time, and I want to applaud you for some excellent articles.

Kudos to Ron Frizzell for the Titanic piece. I, too, have sat frustrated time and time again by the immobility of the various radio groups when AM is concerned.

Study after study is commissioned, findings are published and no one does a damn thing except sit and wait to see what happens.

The old saying has to apply here when it comes to AM radio: keep moving ahead or get out of the way!

I've watched the blame placed on every group possible: the FCC for crowding the spectrum, the receiver manufacturers for not "moving fast enough," programmers for not fulfilling the community needs, owners for using their AMs as loss leaders, etc., etc., etc..

The time has come to stop placing blame! Those who are in AM radio for the long haul have got to kick aside all the excuses for why it can't work, and **MAKE** it work!

To do this is going to take a radical approach: spending money! Imagine that, you'll have to spend money to make money.

In this age of short-term profits, we are going to look ahead to long-term gains and invest in our future by mortgaging our present.

Instead of switching on the satellite or automation or simulcasting, hire a crack team of good announcers who are not afraid to be personalities tied into your community.

Upgrade your audio chain so it will surprise those who tune in to try you out instead of confirming their prejudices.

Program your station to **WIN**, not just hopefully fill some nearly non-existent void in all South American weather fore-

As the deadline for comments on a mandatory NRSC standard approaches, questions about adopting only the audio portion, only the transmission portion or both parts cloud the issue.

The NPRM favors adoption of NRSC-2—the transmission standard or RF mask—because the FCC's role is one of regulating emissions.

The FCC doesn't want to regulate a station's audio processing (NRSC-1), and even if it tried, enforcement would be difficult.

Now NAB, among others, is encouraging a "presumptive compliance" policy, whereby stations adding the NRSC preemphasis and 10 kHz stop-band filter would be presumed to be in compliance with NRSC-2.

This is too much of a presumption. It is possible for the station's transmitter to be out of compliance with NRSC-2 even if NRSC-1 is in place.

## Don't Presume Too Much

Spurious emissions, poor tuning or clipping within the transmitter can all cause problems even if an NRSC filter which adheres to the standard is in the audio chain.

NRSC-1-only proponents have argued that determining compliance with the RF mask would be more costly to a station, since testing can be complex.

But many stations have contract engineers with test equipment, can share a spectrum analyzer with other stations or can make use of specialized monitoring products to insure compliance.

And, as the FCC pointed out in its NPRM, diligent engineering dictates that a station should go to the same lengths to assure compliance with the audio portion of the standard even without the adoption of the RF mask.

If the NRSC is truly going to help AM, it needs to take a systems approach from the audio chain through the transmitter.

Presumptive compliance goes against sound engineering and threatens to undermine all the hard work which has gone into developing the standard.

AM radio needs both portions of the NRSC standard as a mandatory rule.

—RW

casts, or the like.

Spend money on outside advertising. Buy billboards, TV time, newspaper space, bumper stickers, blimp space—whatever will get you noticed.

Support a strong news department, equipped with the manpower and equipment needed to be on-the-spot when something happens.

In short, do the same things a successful FM must do to win! I'm continually amazed at the "consultants" who point to AM and say "it can't win" and then proceed to recommend budget cuts, odd formats and sundry other things no sane radio owner would dream of doing to an FM.

If you want to win, get back to the basics and take your lumps!

This will have two immediate benefits. First, it will make your community aware that you're still there.

It will show them you're alive and growing and not a stale leftover of 1958.

Second, it will show potential advertisers that you are a station interested in making an impact, that you are doing everything possible to make their ads effective and that you're not afraid to take a chance at success.

It will give your sales staff something to sell for a change, and justify rate increases.

Where will the money come from? If you're a small owner, how about a loan? It's your business at stake, so go for broke because you've got nothing to lose.

If you're a large group owner with an AM that is still one of the few making money, allow it to make only a 10% profit for a couple of years instead of 36%.

Either way, find a way to make it hap-

pen, or be content to sit back and watch your AM die, because that will happen.

Two epitaphs will be available for your AM's tombstone: "I just can't afford to spend the money" and "we can't do it that way because we've never done it that way before."

One final thought—and I confess it's not an original one. Let's start an AM-only organization!

Let's not forget that the NRBA started out as the FM Radio Broadcasters Association, designed to help a new and struggling band.

I envision an organization with paid lobbyists in Washington, a newsletter sharing **POSITIVE** suggestions for AM growth, a talent pool for AM announcers, engineers, sales managers and general managers, maybe even a national AM campaign to draw some listeners back to the band.

Are you interested? If so, let me know of your support.

Send me your ideas and suggestions, and let's work together to get this started.

I am at work behind the scenes right now for financing, and need a show of support. If we are to survive, we must take an aggressive, militant stance and have a "can-do" attitude.

As a beast, our back is against the wall and no one is going to help us but ourselves, so let's **DO IT!**

Send your letters to me, Keith Harris, at PO 7880, Lafayette, Indiana, 47903. I'll keep you all posted on how we're doing.

Take heart, and remember: work to succeed!

Keith Harris, Programming Manager  
WASK-AM  
Lafayette, IN

## Radio World

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# Coordinates Stay "As Is" at FCC

by Charles Taylor

Washington DC ... While a new standard altering the coordinates for latitude and longitude in the US is taking hold in many government agencies, the FCC has assured broadcasters that—at least for the time being—it will maintain the traditional coordinates for station applications.

At least one consulting engineer looking to the future, however, has raised concerns that once the new coordinates do go into effect, one equation used to determine the new standard would complicate mathematical procedures for broadcasters.

Latitude and longitude coordinates traditionally are required on FCC applications to identify where any fixed-site transmission-related equipment is to be installed. Such equipment includes transmitters, STLs, remote bases, transmitters and boosters.

The change in coordinates disrupts a standard first derived in 1886 that helped establish the North American Datum of 1927 (NAD27), which has been followed nationwide until now.

The difference in the standards is that the new one, the 1983 North American Datum (NAD83), is based on the earth's center of mass, while NAD27 was derived from an initial point at Meades Ranch, KS.

The new standard takes into account that the earth is not a perfect sphere, but more closely approximates an oblate spheroid, flattened at the poles and bulging at the equator, according to the US Geological Survey (USGS).

## Not in effect

The FCC has thus far held out on adapting the new standard while USGS determines how best to convert the nearly 55,000 primary series maps. That will take at least five years, USGS said.

In a 14 March 1988 public notice, the Commission issued an "Interim Procedure for the Specification of Geographic Coordinates," which advised broadcasters to furnish coordinates on applications based on the original NAD27 datum. Failure to do so could delay processing of an application, the notice said.

"Everybody has been filing coordinates for a lifetime using the same methods that they've been using all along," said Don Precure, an FCC engineer and head of the Commission's steering committee on the conversion. "The public notice says that you should continue to do it exactly as you have in the past and that if anything changes, we'll let you know."

The notice also said the FCC will continue to specify NAD27 coordinates in its own data bases, authorizations, notifications, forms and rules, although it added that eventually NAD83 would be re-

quired "to maintain accuracy in our records and to maintain consistency with other government agencies and foreign administrations."

## Conversion outlined

Once that change does take place, two algorithmic equations have been derived to convert coordinates from NAD27 to NAD83. One was developed by the National Geodetic Survey (NGS), the other by USGS.

The NGS equation can be figured on a sophisticated calculator and offers accuracy of  $\pm 0.04$  seconds in latitude and  $\pm 0.06$  seconds in longitude. The USGS offers a more precise coordinate determination,  $\pm 0.0003$  seconds in latitude and  $\pm 0.0005$  seconds in longitude, but requires either a reference volume of conversion tables or a computer.

"One is accurate to a matter of three or four feet, one is accurate to a matter of three or four inches," Precure said.

But the level of accuracy derived from the USGS equation is not worth the extra burden of the additional equation

that is required, according to Dane Erickson, a consulting engineer at Hammett & Edison in San Francisco.

Eriksen, in a 12 October letter to Robert Eckert with the FCC's Office of Engineering and Technology, voiced concern that the FCC is moving toward favoring the USGS equation, which would make conversion "much more cumbersome" than the NGS equation.

## Questions abound

Eriksen finds "no need" for the USGS equation. "There is a significant burden in implementing it, where it would seem to me that the NGS method is completely precise enough for FCC and (Federal Aviation Administration) purposes," he said.

"My point was, let's not be premature in adopting something. Anything they adopt now will end up being binding at some future date if (NAD83) formally occurs. What they implement now tends to get etched in stone."

Precure claimed, however, that Erik-

sen's fears are exaggerated and premature.

"If we ever go to NAD83, what we're going to be pushing for is to go to the simpler (NGS) equation," he said.

But if the USGS equation does by chance become the required equation for conversion, he added, then it is likely that FCC forms will give applicants the option of submitting NAD27 coordinates, which the Commission's computer will convert for the applicant.

"Our computers can make the conversion in thousandths of a second, so why should we force people to make conversions which are difficult when we have to do it anyway?" Precure noted.

In either case, Precure said the conversion to NAD83 is at least five years away. Then again, there remains the possibility that the NAD83 standard might never be adopted.

"(USGS) is reluctant to go in for supplemental appropriations for updating maps when there appears to be so little interest on the public's part for them," he said. "So there is a possibility that we may never go to NAD83."

For details, call Don Precure at 202-653-8152; or Dane Eriksen at 415-342-5200.

# Letter Calls for Minority Action

Arlington VA ... A black broadcast engineer has called upon industry organizations to increase their interest in minority issues, saying the current lack of participation in minority activities should be an embarrassment.

In a letter sent to 28 organizations, ranging from the NAB and Society of Broadcast Engineers (SBE) to NABET and the Broadcast Education Association, Ellis Terry, an assistant supervisor of maintenance at WETA, a noncommercial FM here, discussed the need for minority recruitment and forums to address minority issues.

According to a study sponsored by the FCC, minorities made up 16.2% of the broadcasting workforce last year. Despite a drop in the total number of broadcast employees nationwide, the number of

minority employees actually rose slightly last year.

Terry's letter was prompted, he said, when he claimed minority interests were

**"Another minority mentioned to me that the SBE is just a good ole boy organization. Those types of mentalities need to be addressed."**

virtually ignored at the recent SBE conference in Denver, CO.

"Things just hit a boiling point," he said. "Another minority mentioned to me that the SBE is just a good ole boy organization. Those types of mentalities

need to be addressed."

SBE President Jack McKain declined to comment until he had read the letter from Terry.

## Discrimination surpassed

In it, Terry stated, "At the conference the topic of discrimination was addressed very briefly. There was some discussion of age discrimination but not a single word on sexual or racial discrimination."

"It seems to me that if the SBE was interested in advancing the cause of the broadcast engineer, it would or should address the minority issue in a meaningful manner, such as establishing a minority recruitment program or any such vehicle to address ways of increasing minority participation."  
*(continued on page 10)*

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# Radio Makes Inroads at RTNDA

by Alan Carter

Las Vegas NV ... The electronic news industry will gather 30 November-3 December here for the 43rd annual Radio-Television News Directors Association (RTNDA) international conference and exhibition.

Among the events designed for radio attendees is a session on radio news equipment.

The roundtable discussion scheduled 2 December will ex-

amine what's new in news gathering equipment. Topics will include two-way radio gear, cellular phones, phone patch equipment and tape recorder design. The session also will address how successful stations make the most of their equipment.

More than 100 companies are scheduled to show products at the exhibition in the Las Vegas Convention Center. The exhibits open 6-8 PM, 30 November; 10

## Among the events designed for radio attendees (of the RTNDA convention) is a session on radio news equipment.

AM-6 PM, 1-2 December, and 8 AM-1 PM, 3 December.

As a special incentive for radio engineers, RTNDA is offering complimentary one-day registra-

tion to station, group and network engineers who attend the convention and visit the exhibition on 3 December.

Companies with radio exhibits

include Gentner Electronics, which will show its new three-line EFT 3000 frequency extension that will provide 7.5 kHz frequency response on standard dial-up telephone lines.

According to Gary Crowder, Gentner also will display the Hybrid Coupler and Auto Coupler, which are telephone couplers for the newsroom that will allow two-way telephone conversations for filing reports and interviews.

Another product from Gentner will be its combination remote mixer, with individual limiting on each mic channel.

On display at the Comrex Corp. booth will be its frequency extender for use with cellular telephones, according to Lynn Distler. The company also will show its full line of telephone interface equipment.

Shure Brothers will present products including a full line of broadcast microphones, circuitry products and BC Series Broadcast Phono Cartridges.

Shure also will highlight the AMS Automatic Microphone System, a patented voice-activated microphone system that the company said is becoming a popular choice for use on fast-paced radio talk shows where quick, consistent microphone gating is crucial.

Another exhibitor with radio equipment will be RF Technology, which manufactures and markets microwave communications equipment.

For additional information on the conference and exhibition call RTNDA at 202-659-6510.

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Circle Reader Service 15 on Page 32

World Radio History

## Lobbying

(continued from page 3)

NAB chief counsel Jeff Bowman added that an NAB study on the issue of renewal abuses "gives the Commission ammunition to stop payoffs."

The single issue where the NAB's viewpoint "did not prevail," according to the organization, regarded indecency legislation.

The Senate proposed an amendment requiring the FCC to enforce broadcast indecency prohibitions on a 24-hour basis; it was passed by Congress "despite clear judicial precedent that indecent speech cannot be prohibited, but only 'channelled'."

NAB said it will join other media groups in appealing the legislation in court.

NAB President and CEO Eddie Fritts added that the 101st Congress will be among the most important for broadcast issues that the NAB has faced, citing station renewal reform as one of the top issues.

For information on NAB lobbying efforts contact the government relations department at 202-429-5301.



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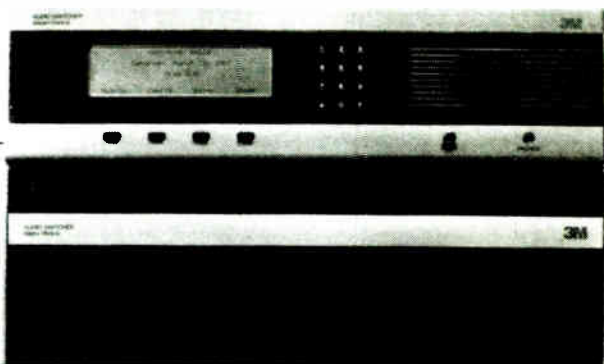
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# US, Canada, Mexico Meet to Talk Radio

Mazatlan Mexico ... The NAB, along with the Canadian Association of Broadcasters (CAB) and Mexico's La Camara Nacional de la Industria de Radio y Television, have taken a mutual stand on seven broadcast issues, including the AM expanded band, AM quality of sound and sensitivity to freedom of speech.

The resolutions were passed at a three-day annual meeting held here in late September.

Among the resolutions pertaining to

radio, the organizations noted that increased quality of sound will help AM stations improve coverage and listener satisfaction, and agreed to establish a task force to implement a "quality" certification mark to help consumers identify high-quality AM receivers.

The groups also recognized that the imminent expanded AM band will afford an opportunity to provide high quality and low interference levels, and agreed to urge governments to establish high-quality station allocations and tech-



Broadcasters from the US, Canada and Mexico passed seven resolutions regarding radio.

nical assignment criteria. Also, receiver manufacturers will be urged to design and build expanded band receivers.

The groups also expressed concern that the US government's intent to establish TV Marti poses a threat to radio and

TV services in North and Central America.

The organizations also agreed to urge governments and federal agencies to continue to be sensitive to and respect the rights of their citizens to freedom of speech in the media.

A final radio issue focused on copyright and fees to recording artists. The groups noted that exposure and airplay given to recording artists and records are primary factors for their commercial success. They suggested governments be urged to refrain from introducing copyright legislation that would provide additional compensation to artists at the expense of broadcasters.

For more information, contact the NAB department of public affairs and communications, 202-429-5350.

## Minorities

(continued from page 7)

ing minority involvement in the SBE nationally," he continued.

Terry also suggested a workshop or panel session at any of the various broadcasting organizations' conferences, as well as formation of an association made up of minority broadcast technicians. The organization, he said, could address specific minority issues that need to be dealt with, including how to hire minorities and how to discharge minority employees without fear of a lawsuit.

Such an organization also would allow "the relatively few black broadcast engineers to network among themselves more efficiently so that they can reach out and identify young emerging talent to bring into the business," said Dwight Ellis, VP of minority affairs and special services at the NAB.

Ellis also suggested approaching the problem from the college level.

"There's a dual responsibility here," he said. "Colleges and universities through faculty need to become more aware of opportunities for broadcast engineers and convey that to their students. More minorities should be encouraged to go into the field," Ellis said.

"The other part of the equation is that broadcasters who are anxiously looking for engineers, need to reach out more to the institutions and organizations," Ellis added. "They should be visiting conferences put on by minority groups. There are at least 10 major media minority conferences each year for recruiting purposes."

### Await more reactions

The next step for Terry is to await reaction from the organizations that received his letter.

"I think the letter is a good starting point. What I plan to do is see what the response is to the letter and go from there," he said.

For more information, contact Ellis Terry at 703-998-2807.

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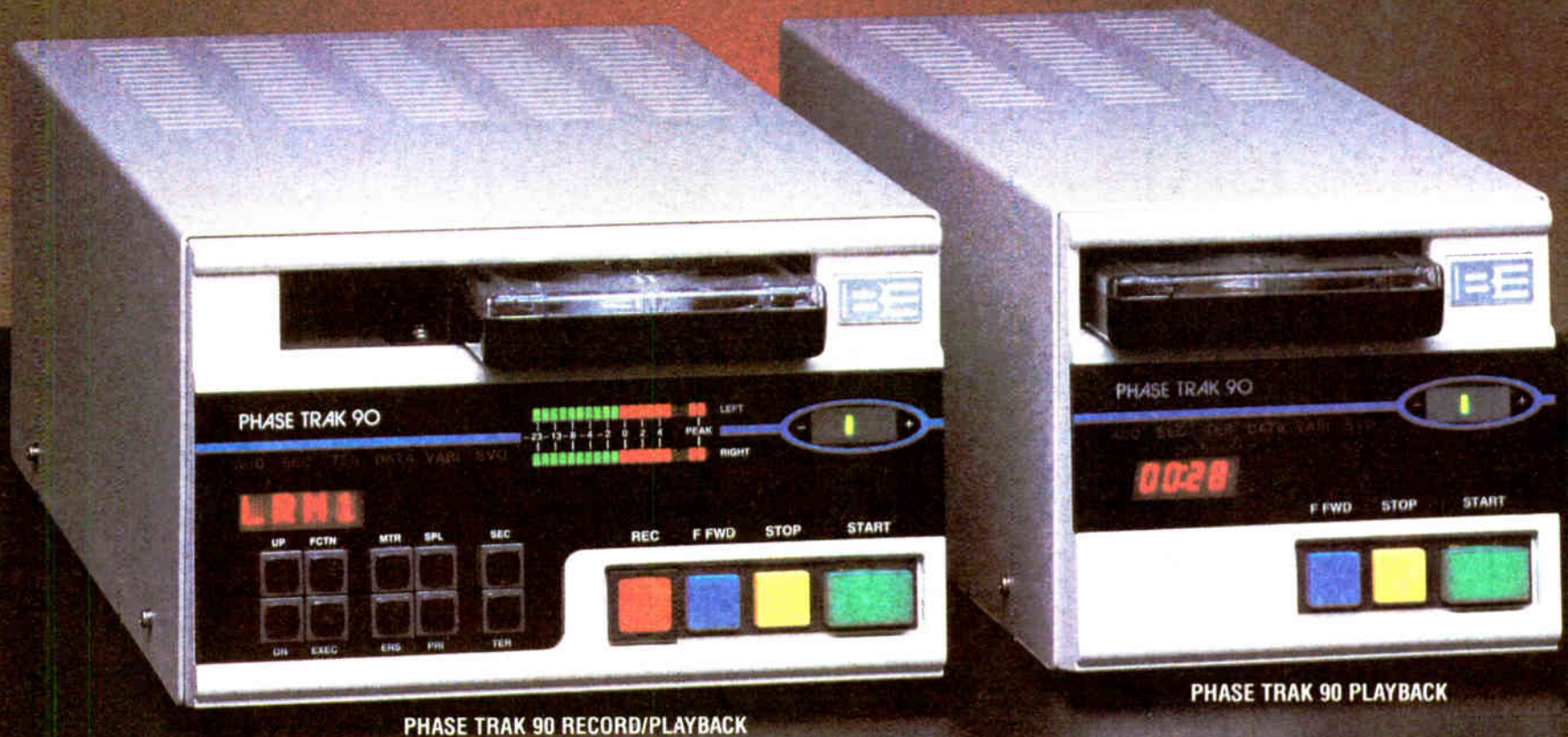
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# License Renewal Reform Sought

(continued from page 1)

CBS asked the Commission to use the "hard look" approach currently in effect for processing applications for vacant FM frequencies when reviewing competing applications.

"Under such a policy, a challenger's application would be given a thorough review and rejected as unsuitable for tender or filing if any critical information is found to be missing or obviously false or inconsistent," CBS explained. "The Commission would further refuse to accept an amended application . . ."

On renewal expectancy, CBS said it supported continuation of the program-based standard, with some modifications.

Two of the radio broadcasters pointed

to specific cases where they faced competing applications.

Metroplex, owner of 10 radio stations, said it is defending a comparative renewal for WHYI-FM, Fort Lauderdale, FL. Metroplex claimed the competing application is without merit.

The group owner also said that in addition to direct financial costs, station management and staff have been pulled from operational duties to focus on the renewal.

"This consideration makes it especially important to discourage renewal challenges by those who file for ulterior motives and who have no serious prospect of winning the license," Metroplex explained.

A second broadcaster, Great American Television and Radio Co. which has 15 radio stations, said that under previous ownership as the old Taft Broadcasting Co., the group faced a similar renewal process for a station it once owned in Buffalo, NY.

"In that case . . . , Great American's predecessor (Taft) was forced to conclude that it should accept a settlement with a renewal challenger even though the terms of the agreement related almost entirely to economic demands of the challenger in an unrelated, pre-existing private dispute with the challenged station," the group claimed.

Among other broadcasters, Cox Enterprises, owner of 11 radio stations and

Diversified Communications, owner of two stations, in joint comments presented a list of recommendations including restricting payments to reimbursement for documented "legitimate and prudent" expenses.

To deter "frivolous or speculative" comparative renewal applications, Cox and Diversified suggested the Commission require applicants to demonstrate their financial qualifications, prepare and file an independent technical proposal and to certify their intent to construct and operate a station.

"The Commission should affirm that it will impose sanctions for misrepresentations or sham applications," the groups added.

The two groups also said the FCC should revise the criteria for comparative renewal proceedings so that an incumbent's diversification is not considered if its ownership complies with relevant rules and policies, and there have been no adjudicated instances of anticompetitive misconduct associated with the incumbent's other media interests.

## The other side

Not all broadcasters, however, were so upset with the current comparative renewal process, specifically the judgment on "meritorious service."

**"The Commission should affirm that it will impose sanctions for misrepresentations or sham applications."**

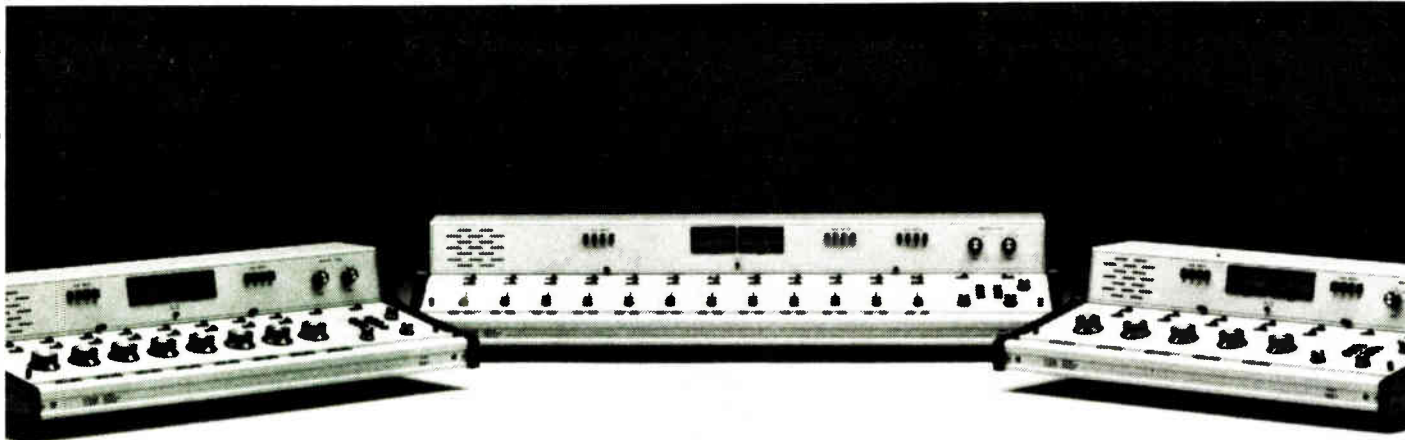
While supporting limitations on payments, one group of commenters including the NOW Legal Defense and Education Fund, the Black Citizens for A Fair Media and the National Association for Better Broadcasting, rejected the FCC's proposal to drop the "meritorious service" standard in favor of a "rules-based" minimum compliance standard.

"It is a settled matter of law that the Communications Act affords no property right to broadcast licensees," the group stated. "Rather, a broadcast licensee is granted for a limited period of time, conditioned on service in the public interest, and subject to Commission scrutiny and review."

In joint comments, Southeast Broadcasting Limited Partnership and Garden State Broadcasting Limited Partnership questioned the legality of placing "unique burdens on an entire class of applicants based on speculative fears (largely industry-generated) that particular members thereof might engage in misconduct."

For information on the comparative renewal inquiry under Docket 81-742, contact Andrew Rhodes at the FCC, 202-632-7792.

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# Madison Goes Back To Basics

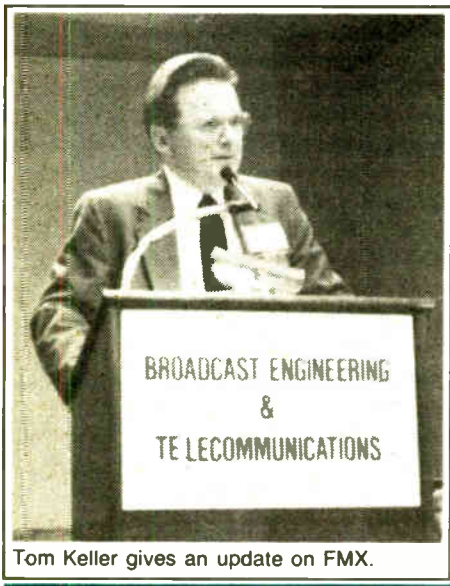
## The 34th Annual Conference Focused on Engineering Fundamentals With Some New Tech

by Judith Gross

Madison WI ... They came to learn about new technology, they came to see the latest gear, but most of all they came to hobnob with their colleagues in broadcast engineering.

The 34th annual Broadcast Engineering and Telecommunications Seminar, held by the University of Wisconsin here 18-20 October brought together 178 attendees, most of them regional, and 55 exhibitors.

The seminars included a full slate of



Tom Keller gives an update on FMX.

presentations on a wide range of radio and TV topics starting with the basics and working up to such recent complexities as fiber optics.

But as with several fall trade shows, there was a sense of too many such gatherings in too short a period of time and discussion on possible consolidation or changes in the future.

One of the highlights of the conference was a luncheon presentation by Tom Keller, formerly of the NAB and now a consultant to Broadcast Technology Partners.

Keller is co-inventor of FMX, the noise reduction system for FM which BTP is marketing.

Keller talked about some early problems with the system involving compatibility and multipath—

problems which he says have since been corrected, after they became widely known.

"We did our development in front of you all," Keller explained, "I'm not sure, if I had it to do over again I would do it that way."

Keller explained that there are a total of seven patents pending on the FMX system, and in addition to a number of conversions by stations including CBS-owned FMs, there are companies selling receiver chips and test equipment for the system.

Keller estimated there would be FMX receivers on the market in 1989, close to the spring NAB convention. He said there are currently 10 prototype FMX receivers for cars, six for home. In addi-

tion, the system has been endorsed by the Car Audio Specialists Association.

One of the benefits of FMX not widely publicized, according to Keller, has to do with a characteristic of FM receivers known as "blending."

FM receivers in cars are designed so that when the stereo separation drops below a certain level—approximately 35 dB—the audio is blended back into mono. Keller says the audio blends to mono despite the fact that the stereo pilot light continues to be lit.

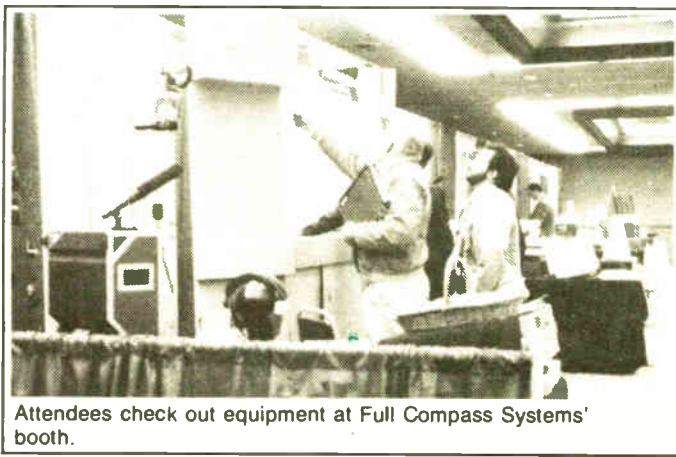
"Blending is designed to reduce stereo noise—the same problem FMX corrects," Keller explained. He said with blending, the noise can't be heard, but neither can the stereo separation.

Keller said that the use of FMX might make it less necessary for receivers to use blending. He also pointed out that a station using FMX could expect a better stereo signal for a larger portion of its coverage area, thus the system could help even stations who don't feel they would benefit from the noise reduction aspect—such as rock stations which employ heavy processing.

Many of the seminar topics stayed with the fundamentals of radio engineering, including one on "Back to Basics" by consulting engineer Don Markey.

There was also a session on technical management by Tim McCartney of KBSU, Boise, although the conference dropped its traditional engineering management seminar this year.

Also absent this year was the "great



Attendees check out equipment at Full Compass Systems' booth.

idea contest" held in past years. But the Madison conference did feature its evening engineering forum, the informal give and take or "nuts and bolts session."

Ed Anthony from Broadcast Electronics opened up the discussion by talking about AM synchronous noise in FM transmitters.

Other topics of concern to engineers are dissatisfaction with EBS tests and the system in general; non-ionizing radiation, including a recent deadline for compliance with regulations for stations filing renewal licenses; and PCBs, with confusion over variations in laws in different states.

Since attendance at the conference decreased this year, there was talk of possibly changing its format to a single topic, more intensive seminar, possibly in a



Allied featured the Audiometrics Premium retrofit card for ITC cart machines.



Full Compass Systems' Psychologist is a versatile mic mixer.



Broadcasters General Store featured the Harrison 790 console.



In between seminars, attendees visited equipment exhibits.

different location.

But a majority of engineers favored the Madison location. In addition, most engineers said that one of the things they like best

about the Madison conference is the opportunity it affords engineers to interact with their colleagues in the field.

Nonetheless, Don Brochert of WHA, who chairs the program committee, explained that next year, in addition to the fall Madison conference, the University has committed itself to a two day intensive seminar in June, with the subject and location still to be determined.

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# Engineers Rate Skills in Survey

(continued from page 1)

pointed to weakness including "ill-prepared in math," "weak writing skills," "fear of computers," "poor craftsmanship in construction/modification," "inability to interact with non-engineers."

But in the positive column, 93% of the radio engineers rated knowledge of analog as a strength, followed closely by audio at 92%; troubleshooting at 79%; test equipment at 77%, and RF at 73%.

Among the general comments cited, engineers praised their colleagues for dedication, their ability to get a station back on the air in a crunch and their ability to conceive and develop solutions.

Harris said he was concerned with some of the survey's results.

An educational proponent, Harris said he couldn't believe his finding that almost 50% of the respondents across the board lacked a degree. Furthermore, Harris found it hard to comprehend that nearly half of those respondents with a degree didn't possess a technical degree.

"Without a degree or rigid technical training in electronics, broadcast engineers are going to find themselves up against a wall," Harris warned.

## Technical degree

While less than 5% of radio engineers agreed with Harris on the need for a four year degree, almost all agreed that entry level engineers should possess a two-year technical degree or some combination of on-the-job experience and trade school or military training.

Over half felt that broadcast engineers should be SBE certified and/or possess a FCC license, even though most FCC requirements are now extinct.

SBE certification program chairman Jim Wulliman commented that all engineers are not cut out for or seek management positions.

"The guy with the screwdriver in his pocket has always existed," Wulliman said. He added, however, that "requirements for operators and maintenance are shifting."

Larry Titus, an equipment manufacturer and engineer with 20 years experience who was on the SBE convention panel where the survey results were revealed, also expressed surprise at the microprocessing and digital deficiencies in radio engineers' training.

Like Wulliman, Titus said he believed the need for a four-year degree depends "on how high you want to climb the corporate ladder," but that "keeping pace with technology is critical to all levels in the field."

"A lot of engineers get into a rut," Titus said. "They say they can't find the time, don't have the time. It's a matter for the engineers to start saying I have to learn digital, I want to learn digital, and making the time to learn it."

Second to increasing job demands, engineers faulted management's lack of commitment to its engineering operations for lagging development in the field. Barely half of those radio engineers responding said they are provided finan-

cial aid for education.

In line with engineers' discontent over management's perception of their jobs, Titus said engineers are being driven from the field. In particular, he pointed to the "bottom line effect of deregulation," which has made stations "simple

But Harris is convinced that the broadcast engineer's fate is linked to higher education. Beyond college, Harris feels that professional societies within the industry should technically cultivate the college graduate for a career in broadcast engineering.

A non-technical deficiency noted by 75% in the survey was a short fall in interpersonal communications among en-

---

**... engineers praised their colleagues for dedication, their ability to get a station back on the air in a crunch and their ability to conceive and develop solutions.**

---

commodities in the eyes of today's station owners and managers."

## Management

Despite the lifeline between a station and its engineer, Titus, Harris and Wulliman all agreed that management does not equate the broadcast engineer's technical contributions with profits.

"But that's not true of every station," Wulliman added, "and I think that we're starting to see the pendulum swinging back toward the technician and engineer."

The sophistication of new technologies require higher levels of skill by both maintenance and operators, he said. The engineer's ability to control, tune and extrapolate the best sound is a great asset and Wulliman said he believed station managers and owners are coming around to realizing those benefits.

gineers.

Titus said poor communications skills is "probably the single most significant factor holding the engineer back from advancement."

He theorized that an individual's "mechanical aptitude" and "creative, but somewhat introverted nature," probably is what leads an individual into radio broadcasting.

But Titus advised engineers to climb out of their shells and conquer the art of interpersonal communication, "if they really want to go somewhere in this business."

Ironically, in a question asking participants to list the content of courses they would like to take, no radio engineers included personal development or communications oriented classes.

For information on the survey, contact David Harris at 219-989-2471.

# Splatter matters.

Splatter is a form of radio interference that can drive listeners away from AM radio. It creates distortion in your signal, wastes transmitter power on undesired sidebands and interferes with other stations. Even with an NRSC audio filter, misadjustment of the transmitter or audio processing equipment can still produce an RF spectrum that can exceed NRSC or FCC limitations.

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# When You Replace Your Boss

by John Cummuta

**Downers Grove IL . . .** When the new President takes his oath in January, he's going to assume a series of significant problems. They come with the office. But one of these problems will actually be a product of his predecessor's popularity.

Ronald Reagan, whether you agree with his policies or not, is a popular leader. The people "like" him and that means that the man who replaces him will inherit a certain latent resentment, simply because Ronny's not there anymore and this new guy is trying to pretend he's like Ronny.

It's a common situation whenever there's a change in command, and it may be something you'll have to wrestle with, should you end up being promoted or brought in from the outside to replace a popular manager.

## Engineering Manager

Whether that manager died, resigned or was fired, there are certain do's and don'ts that you should keep in mind to make the transition as smooth as it can be.

### If you can't say something good . . .

Even if you happen to know the person better than any of the subordinates ever did, and you know that the old boss was an absolute scoundrel—don't say anything bad about your predecessor. Why?

Because your negative comments will tell the troops more about you than they will about their former boss. This attempt to kill the glorious image (true or untrue) of the person you're replacing can do nothing but reflect poorly on you, and it usually raises the now-martyred ex-boss's image even higher.

It's even trickier if the negative comments come from one of your subordinates, or worse yet from the station's management.

You still must walk the fine line of saying that, in your experience, there are always two sides to every story and you'd rather concentrate on building a strong and productive future for your department than to dwell on the misunderstandings of the past. Always dodge these bullets if you can.

One thing you can count on, should you break down and make negative comments about your predecessor. He or she still has agents in your camp, and your words will get back to that person.

Broadcasting being the rather small brotherhood that it is, you could one day be sitting in front of that person you disparaged—asking for a job. It's a lot easier to never say the words than to try to eat them under such uncomfortable circumstances.

### Don't be an imitator

When Pacific Fleet Commander Nimitz was putting together his tactical commanders for the upcoming battle of Midway, he wanted the vaunted "Bull" Halsey to run the decisive engagement for the Americans.

As luck would have it, Halsey came down with a severe skin disorder and was beached. But he recommended a relatively young cruiser commander

named Ray Spruance to take his place on the bridge of the USS Enterprise.

When he heard of his appointment, Spruance went to Halsey's hospital room and asked how he should play the upcoming battle. He wanted to do it like Halsey would have.

The senior Admiral's words are as relevant for someone assuming command in the battle of the radio marketplace as they are for a commander in war.

He said, "Ray . . . don't call it the way you think I'd play it. Call it the way you feel it." He went on to say, "You just find Yamamoto and chew his \_\_\_\_\_!" The translation is to just identify your objectives as a manager and move full-force to achieve them—your way.

The reasoning here is simple. If you try to imitate the person you're replacing, you'll never be as good at being them as they were, and you'll be begging for ongoing comparisons. You will always lose. The cleaner the break the better for you.

### Don't try to change all at once

Even if you had some policies and procedures at your last station that worked like a clock, don't be too quick to implement them.

It will be tempting to quickly put your imprint on your new department and changing the way things are done will seem like the fastest way to accomplish that. But there are two good reasons

why to go slow here.

First of all, anytime you change a policy or procedure you'll be perceived as knocking the old boss's way of doing things; and there you'll be, going head-to-head with that ghost again.

Secondly, there's just a chance that some of the previous methods are better than yours. If you take your time and only change the ones you know you can improve, you'll avoid bruising anyone's feelings, and you'll show judgment and sensitivity.

The fastest way to get the troops on your side is to take the focus off of you and put it on them. Emphasize the fact that a good manager knows he or she doesn't do the job alone, but rather it gets done through the individual and collective efforts of the team members in

(continued on page 16)

# RADIO

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# Mechanical Drive Maintenance

by Thomas Vernon

**Harrisburg PA . . .** On a recent contract engineering trip, I was asked to look at an ill cart machine. "Excessive wow and flutter" the note on the top said.

I removed the sludge and grime from the capstan and pinch roller with a rag and mineral spirits. It made no difference. "Odd," I thought.

Upon removing the deck from the chassis, however, the problem became obvious.

## Station Sketches

The belts had failed and someone had replaced them with two small rubber bands. Replacing the rubber bands with belts and adjusting the end play in the flywheel solved the problems.

It occurred to me that there are probably many younger technicians who have been raised on digital and are not familiar with what is involved in maintaining mechanical drive systems. Hence, the subject of this month's column.

### The mechanics

The simplest is direct drive, which is used in turntables, cart machines and reel-to-reel machines. Typically a high torque synchronous motor is employed, with the shaft acting as the capstan.

Advantages are simplicity, ease of maintenance, reliability, as well as superior wow and flutter specifications.

Routine maintenance is reduced to regular cleaning of the capstan and idler

wheel surfaces to remove oxide buildups, and occasionally checking the tension between the two.

The only real disadvantage is the high cost of precision sync motors. The failure mode of these motors is usually noisy and worn bearings. Only rarely do the windings open.

Many tape machine manufacturers will give you credit for returning worn motors against the purchase price of a new one. Also, there are several smaller companies that specialize in motor rebuilding.

### Belt drives

Older machines often use a belt drive, employing a sync motor with a small

Thus a 2500 RPM with an 8:1 ratio would yield a flywheel velocity of 312.5 RPM.

In the real world, belt thickness influences speed, increasing pulley diameter by as much as 1/3 the thickness of the belt.

If the original belt is replaced with a thicker substitute, the end result will be slower speed. The "real world" diagram of pulley/speed ratios is shown in Figure 2.

Precision ground flat belts have more consistent speed characteristics than molded "O" rings. This is because changes in the thickness of the belt can cause speed changes.

As belts age, they usually stretch out,

attempt is made to oil them.

Some of the less expensive sync motors require periodic (six month) disassembly and soaking of felt washers with Wynn's Friction Proofing Oil.

Flywheel thrust bearings should get an occasional dab of Lubriplate, and be adjusted for about 1/16" end play.

### Idler wheel drives

Another popular drive method is to employ an idler wheel between the motor shaft and the rotating surface, as with older turntables.

Most drive the outside rim of the platter with idler wheel, although one manufacturer drives the inside rim to yield better rumble characteristics.

In either case, maintenance involves regular (weekly) cleaning of all drive sur-

Figure 1. The 'physics lab' pulley/speed relationship, where V = rotational speed in RPM, D = diameter, R = radius.

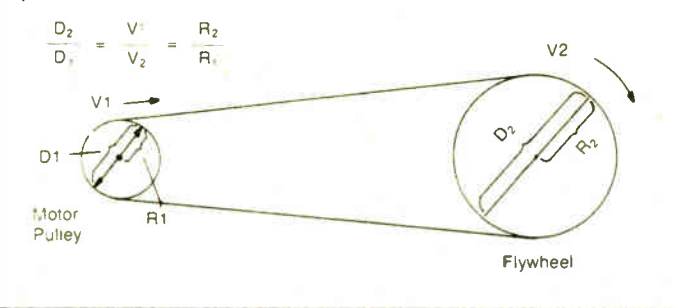
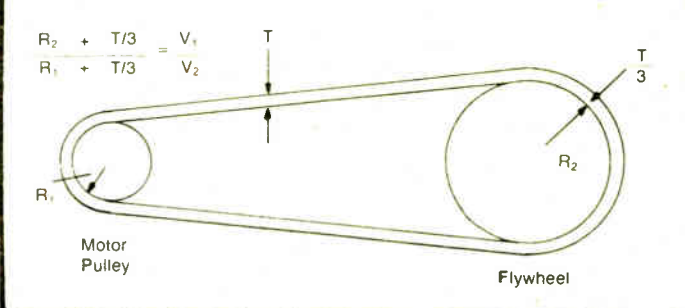


Figure 2. The 'real world' pulley/speed relationship, T = thickness of the belt.



pulley driving a large diameter flywheel. These have the advantage of lower initial cost but inferior wow and flutter, as well as more maintenance problems than direct drive units.

Going back to basic physics in Figure 1, we can calculate the rotational speed of the flywheel by knowing the motor speed and size ratio between the pulleys.

resulting in increased effective length and slower speed. Slippage also becomes a problem.

Replacement belts should have the same inside diameter as the original when it was new, not as it is measured when taken out of service.

Never store replacement belts in direct sunlight. Ultraviolet rays will break the rubber down and render them useless. It's much better to store them in the dark and avoid extremes of temperature.

### Replace them all

When servicing a unit that has several belts, it's best to replace all of them at once. Usually the time, trouble, and labor costs of pulling a machine out of service far outweigh the cost of a few belts.

Be sure to clean all pulley grooves and contact surfaces with mineral spirits before installing new belts.

If the machine has a motor speed control, be sure to play a test tape and verify proper speed after replacing belts.

Machines should be lubricated per manufacturer's instructions. Many newer motors have permanently lubricated bearings and can be damaged if an

faces. Rim drive turntables have adjustment screws that provide a tradeoff between instant start and reasonable rumble characteristics.

Sometimes the speed shift lever is left engaged and the idler wheel is pressed against the motor shaft. This will deform the surface and produce audible thumping when the machine is next used.

Running the turntable for awhile may get rid of the indentation, depending on the type of idler wheel.

Better quality idler wheels are made of silicon rubber or some other good memory material. Lower cost wheels are made of neoprene, have have poor memory characteristics.

It may be necessary to carefully sand these wheels to get rid of indentations.

If you need replacement idlers or other rubber parts for an obsolete machine, don't despair. Some companies, such as PRB, will remanufacture parts if you can provide an original.

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

## Now That You're the Boss

(continued from page 15)  
that department.

Then begin to recognize and encourage those efforts. When your people start to feel you showering them with praise, it will be remarkable how quickly they'll begin to see how smart a person you really are.

### Look and act like a leader

One attribute a leader should display is self-confidence, and a self-confident person doesn't waste energy competing with the image of someone who is no longer a real factor in the situation.

Make an effort to praise your predecessor. Commend those facets of his or her management tenure that deserve commendation. Recognize the progress the department made under that

person's leadership.

Make it clear that you have no intention of changing things that work and that you will be sensitive to everyone's input when you do feel a change is required.

And whatever happens, especially early on, don't be spooked or intimidated by your people's memories of the person you've replaced. Let it die a natural death.

Above all else, however, stand tall in the knowledge that you were given the position because you deserve it and "Play it the way you feel it."

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

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# Lee Abrams: Talking Production

by Ty Ford

**Baltimore MD** . . . I first became aware of Lee Abrams, one of the top names in programming, while I was working at WHFS in the Washington DC market in 1974.

Within a year, the (then Burkhardt/Abrams) consultancy decimated WMAL FM's "soft explosion" and had a significant impact on WHFS's more progressive format as well.

Three years later I became part of the original airstaff of WIYY (98 Rock) in Baltimore which was consulted by the expanded Burkhardt/Abrams/Michaels/Douglas firm. In about the same amount of time we became so strong that WKTK FM and WAYE AM, both album rock stations, were forced to change formats.

Granted, WIYY has one of the best signals in the market. Also granted is that Denise Oliver, one of the smartest people in radio, was the PD. The consultancy provided many great programming and promotional ideas and acted as a brain trust, collecting and distributing the ideas of others to member stations.

In addition to that, they also launched a production concept called "Theater of the Mind." It was a way of thinking, an attitude, an approach to be applied to all station production.

Most importantly, it was applied to station promos. Those experimenting with the concept were encouraged to watch and listen to television and movies. The challenge was to make promos so strong that listeners would see pictures when they heard station promos.

The consultancy was well aware that the competition would eventually figure out their successful but complex music rotations.

They knew they needed something special to separate themselves from what was becoming a cluttered FM dial: production so special that the listeners didn't even have to hear the call letters to know they were listening to "their" station.

Finding people who could create effective promos was not easy. Most airstaff people didn't enjoy doing production. The problem was that to do "Theater of the Mind" production properly, you not only had to enjoy production, you had to have a passion for it!

## Talking with Lee

Lee Abrams currently has another frontal attack on radio. It's called Z-Rock, and production is no less important now than it was when he started the Superstars format.

I chatted with Lee about the format and what's important about production in today's radio.

**TF:** I know you've signed as Director of Corporate Programming with the Shamrock Group recently, but tell me about Z-Rock and what else you've been up to.

**LA:** Z-Rock is a satellite fed network we're positioning as the first real radio superstation. There's this audience between 16 and 28 that's not getting what they want.

We're balancing the music profile with a presentation that's really reminiscent of Top-40 from the McLendon era. It just screams, it never stops, we nuke records on the air, we play records backwards,

have listeners guess what they are, it's just a completely insane presentation.

Our marketing look is going to be a lot like MTV. We're going to market it nationally, promotion along the lines of,

## Producer's File

"You and five thousand of your friends go see Van Halen in Hong Kong!" We emphasize that it's not like an automation alternative as much as a real national superstation.

**TF:** It sounds to me like you've gone to the other end of the spectrum from "read this ten

second liner, play three thousand songs in a row and shut up," basically boring radio.

**LA:** This is dangerously uninteresting!

## Better production

**TF:** Lee Jacobs, program director of WGRX, one of the Shamrock stations here in Baltimore, says you're pushing for upgrades in on-air production.

**LA:** Oh absolutely! I think that's one of the great advantages a station can have, great production.

**TF:** Does that include spots as well as promos?

**LA:** Primarily promos. Like a lot of stations take an ID and change it once a year, where that can be a strategic posi-

tion in the hour to sound technicolor instead of black and white.

I think 99% of stations' production today sounds real one dimensional and boring. When a station's really well produced, even if you're playing the same music as the competitor, you just sound so much better. So we're really pushing for that.

One thing I like about upgraded production rooms is they get jocks back into the production room. Usually it's like, "ARRRRGH I've got to do production! No, I'm going home."

Now they're lining up to get in and goof around and come up with some  
(continued on page 28)

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## — 57 Years Ago in RW —

Editor's note: The RW of today and the RW of old fortuitously share the same name. The RW of old was printed for a period of time in the 1920s and 1930's, when radio was first becoming popular. The current version of RW that you hold in your hands has been around (in various forms and names) for over ten years.

### "Recording Detective" to be Used for Evidence Against Suspected Stations

INSTEAD of using stenographic service, which is expensive and sometimes open to attack for the possible error factor, the Federal Radio Commission will use phonograph recordings in gathering evidence against stations suspected of abusing their broadcasting license.

A portable recording device made by RCA Victor Company on specifications and order of RCA Photophone, Inc., was demonstrated before the Commission and proved highly satisfactory. The device is AC operated. The turntable revolves 33 1/3 times a minute, as in talking movies and transcriptions for radio program service. The outfit cost \$1,000 to build, but this is not the production price.

A receiving set, very selective, a recording microphone, an engraving head, two turntables, a high-gain audio amplifier, and blank records are used. The overlap is considerable, so that nothing will be missed, and programs of indefinite duration may be recorded.

"We believe the operation of this device will solve many of the problems that have been confronting us for several years," said Acting Chairman E. O. Sykes, following the demonstration.

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Reprinted from Radio World, July 18, 1931.

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Circle Reader Service 26 on Page 32

# Early Station Calls Tell Radio History

by George Riggins

Long Beach CA . . . Wonder if I was the only one who was disappointed in the audio portion of the Miss America Pageant? Of course the problem was probably associated with my location and the receiving equipment.

The listening and viewing location was at a little whistle stop on the Amtrak line in Oregon. Chemult to be exact. The receiver was an RCA, about 4 years old and a mono at that.



. . . many of the early stations were started for purposes other than entertainment or advertising revenue.

The signal was being received from a translator located at Crescent OR, and the transmitter, KTVZ, Bend Oregon. I guess it is asking a lot for a signal to be transmitted via satellite, converted to the TV band, and then re-transmitted by way of a translator and then have the signal be such that one could hear the piano solo part of the Warsaw Concerto.

Or, perhaps there should have been a musical director in the Atlantic City booth who knew how to get the proper mix or microphone placement for a soloist.

One last ad regarding audio and programming for this issue. My dental hygienist told me that she and her husband do not listen to radio, either AM or FM when they are driving.

Instead they take tapes of such things as *My Fair Lady*, *Camelot*, and other musical shows from the recent past. The reason? No good programming on the AM or FM band. Back to the future or history, whichever is applicable.

KFI 4000 W, 640 kC, Los Angeles.

represented so much history?

There are a few more of the original calls on the west coast and the Rocky Mountain West. In Northern California KGO and KFRC are still represented by the original identifiers.

Seems that NBC tried to do a quick two-step or something and lost an oldie, KPO, many years ago. Too bad! Going further north, Portland is represented with KGW, owned by the Morning Oregonian in 1927, and KEX.

(A ham friend says that he thought something was wrong with the family receiver in the late twenties when he first heard KEX here in Southern California and that first encounter with DX is what got him started in amateur radio and kept him in electronics these many years since.)

Just to sell radios

Denver was represented by KLZ and KOA. The former went on the air in 1922, so must be one of the older stations with the same call sign still in use.

Nothing is said in the 1927 publication about the ownership of KLZ. General Electric owned both KGO in Oakland and KOA in Denver, plus others in the midwest and east.

Of interest is how many of the early stations were started for purposes other than entertainment or advertising revenue.

As some of the early engineers have stated, many of the stations were started so a given product could be advertised.

In one case, one of the engineers who built the station said, "We went on the air  
(continued on page 27)

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Circle Reader Service 61 on Page 32



# The Trouble With Manuals . . .

by Barry Mishkind

Tucson AZ . . . Eventually, all equipment comes to a point that it wants attention. That is why it came equipped with that little capsule of smoke. It releases the smoke to let you know it's time to make repairs.

But actually locating the part that emitted the smoke is not always straightforward. Oftentimes hours are spent in its pursuit. And then, the engineer remembers the famous saying that goes, "When all else fails, consult the instruction manual."

Sometimes, sure enough, the answer was right there waiting to jump out at him. So why is it that some radio engineers are reluctant to refer to manuals? Is it arrogance? Machismo? Stupidity? Or is it the generally poor quality of so many manuals supplied today?

## Searching out the culprits

Have you ever wondered who writes these things? After a world-wide search, we are pleased to announce we have discovered that there are three people in the entire world who write technical manuals for a living.

One is ex-military. You know his work by the endless pages of words and schematics with lines going off in all directions onto other pages somewhere, keyed by mysterious combinations of letters and numbers and the easy to follow parts numbers like A3A2A2C31, not to be confused with A3A2A3C31.

The second manual writer is a highly competent Japanese engineer. Unfortunately he knows no English. But, if you understand Japanese, the manual is a dream.

We located the third technical manual writer in Sri Lanka. However, he is so busy that all he can ever produce is a preliminary manual; proofreading is extra.

Of course, there are a few amateur manual writers hiding out there. They occasionally produce a complete, lucid manual. But the ex-military writer has friends who try to stamp them out.

You think I'm making this up, don't you? We are being outrageous, aren't we? If so, how do you explain a manufacturer shipping a manual with a transmitter that has parts that do not match those listed in the manual?

Further, when you call the technical service department, the manual they use matches neither your manual nor your equipment.

Or, how would you explain a manual that contains the following instruction for tuning the PA circuit: "Observe the PA I<sub>62</sub> carefully and do not . . ."

That's right, the instruction ended in mid-sentence and stayed that way through several editions of the manual!

The Sri Lankan manuals are the ones that confuse right channel with left, sending you looking for the wrong part. When the Sri Lankan is especially busy he forgets to recharge the mimeograph machine and the manual is so faint you think you've gone blind.

## Sanity preservation

What can the poor engineer do, to avoid coming up against these types of problems? Buying high quality equipment from reputable suppliers is a good start. Yet, that in itself is not enough.

A fellow engineer up the road in Phoenix called to comment on a manual he received for a tape deck that had no schematics. Calling the factory did little good, they had no schematics either.

Eventually he was forced to send the unit to the factory. It was not determined whether repairs were ever made, or a new unit shipped out to him. An excellent machine in many ways, yet the engineer was reluctant to buy more. As he said, "What about next time?"

One way to protect yourself is to actually read the manuals supplied with equipment you purchase. Make sure everything matches.

If you find strange language, conflicting instructions, etc., let the manufac-

turer know. Let me know, too. If you have a nomination for worst instruction of the month, send it to the address below, and maybe we can share them.

Another positive action is to make sure manufacturers know that you want clearly written manuals, that not only explain the fine points of the gear, but also have a single page of quick, basic, how-to and why instructions.

Also, don't put up with those "preliminary manuals" forever. Demand the finished product. Make sure they know the manual is important to you.

There are some manuals that do convey information to the reader in a clear, friendly way. In English.

ATI, for one, has eschewed the

"professional" tenor of manuals, using a folksie, tongue-in-cheek manner of explaining features and ways of avoiding ground loops: "If you don't have a ground system you will still be OK as long as you don't turn on your transmitter." There are others like ATI.

And like the request for weird statements, you are invited to share samples of manual excellence. With your help, we'll be able to see the worst and the best in manual-ese.

My address is 2033 S. Augusta Place, Tucson, AZ 85710. Let me know your opinions. Here's to better, more informative manuals in your shop!

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

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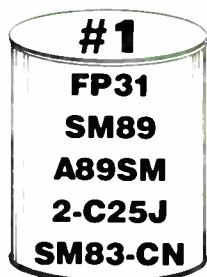
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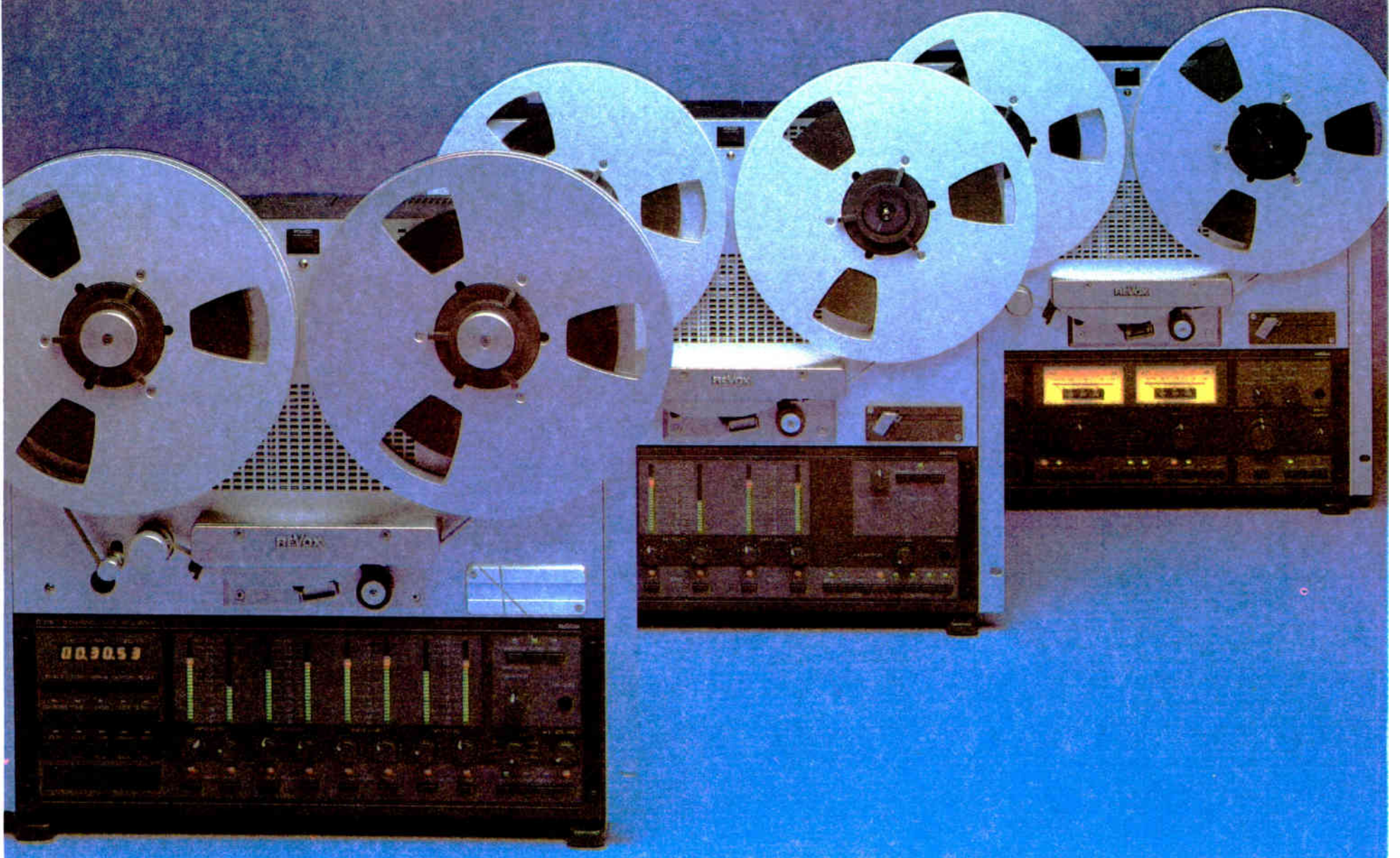


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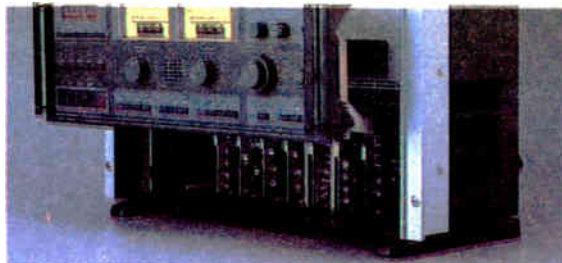
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- Selectable library wind and record inhibit
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## STUDER REVOX



# Tracking Down RFI Problems

## Ground Line, Shielding or Power Supply May Be Your Culprits

by Bill Higgs

Louisville KY ... Sometimes it seems that life is just loaded against us. Budgets are tight; it's tough in small markets these days.

Because of this, we are often forced to make compromises in the equipment we install. For better or worse, consumer equipment often finds its way into the plant. The audio performance of this equipment can be excellent.

Those of us "blessed" with these boxes must consider two headaches.

The first problem, level and impedance matching, is reduced considerably by commercial interfaces or shop-built boost amps.

The larger obstacle, for most of us, is that consumer equipment is generally more susceptible to RF interference than equipment designed specifically for the broadcast market.

(By the way, don't stop reading just because you have no hi-fi equipment in your station. Some of the best AM tuners I have seen were called distribution amps!)

## BottomLine— Broadcaster

RFI problems are not limited to those with co-located facilities. My primary station is located downtown in a major city with the nearest AM transmitter (ours) almost three miles away.

Our FM transmitter is less than a half mile away, however, and two high-power FMs are also within a half mile.

In addition, the former GM was addicted to light dimmers, elevator controls put out considerable RF junk and Ma Bell's main microwave facility is two blocks away.

(This, by the way, rules out the use of a C band satellite dish at the studio. Network services don't seem to think about this when they tell me how much money we save).

This month, we will explore some ways of attacking the RFI problem. I can't guarantee that these techniques will eliminate RFI from your plant, but they should help minimize the problem.

### Tracking the problem

Begin tracking down an RFI problem the same way you should attack any service problem: divide and conquer. If possible, isolate the unit that is causing the trouble.

In other words, make sure it is the CD player and not the interface box. Much time can be wasted chasing blind alleys if you do not take time to set up a plan of action.

Once I have isolated the offending unit, I begin by checking the equipment ground. This would seem to be a simple task (check with an ohmmeter) except that not all grounds are at ground potential, particularly at FM frequencies.

Check the ground connection by holding a small portable radio tuned to the interfering frequency near the ground point.

If the signal level goes up, be very suspicious of that ground! Also try disconnecting the ground entirely and testing

the unit. If the interference level drops, you can be sure that "ground" really isn't.

Let me explain. In many cases, ground lines have become so long that they are no longer ground at all. This is particularly a problem in studios located above the ground floor of a building.

Remember that at FM frequencies only a few feet of wire or strap can represent a tuned circuit. In some cases it is necessary to "tune" the length of the ground strap to a point of low potential.

Simply put, try to connect to the ground strap at a point that is a multiple of a half-wavelength at the problem frequency. Avoid quarterwave multiples;

these are high impedance points just waiting to infect your equipment.

### Persistent problems

If the RF problem persists, I next try to assure that the unit is shielded adequately. Although more expensive hi-fi units appear to be well-shielded, the less-costly equipment tends to be built with fiberboard case and bottom. Fix it!

Cabinets can often be shielded with ordinary coil stapled into place. Another trick is to replace fiber panels with aluminum cut from a cookie sheet.

After checking for and eliminating these gremlins, assume that any wire go-

ing into or out of the device could carry the RF that causes the problem.

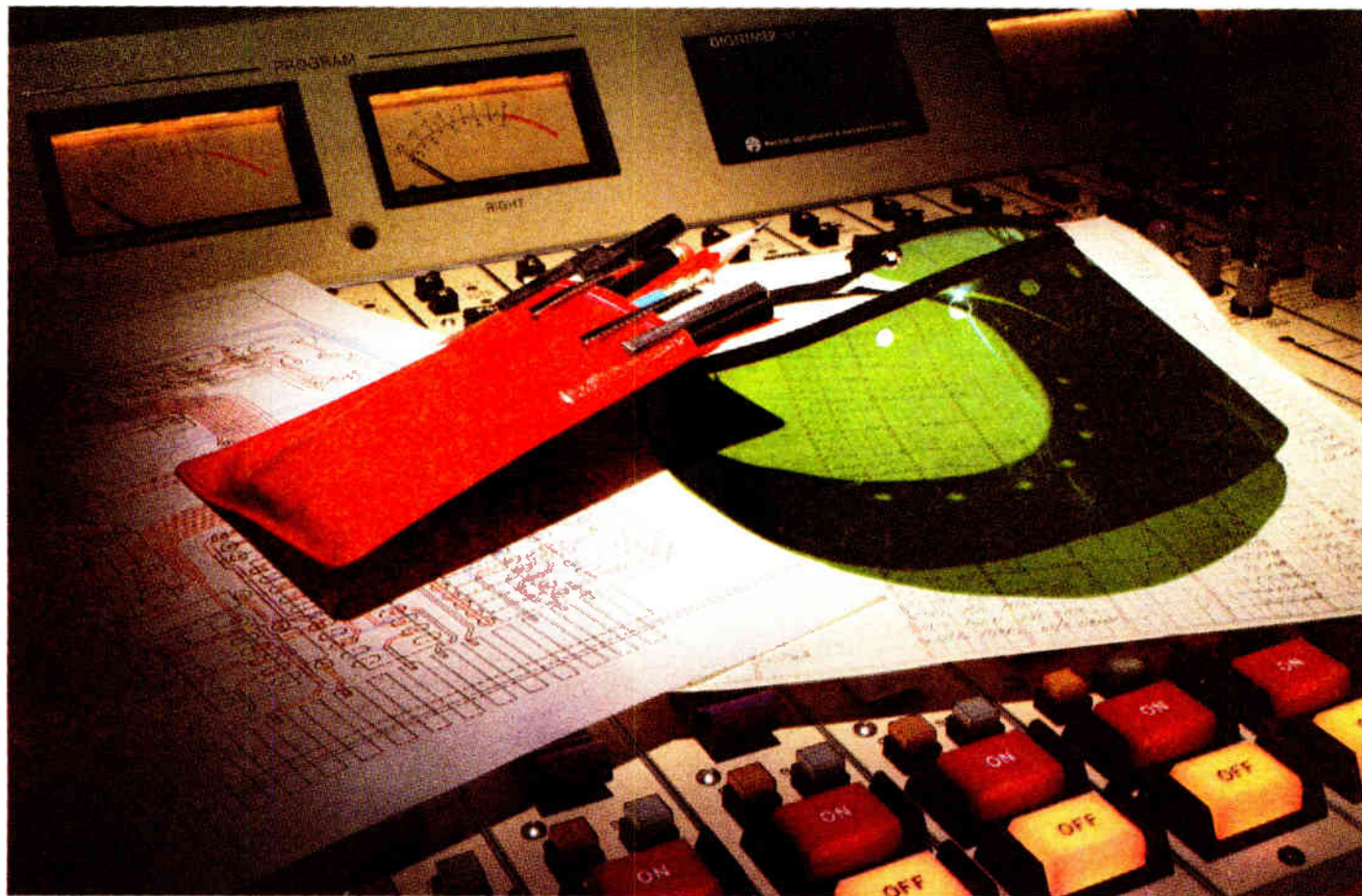
If the unit is an amplifier or pre-amplifier, short the inputs and see if the RFI disappears. If so, it is likely that the problem is at the input stage with RF being rectified by the input transistors.

With AM problems, try using a .001 mfd disk capacitor between the input and ground (for balanced inputs, install one disk across the line and one disk from each input leg to ground). With FM, do the same using 100 pf disks.

The same can be done for output stages, although larger value capacitors can often be used successfully on equipment with tower output impedances.

Conventional wisdom says to make all

(continued on page 22)



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# Tee Network Calculations

by Tom Osenkowsky

Brookfield CT ... Last time we examined design considerations for voltage and current ratings of components used in RF networks.

Now we'll look at the mathematics used in calculating the quiescent (i.e., unmodulated, center range) values of the three legs of a Tee network.

To begin, Equation 1 defines the values of line and load current and voltage. I've illustrated the general case in both instances.

Usually the line is resistive (i.e., 50 ohms +j0) but when it is reactive we must take into account this reactance. We use Ohm's Law substituting the value of R with the value of Z which is the magnitude of the impedance, the resistance and reactance.

Knowing the input and output currents, we may now use the Law of Cosines to calculate the shunt leg current.

When using two components in any leg, the current in both components is the same and the voltage across each component is determined using Ohm's Law. Equation 2 is used for the shunt leg current calculation.

## RF Reader

Table 1 is an example of a non-directional radiator whose base impedance is 57+j68.

Figure 1 shows the schematic. The power is 1000 W and the network design calls for a lagging 84° phase shift.

Realistic values were used in the de-

sign. Where two components were used in series (a coil was used to fine-tune the output and shunt leg capacitors) each individual component voltage was calculated.

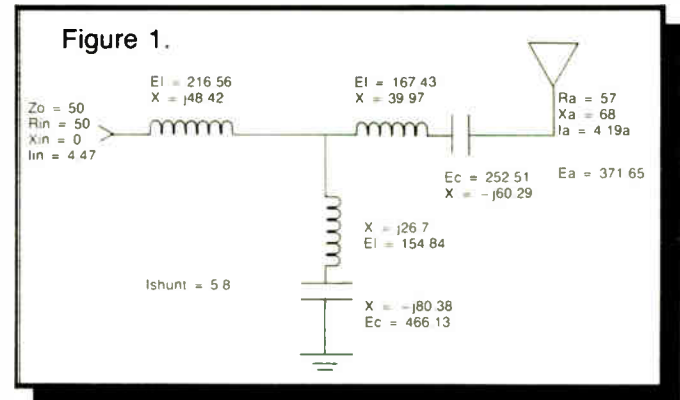
In the case of the shunt leg, the branch total voltage is 311 volts. A high L-C ratio can easily develop a high junction voltage possibly resulting in corona in the high power case.

By plugging the example values into the equations, you will see how the answers were developed. You might recognize the Law of Cosines more easily if the I terms were replaced with the E terms.

This equation can be used to deter-

mine resultant voltage of two generators of any voltage and phase combination. Where the phase angle is 90°, the right-hand terms disappear since cos(90)=0. The simple quadratic applies in that instance.

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.



### Equation 1.

$$E_{load} = \sqrt{P/RL} \times \sqrt{RL^2 + XL^2}$$

$$E_{line} = \sqrt{P/Rin} \times \sqrt{Rin^2 + Xin^2}$$

$$I_{load} = \sqrt{P/RLoad}$$

$$I_{line} = \sqrt{P/Rin}$$

### Equation 2.

$$I_{shunt} = \sqrt{I_{line}^2 + I_{load}^2 - 2 \times I_{line} \times I_{load} \times \cos(\text{phase})}$$

$$E_{shunt} = I_{shunt} \times X_{shunt}$$

Where two components are used, Xshunt will equal each reactance.

Table 1.

#### NETWORK DESIGN FOR A.T.U.

#### ACTUAL ORIGINAL OPERATING IMPEDANCES

FREQ	RESISTANCE	REACTANCE
1310	55.00	63.00
1320	57.00	68.00
1330	62.00	74.00

FREQ	RESISTANCE	REACTANCE	PHASE	VSWR	Ret %	Ret f/s
1310	51.32	+j 5.29	83.01	1.11	24.10	4.01
1320	50.00	+j 0.00	84.00	1.00	100.00	10.00
1330	45.06	-j 5.22	84.84	1.16	27.37	5.23

#### NETWORK DESIGN REACTANCES

NO. 1	SERIES CAPACITOR:-j	60.29
NO. 1	SERIES COIL:+j	39.97
NO. 1	SHUNT CAPACITOR:-j	80.38
NO. 1	SHUNT COIL:+j	26.70
NO. 2	SERIES COIL:+j	48.42
NO. 2	SHUNT OPEN	

#### NETWORK DESIGN COMPONENTS

NO.	TYPE	VALUE	BRANCH	E/I	I/I
NO. 1	SERIES	0.002000 uF	LOAD	371.65	4.19
NO. 1	SERIES	4.82 uH	BRANCH E/1	252.51	4.19
NO. 1	SHUNT	0.001500 uF	BRANCH E/1	167.43	4.19
NO. 1	SHUNT	3.22 uH	BRANCH E/1	466.13	5.80
NO. 2	SERIES	5.84 uH	BRANCH E/1	154.84	5.80
NO. 2	SHUNT	OPEN	BRANCH E/1	216.56	4.47
			BRANCH E/1	223.61	0.00
			LINE	223.61	4.47

NO. 1 SHUNT LEG RESONANT FREQUENCY = 2158.50 kHz

NO. 1 CONNECTS TO LOAD

### A. RF Specialties of Washington, Inc.

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John Schneider & Bob Arnold.

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Santa Barbara, CA 93105  
(805) 682-9429 Sam Lane

### C. RF Specialties of Texas

P.O. Box 8316  
Amarillo, Texas 79114  
(806) 372-4518  
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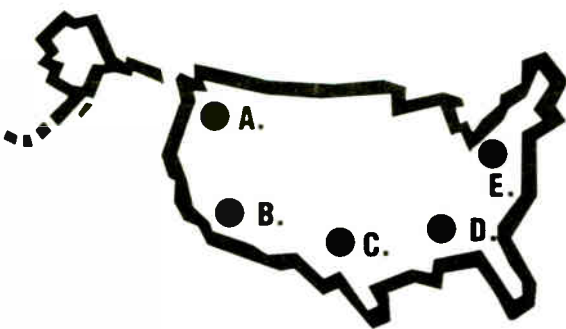
### E. RF Specialties Pennsylvania, Inc.

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## Tips On Minimizing RFI

(continued from page 21)

lead connections as short as possible. In the case of FM interference, however, I urge you to experiment with different values and lead lengths.

It is often possible to hit a series resonance at the interfering frequency which increases the efficiency of the bypass.

By the way, commercial "interference traps" are available for resolving FM interference to television reception. These work well across both input and output connections.

### Bypassing the culprits

Power supplies and power cords are also suspect. Try bypassing the power line as above, or using a power line filter.

Also, bypassing the rectifier diodes or bridge using .01 or even .1 mfd disks may help. In this application, be sure the voltage rating of the capacitors is high enough—400 volts for use across the line.

Ferrite materials are another weapon

for stubborn problems. Beads are available from various suppliers and are simply slipped over the wires or component leads. The equivalent circuit is that of an RF choke.

This ideally keeps any RF differential away from the chip's inputs. Large two-piece toroids are available for wrapping the power cable around and preventing common-mode currents from entering the equipment.

RFI is a stubborn beast which rears its ugly head in many different ways. Sometimes it defies our best efforts. These tricks may not solve your RFI problem, but it may allow you to use a piece of equipment which otherwise would become a doorstop.

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.



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Circle Reader Service 27 on Page 32

World Radio History



# Corky Culver's Big Opportunity

## Our Diminutive Engineering Apprentice Learns About Cart Machines and Discovers Girls

by Peter Hunn

Fulton NY . . . One of the first radio stations to take delivery of a tape cartridge machine was a friendly little 250 watter nestled in the rolling hills of one of our most beautiful states.

The station owner, Mr. Myers, didn't necessarily order the revolutionary unit at the request of his program director (actually, the PD had never even heard of a cart machine).

Rather, the broadcaster purchased the novel gear in order to make a point to Corky Culver, his youthful technical protégé, a quiet tenth grader dubbed, "Part-time Assistant Chief Engineer."

A few days earlier, Corky had impulsively tied an old Q-Multiplier into the broadcast audio chain.

Although not completely sure of its function, he excitedly explained to Mr. Myers that, when set to "4," the gizmo would probably boost the station's output to a full 1 kW!

"Whoa, Corky my boy," calmed the

**The gentleman . . . whispered, "Now's your big chance to impress your special someone."**

station owner, "I don't think that'll work. Besides," he noted while pointing to a tiny American flag standing on his modest desk, "the Commission wouldn't take too kindly to us just helpin' ourselves to an instant power increase. Son, there's a lot of radio that you've yet to learn."

"I guess you're right," Corky quietly confessed, and handed Mr. Myers his soldering iron.

### Corky and the world of carts

When the tape cartridge machine arrived, teacher and student unpacked and inspected the new-fangled device. After studying the instruction booklet, Mr. Myers asked Corky if he'd like to help install it in the air studio.

"You mean you'd really trust me with that baby?"

"Why sure, son. I have confidence in you," came the station owner's fatherly reply. "We'll hook it up during the next network newscast."

At five past the hour, the task was done. Mr. Myers handed the afternoon DJ a pre-recorded, standard EBS test tape cartridge and allowed Corky Culver to give instructions covering the machine's use.

"Perfect timing, my boy. Perfect timing," the broadcaster sang as he and his young assistant left the studio. "Looks like we got our new equipment patched in just in time for this afternoon's Girl Scout tour."

"Gir . . . Gir . . . Gir . . . Girl Scouts!" swallowed Corky Culver. "You mean girls are coming here to the station?"

"Why, yes son, Troop 53 will be here any minute for a look-see into the sparkling world of local broadcasting. And, I suspect some of the girls are about your age."

"Oh no," Corky moaned. "I get so ner-

vous around girls. I wouldn't know what to say."

### Corky and the Girl Scouts

Mr. Myers smiled, remembering his own adolescence. "Son, is there one girl scout in particular who you wouldn't want to know that you get a little jittery around the fairer gender?"

Corky, gulped, looked at the floor and nodded.

"I understand my boy. So, why don't

I act as official tour guide. You can study up on the new cart machine owner's manual in the engineering room."

Through a small pane of studio glass, the whole green-clad troop watched with interest as the afternoon DJ played their favorite record, made mention of the girls' visit, and began that EBS test.

Seconds later, the small hallway speaker revealed a troublesome, slowing, wobbly, wowing sound of the failing EBS test tape cartridge. The audio died just as the tone was starting.

Corky, hiding by the Gates BC-250-GY transmitter, caught the entire swan song

on a green, five-tube, Arvin radio resting on the workbench.

### Corky's solution

Seeing a great opportunity for his protégé, Mr. Myers said assuredly, "Don't worry about this touch of technical difficulty, little ladies, my able assistant can come to the rescue and fix that balky cartridge."

The gentleman stepped into the engineering room and whispered, "Now's your big chance to impress your special someone."

Corky stood motionless for a second. But a wink from his boss quickly caused the fear in his face to change into dogged

**(continued on page 27)**



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Circle Reader Service 38 on Page 32



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# Call Letters from Bygone Days

(continued from page 18)

to sell radios. When one of the radio salesmen got a hot prospect he would call up the station, tell us to go on the air and put on a couple of records so the prospect could hear the music. We were owned by the local distributor of one of the less popular brands of receivers at that time."

In addition to GE, other owners were Earle C. Anthony; KFI, the Packard Distributor; Warner Brothers Pictures had KFNB; KHJ by the Los Angeles Times; the Los Angeles Evening Express owned KNX and KFRC was owned by Don Lee, California distributor for Cadillac Motor Co.

The original KPO was owned by a combination of Hale Brothers (a large department store in San Francisco) and the San Francisco Chronicle.

## Dr. Bob

Locally, I remember the station that Dr. Bob Shuler was on. The station, KGEF (1000 W 580 kC) was owned by Trinity Methodist Church.

We lived next door to a gentleman who was hard of hearing, but wanted to hear Dr. Bob every evening.

The gentleman had to turn the volume up so loud that we could hear the "message" very clearly next door. Loud enough to cover *Amos and Andy* unless we raised the volume enough to make listening on the uncomfortable side.

The flat top antenna for KGEF was in the side yard of the church at—I think—Eighth and Hope Streets in Los Angeles.

We were almost close enough to hear Dr. Bob in person on a quiet night. We were living just south of Jefferson between the USC campus and McClintock.

Another station of the era owned by a religious organization was KTBI, Bible

## Corky's Test

(continued from page 25)

determination.

In no time, Corky nervously made his way past the female crowd, through the studio door and up to the master control board.

Instantly forgetting everything he had recently learned about cart repair, the young technician felt there was but a single avenue leading to a solution. *Everything now depended solely on him!*

The curious Girl Scouts saw Corky glance carefully at the studio clock and flip open the mic switch.

The sudden scent of cherry tobacco filled the hallway as Mr. Myers took a deep, involuntary puff on his pipe.

Corky Culver took a deep breath, leaned toward the RCA microphone . . . And, for exactly sixty seconds said, "BEEEEEEEEEEEEEEEEEEEEEEEEEP!"

*Peter Hunn recently acquired a dark day-timer in the suburban Syracuse, NY market. Although the station looked like Corky Culver might have been in charge, the nondirectional facility was restored with the help of a bona fide broadcast engineer, and began pouring out its trusty kilowatt this past summer.*

*Hunn is also the author of a new TAB book about FM construction/operation, and is an applicant for a new FM in the Wilkes Barre, PA area.*

## The original KPO was owned by a combination of Hale Brothers (a large department store in San Francisco) and the San Francisco Chronicle.

Institute of Los Angeles.

Not to be outdone or out-hustled by the Los Angeles Times and the Los Angeles Evening Express, the Pasadena Star News owned KSPN. The station was on 950 kilocycles with 1000 Watts of power.

Wonder if anyone has any history on some of the long forgotten stations?

KFON in Long Beach became KFOX under Hal Nichols, and is now KFRN for Family Radio Network.

Had the pleasure of meeting Hal Nichols in 1952 about the time he sold the station. A very interesting gentleman. His personal trade mark was a very tame cat that used to lay near the microphone and purr very loudly.

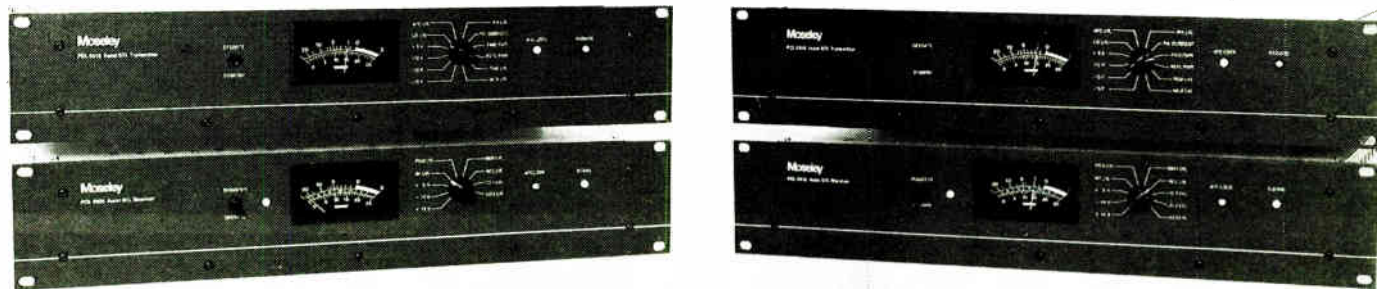
I wonder if some of the older listeners wanted to hear the cat rather than the program of music out of the early 1900 time period.

Roy Trumbull of SBE Chapter 40 has been doing research on the changes of call signs in the San Francisco area over the past many years.

Will ask Roy for permission to use some of his material in future issues. As for other parts of the United States, if anyone has the history of a call sign and the changes, please send the info along so we can all enjoy the past.

*George Riggins has experience in radio and electronics dating back to the 1930s. He is also a licensed ham operator and has had his own broadcast sales and service company, Riggins Electronic Sales, for over 20 years. He can be reached at 213-598-7007.*

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### PCL 6030 System

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# Abrams Discusses Production

(continued from page 17)

stuff. We're also finding that these rooms can be upgraded with some neat stuff pretty cheaply. We just did one here at Z-Rock for a couple grand but it sounds tremendous.

TF: Lee Michaels (then of BAMD) will be remembered for his emotional excursions in how to add life to the Superstars stations, including production. Do you think radio production values have lost ground?

LA: I think lost focus is more it. Stations seem to be very happy with just, "now fifteen more minutes of uninterrupted music." I think there's so much more to it.

Everybody's listening in stereo, at least most people. You can't even rent a car without an FM stereo in it. People have lost track of going back and forth between speakers, just creating the whole "Theater of the Mind" effect.

## Lack of skills

TF: What's your perception of the writing, performance and production skills of today's production people?

LA: I think a lot of these guys either never have experienced it or are real out of practice, but we've got to start somewhere.

TF: How do you work on the writing?

LA: One technique is to dig back and listen to old promos and airchecks from the past 30 years. Get a feel for timing,

It doesn't have to be a minute long to have impact. Old Bobby Ocean stuff and Top 40 stuff from the 60s.

TF: What do you think is the weakest link in today's production?

LA: I just think it's the people just being bored with it. They don't even think about production anymore. It's like, "Oh production, that's where you have to go into the production room and dub commercials or do some promo to some time limit on antiquated equipment."

TF: How do you train someone to be more proficient with production?

LA: We have big orientation sessions here (Satellite Music Network in Dallas) showing how things work, what they're capable of doing, inviting them to come in and practice.

TF: Have you any plans to get people even more directly involved?

LA: We'll probably have to wait until early next year, but we're planning a production seminar where they fly in for a two day deal.

TF: Do you think this kind of thing can be learned or do you think it's a gift?

LA: I think the great production guys are kind of gifted, but you can teach and develop a good one.

## Production gear

TF: This year at Radio '88 there were three companies in the exhibition hall showing synthesizers and samplers. How important

do you believe they and other MIDI gear are to radio production today?

LA: I think it's tremendously important. Here we have a Korg DSS-1. Nobody here knows how to play keyboards, but with a sequencer you do everything in step time, it turns out fine.

I think (having MIDI gear) is critical. We have all sorts of that stuff here ... drum machines ... half the time we're in there making rap records ... (laughs).

TF: I've been using a Roland MT-32 with an Alesis MIDI recorder and a Roland Alpha Juno 1 synthesizer on spots for the last few months. It really makes production special.

LA: I know. The jocks really like the keyboards. With the sampling keyboards you can get just about any sound ... it's unbelievable.

TF: There are usually one or two people at each station who get into production. Do you think a station's air sound could be improved if more members of the staff got involved?

LA: I think initially you should sort it out just to see who's got "it" or not, with the understanding that some people will be the regular producers. I think a lot of people have "it" that have never thought about it.

## Upgrading the room

TF: Do you think there will be a need to rethink the way production studios are set up? For example a big play room and a small dubbing room?

LA: Yes, ideally I think there should be two rooms. I can hear a lot of GMs flinching at this ... I also think there should be two production directors, a creative and a commercial.

TF: Two different people already on staff or extra people brought in to do just that job?

LA: Ideally two specialists, if you have the budget, but the compromise that will most likely happen is somebody from the outside as the creative guy and somebody on staff to do the dubbing.

TF: What can a GM do to upgrade production?

LA: First of all invest in the facility. The

last ten years or so every station had to have that great morning guy; it was a given. There were a lot of fights at first. Now it's time for people to start thinking, "We got to get a great production guy!"

TF: Where do you find them? Are they as tough to find as good morning guys?

LA: Morning guys aren't that hard to find. Originally they were. In a few years, when production becomes fashionable, it'll be easier, but right now it's tough. All it takes is for a couple of stations to get some numbers and everybody says, "Oh they got these great numbers partly because of their production."

## Looking ahead

TF: "Theater of the Mind" was a great concept that came out of the Superstars sessions—is it still valid? Has it been redefined?

LA: It's pretty much the same thing. You should be able to listen in the headphones ... it should sound amazing. Close your eyes and it's technicolor radio, sort of like a movie. Whenever there's an opportunity to use production use it to the max. Take some of the pressure off the jocks' selling by using great promos. Taking advantage of all the opportunities.

TF: Do you have any advice for the companies that make production gear?

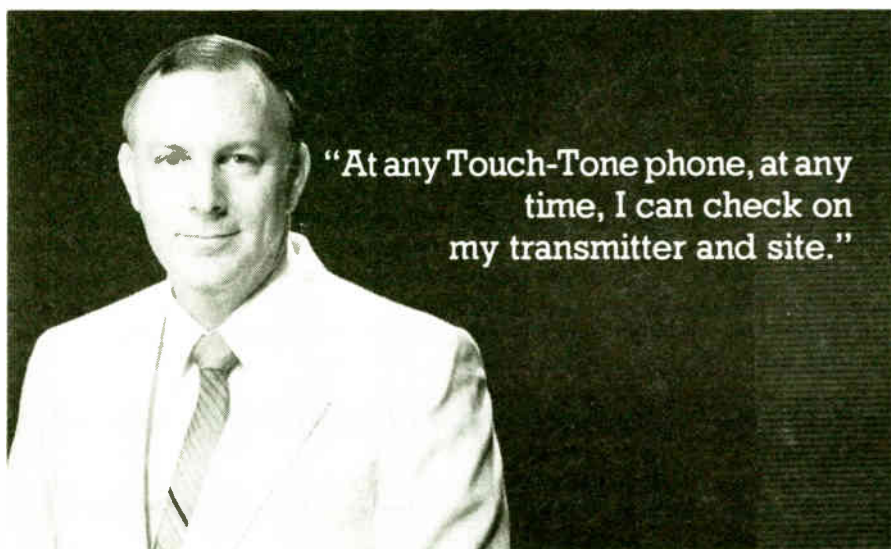
LA: The companies that make equipment for musicians should take a look at the radio market. They need to create some type of awareness. In most of the stations I go to the people don't know the stuff exists or think it all costs \$50,000.

TF: What are your feelings about digital audio and digital work stations?

LA: I like it. I think it's the wave of the future.

Speaking of the future, Lee thinks we're on the edge of a radio renaissance, a period in which radio will again become magic between the records. If he has anything to do with it I'm sure it will.

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



Pat Lane — WKNO Memphis, TN

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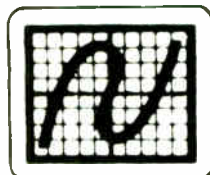
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Circle Reader Service 24 on Page 32

## Tape Type is Key for A Quality Recording

by Steve Keating, CE  
KTWV-FM

Hollywood CA ... The performance levels of today's "consumer"-grade analog audio cassette tape decks have exceeded those of "professional"-grade open reel units designed and produced a mere half-decade ago. With this realization has come the universal acceptance and usage of cassettes as a high quality, cost efficient means of transcribing voice and music information.

Although seldom used as a direct broadcast program source, audio cassette decks bearing the "pro" designation (either by price and/or performance and features) have found widespread application in the recording of on-location news events and interviews outside the radio or television studio.

They have also served to efficiently convey spec of demo commercials to potential advertising clients. At some radio stations, standard audio cassette

tapes and decks have been used to form an automation system.

The ultimate performance of any grade of cassette deck relies heavily on the tape used in it. There are various types of cassette tape formulations currently available.

### Tape types

Today's cassette tape marked "chrome bias," or "CrO<sub>2</sub> bias" seldom contains any appreciable amount of the base metal after which it was named.

In reality, there are three types of standard audio cassette tape formulations.

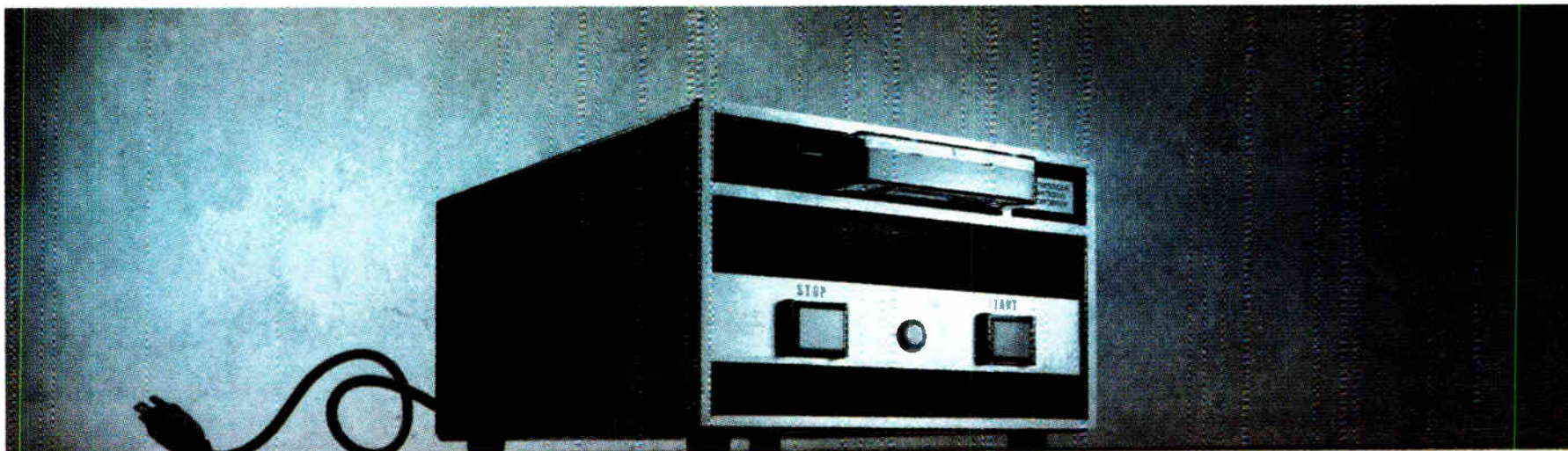
The International Electro-Technical Commission based in Switzerland (affiliated with the Electronic Industries Association) established the standards for audio cassette recording over a decade ago.

Generally speaking, most of those same standards are still adhered to today by both deck and tape manufacturer.

(continued on page 31)



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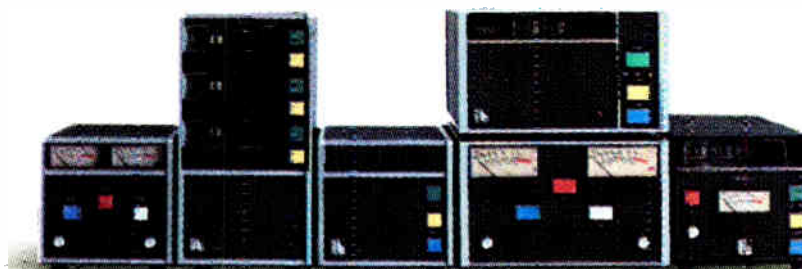
And our reputation doesn't just end there. Engineers tell us ITC also offers the undeniably best support in the business. With toll-free technical consultations. Fast turn around on repairs and replacement parts. And our 2-year warranty on factory labor and all parts, including motors, heads and solenoids.

No wonder, then, more stations buy ITC machines than any other brand. And keep coming back for more.

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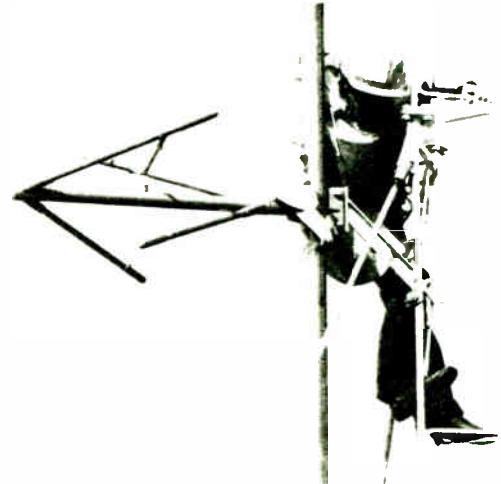
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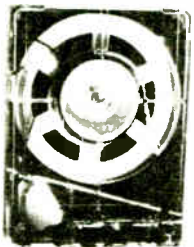
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AA-4

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- 3.5 Minute
- 4.5 Minute
- 5.5 Minute
- 7.5 Minute
- 10.5 Minute

**A-2**

**AA-4**

**3.40**

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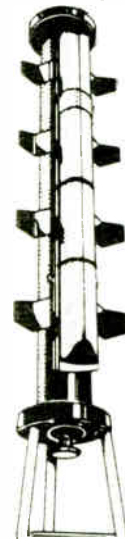
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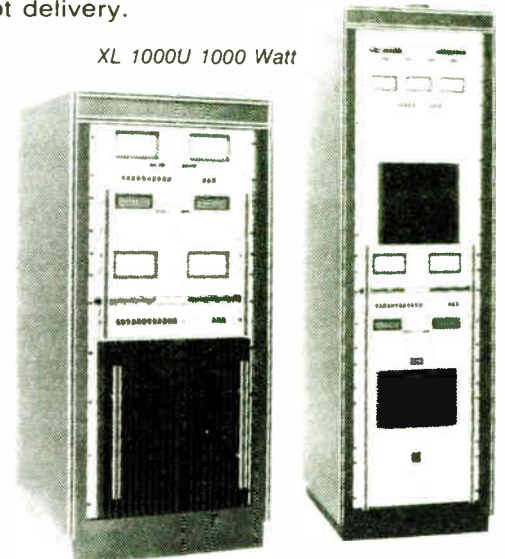
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# Circuit Analysis Ends Site Visits

by Jerry Westburg

**Quincy II** ... Before the use of circuit analysis programs and the microcomputer it was very difficult to tell if an AM station was performing to its maximum capability.

Today there are tower modeling and circuit analysis programs available that can analyze a phasing and matching system.

By analyzing the phasing system with a computer a costly site visit may be avoided. This was the case for KHEY a 10 kW DA-2 in El Paso, Texas.

Herb Rand, CE of KHEY, was concerned about the bandwidth of his four tower DA-2 AM antenna system. KHEY was planning on broadcasting a stereo signal so Herb wanted his directional system in topnotch shape.

Herb organized the data needed for the analysis of his system. These data included the common point impedance sweeps for the day and night modes, array parameters and phasing system information.

An analysis was done on the KHEY system to determine if the system was performing to its maximum capability. To analyze the phasing system it was necessary to model the antenna array and organize the phasing system topology.

This information was then read into a circuit analysis program. By comparing

the measured common point sweep, the array parameters and the results of the circuit analysis program it can be determined if a system is performing as expected.

In the case of KHEY the expected sideband impedances had significantly lower

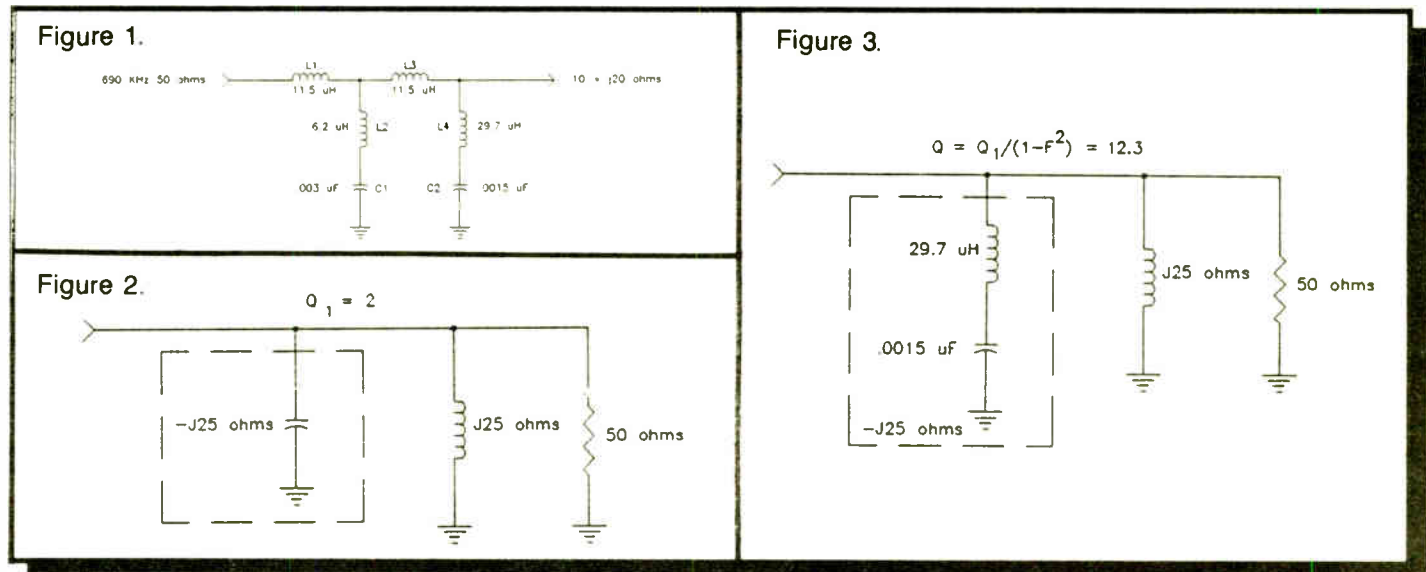
It was found that the day and night common point networks both contained a high Q circuit.

Figure 1 shows a network similar to the common point networks found in KHEY's day and night mode phasing system. L1, L2, L3 and C1 make up a

The parallel resistance and reactance of the bus point impedance are 50 and 25 ohms respectively. Figure 2 shows a circuit with a Q of 2.

If the capacitor in this circuit is replaced by an inductor and capacitor in series as shown in Figure 3, the Q of this circuit is given by  $Q_1 / (1 - F^2)$ .

The  $Q_1$  is the Q of the circuit in Figure 2 where no series inductor and capaci-



VSWRs then the measured common point impedance sweep.

The phasing system was then scrutinized in the hope of finding a network that was causing the discrepancy between the measured and the expected common point impedance sweeps.

-90 degree tee network.

L4 and C2 match the bus point impedance of  $10 + j20$  ohms to 50 ohms. L4 and C2 are storing much energy while making this impedance transformation. The additional stored energy was reducing the bandwidth of the system.

tor is used. F is the ratio of the carrier frequency to the frequency at which the inductor and capacitor are resonant. (F is always taken to be smaller than 1, so the larger of these two frequencies is always in the denominator.)

In this case the inductor and capacitor resonate at about .754 MHz. F calculates to be .915 and  $1/(1 - F^2)$  is 6.14. This means the stored energy in the circuit of Figure 3 is 6.14 times the stored energy in the circuit of Figure 2.

To solve KHEY's situation it was only necessary to make the common point network look more like Figure 2. With the addition of a few capacitors, system bandwidth was improved dramatically.

The day mode 10 kHz sideband VSWRs were reduced from 1.81:1 to 1.25:1. The night mode 10 kHz sideband VSWRs were reduced from 1.66:1 to 1.08:1. With the sideband VSWRs reduced the bandwidth potential and sound quality was greatly increased.

Jerry M. Westburg is associated with Klein Engineering in Phoenix and Labarre and Associates in Montreal, Canada. He can be reached at 217-223-5744.

## Making the Proper Choice of Tape

(continued from page 28)  
turers worldwide.

A few select companies offer cassette alignment tapes conforming to the standards defined by the Swiss Commission.

These serve as the benchmark reference for measuring playback characteristics of a cassette deck and ultimately, the mechanical playback and record head azimuth setting, as well as the electrical settings of the record and playback circuitry.

Other than cassette deck manufacturers, only professional users such as

recording studios, broadcast stations and repair shops employ the use of laboratory standard alignment tapes in measuring and setting cassette equipment performance characteristics.

### Normal bias

Type I or "normal bias" tape content is principally composed of gamma ferric oxide; Type II "chrome bias" tapes are composed primarily of cobalt-doped gamma ferric oxide; and Type IV "metal" tape formulations are made using fine metal particles rather than metal oxide particles.

Type IV tapes exhibit a magnetic coercivity level capable of yielding premium performance beyond Type I and II tapes. They are capable of greater recorded signal bandwidth response and amplitude range available before tape saturation occurs.

One disadvantage in the use of Type IV tape is the necessity that the recording deck provide a higher record bias level than that needed by Type I or Type II. A stronger magnetic field is also required to adequately erase pre-recorded Type IV tapes.

If you're curious about what happened to Type III tape, a ferric chrome composition, it enjoyed a brief existence in the late 1970s. It quickly disappeared when "metal" tapes emerged and exceeded Type III tape's performance capabilities—at virtually the same cost.

### Chrome bias

In the majority of both pro user and consumer applications the most popular audio cassette tape type is the Type II or "chrome bias" tape. It is almost universally accommodated by all cassette decks manufactured in the past five years.

What effect these three generic cassette tape types and deck provisions designed

to accommodate them represents to the broad spectrum of end users is the necessity of matching the pre-recorded or blank cassette tape type with the proper control settings available on the recording and playback equipment.

Two principal factors may affect the performance of any cassette tape system. In both record and playback modes, selection of the correct equalization setting is important to the accurate reproduction of the recorded program's spectral range.

In the record mode, selection of both the record equalization and bias settings appropriate for the type of tape being used will significantly affect the recorded and reproduced frequency response, dynamic range and distortion levels.

## RAC Report

(continued from page 2)

vide no service when silent and only a marginal quality of broadcast service during periods of operation, they contribute to calculated interference received by other, viable stations."

The tightening of the rules (which would not apply in cases of severe technical difficulty, natural disaster or death of the principal owner/operator) might "cumulatively reduce interference and result in a net gain in valuable service," the report added.

If the former licensee or another owner wants to reinstate service at a later time, they would be required to do so as an applicant for a new station subject to the recommended technical rule changes.

The report noted that most of its comments were aimed at the existing AM band: "The expanded band does not present the complexity of 5000 stations and existing service available to the public resulting from the Commission's rules and technical standards which have evolved over a 50-year period," it said.

For more information, contact Wally Johnson at 202-824-5660.

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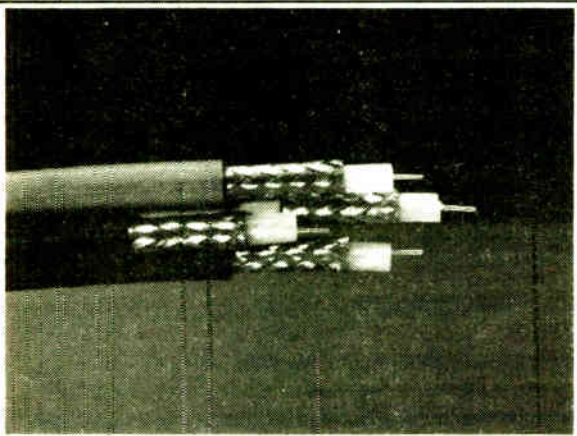
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# Radio World Marketplace

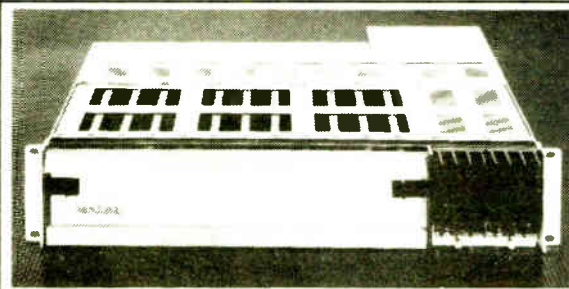
If your company has a new product you wish us to consider in *Radio World Marketplace*, please send a press release and black and white photograph to Radio World Marketplace, P.O. Box 1214, Falls Church, VA 22041



### Cable and wire accessories

A new line of broadcast wire, cable and accessory products have been introduced by Alpha Wire. A plenum-rated line of coaxial cable passes the UL VW-1 flame test and can be used without conduit.

For information contact Patricia Donegan at Alpha Wire: 201-925-8000 or circle Reader Service 51.



### Audio distribution system

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Dual redundant switch-mode power supply modules are also featured, and a VCA option is available for remote gain capability.

For information, call Omar Fattah at McCurdy: 416-751-6262 or circle Reader Service 53.



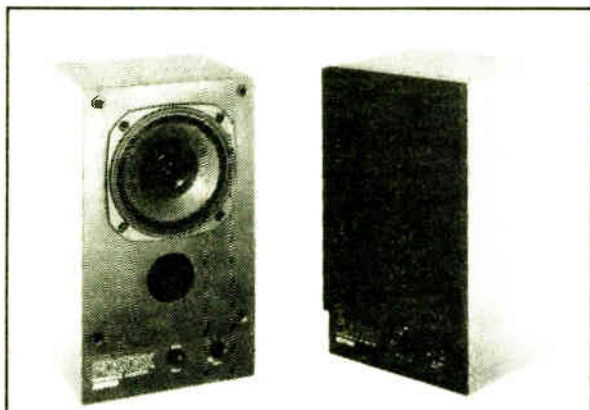
### 950 MHz tuner

The new Johnson Electronics TU-9 950 MHz tuner features a crystal oven for frequency stability and a GAS-FET front end to improve sensitivity and reduce noise.

The TU-9 uses helical resonators for additional immunity against unwanted signals. The unit is also interchangeable with the Johnson SCA/880A board for simple conversion.

Johnson's TU-9 tuner operates in the frequency range of 950-960 MHz, with a 5 kHz deviation and a sensitivity of 4  $\mu$ V. The tuner has 70 dB adjacent channel selectivity and power requirements of 115 VAC/50-60 Hz.

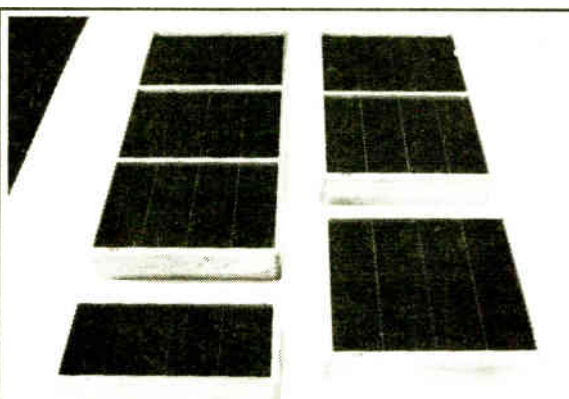
For more information contact Robert Peters at Johnson: 407-677-4030 or circle Reader Service 57.



### Near field monitors

The new Fostex line of near field reference monitors are point source, coaxial speakers, designed so that all sound reaches the ears at the same time. The monitors are designed to operate within three to four feet of the listener.

For further information contact Bud Johnson at Fostex: 213-921-1112 or circle Reader Service 59.

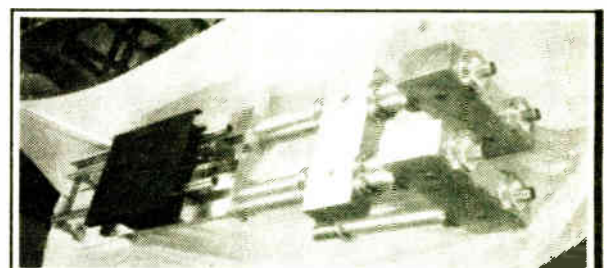


### Compact disc storage

Allied Broadcast Equipment announces a new series of compact disc storage units. Frames are structured in natural oak and dividers are tempered fiber board.

The units permit removal of the horizontal shelves to accommodate multi-disc jewel cases.

For information call your regional Allied Broadcast Equipment representative.



### Switchless combiner

Micro Communications Inc. has designed a new VHF switchless combiner.

The unit can combine and/or switch two transmitter inputs to one or both of the combiner outputs. The switching operation is done under full power without interruption of programming.

The positions of MCI's combiner are factory preset. A microprocessor controller with momentary push-button user contacts and full status interlocks controls the single motor drive and allows for remote switching.

For information contact Jennie Allen at MCI: 603-624-4351 or circle Reader Service 52.

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Please circle only one entry for each category:

#### I. Type of Firm

- |                              |                                 |
|------------------------------|---------------------------------|
| A. Commercial AM station     | F. Recording studio             |
| B. Commercial FM station     | G. TV station/teleprod facility |
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| D. Combination AM/FM station | I. Mfg, distributor or dealer   |
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#### II. Job Function

- |                       |                           |
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| B. General management | E. News operations        |
| C. Engineering        | F. Other (specify) _____  |

#### III. Purchasing Authority

1. Recommend 2. Specify 3. Approve

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

### Sales Call Service

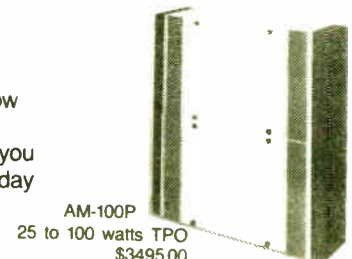
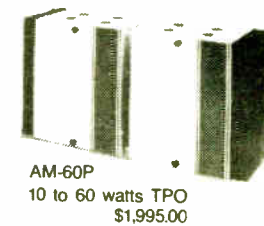
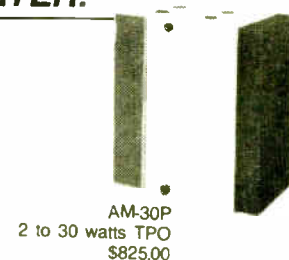
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# BUYERS GUIDE

FM Transmitters, Exciters & SCA

## FM-30A Rates High at WKSZ

by Douglas W. Fearn, CE  
WKSZ-FM

**Media PA** ... After almost six years of 24-hour a day service, we decided to retire our Broadcast Electronics FM-30 30 kW FM transmitter to auxiliary status and install a new transmitter. This would give us full-power back-up capability, something we never had before.

In almost 50,000 hours of operation the old FM-30 had only failed three times: a defective circuit breaker was discovered in the first days; a filament/high voltage interlock relay developed an open coil after a few years; and a filament contactor failed.

A couple of times a 4CX20000A PA tube suffered a catastrophic failure without warning. But otherwise the transmitter had a perfect reliability record.

### BE remains choice

Although there are several other fine transmitters available in this power range, I felt the BE was our best choice, particularly if some of the spare parts were interchangeable between the old and new FM-30s.

The order was placed and the transmitter was delivered a week before our deadline. Fortunately the new room at our transmitter building was ready and the delivery took place smoothly.

The transmitter arrived in good condition except for one broken 200 watt bleeder resistor in the high voltage supply. There are several of these resistors, which are mounted by their lugs on standoff insulators and this is the second

FM-30A I have installed that arrived with a broken resistor.

If the installer is not familiar with the layout of the power supply, it is difficult to spot the missing resistor. Fortunately a call to BE resulted in two new resistors arriving the next morning.

### Installation

Installation went smoothly. The instructions are clear and accurate—plus this is the fourth BE transmitter I have installed, so I knew what to expect.

Turning on a new transmitter is always an adventure. There is almost always something you forgot, or something broken or something so far out of tune that the overload trips. But the FM-30A came on perfectly.

In fact, after the last bolt was tightened on the installation, it took only fifteen minutes to get it up and running at full power into the dummy load. The meter

**At our power level it takes about five seconds for the screen voltage and output to reach 100%.**

readings were very close to the factory check-out sheet.

After a few hours into the dummy load, we felt it was ready to put on the air. On a Sunday night at

midnight I went out to the site, turned off the old FM-30, swung the coaxial switch to the FM-30A, turned on the new transmitter and tuned it into the antenna.

### Put to the test

We then did complete audio proof of performance measurements

on both the new and old transmitters and both passed with plenty of margin. Some crude measurements of incidental amplitude modulation demonstrated very good performance from both transmitters.

That was three months ago and since that time the FM-30A has continued to work and sound great. The only problem occurred during a severe thunderstorm in August. A direct lightning hit to the power line, or possibly a power line cross, sent a huge overvoltage into our transmitter building.

The station was off the air for 55 minutes. Both our main and back-up remote controls were severely damaged and when I tried to put the FM-30A back on from the site the lights dimmed in the building when I hit the high voltage switch.

This lasted only a second before the main 200 amp three-phase circuit breaker tripped. Then I tried the old FM-30 but its controller was damaged by the surge.

### Problem solving

My first thought was that the PA tube had shorted, so I put in the spare. That didn't cure the problem, so I started looking into the HV power supply. There are eight main rectifier stacks, each with 18 diodes. On one stack, all 18 diodes were shorted.

We didn't have a spare, so I borrowed one from the other transmitter. Unfortunately, they are slightly different in size (the old ones are bigger) so it took some crude rigging with tie wraps to get the borrowed stack in place.

But it worked. BE sent a new rectifier assembly that afternoon and we had it in the next day. The FM-30 problem was just a blown fuse.

Although superficially similar, the FM-30 and FM-30A are quite different transmitters. Both use the FX-30 exciter, and the controllers use the same board, but the automatic power control is completely different and the IPA section uses three modular amplifiers instead of five.

The PA section and the HV power sup-

ply look almost identical, except for the minor differences in the HV rectifier stacks. The circuit breaker arrangement is different, as is the front panel control section. I believe all the changes are improvements.

### Special features

One feature I particularly like on both transmitters is the step-start and soft-start feature. When the transmitter is turned off the controller automatically cranks the PA screen voltage down to minimum. When the transmitter is turned on, a resistor in series with the plate transformer limits the inrush current for a fraction of a second.

At our power level it takes about five seconds for the screen voltage and output to reach 100%. This prolongs component life and helps prevent damage in case something is wrong when the transmitter is fired up.

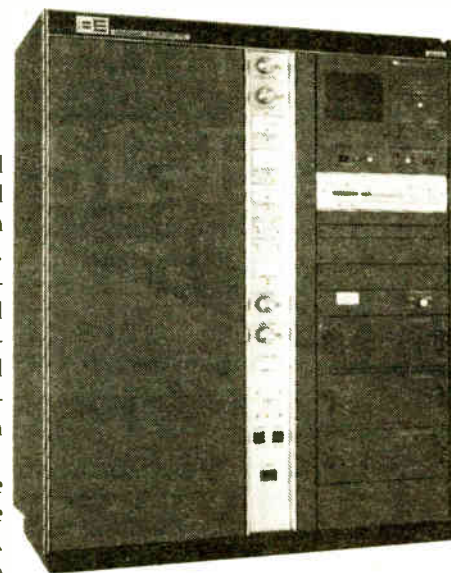
The automatic power control adjusts PA screen voltage through a motor-driven auto-transformer. It maintains the output within 1% (on the power output meter) even when the primary voltage varies more than  $\pm 10\%$ .

It is not unusual to see an operating log with "100%" written in 12 times in the "Power Out" column, even though the plate voltage and current may vary significantly.

### Controller memory

The controller remembers what was happening at the time of a power failure  
*(continued on page 38)*

## User Report



## THINKING BOOSTER?

If you are one of the many FM broadcasters who would like to know if installation of one of the proven, new boosters or Synchronous Repeaters Systems could really give you a bigger audience and higher revenues, there are some things you need to know.

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Also, a Special Report on Northern Power Systems' design of KTHO's transmission facility and a Buyers Brief from Vector Technology.



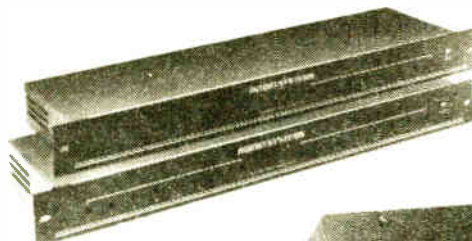
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RS Series Consoles		
	LIST	DIRECT
RS-18	<del>\$ 12,995.</del>	\$ 7,995.
RS-12	<del>\$ 9,995.</del>	\$ 5,995.
RS-6	<del>\$ 6,995.</del>	\$ 3,995.

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Let us DA you



Distribution Amplifiers		LIST	DIRECT
Model DA-8 Mono 8 Output Distribution Amplifier	\$	<del>345.</del>	\$ 255.
Model DA-16 Stereo 8 Output Distribution Amplifier	\$	<del>425.</del>	\$ 325.

(OR)

Let us Pre-Amp you



Phono Pre-Amplifier		LIST	DIRECT
Model PA-1 Stereo Phono Pre-Amp	\$	<del>295.</del>	\$ 225.

(OR)

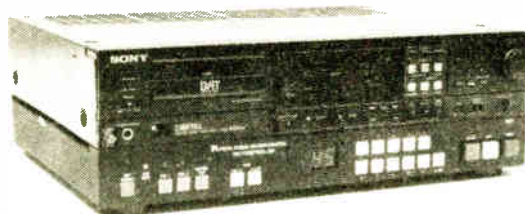
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Studio Timers		LIST	DIRECT
Model TM-2 6 Digit Timer	\$	<del>175.</del>	\$ 145.
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# TTC Improves WRTI's Coverage

by Mark Humphrey, Asst. GM/CE  
WRTI-FM

Philadelphia PA ... WRTI, Temple University's public radio station, has a unique role as the region's only full-time jazz service. One of our objectives is to provide a quality signal to as many area residents as possible.

Several years ago, we decided to establish non-commercial FM translator stations in Reading and Allentown, PA to remedy coverage problems in those communities.

After evaluating the offerings of various manufacturers we purchased two TTC Model XL10 FM translators. We have been quite pleased with the design and performance of this equipment.

## A host of features

Several features of the XLFM series are noteworthy. A ferro-resonant transformer is employed in the power supply to assure stable operation under varying line voltage conditions.

This stage is protected by a circuit

minimize overload and intermodulation problems. There are two five pole Bessel LC filters in the IF stage for excellent selectivity.

TTC also offers a special high selectivity option at no extra charge, which provides 70 dB adjacent channel selec-

tion donor announcements once an hour as permitted by the current FCC rules. The timer can also be triggered by a built-in tone decoder which will detect tone bursts sent by the primary station.

The XLFM series can be ordered with

**... we have found our translators to be good investments as they have increased listener support from the communities they serve.**

tivity, according to published specifications. We chose to order this option to prevent interference from first adjacent stations near our two translator sites and I have noticed that it performs very well.

The increase in distortion resulting from the narrow bandwidth is imperceptible, and we have not observed any

## User Report

crosstalk problems from our SCA into the main channel. However, crosstalk from main channel to SCA is noticeably degraded with this option.

Another unique feature of the XLFM series is a phase-locked loop upconverter stage. This design eliminates

problems with spurious signals which might be encountered with heterodyne upconversion. It also provides a simple and clever method of local modulation.

## Modulator option

The modulator option includes a timer which will start a cart player for local

single or dual power amplifiers rated at one or 10 W output. A choice of 50 or 75 ohm load impedance is offered. Modular construction is employed, so it is no problem to add a second PA module in the field.

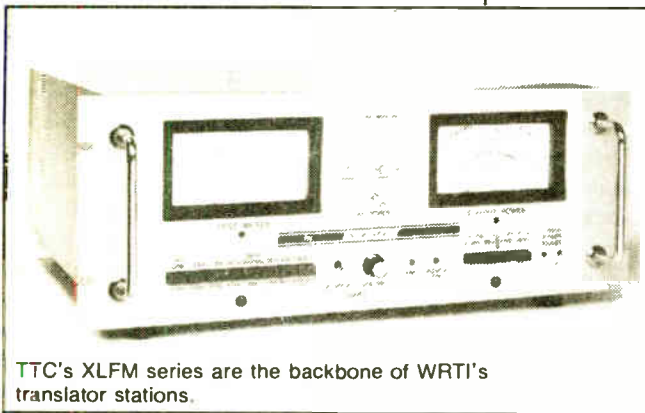
The PA stage has plenty of reserve power and will operate into a load VSWR up to 3:1 without shutting down. Output power is very stable; we have never seen it vary more than two percent from its normal level.

## Monitors

TTC has provided ample monitoring provisions on these translators. An RF monitor port supplies a sample of the IPA output to facilitate carrier frequency measurements. A stereo headphone amplifier is also included to permit audio monitoring.

A multimeter permits checks of power supply voltages, VCO voltage, input signal level, FM deviation and IPA output level. A separate meter monitors PA forward and reflected power.

Both of our translators have proven to be very reliable. One of our units failed when lightning destroyed the protective MOV in the power supply. However, this tripped the circuit breaker and prevented any further damage to other components. Since then, we have



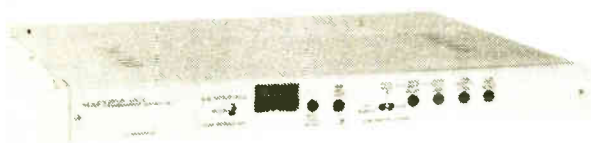
TTC's XLFM series are the backbone of WRTI's translator stations.

breaker and MOV on the primary side of the transformer and by a fuse and thermal switch in the DC regulator. An SCR is also included to provide overvoltage protection in case the regulator pass transistor shorts.

The "front end" uses an FET cascode RF amplifier and FET balanced mixer to

## MODEL SCG-10 SUBCARRIER GENERATOR MODEL SCD-10 SUBCARRIER DEMODULATOR

# MARTI



selectable pre-emphasis of zero, 75, 150 or 225 microseconds. Low pass audio filters of 3 kHz, 5 kHz or 7.5 kHz are available. For subcarrier link systems using the SCD-10, a compander encode board plugs into the generator and a decode board into the demodulator to adapt the system to audio companding.

### MODEL SCG-10 SUBCARRIER GENERATOR \$695.00

The Marti Model SCG-10 Subcarrier Generator is designed to operate in SCA service with an FM broadcast transmitter or with a Model SCD-10 Subcarrier Demodulator, to form a subcarrier link on a microwave (STL) system. Audio processing options include

### MODEL SCD-10 SUBCARRIER DEMODULATOR \$695.00

The Model SCD-10 Subcarrier Demodulator is designed for use with Model SCG-10 Subcarrier Generator to provide a high quality subcarrier channel on a microwave link (STL) or FM station. The SCD-10 may be specified for operation on a standard subcarrier

frequency used in FM broadcasting. The subcarrier input to this demodulator should be from a high quality FM receiver having adequate IF bandwidth with group delay characteristics sufficient for subcarrier work. The Marti R-10 Receiver with 200 kHz phase linear IF filter is excellent in this respect.

Audio processing options include selectable de-emphasis of zero, 75, 150 or 225 microseconds. Low pass audio filters of 3 kHz, 5 kHz or 7.5 kHz are available. For subcarrier link systems using the SCG-10, a compander decode board plugs into the demodulator and an encode board into the generator to adapt the system to audio companding.

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installed an external surge arrestor on the power line.

The instruction manual supplied with the XLFM series is written well and includes comprehensive test procedures and instructions for rechanneling. The quality of construction is very high and circuit design is well-conceived.

As a member-supported station, we have found our translators to be good investments as they have increased listener support from the communities they serve.

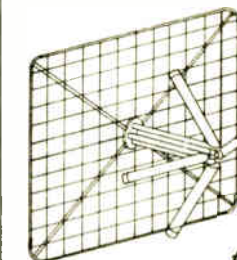
Editor's note: Mark Humphrey is SBE-certified and began his broadcasting career in high school, where he started an FM station. He may be reached at: 215-787-8405.

For more information on TTC's XLFM series, contact Bill Kitchen at TTC: 303-665-8000.



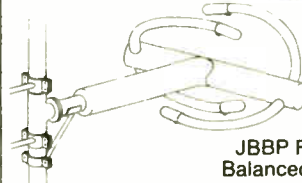
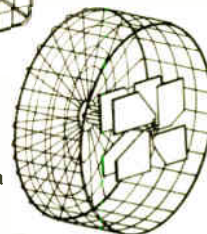
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# Price, Stability Lead WDBI to FMQ-3500

by Don Backus, GM/CE  
WDBI-FM

Tawas City MI ... There's no worse time to install an FM transmitter and antenna than in the dead of winter. So nat-

## User Report

urally, that's what we ended up doing.

In January, 1988, WDBI-FM installed a QEI FMQ-3500 transmitter. The next day I started getting calls from people who commented that our station was coming in better ... and sounding better too!

In selecting our FM transmitter, we evaluated several different products. Each had benefits that another didn't offer; each seemed to have shortcomings not shared by another. Our final decision to purchase the QEI FMQ-3500 was based on several key points.

The design of the transmitter is a single tube grounded grid type, felt by our consulting engineer to be generally more stable than other designs. The price of the unit was also a factor, but not an overriding one.

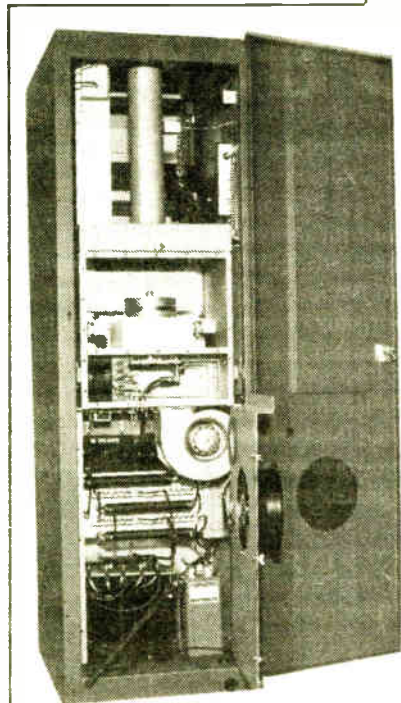
### Power increase potential

Another consideration was the potential for upgrading the transmitter to a higher power level. As a Class A FM, it looked possible (and still does) that the FCC might someday soon offer us the chance to increase power. If it does, the FMQ-3500 can be field upgraded to 5 kW or even 10 kW with optional factory sup-

plied kits.

The FMQ-3500 uses a 3CX3000A7 tube warrantied by QEI for 15,000 hours or two years (whichever comes first) with pro-rated charges applying after the first 10,000 hours. The transmitter itself is housed in a 23" wide by 30" deep by 76" high steel cabinet.

The meters are located in a



QEI's FMQ-3500 stays steady as a rock, according to WDBI.

tilt-out panel at about mid level of the cabinet. There is about 17" of rack space

located above the meter panel for the exciter and processing equipment.

Electric power is supplied from a single phase source of 208 to 240 VAC at 60 Hz (but it can operate at 50 Hz as an option). The IPA is a solid state 250W module that can be replaced quickly if need be.

The control functions and fault indicators are run from a separate 24 V power supply and the unit supports its own microprocessor based remote control system, or outputs to a third party unit.

### Practical use

Our application has the FMQ-3500 running at 3500 W TPO into a two-bay circularly polarized antenna at 281' above average terrain.

The new equipment allowed us to move a Sparta 601 1 kW transmitter that drove a seven-bay Jampro antenna into back-up status. At the same time we installed new coax cable and a QEI Model 695 exciter (a very nice unit in itself).

Installation of the FMQ-3500 was fairly straightforward. The only problems we encountered in

the initial checkout were neither QEI's fault nor our own.

In delivering the transmitter, antenna and coax cable, the delivery truck got lost, took a wrong turn or two at too high of a speed, and the coax cable spool fell over onto the transmitter.

To the credit of the FMQ-3500, there was little trace of this mishap other than cosmetic damage and a slightly loosened drawer slide.

The setup and installation instructions were brief and to the point. While not overly elaborate, they did cover the installation and initial operation fairly well. The schematic drawings left something to be desired in legibility, though. I have since spoken to QEI about that and was told that they are redoing them on a CAD system.

The first problems we discovered were during the latter part of the installation and setup. Interfacing the remote control unit that we have was not easy at all.

QEI sells an optional remote control unit called the ARC-27. It provides up to 64 analog and 16 digital inputs. Unfortunately, the FMQ-3500 does not provide the same access to information for a third

party remote control as does our Moseley MRC-1600.

It was easy to hook up the control functions, but some of the readings, like the PA plate current, which is not supplied referenced to ground, were not. We also had to kluge together an optoisolator circuit to provide status light signals to our Moseley.

### Possible improvements

There are other parameters supplied by the transmitter to the QEI remote control unit that are not accessible at all by any other remote control system. These include the fault annunciators, stack and ambient temperature to name a few. I think it would be a valuable addition to the FMQ-3500 to allow for easier access to these outputs.

However, since the installation was completed in January, we have had only one serious problem with the transmitter. Over the summer, our IPA current seemed to be gradually increasing without a corresponding increase in output. After consulting with QEI, they sent us a new unit which has since operated perfectly.

In retrospect, I believe the impact of the delivery truck may have had some effect on the IPA. The experience we have had with the customer service people at QEI has been quite good. We have had to talk to them at rather odd hours from time to time and have always received courteous, competent assistance.

Maintenance has been a breeze. The cabinet air filters are standard size and easily found even in Tawas City! Cabinet access is good and the unit basically stays steady as a rock ... even when the weather was as hot as the summer of '88.

### Price and service right

When we purchased a transmitter that was several thousand dollars less expensive than some of the "big names" we knew we would be making compromises. But with our experience so far using the FMQ-3500, I would have no hesitation in buying another ... regardless of price.

Product quality is just one element of a successful company. Product support is just as important. While QEI is certainly not the only broadcast company to provide both quality and support, based on our experience, they stand right up there with the best.

*Don Backus has been in broadcasting since 1972. From MSU to WSJM to WVIC to VOA to WDBI he just can't get enough of this business! Currently he manages, engineers and co-owns WDBI-FM, Tawas City, MI and loves it. He may be reached at 517-362-6149.*

*For more information on the QEI FMQ-3500 transmitter, contact Bill Hoelzel at QEI: 609-728-2020.*

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Model TM-2  
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# KTHO Reaches Peak in Tahoe

by Don McBain, Pres/Tech Dir  
KTHO-FM

South Lake Tahoe NV ... Mention Lake Tahoe to anyone and it will evoke a multitude of favorable comments—"Beautiful scenery, great shows and gambling," etc.

But those beautiful mountain peaks that so impress the visitor create problems for the broadcaster trying to deliver a listenable stereo signal to his audience, most of whom live within three miles of the 200 mile shoreline.

## Poor reception

Reception problems are particularly troublesome at the more populous

south end of the lake. When I built KTHO-FM back in 1968 I located the transmitter part way up a ski lift in the hope that I would have solid lake coverage and a good stereo signal. Coverage was fair, but stereo reception was so poor that we went back to mono.

With the hope that a move away from the mountainside might improve this situation, we relocated the FM transmitter at our AM site at lake level and about as far from the mountains as we could get without going into the water. But improvement in stereo reception was minimal and soon we were back on mono.

To try to solve this problem I met with our KTHO consultant, Cecil Lynch and our antenna engineering consultant Peter Onnigian.

Since lake level transmission sites didn't work due to their close proximity to the mountains, our attention turned to the top of the mountains.

## Genoa Peak

Genoa Peak, standing about 4,500' above the city of Genoa, Nevada and about three miles east of Cave Rock, was Peter Onnigian's choice.

The peak looked down on 75% of the lakeshore communities and was direct

line of sight to our studios at the south end. In addition, many of the cities of Western Nevada, including portions of Reno, would be within the signal area of this site.

The next step was to try it. With a test authorization, a 10 W transmitter and a single bay antenna we were able to determine that not only could predicted coverage be met, but that a listenable stereo signal was possible.

From its 9100' level Genoa Peak would provide us with our maximum authorized effective radiated power with a three-bay antenna and a 750 W transmitter.

There were problems though—how to get there with all of the equipment

necessary to build the station and how to power it once it was built, since the only electrical service available was a mile straight down the mountain.

## The power source

For our power problem we turned to Northern Power Systems. Northern configures its power plants to meet load-and site-specific needs and has installed them to operate unattended all over the world. They offer either solar or wind turbine generators as the primary power source.

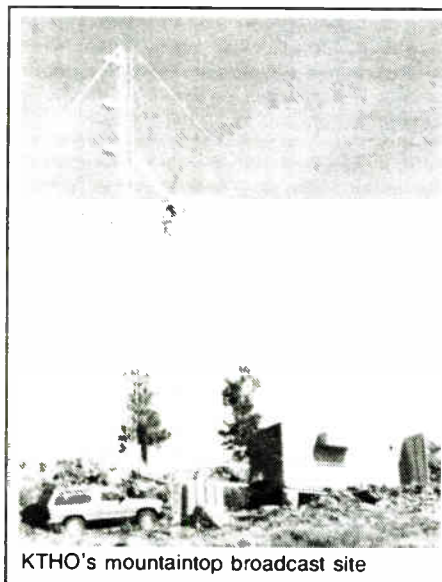
As a former airline pilot, I had logged many flights in and out of Reno and many of the earlier flights were in DC-3 and Convair aircraft. So I was quite familiar with wind-caused turbulence along the mountain tops in the area.

As hot air rises from the Nevada desert in the summer a low pressure area is created beneath it and cooler air from the Pacific Ocean rushes in to fill that low.

Substantial afternoon winds were expected during the summer. During the winter we expected normal storm activity to provide our wind source. Based upon this assumption we chose a 3 kW wind turbine with a 6 kW propane powered generator backup.

Northern's HR2 wind turbine generator was specifically for unattended operation in harsh environments. It employs a passive rotor control system and has only three moving parts.

It had amassed more than 2.1 million hours of operation, some at sites near both the North and South Poles, with system availability exceeding 99%.



KTHO's mountaintop broadcast site

For the power storage system Northern chose the GNB Absolyte battery. This type of battery never requires water and does not vent potentially dangerous hydrogen gasses. This allows placement of the battery bank in the same room as the equipment.

Another significant advantage absorbed electrolyte batteries offer is that they can be frozen without significant damage to the cells. Also they can be

mounted either horizontally or vertically, providing versatility in the shelter layout.

Our 48 V, 2700 amp hour system occupies 21 square feet and weighs 8400 lbs. Northern installed the system in a 10 by 20-foot cargo container. A power controller and regulator were also a part of the equipment that they supplied.

Our next major problem was how to get all of this equipment to the top of Genoa Peak. Northern delivered the container and all of its equipment to Carson City, some 25 miles distant, part of which was over a road known not to be kind to motor vehicles. Also, 26 cubic yards of concrete had to be delivered to the site.

## Climbing the mountain

This part of the project was to be the responsibility of Pete Smith of P&R Tower Company of Sacramento. When cement trucks could not make it to the site Pete used a front-end loader to carry their load the rest of the way.

An 80-foot guyed tower was used to support a Jampro JLCP three-bay CP antenna and a 40-foot guyed tower was used to support the wind generator.

Keeping system efficiency at peak level is always a requirement of battery-powered systems. Since the transmitter would require the greatest power drain, conventional AC powered units were not acceptable.

Paul Gregg of Elcom Bauer came to our rescue by adapting his company's solid state transmitter to operate directly off of the 48 V DC supply.

## The EB 6300X2

The Elcom Bauer Model 6300X2 consists of two 300 W amplifiers combined  
*(continued on page 38)*

## Special Report

The Davis Communications Group

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# WKSZ Doubles Up with BE Gear

(continued from page 33)

and will automatically bring the transmitter back up as soon as power is restored. It will first turn the screen voltage all the way down if it didn't have a chance to do it when the transmitter went off. A battery back-up (9 V) maintains the power out setting memory and any overload information.

*Editor's note: Doug Fearn is a contributor to the "Handbook for Sound Engineers (The New Audio Encyclopedia)," as well as a frequent contributor to RW. He may be reached at 215-793-1533.*

*For more information on the Broadcast Electronics FM-30A transmitter, contact Bill Harland at BE: 217-224-9600.*

The solid state driver consists of one drawer-mounted amplifier (running about 37 W) driving two other similar amplifiers (at about 175 W each) through hybrid combiners to provide 300 W of drive to the PA. (Of course this will be different for transmitters set up at different TPOs.)

The only adjustment required is the power output of the first stage.

## The PA

The PA is a single tube in a folded half-wave cavity. This output scheme eliminates sliding contacts and the plate blocking capacitor. Tuning is precise, predictable and stable. And the tube can be quickly replaced. In fact, I once changed

a tube in five minutes from turn off to turn on and I wasn't even hurrying.

The transmitter interior is very accessible for cleaning, with the exception of the PA grid compartment, which has dozens of screws. This is the weakest area of the transmitter, in my opinion. It tends to get very dirty and this has created PA grid tuning problems in the FM-30.

The grid uses sliding contacts for tuning and loading and when these get dirty, tuning is erratic. The threaded rods that drive the tuning elements get corroded and dirty, making the adjustments hard to turn.

There is a tremendous amount of air rushing through this compartment and

into the PA tube and it seems like a lot of dirt gets deposited along the way. Time will tell if the "A" version is any better in this regard.

We have been very happy with the original FM-30 and expect to have comparable results with the FM-30A. It is a rugged transmitter, a well-conceived design that has the maintenance engineer in mind. And the sound is superb.

## Lake Tahoe

(continued from page 37)

in a conventional manner and a 100 W driver. The combination produces the 717 W TPO necessary to meet 1000 W ERP, which is the equivalent of 50 kW at our height above average terrain. A La Marche inverter is used to power a Moseley STL receiver and a TFT remote control unit.

The system went on the air in October 1987 with a special temporary authority to operate at reduced power.

The system performed well during this past winter, and in May the transmitter power was doubled. Full power tests were run in late July to gather final test data, with full power operation expected to begin this month.

The station load is approximately 1500 W and the wind energy system is expected to supply most of the necessary power. Should there be an energy shortfall, sufficient propane has been stored to power the system with the backup generator.

At KTHO we are looking forward to our first winter of full power operation from Genoa Peak. Power bills are now past history, and a good stereo signal is now finally available throughout the Lake Tahoe basin.

*Editor's note: Don McBain flew commercial airline flights for United Airlines for 33 years, and was an engineer and announcer for CBS in the 1930s. He may be reached at 818-990-7277.*

## BUYERS BRIEFS

The Vector Technology Model FMT-40 FM transmitter uses a high power amplifier chain and an up to date solid state and relay logic control ladder.

The control ladder has four plug-in circuit cards: Transmitter Control; Overload Cycle; Overload Sense; Auto Power, VSWR Fold Back and VSWR Overload.

The transmitter's circuitry is solid state throughout. LEDs are used for all control ladder logic and overload fault indicators, as well as for all interlock circuits.

The FMT-40 has a 12 phase power supply for improved S/N ratio (ripple), eliminating the need for high voltage filter chokes.

All control switch functions are momentary contacts and no interface relays are required for remote control operation.

For more information, contact Mel Lieberman at Vector Technology Inc.: 215-348-4100.

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If you're shopping for a 10KW unit in the first place, the QEI FMQ-10000 has lots to recommend it. No other FM transmitter packs this much power, reliability and performance into a single 24" wide rack cabinet. And the FMQ-10000 is designed to operate on single-phase power, so there's no need to pay for installing new three-phase electric service.

What's more, for upgrades to power levels beyond 10KW, each of these FMQ series

transmitters can serve as the driver section for QEI's 20, 30 or 60KW transmitters, again resulting in major cost savings.

Every QEI "New Reliables" FM transmitter is built to deliver ultra-dependability and performance. So—whether your station is thinking of upping its power down the road, or if the power you start with is the power you stay with—you'll be glad you chose QEI. Call us toll-free at (800) 334-9154 for the full story.

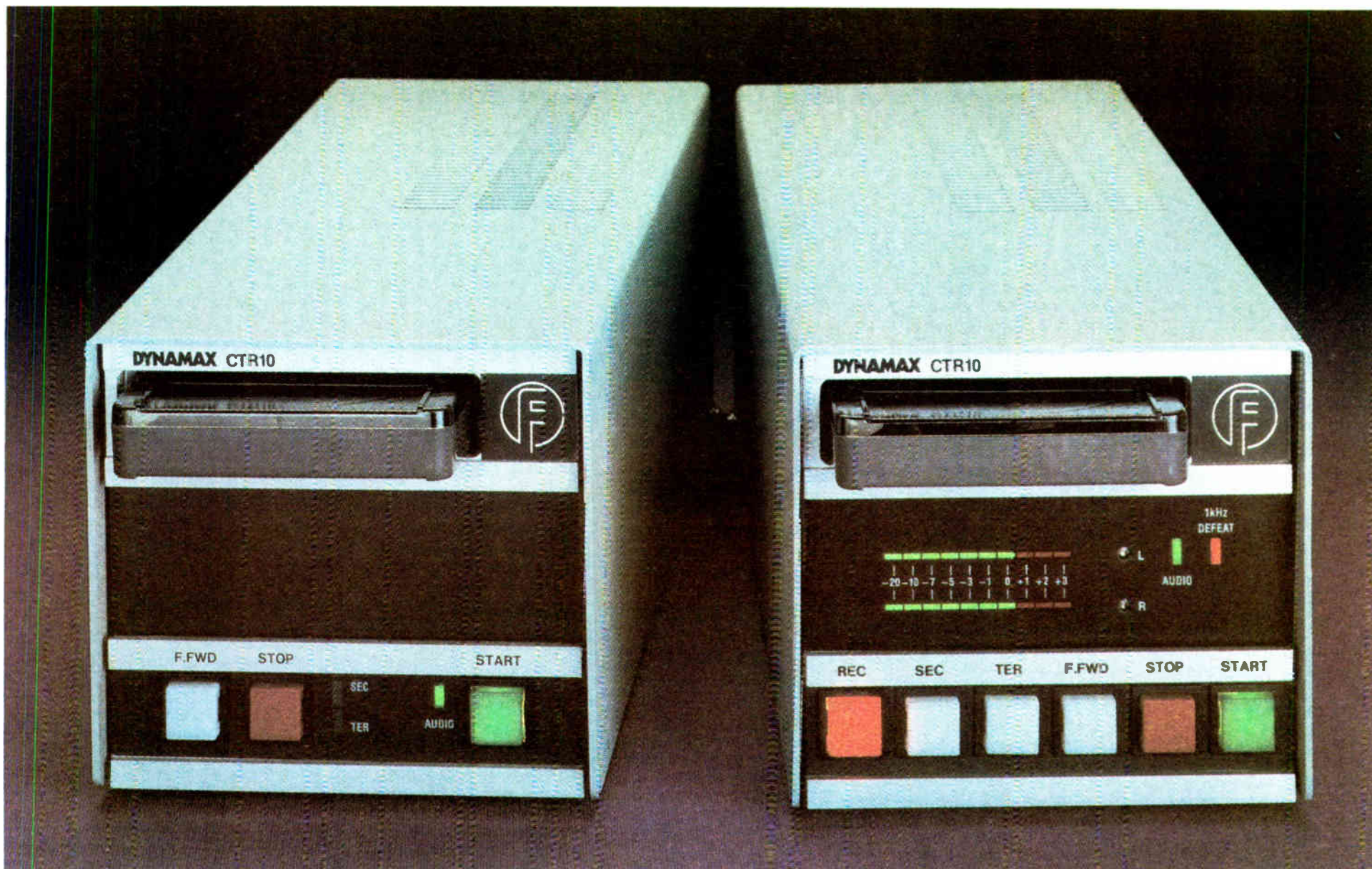


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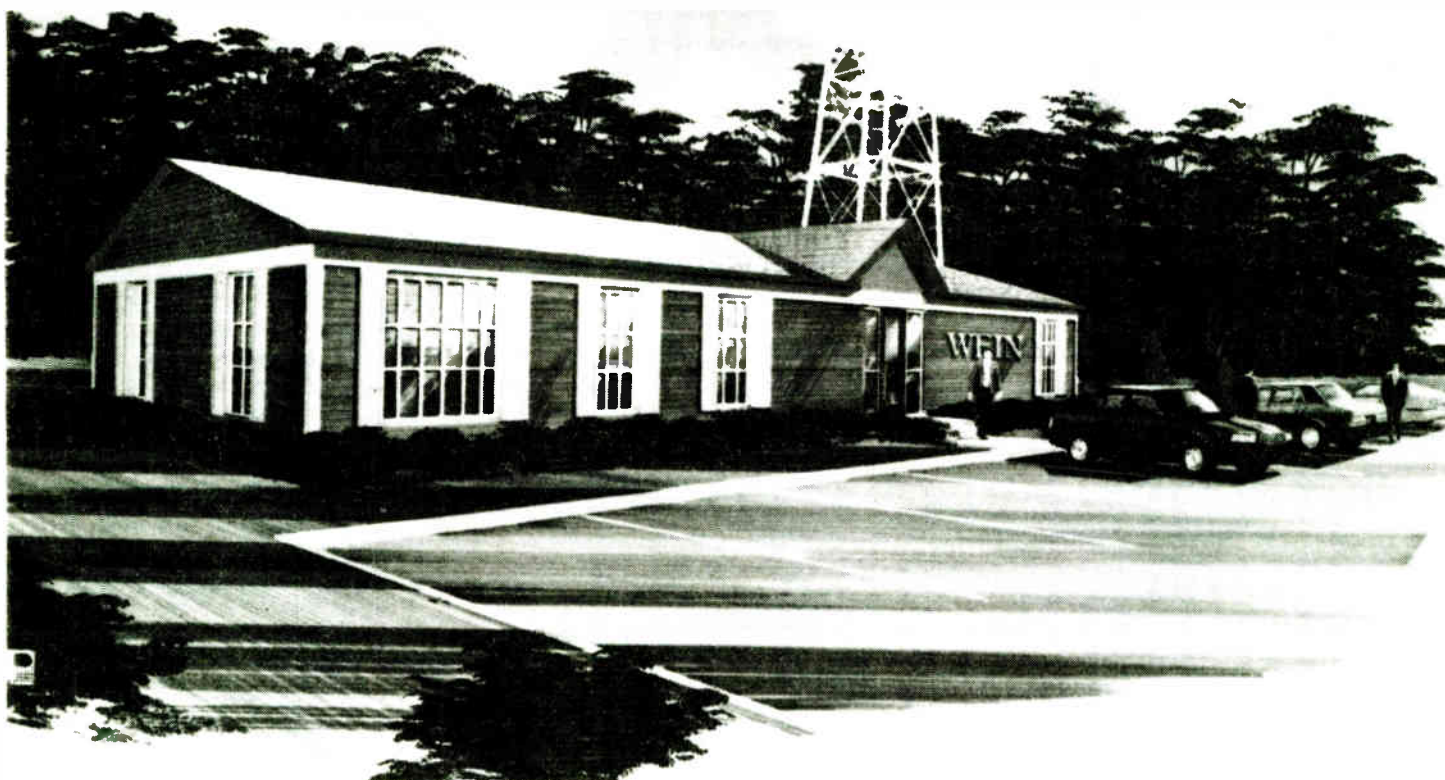
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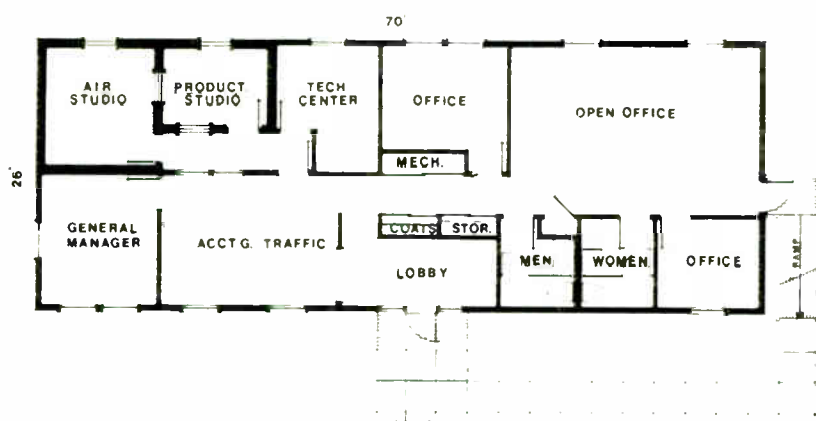
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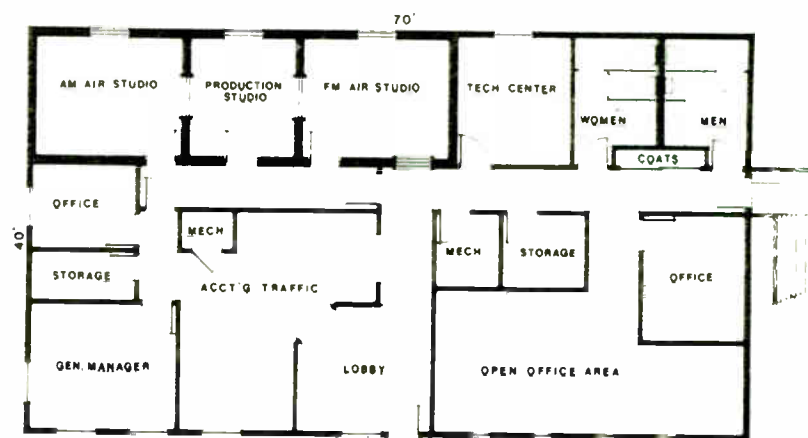
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# Dayton Radio Beats Multipath

by Lyle Henry, CE  
KIQQ-FM

Los Angeles ... Finally you can get really good SCA receivers for a variety of applications, with delivery times that are reasonable too.

## User Report

Dayton Radio in Ohio has come out with specialized conventional receivers. They are conventional in that they use the standard 67 and 92 kHz FM subcarriers.

The Dayton Radio Plus SCA receivers, now being marketed through Allied, are not only great radios for their intended applications, but are also practical and fun pieces of test equipment.

I've been fortunate to have the opportunity to use several of them during their rapid evolution over the last year or so.

### The initial stages

First introduced for the Reading Services for the blind, Dayton's radios had to be mass-produced to keep the price down. But with a different station frequency in every market, they could not be crystal-controlled.

Then, too, just a few years ago the 92 kHz SCA was added, so they had to be able to hear that as well as 67 kHz. Since only a whip antenna would normally be

used, they needed very high sensitivity.

And wouldn't it be nice to include some ergonomic thought? Like a flat design that wouldn't tip over, push buttons and a slide rule volume control?

Kurt Farmer and Bob McDougall created a unit that filled the above needs and beyond. The receivers have GaAs FET front ends with a unique biasing cir-

cuit. Coils use a special core material and shields for high Q. The result is superb sensitivity, without overload or cross-modulation if an outdoor antenna is connected.

### Frequency selection

Frequency selection is made with nine tiny DIP switches inside. The main chan-

nel, 67 or 92 kHz SCAs can be selected from the top panel. A choice of audio bandwidth is also available for "hi-fi" or narrowband listening in fringe areas where noise may be present.

Two watts of audio drive a loud internal speaker. Jacks provide connections for an external speaker, music on hold, etc. A separately adjustable bridging output on tuner models for the music services conveniently drives any amplifier.

Computer designed filter networks are  
*(continued on page 46)*

## TUNED IN

**People ... Gentner Electronics Corp.**, busy restructuring, is consolidating its San Jose RF Products Division into its Salt Lake City operations, in the process losing John E. Leonard, Jr., who is resigning as President of the RF Products Division.

Gentner has added to its R&D department, though, appointing Jim Pino director of R&D. Pino formerly served as manager at ADT, a circuit board design division of Gentner.

Gentner has also brought in Craig Boswell as product development coordinator and Jim Wright as CAD services coordinator. The busy company just recently also named Bill Traue to its Customer Support Team, where the former CE for six radio stations will add broadcast engineering customer support.

In other people news, Leslie B. Tyler has been named VP of Carillon Tech-

nology and will head that company's newly-formed CTI Research Group.

**Moseley Associates, Inc.** welcomes Dr. R. Douglas Hogg, Jamal Hamdani and John Primeau to new posts. Hogg will become president and will manage R&D for the company. Hamdani, former Moseley international marketing director, becomes VP of Marketing. And Primeau joins the company as director of manufacturing, assuming both line and administrative functions.

**Harrison Systems** brings Tom Irby, former owner of Studio Supply Co., into the fold, making him Advanced Technology Product Manager. Irby will preside over Harrison's Series Ten MR-20 and other advanced technology music recording and related audio console products.

**Special note:** Access Communications, the Wauwatosa, WI vendor of cellular phone gear mentioned in 15 October *Buyers Guide* wants to make sure they ar-

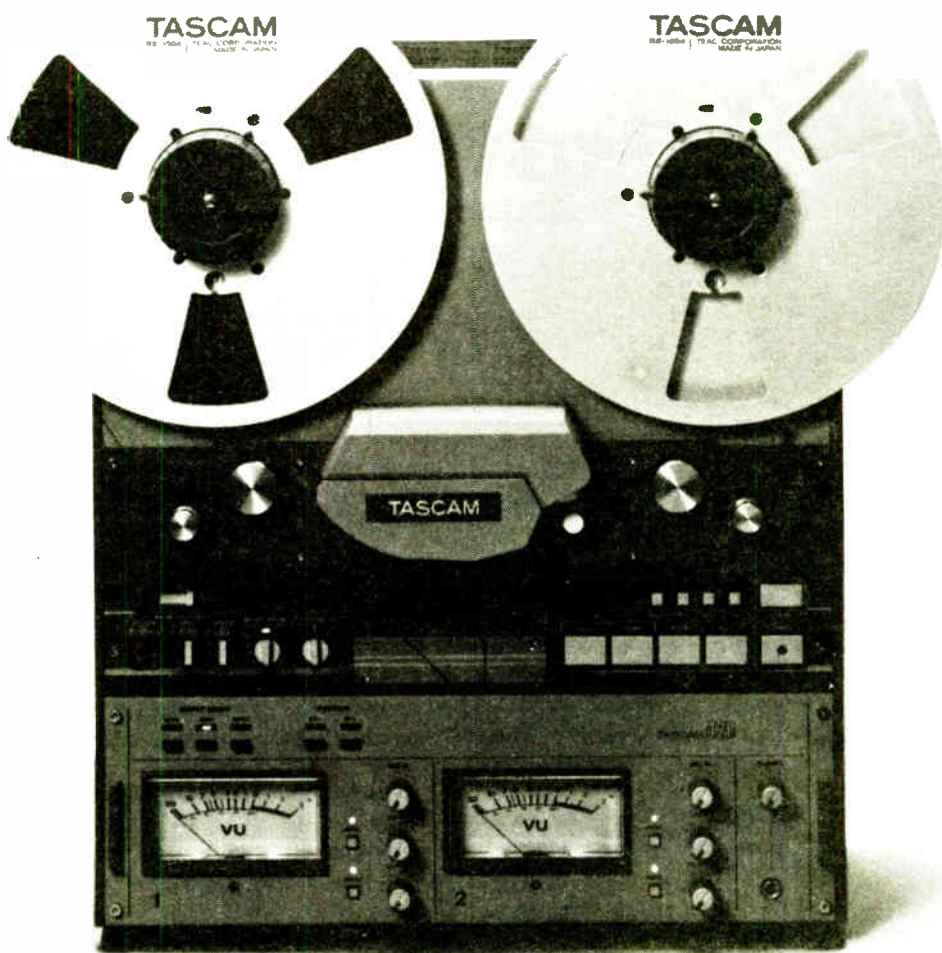
en't confused with the other company by the same name which rents out the gear in Texas. Contact the WI Access Communications at 414-453-6210.

**Gains contract ... Vector Technology, Inc.** has won a contract valued at nearly half a million dollars from A.H. Al Sagar and Brothers which calls for Vector to provide antenna transmission equipment for the new Al Magwa transmitting station in Kuwait.

**Expansions ... Los Angeles-based satellite transmission services supplier IDB Communications Group** has formed a new division, IDB Systems, that will specialize in systems integration, systems operation and maintenance and systems services for the satellite communications industry. The new division's doors opened 1 October, and are at its new Dallas headquarters at 14480 Beltwood Parkway East.

*If you have any industry/equipment news, send it to Radio World Buyers Guide, PO Box 1214, Falls Church, VA 22041.*

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For more information, call or write about the Tascam 42B today. It's a new and vastly improved way to keep meeting your deadlines.

And your budgets. **TASCAM**



# Will Booster Use Rise After FCC's Ruling?

by Richard Farrell

Falls Church VA ... The FCC's approval of Docket MM 87-13 on 16 July 1987 allowed FM stations to increase power at their booster facilities beyond previous limits.

Before there was a 10 W power limit, now stations can use boosters up to 20% of their maximum permissible ERP for the class of primary station they rebroadcast.

## Industry Roundup

This relaxation of limitations may in time create a genuine surge of interest among radio stations as to the relative benefits of using boosters to increase their coverage areas.

There already is evidence of some emerging interest.

Omega International VP and CEO Kin Jones called the ruling, "a very practical approach to a very real problem. It is spectrally efficient and is not really something that makes itself prone to any kind of abuse ... all of a sudden (radio stations) see a solution to something they thought was unsolvable."

### Potential problems

But to say that the ruling does not open itself up to abuses—accidental or otherwise—may to some seem overly optimistic. Current FCC rules mandate that a booster cannot extend a signal beyond its permissible 1 mV contour area.

Yet stations can and have gone beyond this range when they have installed new boosters. California's KKIS was recently ordered by the FCC to shut down its booster facility because it was extending that station's signal beyond its legal limits

and causing interference with two adjacent stations' signals (see RW 15 August).

It has been suggested that part of the problem—and it is a problem insiders feel must be more clearly addressed—is that the FCC doesn't have an accurate process for accounting for various terrain anomalies and does not have an adequate method for predicting interference.

The result is that while some stations may on paper be in compliance with the FCC's booster regulations, they may in practice be extended beyond their contour areas—intentionally or unintentionally.

### Interest is there

However, there remains much that is positive about the situation. "Stations have accepted a lot of their coverage problems as a matter of fact, one of those

things about life that can't be changed," says Jones.

"Now they're saying there is a solution that works, is not that expensive, and is available to everybody.

"Naturally," he cautions, "there are some stations with coverage problems that can't be solved in this way. It is a case-by-case thing." But Jones feels that "most FM stations," or "anybody that has

through increased coverage area merits incurring the cost of the installation.

### Where to put it

A booster helps a station reach the limits of its licensed area, overcoming various obstacles to its signal such as mountains, tall buildings or other geographical features that might cause a station headaches. Its advantages are

**... relaxation of limitations may in time create a genuine surge of interest among radio stations as to the relative benefits of using boosters to increase their coverage areas.**

something to gain" are looking into the use of boosters.

Although it will vary with each station, according to what sort of customization is necessary, the cost of virtually any booster installation will run easily into the tens of thousands of dollars.

So stations must decide for themselves if the advertising revenue to be gained

obvious—increased coverage means more potential advertising dollars.

An important question, then, is where to put the booster. "The best places to use a booster," says Broadcast Electronics' VP of Engineering Geoff Mendenhall, "are where, for instance, you have a mountain ridge, and on the other side of the mountain you have your booster."

(continued on page 47)

## Harris Exciter: THE-1 for WGLF

by Bill Marriott, GM  
WGLF-FM

Tallahassee FL ... In August we retired our old exciter because of frequent failures and decided to replace it with a new THE-1 exciter from Harris, just recently introduced. This unit features

## User Report

among other things a 55 W high power setting for those occasions when emergency standalone operation is required.

Most engineers will be pleasantly surprised—others amazed—by the coverage of 55 W into a broadcast antenna. It may just keep you on the air,

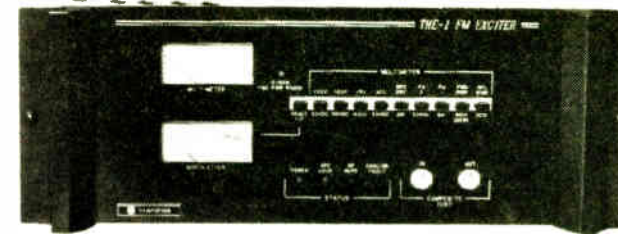
as far as your clients are concerned, while your transmitter is being repaired.

### "Real" English

A large muffin-type fan forces air into the unit allowing cool operation even inside a transmitter cabinet and as you would expect

from Harris the exciter comes with an excellent manual, well written in *real English* and accompanied by legible schematics (Japanese companies take note).

The chassis comes with a slide mount system that is very useful in cramped sit-



Harris' THE-1 exciter was the choice for WGLF.

uations. The controls and metering switches are well laid out except for the on/off toggle switch, which is too close to the AC plug to get your finger around easily.

When THE-1 arrived we ran it on the bench into a dummy load to check it out and settle it down. We plugged it into the transmitter and everything worked but the VSWR was up about 3:1 and would not tune out. It even worked perfectly into a dummy load inside the transmitter cabinet.

So here we had a transmitter that worked with two other exciters and a new exciter that worked perfectly into a dummy load!

### Customer service

One of the reasons that I bought Harris is the excellent customer support (I called them one New Year's Day at 3 AM and had a replacement part in my hand in Key West by noon—that's service). For our VSWR problem, a field engineer with a spectrum analyzer showed up the next day to make a diagnosis.

The spectrum analyzer showed broadband splatter, but only when connected with the transmitter input. This input was not quite a perfect 50 ohms, and the difference was enough to send the defective exciter power amp into oscillation. Another exciter was overnighted to us and it has worked perfectly.

I believe that real reliability is not just MTBF—mean time before failure—but also how long it will take to get it fixed. As a former engineer I know that even-

(continued on page 46)

## Portable Partnership

When you're on the scene, you're on the air—with a cellular phone and a Comrex. Our PLXmicro converts telephone quality to program quality around town or around the world.

The PLXmicro is the tiniest extender we've ever built. Just about pocket size, it stows-and-goes-almost anywhere.

Yet despite its size, it's packed with features: the Comrex frequency extender is built in, along with interface for cellular telephone or standard dial line. There are microphone and tape inputs and

automatic send level control.

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# KVLE Delves Into SCA With BTC

by Dan Brown, GM  
KVLE-FM

Gunnison CO ... To meet the SCA needs of FM broadcasters, Broadcast Technology of Colorado offers excellent equipment at affordable prices.

## User Report

BTC has designed three quality products that allow budget-conscious broadcasters to utilize SCA or let SCA users purchase second channels or back-up units at reasonable costs.

I wanted to use SCA but could not see spending thousands of dollars to put my subcarriers on. So I purchased three products from BTC: the Model 1000 dual channel SCA generator, the Model 2200 dual channel SCA tuner and the Model 3000 SCA field strength meter.

### Price right

I needed both 67 and 92 kHz, and while shopping around I found that BTC had a dual channel generator on the market for \$485. It has been ideal for my background music requirements. I run classical music on one sub and background music on the other.

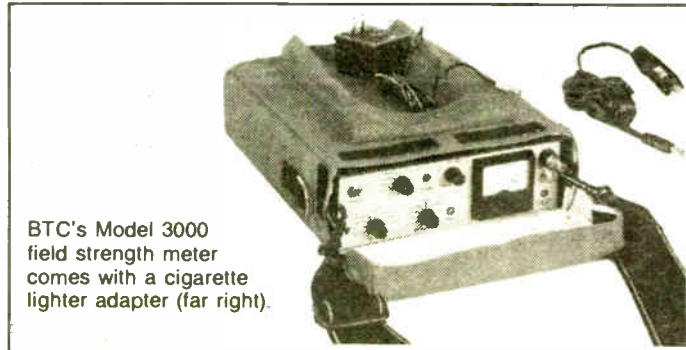
The Model 1000 fits in a standard 19" rack and is very easy to install. Even in the multipath environment here in the Rockies, it sounds great. Another nice feature is that by using its locking front

panel switches, I can individually turn the subcarriers on or off.

Two months ago, KVLE was struck by lightning and it knocked out my automation system, satellite receivers and main board. The only thing it did to the Model 1000 was blow a fuse.

I haven't had to perform any repairs or maintenance on this unit. It is a real workhorse!

When I have had any questions regarding design or usage, Bob German, the design engineer at BTC, has always been available to assist me, even after hours, which is a great help to me, es-



BTC's Model 3000 field strength meter comes with a cigarette lighter adapter (far right).

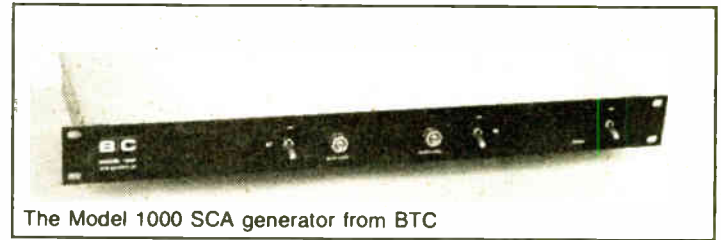
pecially when we were struck by lightning.

### Other applications

From talking with Bob, I know that the Model 1000 is also being used in other applications such as telemetry, paging, ethnic programming and commodity quotes—things that aren't done in this market of only 10,000 in population.

We are using several of the Model 2200 dual channel SCA tuners. Due to their sensitivity, the tuners have given me a larger geographical customer service area.

Other features that I like about this tuner are its simultaneous dual channel capability, individual tone controls with separate adjustments for bass and treble, and three LEDs on the front, indicating the presence of both subcarriers and the main carrier.



The Model 1000 SCA generator from BTC

And the fact that it is synthesized is a real benefit for me. When I install at a customer site served by my translators I do not need to re-crystal.

My customers, incidentally, have commented on how clear the sound is,

so I know we made the right choice with this tuner.

### Field strength meter

The Model 3000 field strength meter tells me everything I need to know about my SCA signal, and it is very light and easy to carry. I have had it bouncing around in the back of my truck for a few months now and it still works perfectly.

The most outstanding features of this unit, from my point of view, are that it can read both 67 and 92 subcarrier injection and deviation and is also synthesized so that when I use it with my translator chain I don't need to re-crystal.

I select the frequency with DIP switches in the back of the unit. A built-in speaker and headphone jack enable instant checks on crosstalk and other problems by just monitoring one chan-

nel on the meter and the other on the audio. My main deviation can also be measured and it even has a peak flasher.

The ability to power the meter by using the cigarette lighter jack in my truck is the unit's most convenient feature for me, but it also comes with a plug-in wall transformer and battery.

I can heartily recommend these SCA products from BTC and feel they have done an excellent job of meeting our broadcast needs at an affordable price.

*Editor's note: Dan Brown is president of High Country Communications, a member of the Board of Directors of the Colorado Broadcasters Association and was formerly with Motorola International in South America. Call him at 303-641-3227.*

*For more information on Broadcast Technology's line of SCA equipment, contact Bob German at BTC: 303-641-5503.*

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# Marti Offers Flexibility at KOLA

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

Los Angeles CA ... As the spectrum grows more congested and unused frequencies dwindle, stations preparing to expand their facilities often overlook an obvious and economical solution: the use of one or more subcarriers.

A subcarrier allows a station to transmit separate programming—or data—to a large area or a single point.

"Subsidiary Communications Authorization," commonly called "SCA," is probably the best-known use of a subcarrier. First issued by the FCC in 1955, SCA was created to allow FM stations to transmit background music.

## New uses

In the early 1980s, many new uses for SCAs began to emerge which have since become popular. Today, remote control data is frequently sent to the transmitter site on a subcarrier of the studio-to-transmitter microwave link (STL).

## User Report

Personnel in the field equipped with subcarrier/pager receivers can also be voice dispatched or cued by using a subcarrier.

Audio received from a remote pickup (RPU) transmitter can be sent back to the main studio via a subcarrier that originates at the transmitter site. An entirely different subcarrier could be simultaneously transmitting remote control

telemetry data.

One station is using a subcarrier to feed commercials between remote studios. Another is using an inter-city microwave relay system to link a satellite receive station with its studio. The main channel is used for music, while subcarriers relay 5 and 7.5 kHz voice channels.

Lately, systems that support three subcarriers, in addition to the main channel, are becoming prevalent.

## Signal to noise down

Modern technology has largely eliminated many of the undesirable effects



The SCD-10 Subcarrier Demodulator from Marti.

that plagued engineers years ago. Looking at just one specification, an SNR of 45 dB was once considered "state-of-the-art." Today, a companded subcarrier can achieve an SNR of 70 dB.

This vast improvement and others have transformed the once thought of low-quality, sometimes unreliable subcarrier into a high-quality alternative. And if no frequencies are available in an area, a subcarrier may be the only alternative.

To meet the increasing demand for subcarrier equipment, Marti Electronics recently introduced the SCG-10 Subcarrier Generator and the SCD-10 Subcarrier Demodulator.

Both the generator and demodulator can be supplied on standard frequencies

of 26, 39, 41, 67, or 92 kHz; special frequencies can be supplied on request. Audio bandwidths—normally dictated by usage—of 3, 5, and 7.5 kHz are available.

Typically, 3 kHz is used for remote control and telemetry data, while 5 and 7.5 kHz are reserved for voice or music service.

## Companion option

To allow the subcarrier system to be used for ultra low-noise purposes, a compander option is available. When installed in the generator and demodulator, the sub-channel can offer a SNR of

more than 70 dB and a main-to-sub crosstalk ratio of better than 60 dB, even with full 7.5 kHz bandwidth.

When companding is not required, the user can easily select pre/deemphasis values of 0, 75, 150, or 225  $\mu$ seconds, allowing operation that is tailored to the intended application.

The Marti SCG-10 generator employs direct FM modulation with a deviation that is  $\pm 7.5\%$  of the subcarrier frequency. Input impedance is 600 ohms balanced, which can be accessed by either rear panel screw-terminals or a "D" connector.

Input levels of  $-10$  to  $+8$  dBm can be accommodated, and an FSK/subaudible input is also provided on the "D" connector.

## Automatic muting

The generator incorporates an automatic subcarrier mute feature that is adjustable both in terms of level and time. The carrier can be set to mute at any level from slightly under 100% modulation to a full 40 dB down.

And the mute time can be set from about 1 to 18 seconds. When muted, the subcarrier falls to a level more than 60 dB below rated output. The subcarrier can also be controlled remotely.

The subcarrier output of the SCG-10 is designed to drive loads as low as 600 ohms over a range of 0.3 to 7 VP-P, and terminates in a BNC connector. A front-panel, illuminated meter displays either subcarrier output level or peak modulation.

The Marti SCD-10 Subcarrier Demodulator, although normally used in micro-

wave point-to-point applications, is also useful in demodulating an FM station's off-air subcarrier.

The SCD-10 requires a subcarrier input level of 0.1 to 1 VRMS; input impedance is 10 k $\Omega$ . The heart of the SCD-10 is a phase-locked FM detector that tracks the carrier, ensuring low distortion, a high degree of AM rejection and a good capture ratio.

The audio output level is adjustable over a range of  $-60$  to  $+10$  dBm into 600 ohms. Like the generator, a front-panel meter can be switched to display audio output level or subcarrier input level.

## Squelch circuitry

As a complementary feature of the generator's automatic subcarrier mute capability, the demodulator includes squelch circuitry. If the subcarrier should cease or fall below a preset threshold, the demodulator will noiselessly mute its audio output.

This feature allows the sub-channel to be used on an intermittent basis automatically, operating only when audio is present. Otherwise, the system stands by in a muted, noiseless mode until called upon.

A front-panel LED on the demodulator displays squelch on/off, and normally-open contacts are available for controlling other equipment.

**... we found Marti's published specifications to be highly conservative compared with the units tested ...**

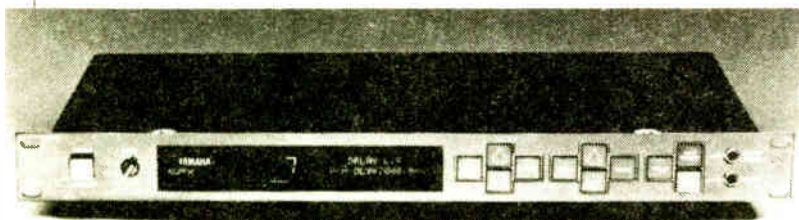
As for system operation, we found Marti's published specifications to be highly conservative compared with the units tested: we measured a frequency response of  $+0.7$ ,  $-0.6$  dB, 20 Hz to 7.80 kHz; 0.676% second harmonic, 0.071% third harmonic, and 0.68% THD+N at 1 kHz and 100% modulation; and an SNR of 74.4 dB (NAB, unweighted).

One-third octave spectral analysis of the noise floor did not reveal any noise peaks across the band.

Finally, minimum AC line voltage was found to be less than 80 VAC. We tested the system in a back-to-back configuration, using a 67 kHz subcarrier, and 225  $\mu$  seconds pre/deemphasis (no companding).

## Flexible construction

Modular in construction, both units can be modified or repaired in the field **(continued on page 47)**



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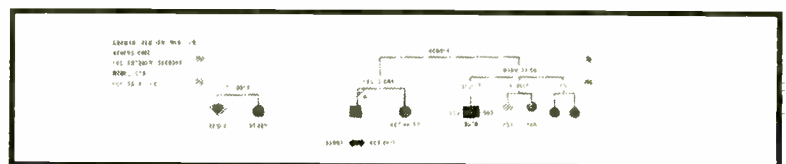


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# Music 4 a Hit With Showsound

by Cloyd C. Peterson, VP Showsound, Inc.

**Tampa FL . . .** The new SCA Data Music 4 System operates on 67 kHz or 92 kHz and allows you to transmit four channels at 2.5% injection each. The carriers are 5 kHz wide.

The two carriers below the center frequency would be Channel A, lower and upper. The two above the center frequency would be Channel B, lower and upper. You may configure the system with four 5 kHz carriers, or two 10 kHz carriers or one 10 kHz and two 5 kHz carriers.

Using pink noise and a real-time analyzer we checked the 5 kHz bandwidth and found it extremely flat from 20 Hz to 5 kHz. The four subcarriers are

## User Report

amplitude modulated, which accounts for the wide audio bandwidth within the  $\pm 6$  kHz deviation of the FM subcarrier.

### State of the art design

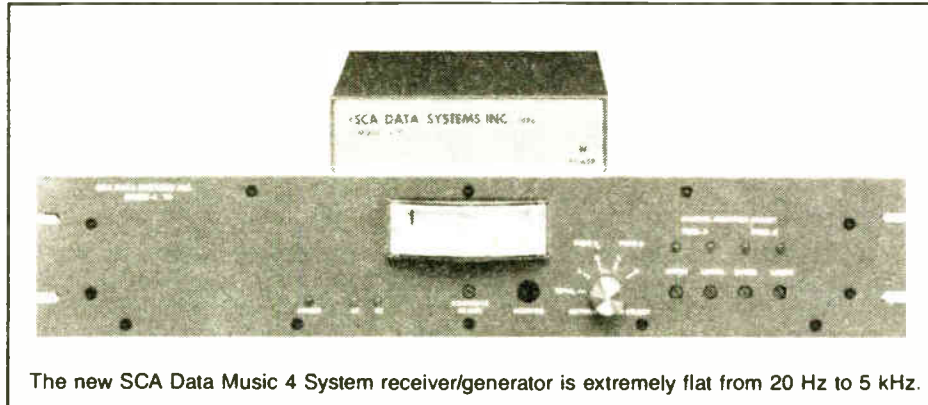
The Music 4 Generator is a well designed unit with state-of-the-art printed circuit boards. Front panel controls allow you to monitor the off-the-air signal by using a built-in receiver which can be coupled via a pad to the RF monitor tap of the main transmitter.

## SCA Data's Receiver/Generator System Allows Sound Contractor to Broadcast on Four Channels

You may monitor the four audio channels via a headphone jack, level control and selector switch. Injection and modulation are measured on the front panel

the combinations.

The receiver has a very nice noise gate that tracks the audio while causing complete silence between selections. Muting



The new SCA Data Music 4 System receiver/generator is extremely flat from 20 Hz to 5 kHz.

meter. Each channel input to the generator is adjusted by individual input controls. The composite control adjusts the four carriers into the exciter.

We installed our generator back in June. At first we had several problems with modulation but experimenting with some compressors solved the problems. You must remember—no audio, no carrier.

The Music 4 Receiver is frequency-agile via DIP switches on the inside of the unit. The nice thing about it is you get the combination for your station only. It would take quite a while to figure someone's frequency if you did not have

of the audio is quiet and complete if the RF stays below 80  $\mu$ V.

### Noise reduction

Noise reduction can be selected in the generator and the receiver and you may also select 5 kHz, 10 kHz and 15 kHz bandwidth in the receiver. Upper and lower channel configuration is accomplished using settings of the DIP switches for the subcarriers.

Selection of 2.5%, 5% or 10% injection sets the audio gain of the Music 4 Receiver. Audio output is on an RCA jack and is around 100 ohms at .775 V.

Considering the cost of subcarriers from radio stations, the Music 4 System can be a real money saver. We are currently using 10 kHz for adult contemporary music and it sounds great. One of the 5 kHz channels is for background music and is perfect.

When receiving the signal you should have a good antenna with no VSWR. With this system instead of crosstalk you have lots of AM noise. You should take great care in tuning the AM noise out of the transmitter.

### Installing the antenna

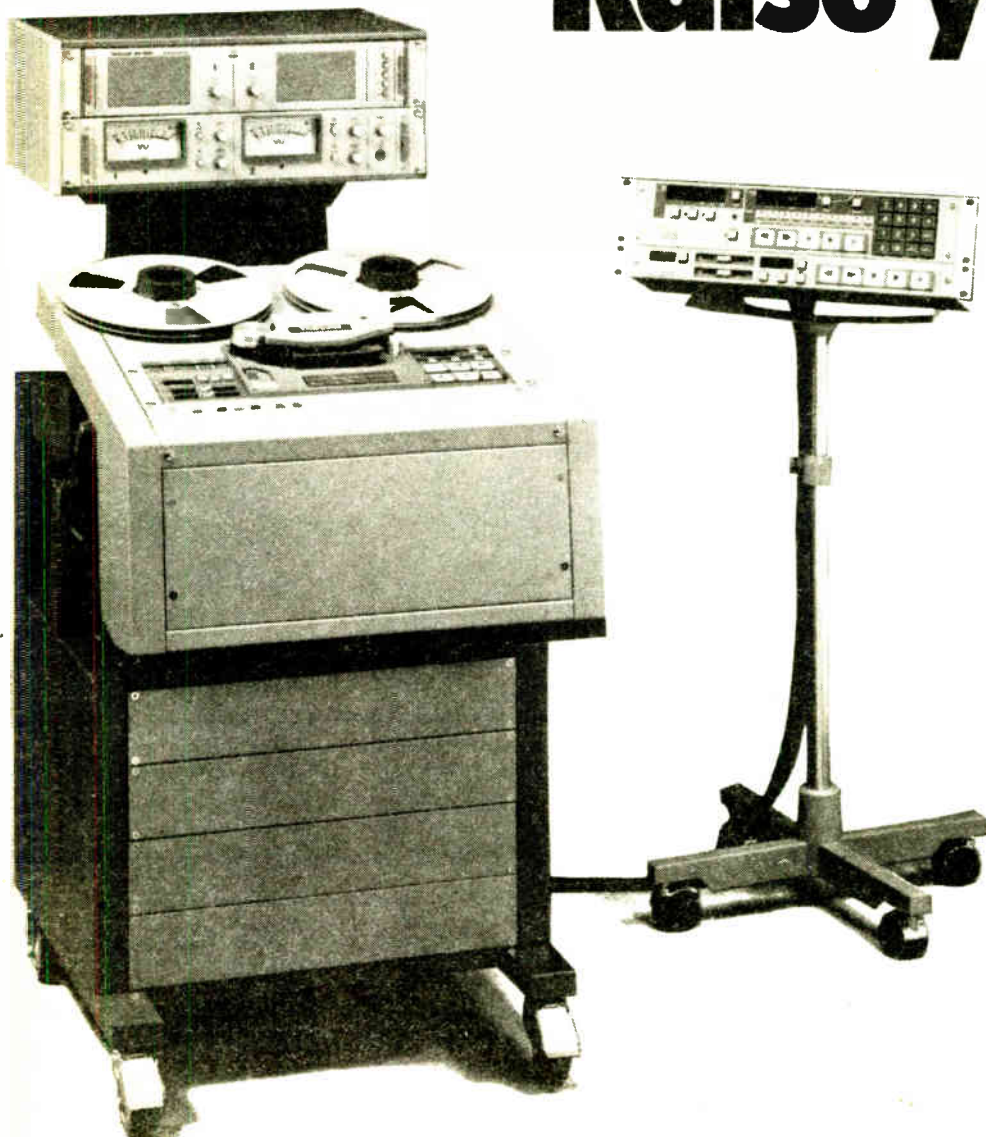
Installation of the antenna for receiving the four channel broadcasts is very critical. We are currently operating our system as far as 50 miles from the transmitter. With 100,000 ERP we have about 180 to 200  $\mu$ V at our receivers at 50 miles, using a four or six element antenna.

This seems to work quite well as long as there is no noise from power lines, etc. I suggest using the Channel Master antenna rotation unit. This will minimize noise by rotating the vertical polarization of the antenna.

*Editor's note: Cloyd C. Peterson owns his own sound contracting business, and has been in the business in one form or another since 1957. He may be reached at 813-884-1461.*

*For more information on SCA Data Systems' Music 4 system, contact Corinne Weber at SCA Data Systems: 213-452-2506.*

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Then call or write today about the Tascam ATR-60/2N. And take your broadcasting to a higher level.

# TASCAM



# Noise No Problem For Dayton

(continued from page 41)

swept aligned for 67 and 92 kHz. A notch removes interference from 57 kHz ARI (traffic) and paging systems and a second notch removes possible main channel crosstalk around 76 kHz. Ceramic resonators provide exceptional stability. Noise operated and auto-mute "thumpless" squelches are included for music service clients.

The auto-mute circuit works even when the SCA carrier doesn't drop. Thumping was eliminated by borrowing an electronic audio attenuator circuit from the venerable ITC cart machines. Attack time is much faster than release time for good noise immunity and a sense of smooth transition to and from music.

### Reading service use

The receivers for reading service use are also ideal for foreign language clients. They are supplied in strong plastic cases. A UL approved 12 VDC wall

power supply is provided and a cigarette lighter cord can be used for reception in a vehicle. For this purpose a Motorola antenna jack is included in addition to an adjustable whip antenna.

Models for music service clients come

**The Dayton Radio Plus . . . worked beautifully in every problem location.**

in metal enclosures with rubber feet to sit on a shelf and keyhole slots to hang on the wall. Looking at the slots, one notices that they line up with holes in the circuit board. The cover can be removed and the screws turned tight.

After the cover is replaced, the receiver cannot be easily removed from the wall. There are 12 V supplied to the antenna

jack for powering a mast mounted preamplifier, should an excessive cable run be needed. A DIP switch turns this voltage on and off. Current is limited by a series resistor.

For convenience in changing frequency I added a row of nine small switches to the top of my reading service model. Last January I got a chance to really test the radio when I was called in to help a foreign language client who was trying to serve San Francisco's Chinatown.

### A real test

This is truly multipath city! The local franchise operator was complaining constantly to KFOG which carried his 92 kHz subcarrier from Mt. Sutro. I found the station to be impeccably engineered with some of the flattest bandwidth and lowest AM noise I have ever measured.

The trouble was with the receivers be-

ing used. They were overloaded by the many strong signals. Internal intermod killed most SCA reception. The Dayton Radio Plus, however, worked beautifully in every problem location.

Dayton Radio's warranty is quite remarkable: a full year on parts and labor. If you experience a problem, simply return the radio to the factory and they will replace it with a new unit. After the warranty expires, they will repair or replace it with a like unit for a flat rate of \$39.50.

I don't have any complaints about the receiver. It does what it was designed to do. Of course, I'm still waiting for the model with a built-in translator so that I can quit my daily Chinese classes!

*Editor's note: Lyle Henry has built and rebuilt stations in Arizona and Wisconsin. For the past 11 years he has been CE at KIQQ. He does SCA consulting in his spare time and enjoys visiting his many friends in Asia.*

*For more information on Dayton Radio's SCA receivers, contact Kurt Farmer at Dayton: 800-543-8513.*

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## WGLF Opts For THE-1

(continued from page 42)

tually everything at a transmitter site will break and there is nothing worse than trying to rely on a 10-page manual with microscopic hand-written schematics at 3 AM Saturday with no one to call until Monday morning.

### Better sound

The flawless replacement exciter measures up to published specifications. And what is more important is that my PD has noticed that we sound better (without being told in advance of our new exciter).


Although our first exciter was defec-

tive, I believe that this was a rogue unit that needed a specific set of conditions to malfunction. The replacement has worked perfectly. Because of this and Harris' well deserved service reputation, I would not hesitate to recommend this exciter.

*Editor's note: Bill Marriott spent four years as a chief engineer in AM and FM. He took his degree in Engineering from the University of London. He may be reached at: 904-878-1104.*

*For more information on Harris' THE-1 FM exciter, contact Ron Frillman at Harris: 217-222-8200.*

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# Is FM Booster Use on the Rise?

(continued from page 42)

In this way, he says, "your equal signal contours are along the top of the mountain—somewhere where you don't care about listeners."

Technical drawbacks to using a booster do exist, however. Manufacturers seem to be in general agreement that the biggest danger to using booster technology is in a booster's tendency toward interfering with its own main signal, landing the signal in what is known as the "mush zone," where signals of equal strength beat against each other and cause multipath.

## No answer for some

"No matter what you do, when you get into a roughly equal signal strength area it's going to sound terrible," laments Mendenhall, who consequently admits to being "cautious about overselling what a booster can do."

This is because for some stations a booster will not be the answer, and in some cases will cause more problems than it solves.

Harris Radio Sales Manager Ron Frillman echoes this sentiment, noting that "RF is like black magic. You don't know what effect it's going to have on the signal you're putting out—what happens when the two signals meet and start beating together, what kind of interference will you get?"

But radio stations are in business to make money, and the question is will the

FCC's rule change set off a spark in the booster arena or is it much ado about nothing? Opinion among manufacturers seems mixed.

## Will stations shell out?

BE Design Engineer Ed Anthony is among the camp that sees wide-ranging possibilities for the booster. "I think the FCC rule not only to increase the amount of power, but to allow the use of intercity relay STL-type transmission to the booster, is opening up a huge market for potential problem areas that exist in FM due to terrain scattering and possibly to reduced multipath," Anthony says.

But Anthony is also quick to sound a cautionary note, warning that using boosters "could be a dangerous adventure. You certainly don't want to lose listeners you already have due to mutual interference between the booster and the main."

Jones says the FCC ruling "did two significant things: one was the increase in power possibilities, and the other was the possibility of feeding the retransmission system, or booster, by means other than RF amplification."

Jones feels that "the response that has occurred is proof positive that there is an awful lot of interest in the use of boosters."

## In the heartland

In fact, at Omega they ended up underestimating the reaction, particular-

ly in topographical terms. "Our expectations for this product area," noted Jones, "were such that we felt it would be a good solution in very terrain-intensive markets like San Francisco and Seattle."

"We didn't expect that it would be something that would interest stations in the flatter part of the country, but we were completely wrong," he adds.

Although some would claim that booster applications in such flatland areas will as a matter of course be fairly limited, Jones reports that "We now have literally hundreds of these projects in such places as Oklahoma, Missouri and Indiana—a lot of places where a high mountain is 300 feet."

# KOLA Goes SCA with Marti

(continued from page 44)

quickly, since all PC boards are "unpluggable." If it becomes desirable to convert, say, a 7.5 kHz system to 3 kHz bandwidth, simply replace the audio PC board in both units.

It's that easy to add companding: just install a plug-in encoder in the generator and a decoder board in the demodulator.

Both the Marti SCG-10 Subcarrier Generator and the SCD-10 Subcarrier Demodulator are rack-mountable, only 1 3/4" high, and weigh in at about 4-1/2 lbs. each.

At first blush, it would seem odd for flatland areas to be interested in boosters, but Jones says that even in these types of areas there are terrain problems not necessarily associated with huge mountains or booming skyscrapers.

For instance, Jones says, "if you take a couple of communities in the flat part of the country that may be separated by twenty miles or so, and you have a Class D station in one of them, the station may have a great signal in its hometown, but there may be just enough hills on the outside of town to make its signal weak in certain areas."

With even stations in the rolling American flatlands seemingly showing interest in booster technology, it is anyone's guess just how widespread these booster devices will become in the years ahead.

Extensive EMI filtering and fully shielded and bonded enclosures guarantee reliable operation in even harsh RF environments. The units are also designed for 12 V battery operation.

*Editor's note: Dennis J. Martin is Director of Engineering for House of Music, Costa Mesa, CA, Chief Engineer for KOLA/KMET, 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 SCG-10 and SCD-10, contact Selene Nix at Marti: 817-645-9163.*

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For those interested in more advanced techniques, the SP-6 employs a powerful talent monitor section designed to rapidly call up live mic and track combinations, making difficult punch-ins a breeze. Standard SP-6 input channel equalizers are more comprehensive than

those supplied as optional items on competing products, allowing much greater creative freedom. Input channel auxiliary send sections are designed to be the most versatile in the industry, providing 4 different auxiliary buses to allow digital delay, reverb, talent foldback, and mix-minus feeds. Stereo input channels can provide either mono or stereo effects sends. Even more, the SP-6 has 4 auxiliary effects return inputs that allow effects to be recorded onto the multitrack or sent to the monitor buses.

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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