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FCC Declines SBE Request

Rejects Coordination Role

by David Hughes

Washington DC . . . The FCC has rejected an SBE request that it adopt broadcast auxiliary frequency coordination procedures. In addition, the Commission has proposed relaxing the operational and licensing requirements for remote pick-up stations (RPUs) and broadcast auxiliary facilities.

The FCC's latest actions, which are in line with its previous attempts to turn over all broadcast auxiliary coordination efforts to user and industry-based groups on a voluntary basis, came at its 16 October meeting.

The SBE had filed a petition in September 1985 asking the Commission to require auxiliary band users to certify coordination of frequencies with local users or frequency coordination committees. It proposed that users notify the co-channel and adjacent channel licensees identified by that coordinating committee.

The society also proposed that if the frequency coordination committee could not be contacted or did not operate, the operator of the new broadcast auxiliary service should be required to certify, via an engineering study, that the channel is available on a non-interference basis to existing users.

The FCC said that the SBE's request would be "unnecessarily burdensome to licensees." The Commission added that "existing voluntary frequency coordination efforts have been highly successful in achieving effective spectrum usage."

The FCC also said that "current rules already require frequency selection and operations scheduling so as to avoid interference to other stations."

However, SBE President Richard Rudman said the FCC has seen so few problems because frequency coordination groups, such as those operated by the SBE, have taken "great time and expense to solve them."

Rudman, who said he would reserve more detailed comments until he had seen the full text of the FCC's decision, maintained that the Commission has not listened "carefully" to the SBE's original frequency coordination complaints.

NAB opposition

The NAB filed comments in November 1985 asking the FCC to set aside the SBE petition without prejudice, claiming that the Commission's existing rules "appear to accommodate SBE's concerns, so that further rulemaking may not be required."

NAB told the FCC that a number of existing FCC rules require licensees to select auxiliary frequencies in order to avoid mutual interference. It said the Commission already requires a station to perform a frequency engineering analysis before filing an application for new or modified facilities.

The broadcasters' association has also been working on a frequency coordination project of its own.

Industry-based committee

In early 1986, the NAB said it was planning to organize an industry-based national frequency coordination committee that would include the participation of many other groups, including the SBE.

NAB Engineer Mike Rau said that ongoing meetings are taking place to create the committee, which will coordinate activities among local groups and standardize data. However, he said that NAB had no developments to announce.

"We're still working on it," he added.

At the same time the Commission rejected the SBE petition, it announced

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NAB Antenna Plans Continue

by Alex Zavistovich

Washington DC . . . The NAB's plans to field test two new reduced-skywave AM antennas continue, in spite of negative critical reviews at the late-September IEEE convention here of the antennas' expected performance.

The two designs are part of an NAB-sponsored project to develop AM antennas which enhance groundwave propagation and minimize skywave interference.

Richard Biby, of Communications Engineering Services (CES) in Arlington, VA, designed a monopole antenna encircled by a ring of smaller antennas located 5° from the monopole. To prevent lessening of the groundwave, Biby included a screen ¼ wavelength from the monopole.

Ogden Prestholdt, with the Washington, DC-based engineering firm A. D. Ring & Associates, submitted an array with a single vertical and single horizontal element, which would put a null in the skywave elevation angle.

Performance characteristics of the antennas were presented in papers by R. W. Adler of the Naval Postgraduate School and Jim Breakall of Lawrence Livermore Laboratories, during the IEEE symposium.

Modeling

Both the Biby and the Prestholdt antennas were modeled using the Numerical Electromagnetic Code (NEC), a mathematical system which determines current distribution on an antenna, using specific drive voltages.

Biby's antenna design was critiqued by Adler. During the IEEE presentation, Adler said that NEC modeling of the antenna indicated a lower signal, different impedance and lower current (therefore lower signal strength) than Biby had calculated.

Breakall used NEC modeling to test the performance of Prestholdt's antenna over perfect ground. Prestholdt's antenna design, Breakall suggested, indicates large field strength at high angles, which might cause skywave interference in one's own coverage area.

The review came unexpectedly for Prestholdt, who said he was unaware of plans to discuss his antenna at the symposium.

Prestholdt said that approximately six months ago he had heard that someone at Lawrence Livermore Laboratories was examining his model. He maintained, however, that he was never contacted, and did not know that the paper was to

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Regulatory News

FCC May End Main Studio Regs

by David Hughes

Washington DC ... In the near future, stations may no longer have to apply for an "Arizona waiver" if they want to move their studio facilities outside their city of license.

In its 16 October meeting, the Commissioners proposed "modifying or eliminating" main studio and studio origination rules. The plan comes in response to a June petition from an ad hoc group of 14 radio licensees which calls itself the Arizona Justice Committee (AJC).

FCC regulations currently require a radio station's main studio to be located in its city of license. More than 50% of the station's "non-network" programming must originate from that studio or elsewhere in the community of license.

The rules were intended to ensure that a local community has access to a station's main studio. Stations can obtain an Arizona waiver to build studios outside their city of license if they agree to provide at least 51% of their public affairs programming from within the city of license. Prerecorded music programming is exempt from the requirement.

Earlier this year, the FCC found two stations in violation of the rules and fined them $10,000 each.

In its October proposal, the FCC said the "modification or elimination of these rules would result in wider discretion for all broadcast licensees in situating their main studios and in choosing programming to serve their audiences."

AJC petition

AJC Legal Counsel Greg Skall, of the Washington, DC law firm of Baker and Hostetler, said the FCC's rule proposal is "good news. We are very pleased with the plan and with the comments delivered by the Commissioners at the (16 October) meeting. They obviously understand our arguments."

The AJC had complained that the FCC's studio rules were outdated and unnecessary, and maintained that they are contrary to providing the best radio service to the public.

"In the 1950s, when the rules were developed, recording equipment was not as good as it is today," Skall said. "You had to get people into the studio. Today, a studio is where the action is. There is lots of new technology," including remote facilities and satellite links.

The term "main studio" has become useless, he added.

NAB backed the AJC petition in comments it filed with the FCC in July. It said the effects of increased competition in many markets brought on by the growth in the number of stations, coupled with major advances in technology, make the time ripe for a revision of the rules.

> *The rules were intended to ensure that a local community has access to a station's main studio.*

The association added that broadcasters do not need a "government mandate" on where to locate their studio, or on program origination, in order to best serve their community.

Skall stressed that rule changes would not affect a station's requirement to serve its community.

FCC Commissioner James Quello added that the rule change proposal "should in no way be construed as signaling an effort to erode what I believe to be a licensee's obligation to serve the needs and interests of the community to which it is licensed."

Amending or deleting rules

The FCC's proposed rule changes would affect both radio and television stations.

According to Terry Haines of the FCC's legal branch, the changes could include either amending the main studio rule to allow a station to locate its main studio within its "city grade" contour or eliminating the requirement entirely.

Skall said the AJC would like the rule to specify a 1 mV/m contour limit.

"The continued relevance of these rules was questionable in the context of current regulatory policies and broadcast station operations," the FCC said. "Remote facilities and satellite transmission capability effectively allow origination to occur from anywhere."

The Commission also said that the rule change would reduce overall construction and operation costs at stations.

Office clause

In its June petition, the AJC argued that stations should only have to maintain an office that is accessible to its community of license and should be allowed to operate a studio anywhere within its prescribed service area.

However, Skall said the FCC's plan may not even require stations to provide such an office. "That clause was our attempt to be conservative," he said. "I think the FCC realizes that requirement would be unnecessary."

Members of the AJC, which was formed as a "single purpose" group, met at the September Radio '86 show to discuss developments in changing the rules, Skall said.

At RW's press time, no comment/reply deadline had been set on the proposal, which is contained in docket number MM 86-406. The rule changes involve rule sections 73.1125 and 73.1130. For more information, contact Terry Haines at the FCC, 202-632-7792, or Greg Skall, the AJC representative, at 202-861-1500.

Featured this issue

FCC Clips

DA Measurements Decision

In early October, the FCC said it "reaffirmed" its 31 October 1985 decision that deregulated rules requiring proof of performance measurements by AM stations using directional antennas (DAs).

The Association of Federal Communications Consulting Engineers (AFCCE) and duTreil-Rackley, a consulting engineering firm based in Washington, DC, had asked the FCC to reconsider the ruling.

The Commission, saying it was "unnecessary to incorporate such an acknowledgement into the rules," denied an AFCCE request to amend the rules to sanction the use of non-directional measurements in performing partial proofs.

DuTreil-Rackley asked the FCC to reinstate the criteria defining acceptable sampling systems. While the Commission partially denied the reconsideration request "because such information can easily be obtained from a public notice dealing with this issue," it said it would add a note to the rules explaining where and how the notice can be obtained.

Docket number is MM 85-90. For more information, contact John Reiser or John Wong at 202-632-9660.

EBS Update

The FCC said it had received 922 reports from a total of 125 stations that had activated the Emergency Broadcast System (EBS) during the first nine months of 1986.

The EBS was activated for a variety of reasons, including floods, snowstorms, tornadoes, thunderstorms, hurricanes, telephone outages, toxic leaks, earthquakes, forest fires, a tsunami (large ocean wave) and "a St. Augustine volcanic eruption," (*sic*) the Commission said.

Stations that used the EBS most frequently during the period include KORQ, Abilene TX (165); WOWO, Ft. Wayne IN (76); KRLD, Dallas TX (76); KRED/KPDJ, Eureka CA (38) and WKBN Youngstown, OH (38).

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

GROL Bulletin

The Commission has prepared bulletins which contain information about changes in General Radiotelephone Operator License (GROL) examinations. Because of changes in technology, the FCC said it will now include some marine radio subjects and omit some outdated questions.

The bulletins on the changes are labeled FO-32 and FO-33. The FCC's commercial examination policy is contained in bulletin FO-4. For more information, or to obtain copies, contact any FCC office.

Response to CAB Choice Mixed

by David Hughes

Washington DC ... The recent Canadian Association of Broadcasters' (CAB) recommendation to the Canadian government to select C-QUAM as that nation's AM stereo standard is expected to have little or no affect on the FCC's "marketplace" approach in the US.

FCC Mass Media Bureau Chief James McKinney told those gathered at the SBE National Convention, held mid-October in St. Louis, that, if the FCC formally opens the AM stereo issue to select a standard, the rule-making procedure could take upward of a year to complete, and perhaps longer if complications develop.

That delay, he and other FCC officials have maintained, could encourage a continued, perhaps detrimental, wait-and-see attitude on AM stereo among radio station owners and receiver manufacturers.

In late September, the Commission received a formal request from Texar Inc., a Pittsburgh-area based audio processor manufacturer, to abandon its four-year-old "marketplace" decision and formally pick an AM stereo standard. Texar president Glen Clark said he fears that receiver manufacturers may stop producing AM stereo receivers if a standard is not selected soon.

The petition did not say which system the FCC should pick—Motorola's C-QUAM system, which is in use at more than 300 stations, or the Kahn/Hazeltine ISB system, in use at about 80 stations. So far only about 10% of US AM stations have gone stereo.

William Hassinger, McKinney's engineering assistant, said that an AM stereo standard rule-making procedure could be "very disruptive." He said that receiver manufacturers and broadcasters may decide to sit back and "see how it develops."

The mere suggestion that the FCC might open up the issue could further delay an AM stereo standard, Hassinger added. "AM stereo would lose momentum."

> *The mere suggestion that the FCC might open up the issue could further delay an AM stereo standard, Hassinger added.*

If the FCC were to start a rule-making procedure, a process that could take at least a year, the loser would most likely fight the decision, he said.

Hassinger maintained that the FCC will eventually respond to the Texar petition, but it is under no obligation to open a comment period on the item.

McKinney characterized the US situation as a "rocky bed."

Others in the broadcasting and receiver manufacturing communities echo the FCC sentiments. NAB Science and Technology VP Thomas Keller has said that a formal FCC reopening of the issue could prompt receiver manufacturers to hold back production of AM stereo receivers in anticipation of the official action.

While representatives of the Electronic Industries Association (EIA), which represents receiver manufacturers, said their organization was still studying the Texar petition, they also indicated concern that a formal rule making could harm AM stereo.

"We do have a concern that the FCC process could be a very long one," said EIA VP/Government and Legal Affairs Gary Shapiro. He said that those parties unhappy with the decision could appeal the decision in the courts. "You're talking years, and that would not be in the interest of AM stereo."

However, Shapiro and EIA VP/Engineering Eb Tingley stressed that the EIA is still studying the Texar petition and has not made a decision on it.

"The bottom line," Shapiro added, "is that everyone wants AM stereo, but there are still a lot of questions as to how it happens. We're still looking at every alternative."

Kahn's position

In a newsletter dated 6 October sent to supporters of the Kahn/Hazeltine ISB system, Kahn Communications Inc. President Leonard Kahn said that a request to have the FCC select an AM stereo standard "has as much logic as the FCC awarding Harris a monopoly to sell transmitters."

Kahn has repeatedly refused comment to RW.

In apparent support of the FCC's marketplace approach, Kahn said in the document that, even with Commission support, it took 10 years to firmly establish color television and FM stereo standards. "It has taken only four years to drive three systems out of a five-way AM stereo race."

He maintained that, even if the FCC selected a standard, which would take "a year or so," the decision could face a

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Costs Up Due to Exchange Rate

by Alex Zavistovich

Washington DC ... As the exchange rate of the dollar has dropped in relation to the yen and the mark, the cost of professional equipment from Japan and Europe has increased, with some equipment manufacturers showing several price increases to date this year.

In June, the exchange rate for yen was 201 to the dollar, according to Dave Burns, national sales manager of Allied Broadcast Equipment. By August, he said, the rate was 154 yen to the dollar.

The cost to consumers of equipment has risen greatly, Burns said, but particularly over those three months. He added that price hikes usually take the form of so-called "emergency increases."

These hikes can occur rapidly, he said. In one case, Burns recalled a manufacturer-announced emergency increase which was followed by a second "before the first one hit the street."

In the past year, Burns maintained, two 5% increases were announced for one product alone.

The constant escalation of prices has not deterred consumers, he commented. However, with most pro audio equipment manufactured abroad, Burns stressed there is nothing else to be done but pay the higher costs.

Dramatic increase

Neil Glassman, sales representative for Bradley Broadcast, another broadcast equipment distributor, has seen a "dramatic increase" in the prices of European and Japanese equipment.

There has not been an overseas manufacturer who has not raised equipment prices this year, Glassman said, and each increase has been in the range of 5%-20%. Japanese manufacturers alone have announced two or three increases since this past January, he said.

Otari, Tascam and Studer Revox have each raised the price of their tape machines twice in 12 months, Glassman noted.

The manufacturers' US offices "are doing their best to keep prices down," he said, but the dollar's losing battle against the yen continues to force increases.

In some cases, distributors get 30 or fewer days' notice of the price hikes, Glassman maintained. Some companies, he added, have been known to announce increases after the fact.

Holding the line

On 1 August, Studer Revox America, an arm of Switzerland-based Studer International, raised the prices on a number of products, according to Bruce Borgerson, the company's public relations manager.

The increases "varied by product," Borgerson said. He cited as an example the PR-99 compact open-reel recorder, which increased in cost from $2,295 to $2,595.

Borgerson said Studer Revox was able to hold the line on equipment prices for more than two years, from 1982 to 1985, when the exchange rate was high.

But when the rate turned, Borgerson noted, "it turned with a vengeance."

Still, Borgerson said, his company expects to maintain product prices at their current level "for a while." He added it is too early to say whether the recent hikes have hurt sales.

Price increases have hurt the sales of Otari products, however, said John Carey, marketing manager for the Japanese-based manufacturer.

Although the dollar figures of the company's sales may be comparable to last year's, they represent a cash average of fewer products sold at higher prices, Carey claimed.

Carey said that Otari began "bracing itself" for possible increases as early as September 1985. The company management was willing to "accept a lower profit margin" to forestall the hikes, he stressed.

On 1 April, however, Otari announced its first increase since before 1981—approximately 6%-8% across the board, he said.

Some new prices were greatly raised (their ½" 4-channel MX550 machine is up to $4,795 from $3,895), while others either experienced only slight increase or were left unchanged, Carey maintained.

Otari raised its product cost a second time in September of this year, he added.

Domestic prices

Not all companies have raised their prices. Gary Fisher, sales manager of the US-based pro audio manufacturer Telex Communications, said his company has lowered consumer costs in some cases.

Telex, which makes mics, tape transports and related products, adjusts its prices in relation to actual manufacturing costs, Fisher said. As a domestic company, it is unaffected by currency exchange rates, he said.

The cost of some Telex wireless products actually has been lowered, Fisher noted.

In general, he added, some prices may go down as new manufacturing processes are developed or as component costs are reduced.

The company has also increased some equipment prices, Fisher acknowledged, but he commented that the rate of increase from Japanese and German manufacturers has been much higher overall.

For additional information, contact Bruce Borgerson at Studer Revox: 615-254-5651, Dave Burns at Allied Broadcast: 317-962-8596, or Neil Glassman at Bradley Broadcast: 301-948-0650.

Contact Gary Fisher at Telex: 612-884-4051, or John Carey at Otari: 415-592-8311.

'Spectral Recording' Broadcast Possibility

San Francisco CA ... Originally developed as a processing system for studio master recording, Dolby Laboratories' new spectral recording—"Dolby SR"—system may also have applications for the broadcast industry, according to Bob Cavanaugh, the company's technical marketing consultant.

Cavanaugh suggested the Dolby SR system might be used in commercial production, but stressed that it is actually a high-quality, low-cost alternative to digital recording.

In the marketing battle between analog and digital technology, "the steamroller of digital hype helps to sell records," but raises recording budgets, he maintained.

At a cost of $750 per unit, Cavanaugh is hopeful Dolby SR, essentially an analog compander, will "establish a new world standard" in the recording industry.

According to the firm, the SR stage layout resembles Dolby's C-type noise reduction system, but uses multi-level (high, mid, and low) stages to provide "good spectral discrimination, accuracy and reproducibility, low distortion and low overshoot."

Dolby SR is intended for use with professional analog tape recorders, and uses a "new coding algorithm sensitive to variations in signal spectrum as well as to level changes," a Dolby spokesperson said.

The technique reportedly gives professional analog tape recorders a dynamic range equal to or greater that that of a 16-bit digital system.

The Dolby SR unit is designed to plug in as a replacement for Dolby A, Cavanaugh indicated, as long as the facility is already equipped with and wired for a Dolby chassis.

More than 200 units of the Dolby SR system have been shipped, and many more have been ordered, he said.

For additional information, contact Bob Cavanaugh at Dolby: 415-558-0293.

Opinion

Readers' Forum

Got something to say about *Radio World*? Any comments on articles? Call us at 800-336-3045 or send a letter to Readers' Forum (*Radio World*, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776).

NAB $how '87

Dear **RW:**

Your article in the 1 September issue, "NAB to Open Show Day Earlier," was interesting. I well remember the exhibitor's meeting prior to the last NAB Convention held in Washington, DC. I do not know what year that was, but surely it was several years ago.

At that meeting Duffy Wilkinson (now deceased), Wilkinson Electronics, got up and pleaded for the exhibits to open a day earlier so that the chief engineers from the smaller nearby stations would have a better opportunity to attend. Duffy received a standing ovation from the exhibitors present. My, but it took a long time for NAB to hear him!

The 1987 Convention exhibits will not close at 2 PM as they have for the past several years. This early closing was a plea from the exhibitors. Nine to six on the exhibit floor, followed by another six hours in the evening spent packing, makes it a damn tough day, especially when they are always so nice as to promptly turn the air conditioning off in the hall as soon as the last attendee has left.

It appears that NAB also suffers from that common malady of presuming that the exhibitors have unlimited financial resources. I see that the per-square-foot fee is up a dollar this year. Your article did not point out that it also went up last year. LPB's modest 20×20 booth at the 1987 convention will therefore cost $6,800 for the foor space alone!

I figure that we don't get out of an NAB Convention for less than about $20,000. That's the profit on a lot of audio consoles!

Richard H. Crompton, Pres.
LPB, Inc.
Frazer, PA

Right on the money

Dear **RW:**

Bruce Browning was right on the money ("UREI Withstands Student Abuse," **RW** 15 August).

KLA, the student-run radio station on the UCLA campus, has had a UREI 1683 console for over two years now, and except for some minor problems (one Penny & Giles fader going bad, indicator lamps burning out rapidly, and an old CE destroying one of the start/stop circuit boards . . . I think he used a blowtorch to solder!), we have never had a console failure.

The station sounds great, the console is very adaptable, and most students have absolutely no problem learning to use it. My only complaint has to do with a problem that Browning almost glossed over—it is a pain to wire the remote start/stops with the circuit board mounted the way it is. Other than that, I feel that the console is one of the best—regardless of price!

Richard Wagoner, Eng Consultant
KLA-AM/FM
Los Angeles, CA

Alive and well

Dear **RW:**

Your 15 June issue of **RW** reported that the Northern Virginia Community College no longer has a program in broadcast engineering. This is unfortunate since qualified engineers continue to be in short supply for the growing demand in radio, television, industry, cable TV and production houses.

Ashland College has three major programs in broadcasting: Production Performance, Sales Management and Broadcast Technology.

The four-year degree program in Broadcast Technology began in 1980. Our graduates have easily found positions in a variety of locations across the US. The number of candidates for the degree in Broadcast Technology has understandably not been large since the curriculum appeals to a rather special group of students.

The program includes 50 credit hours of radio/TV engineering courses, an internship and production courses in both radio and TV. This curriculum creates a comprehensive major. The addition of liberal arts courses required for graduation completes the four-year program. Our graduates are prepared to assume positions as station engineers, studio personnel, directors, etc.

We are currently installing a new engineering laboratory at Ashland College and we expect to expand this major program in our efforts to supply personnel to both broadcast and nonbroadcast industries. Broadcast Technology is alive and well at Ashland College.

Richard D. Leidy, Dir. Radio/TV Operations
Ashland College
Ashland, OH

The most sense

Dear **RW:**

I'd just like to add my two cents to a very sensible *Reader's Forum* letter from your 15 August **RW** penned by LeRoy Schneck, WNAE/WRRN in Warren, PA.

Let's all unite behind LeRoy and push for a spring NAB-TV convention and a separate fall NAB-Radio convention. It just makes the most sense. From an exhibit point of view, you just can't possibly get around to see everybody, if indeed you are lucky enough to find the exhibitor you're looking for.

Forty thousand people in the city is just too much! Let the TV people devote their entire time to TV topics and exhibits in the spring. We'll do our successful radio show in the fall.

If all the broadcasters, and especially the exhibitors, got behind LeRoy's solution, I'll bet the NAB would abide by the majority rule. How about a reader poll in **RW**? How about the NAB circulating a questionnaire to exhibitors and radio & TV members?

Budd Clain, GM
"The Music Director"
Programming Service
Indian Orchard, MA

Laudable proposal

Dear **RW:**

I read with great interest your editorial in the 1 August **RW** where you mention that Texar, Inc. has appealed to the FCC to reconsider its AM stereo "marketplace" decision and to finally select an AM stereo standard from the two remaining contenders.

It is indeed a laudable proposal, and I just wonder why someone hasn't done it sooner.

WPTR, Albany has been pumping out 50 kW of Motorola AM stereo since March 1985. We made the decision to go AM stereo early as part of our major rebuilding of a seriously dilapidated facility and our commitment to technical quality. Our main reason for choosing Motorola was because of the rapidly growing number of C-QUAM-only receivers and the realization that we would only frustrate people if we went with a system that they could not receive.

Although my sympathies lie with

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Burdens, Benefits

The SBE's petition to the FCC—asking it to encourage informal frequency coordination by requiring applicants seeking their initial license for authorization for a Subpart D, E, F or H auxiliary station—was a reasonable request.

The SBE plan would have aided the SBE's 80 or so frequency coordinating groups and other groups in handling interference, since applicants for auxiliary stations would be officially on record as having agreed: 1) to contact the Database Administrator of the coordinating committee in that area and 2) that, if the applicant chooses not to participate in local coordinating efforts, to determine through its own studies that the channel is available on a noninterfering basis with the existing users.

The goal was to make this agreement part of the license-seeking process. In that way, groups spending time and resources on local frequency coordination efforts would have the means to handle interference from offending groups.

However, given the climate in Washington, asking the FCC to increase regulation is essentially a lost cause, as the SBE found out.

Since the FCC cannot directly endorse or authorize private industry or professional groups to handle something which it no longer considers to be a regulatory issue, it therefore cannot force broadcasters to use such groups.

The NAB stepped into the arena by, first, rejecting the SBE proposal and then by announcing the formation of its Frequency Coordinating Advisory Committee. Almost a year later, the NAB has yet to announce any results of its ongoing discussions on how to handle or implement its frequency coordination plan.

The NAB feels it has the resources to serve as the central authority for the various coordinating groups around the country, and it seems logical for them to do so. However, NAB should act as quickly as possible to protect broadcasters from interference from nonbroadcast sources, and to give support to those groups—the SBE committees, in particular—who are in the front lines of a complicated situation and who have very little alternative.

—**RW**

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More Readers' Views

(continued from page 5)

Leonard Kahn, and I personally favor his system, I thinks it's best that he throw in the towel for the greater good of AM radio.

AM stereo is indeed running out of time, and we must break the present stalemate by declaring a standard and converting over to it as fast as possible. If we don't, I think AM stereo will be history in 12 months' time as more receiver manufacturers give up on it.

It was crushing news to hear that Sony pulled its SRF-A100 from the market. There was AM stereo for less than $100, and a multimode unit at that!

The Pioneer KEA-433AM was perhaps the best mid-priced AM stereo car radio available.

It was a major disappointment to see these units discontinued due to poor demand and lack of consumer awareness. For this I equally blame the manufacturers who have done virtually no AM stereo promotion to spur sales, as well as the majority of AM broadcasters who have remained mono and failed to create consumer demand.

It seems that many AM stations would rather slide down the tubes clinging to obsolete equipment, deteriorated narrowband antenna systems and stale programming, rather than taking the bold initiative to modernize their plants, invest in AM stereo and give people a reason to listen to AM radio again.

I find it pure hypocrisy that many broadcasters stress their commitment to the revitalization of AM, yet refuse to get off their collective butts and into stereo, citing lack of receivers, no listener demand, and their desire to wait until the Motorola/Kahn controversy is settled . . . by someone else. The day of reckoning for AM is coming soon; we have to do something quickly before there is nothing left to save.

The current crisis in AM radio seems to be an unwillingness to take risks and a desire for short-term capital gain rather than a long-term investment. It's as if AM has already been written off by many owners and they are simply trying to get whatever is left out of AM radio while the getting is still good.

I don't think that AM stereo in itself will revitalize AM radio unless we conquer the first two problems, but it's a good start.

James D. Seaman, CE
WPTR-AM Stereo
Albany, NY

Strongly disagree

Dear RW:

I read with interest the letter from Zaven "Doc" Masoomian regarding AM stereo (RW, 15 August). While I would not dream of questioning Mr. Masoomian's obvious superlative credentials in the field of radio broadcasting, I must strongly disagree with several statements which I feel are misleading.

I listened to a tape distributed by Leonard Kahn which illustrated the disastrous effects of "platform motion" in the Motorola system. I listened to the tape and indeed could hear some motion in the stereo image.

I decided to play the tape to some friends to see what their reaction would be.

I told them to tell me what they thought of the recording, asking for opinions as to what they liked or disliked about the recording. They basically said the same thing, that the signal was weak, and that they wouldn't listen to it. When told what to listen for (platform motion), several said they couldn't hear the merry-go-round rotation which I described. One said he heard it and "thought it sounded 'neat' " (sigh) and one said "Yeah, I hear it, but I wouldn't listen to a station that was that scratchy." I had to agree, the signal was of poor quality anyhow.

With regard to Motorola's "high pressure hype" and use of loaners, I have found them no more or less guilty than Kahn. Although Mr. Kahn does not have a loaner program, he has been known to *lease* equipment to stations at no charge to get a station on for an NAB show. In my opinion, Kahn is equally guilty with regard to "hype"; it's called *marketing*.

With regard to mono coverage loss of the Motorola system, I would have to agree that there is a small loss of coverage area when using the Motorola system. Oftentimes, a station finds its coverage increases because transmitter, antenna and audio processing limitations are corrected. This coverage loss is quite similar to the losses experienced by FM stations converting from monophonic to stereo. Just look how adversely FM has been affected!

Mr. Masoomian's limited sampling of four stations in Syracuse is, frankly, ridiculous. Isn't it possible that the programming on the stations which dropped in the ratings was inferior to those which rose and not because of technical deficiencies? It has been my experience that stations with excellent programming frequently beat other stations which are far superior in facilities.

If one were to apply Mr. Masoomian's methods here in Las Vegas, one would conclude Mr. Kahn's system to be the loser, as the Kahn station has virtually no numbers, while the Motorola station doubled its share. The fact is, nearly all AM music stations are doing poorly at the present time.

It is my sincere hope that this matter can be resolved soon.

If something isn't done soon, I fear AM will be used only as a means of controlling load management systems and power grids. Let's work toward achieving a single system based on fact and not emotion.

Joseph Sands
Sands Broadcast Engineering
Las Vegas, NV

Reaction to CAB Choice Mixed

(continued from page 3)
court challenge, of which the result would involve "starting everything over" and taking even more time.

Kahn's competitor, Motorola, has gone on record in support of the Texar petition. However, it maintained that, even if the FCC fails to act on the request, their C-QUAM system is already the nation's de facto AM stereo standard.

Canadian developments

Despite the continuing debate in the US, Canadian broadcasters are looking to their Department of Communications (DOC) to formally endorse Motorola's C-QUAM system as a national standard by April 1987 (see the 1 November issue of RW). This comes after a CAB endorsement of the C-QUAM stereo system in a 3 October formal recommendation.

The DOC, which develops and defines Canada's technical broadcasting regulations, has asked for comment on an AM stereo standard. The comment period lasts until the end of 1986.

"The CAB believes that urgent action must be taken in a whole range of areas in order to improve the quality of AM radio broadcasting," said CAB President David Bond in a letter to the DOC.

"We see the early implementation of a standard AM stereo system in this country as being essential to this effort, and we urge the department to proceed as quickly as possible in this regard," he added.

A Motorola spokesman commented, "We have always been impressed by the objectivity of Canadian broadcast engineering and, of course, we are pleased with the recommendation of the CAB. We look forward to the Department of Communication's decision."

The CAB officials said that the marketplace has spoken, and stressed that its recommendation was not based on technical grounds. "We believe that Canadian broadcasters have already made the choice for us," CAB VP/Radio Pierre Nadeau said.

Added CAB Chairperson Michel Arpin, "The AM committee definitely wants to stress that our decision to choose the Motorola system was purely based on marketplace forces."

As of the CAB's last count in April, 51 (or 11.7%) of Canada's 435 AM stations had gone stereo. Nadeau said that 42 were transmitting with the C-QUAM system and 8 with the Kahn system.

Nadeau indicated that Canada's largest single AM broadcaster, the government-supported CBC network, has not taken a lead in converting its AM stations to stereo. He said the CBC has been working to improve its network of FM stations.

The CAB has also issued a recommendation to the DOC that would require many AM receivers sold in Canada by 1990 to offer stereo reception.

In addition, Nadeau said the CAB asked the DOC to create rules, which would also take effect in 1990, that would set "minimum technical standards" to encourage the importation of higher quality AM receivers into Canada. The specifications are still "to be determined," according to the text of the resolution.

According to Jim McLaughlin of the CAB's Radio Board, "Better AM receivers and stereo will improve the technical quality of AM radio and therefore provide the public with increased listener enjoyment."

The DOC is expected to rule on the CAB petition in early 1987. However, Nadeau said an earlier ruling would not be totally unexpected.

Contact Motorola at 312-576-5304, Kahn at 516-222-2221, the EIA at 202-457-4975, or the FCC's Mass Media Bureau office at 202-632-6460. For more information on the CAB's decision, call 613-233-4035.

NAB Overmod Report Released

Washington DC ... The NAB has released its report on AM overmodulation, which indicates that too much high-frequency audio signal content can cause interference.

Entitled "Modulation, Overmodulation, and Occupied Bandwidth: Recommendations for the AM Broadcast Industry," the report concludes that the primary cause of splatter interference "is not so much the disappearance of the carrier during overmodulation, but the presence of excessive high-frequency content in the audio signal that modulates the transmitter."

The study, which was prepared by Harrison Klein, of Hammett and Edison Consulting Engineers, San Francisco, also says that meeting FCC bandwidth limits is "no guarantee" of transmitting a clean signal.

In preparation of the report, a computer program was used to assess the extent to which out-of-band emissions result from overmodulation, improperly processed audio and RF networks in transmitters and antennas, the NAB said.

Optimal locations for measuring overmodulation and the best ways to measure occupied bandwidth are covered in the 50-page report.

The document also indicates that splatter interference can be minimized by low pass filters on audio prior to modulation, final protective clippers in processors or at transmitter inputs, and the elimination of DC level shift in AM transmitters.

The report is available free of charge to NAB members from the NAB Office of Science and Technology, 202-429-5346.

Harris/Technics Link

Quincy IL ... Harris Corporation, Broadcast Division, has been named an authorized Technics pro dealer, and will be distributing selected professional products which are being introduced by Technics to complement its traditional product line serving the broadcast equipment market.

The Broadcast Division, a part of Harris Corporation's Communications Sector, is a leading supplier of radio and television broadcast equipment, including transmitters, antennas, microwave links, audio products, video production systems and station automation equipment.

Harris Corporation is a $2.2 billion producer of information processing, communication and microelectronic products for the information technology market.

For more information, call Harris at 217-222-8200.

FCC Eyes Electrical Interference

by Alex Zavistovich

Washington DC . . . Although the number of complaints to the FCC has remained constant over the past few years, the Commission is taking part in a committee studying the problem of electrical interference to radio broadcast.

Standards Committee C63 (the Ad Hoc Committee on Radio Interference Limits for Appliances), was assembled in the spring of 1986 to investigate the susceptibility of broadcast signals to interference from home appliances, said Liliane Volcy, electrical engineer for the FCC.

The committee is a joint group comprised of the FCC, the Institute of Electrical and Electronic Engineers (IEEE), the NAB, the Electrical Industries Association and various industry representatives, Volcy said. The committee is meeting to determine, among other things, whether to impose radiation limits on home appliances.

For the past four or five years, complaints of electrical interference have remained constant, representing approximately 8% of the branch's total, or roughly 5,000 complaints each year, according to Sue Earlewine, chief of the FCC's Public Contact Branch, which handles the problems.

She added that few of the problems are reported by broadcasters. The majority of the complaints come from individuals, with 90% traceable to devices in the home, such as light switches, furnaces or VCRs, Earlewine said.

Earlewine pointed out that some possible solutions to interference problems in the home are available through the Commission.

The FCC's "Interference Handbook," a compilation of the most common problems and their possible solutions, is divided into three categories of interference: transmitter (CB and amateur), electrical and FM transmitter, Earlewine said.

The booklet also includes a section on equipment manufacturers and the services they provide to their consumers, she added. Copies of the guide are available at any FCC office at no charge, Earlewine said.

In some cases, however, the problem does not come from inside the home, but from stray signals generated by power lines or other sources.

Electrical interference problems of that type ought to involve the field office of the FCC, with whom the power company maintains a "good working relationship," according to Jim McKinney, chief of the Commission's Mass Media Bureau.

Speaking at a "Town Meeting" open forum during the recent Radio '86 convention, McKinney indicated that power companies have persons on staff whose main responsibility is the settlement of RF interference problems.

If the interference problem is determined to come from a power line or other outside source, the FCC field office contacts the power company, according to Jeffrey Young, an engineer in the FCC's Field Operations Bureau.

Young said the company sends "interference trackers" to the complaint area to check for leaks or corona arcs, or other possible causes of the interference.

The power companies generally are willing to make this effort, he said, because the leaks represent power loss for which no one is being charged.

Virginia Power regularly sends technicians into the field in response to interference complaints, according to Tesfaye Konde, an operating supervisor for the company. Konde said the technicians examine underground utility locations in the complaint area for loose wiring, faulty insulators and other possible interference sources.

Konde added that his company usually tries to respond to the complaint before the FCC becomes involved.

Further action

If the problem persists, Young said, the FCC recontacts the company. Under part 15.25 of the FCC Rules and Regulations, "interference due to incidental radiation is the responsibility of the originator to correct," he said.

The FCC may make an "on-scene investigation" of the area to measure the interfering signal, Young continued, but FCC involvement very rarely has to go beyond emphasizing the company's duty to take action on the complaint.

Corrective measures are often a "judgment call," Young stated. When only minor modifications are necessary to solve the problem, these are done right away, he maintained.

But, Young continued, some complaints (such as those from amateur operators whose equipment may be more sensitive to interference) may be quite costly to correct.

In those cases, Young said, the FCC makes a determination of the gravity of the problem and what action, if any, to take.

For more information, contact Jeffrey Young at the FCC Field Operations Bureau: 202-632-6345. Contact Sue Earlewine at the FCC Public Contact Office 202-634-1940.

JRF, Globe to Sell, Service Audio Heads

Landing NJ . . . JRF/Magnetic Sciences and Globe Precision Products PTE, Ltd., have established a joint venture to sell and service audio tape heads in Singapore.

The new venture, Globe Magnetic Sciences PTE, Ltd., reportedly will be the first head-polishing facility in Asia outside of Japan.

JRF Treasurer Cookie French said the facility, which has been in operation since last February, services a number of countries, including China, India and Pakistan. Before the establishment of Globe Magnetic Sciences, tape heads had to be sent to Japan, Europe or the US for technical servicing, French said.

The new venture is the product of JRF's association with Arthur Ngiam, managing director of Globe Precision Products, a distributor of recording products in Southeast Asia.

French said the potential for growth in Singapore is great, and she anticipates the new company will be "as big, if not bigger than," JRF's domestic operation.

She stressed that, in addition to tape duplicators, the facility has been working with unspecified radio stations in the Orient.

For further information, contact Cookie French at JRF: 201-398-7426.

FCC Turns Down SBE

(continued from page 1)

that it would relax its operational and licensing requirements for a variety of broadcast auxiliary services, including RPUs.

The plan calls for "more flexible licensing procedures" that, according to the FCC, would reduce paperwork in the broadcast auxiliary licensing process.

The Commission is also considering "blanket frequency authorizations for mobile or portable operation on any frequency in bands they (these particular services) are permitted to use." Currently, the FCC licenses such stations to operate on specific frequencies.

More specific details on the plan were not available at RW's press time; the full text on the plan had not been released.

The docket number of the auxiliary license proposal is MM 86-405. The FCC had assigned the SBE petition a rule-making rumber of RM-5179.

For more information on either issue, contact Hank VanDeursen at the FCC: 202-632-9660.

The SBE contact is Richard Rudman at KFWB, Los Angeles: 213-462-5392.

Studio Dominator Scrutinized

by Tyree S. Ford

Baltimore MD ... Thanks for all the calls on our mike poll from last month's article. Unfortunately, the advance time needed to get this article in by deadline precludes a full count.

We should have a full count in next month's column.

This month's topic is a device I've had in the rack for about a month. It's the Studio Dominator from Aphex. This "new-age" stereo limiter has several distinct advantages over what most of us have come to know as an audio limiter, but before I get into the box itself, the operating guide/service manual deserves mention.

The manual is 50 pages long. It is extremely well written and covers a great wealth of information, not only about the Studio Dominator, but about gain reduction in general.

In its own way, this manual reminds me of the Ampex 351 manual I acquired many years ago.

Then, as a young engineer/announcer, I found answers to questions about recording that have served me well ever since.

Producer's File

I have spoken with recording engineers and production people who feel at ease enough with me to disclose that they haven't had a lot of experience with limiters and compressors.

For them, and others like them, the Studio Dominator and manual will be like a trip to the Disney World of dynamic range control.

Main features

At the heart of the Studio Dominator is a tri-band adjustable limiting network, an automatic limit threshold and a calibrated output. This design greatly reduces "hole punching," pumping and many of the other side effects of conventional limiters.

The Studio Dominator comes flanged for rack mounting and occupies one rack space. Its power supply is programmable for 100, 120, 220 or 240 VAC. A slo-blo main fuse is externally accessible.

Audio in and out are via XLR three-pin connectors. The input impedance is 160K ohms. The manual advises that a 600 ohm resistor may be tied across pins 2 and 3 on the input plug, if needed.

The output is active and transformerless, with an impedance of 20 ohms between pins 2 and 3. The manual suggests building out 287 ohm 1% resistors in series on those pins to create a 600 ohm source impedance.

Please note that no such special considerations were observed during any of the testing we did.

Another tribute to Aphex user consideration are the two micro switches inside that let you choose between −10 and +4 operation. Access to these switches involves removing four screws and popping the cover.

If you enjoy a well-laid-out circuit board, you might want to take a peek anyway. The ICs are socket mounted, another nice touch.

The front panel has five knobs and six switches, an LED limiting display readout and a few LEDs to identify what mode the switches are in.

We started with all knobs at the 12 o'clock position except the output ceiling knob. It should be turned down until you decide which of the two output ranges (−2 to +9 or +10 to +21 dBm) you wish. This dual range comes in handy when feeding a variety of circuits with different input requirements.

We fed the inputs with music from a recent Windham Hill album, and fed the output into our Revox PR99 recorder.

Because our program material was stereo, we enabled the stereo tracking switch on the front panel of the Studio Dominator.

You can run stereo material without stereo tracking, but you will hear some image shifting on the stereo spectrum due to independent channel operation. The

(continued on page 10)

Ty Ford, a radio audio production consultant, helps stations optimize their use of production equipment and airstaff skills. Call him at 301-889-6201.

Aphex Box Gets Rave Reviews

(continued from page 9)
overall punch of the unit is slightly reduced with tracking on—but you be the judge.

When we switched the processing in, the yellow LED Total Limiting display on the right side of the front panel showed that we were limiting occasional peaks 2 or 3 dB.

By increasing the drive to the limiters, we were limiting average programming by 6 dB, and peaks by 10 dB. We adjusted the output ceiling level for 0 VU into the PR99.

The unit was amazingly transparent. To prove to myself that the unit was really working, I switched off the processing. The meters of my PR99 slammed off scale to the right.

After quickly kicking the limiting section back in, it was time to check the release function.

Slowing the release time, we perceived a loss in gain and an increase in dynamic range. The faster the release, the louder the sound and the smaller the dynamic range.

We increased the drive to full with the shortest release time, (0.1 second). The Studio Dominator was now limiting in excess of 10 dB. At these settings limiting was apparent, but far less than with a broadband limiter.

Just out of curiosity, we reset the input levels to the PR99 to peak at −15 and disabled the limiting section. The meters were now peaking at 0 VU and there was a slight increase in the bass frequencies. Impressive.

We returned the release knob to the 12 o'clock position, set the drive back to an average of 6 dB with peaks about 10 dB and reset the limited output to peak at 0 VU on the PR99.

It was now time to check out the low frequency and high frequency EQs and crossovers, and the mysterious TEC control.

At the 12 o'clock position, both low and high EQs are set for unity with the midrange. These knobs each allow ±6 dB in their respective bands, which is a real plus if you're recording complex waveforms like music. You also have a choice of 80 Hz or 160 Hz for low frequency crossover and 1,700 Hz or 4,500 Hz for high frequency crossover. Again, very useful for music.

The TEC function

The Transient Enhancement Circuit is very subtle in its effect. What is first perceived as a little high EQ was much more complex after longer listening. Even the middle and low frequencies seemed to gain definition and edge with its use.

Was this a bit of aural excitement thrown in by Aphex?

Donn Werrbach, the Studio Dominator's designer, said "No." He explained that the TEC is a transient peak detector which increases the drive level into the limiter sections during transient passages. This explained why the effect was more noticeable on some music passages than others.

Studio testing

Satisfied that the unit was doing what it was supposed to, I called a few friendly studios for further testing. First on this month's list was GRC Studios here in Baltimore. Bob Friedman, Leo McLaughlin and Greg Weil operate this 24-track studio, which does a mix of music, commercials and A/V projects.

When we got there, they were working on a mix for a scratch tune. Dominant in the mix were kick, snare and vocal. They were as impressed as I had been with the overall transparency of the unit.

We put the Studio Dominator on individual tracks first and found that the crossovers, EQ and TEC offered us a wide range of sounds. The big test was to try to fit kick, snare, vocals and high hat *all* through the Studio Dominator, while limiting heavily, to see at what point hole punching or pumping might take place.

With at least 10 dB of limiting and the release set moderately fast (in the 3 o'clock position), the sound started to flatten out with some loss of bass.

Later, Leo played some electric slide guitar through the unit. The moderate settings that we found so successful earlier worked fine for us again.

My next stop was Roar Productions in Columbia MD; owner Steve Rosch had invited me in for a test spin with engineer Gary Zeichner. Roar is a 16-track studio which handles spot, jingle, A/V, remote and duplication projects. Our first program material was music from the production library.

After a few minutes of listening, Gary came to the conclusion that the Studio Dominator, while simple to operate, was a complex unit that would take a lot of listening to to fully understand.

As our session progressed, he too commented that the audible effects on the signal were a lot less objectionable than those of other limiters he was using.

Searching for extremes, he adjusted the unit for 10 dB of limiting with the slowest possible release time. The entire LED limiting display remained lit.

He remarked that the Studio Dominator did not impart a "canny" sound typical of other limiters.

He was especially impressed with the way the unit processed narration. Members of both studios appreciated the tone controls, and the TEC.

"The Groan"

After each session came groans from both crews. If you've spent any time chasing the state of the art, you know the groan to which I refer: "Oh, no ... now I need another piece of equipment!"

So where would you expect to use the Studio Dominator? Any place you wanted absolute and very transparent control over your audio: AM and FM transmitter modulation control; in the production studio between the console and tape machines; for satellite uplinking; before the A/D converters in a digital system; CD and disc mastering or on remote broadcast feeds (notorious for overmodulation).

Let's add up the main parts: three limiters per channel, two channels, so six limiters; EQ for two channels; dual range calibrated outputs; −10 or +4 operation, etc.

Factory options include Matrix/Dematrix, Pre- and Deemphasis, and Pre- and Deemphasis with overshoot-corrected 15 kHz lowpass filter.

In the back of the manual are instructions for combining the Studio Dominator with the venerable Optimod 8100A. (Price $1,195. That includes the manual.)

If your philosophy is that the best limiter is one you can't hear, call Paula Lintz or Donn Werrbach at Aphex for more information at 818-765-2212. If you're already using a Studio Dominator, I'd appreciate a call with any additional comments you may have. 'Bye for now.

Device Checks Ground Radials

by Ron Nott

Farmington NM . . . In the typical AM broadcast facility, almost everything can be inspected or tested for condition and performance. The one big item that cannot be readily inspected is the ground radial system.

Over the years, the engineer may notice subtle changes in transmitter and ATU tuning; the manager may notice gradual changes in the station's coverage.

While many factors may explain this, a deteriorating ground system can surely contribute its effects.

Corrosion, due to acidic or alkaline soil, can change the characteristics and effective resistance of the system. Gophers and other rodents may cut the wires. KBIG, Catalina Island, had its ground system wrecked by pawing buffalo and rooting javelinas.

When contractors installing buried pipe lines or telephone and power cables cut across the field near an AM tower, their trenching machines will usually cut the radial wires, while the operators don't know or care that they are chopping up the ground system that is so essential to an AM antenna.

Ron Nott is president of Cortana Corporation. He can be reached at 505-325-5336.

A wire that has been buried for a while turns greenish black, and if cut or broken, often looks a like a weed stalk sticking up out of the ground. I've found lots of them sticking up out of the ground after a new transmission line, remote metering line or lighting power line was buried at an existing station. Unfortunately, when these things fail, they have to be replaced right through the ground system.

Some stations locate their transmitter sites on farmland. If the radials are not deep enough, a plow or other farm implement can cut them. Pasture land, after a good rain, can allow the sharp hoof of a heavy animal to penetrate the soft ground to radial depth and break a wire.

If the wires go under an irrigation ditch, will they survive the ditch cleaning machine?

Sometimes fences are built across an antenna site. Any post-hole digger will chop the soft copper wire in two with little effort, and another of your ground wires is missing.

Albuquerque broadcasters were plagued with copper theft until they found a solution. The thieves would go to a transmitter site in the middle of the night. They would back their vehicles up to the tower and then dig a hole near the tower until they found a few wires. They then cut the wires, tied them to the rear of the vehicle, and drove away from the tower, ripping the wire out of the ground. The wire was then rolled up and sold for scrap.

The solution was to replace the pure copper wire with "copperweld," a hard steel wire with copper plating. It's hard to cut and has little scrap value. Because of skin effect, it's probably as good as pure copper—or at least close. At any rate, it got rid of the copper thieves.

The AM ground system has a multitude of enemies. Its soft copper wire is fairly delicate and vulnerable to a great many things, as noted above. And the older the system, the more suspect is its condition. A means for inspection is obviously needed.

So what can be done?

Determining the quality of the ground system involves more than just locating the wires, although this is the starting point. When a station is broadcasting, each radial wire that is contiguous to the system has a minute current at station frequency flowing in it. The currents should be approximately equal to each other, but may vary with the soil moisture, chemistry and the condition of the wires.

An ordinary metal detector is inadequate for the purpose because, while it may locate buried metal wires, it cannot tell if an individual wire is contiguous to the system. If a wire is cut, the metal detector will not indicate this. It just locates metal, both fragments and continuous lengths. It also cannot give a relative indication of the RF current.

Therefore, a device capable of being tuned to station frequency and giving relative current values is essential. A field strength meter, such as those used by directional stations, can be used, but it's not easy. You must tune it to the station frequency and then invert it over the ground radial field. It must be held so that the loop antenna is almost touching the ground. By moving it around, the meter will peak when it passes over an *active* radial wire.

Considering that a station will have

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Ground Radial Inspection Easy

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from 3.5 to 10 miles of ground wire per tower, you're in for a lot of walking bent over carrying a fairly heavy box. It can be done, but you'd better have a good back.

Specific requirements

Since most nondirectional stations don't have a field strength meter—and most engineers would prefer to do the job standing upright with a lightweight instrument—a simple, inexpensive device can be made or acquired to do the job. The requirements for a ground system inspection device should include the following elements:

1. It should be easily tunable to the station's frequency.

2. It should employ an RF pickup device that can be placed close to or directly on the ground. This pickup should be compact (the loop antenna of a field strength meter is not).

3. It should be lightweight and allow the operator to stand erect.

4. It should have a smooth exterior construction so that it does not snag in grass and weeds.

5. It should have a sensitive but simple indicator.

6. Finally, it should have simple, self-powered circuitry.

A metal detector meets requirements 3, 4 and 5, so it can be used as the physical model.

For requirement 2, a small, flat ferrite loopstick placed in the very bottom of the detector works very well. Requirement 1 is met by using a small tuning capacitor that matches the loopstick to tune the AM broadcast band.

Requirment 6 is satisfied by using a simple diode detector in conjunction with the tuned circuit formed by the loopstick and variable capacitor.

An amplifier and gain control could be used between the detector and meter, but this adds complexity and weight, along with the need for a battery. However, incorporating a 0-50 μA meter with expanded scale at the low end results in adequate sensitivity.

The meter is located in a metal enclosure near the handle for ease of reading.

By making it out of coaxial cable and placing it inside the metallic handle, the wire to the meter is prevented from becoming an antenna. Appropriate bypass capacitors ensure that RF from the meter wire will not get into the tuned circuitry.

It is essential that only the radiation from a ground wire be detected and none from the station antenna that is very close by. Some skill is required in nulling this powerful signal and to pick up only the signal from the ground wire, but it can be done. Normally, an hour of use will make a skilled operator out of anyone who has a basic understanding of the electronics involved.

Once a ground wire is located some 75'-100' from the tower, the operator simply walks it out to its end, which can normally be located within a foot or so (there are exceptions, however). At this point the user drives in a wooden stake.

The next step is to walk in toward the tower about half the distance and then start searching for the adjacent ground wire in the same manner. When its end is located, another stake is driven in, and so on.

Inspecting the results

After an interesting hour or two, a circle of stakes should have developed, at which time they can be counted and inspected for uniform length. There should be 120, but don't be surprised if there are less.

You may also be surprised—and even amazed—when you inspect for length. If a trencher has gone through, part of the stakes may be in a straight line corresponding to the ditch that was dug, but not corresponding to the radius that you should expect.

I have been surprised by finding the ends of wires at drainage or irrigation ditches only a short distance from the tower. The tower installers apparently figured that no one would ever find out that they only installed partial radials, rather than go over or under the ditch as they should have!

Site conditions

Inspection by this method is seldom easy. Some antenna sites are overgrown with weeds and shrubbery. Others may be in swampy areas.

Mowing or burning off the undergrowth is sometimes necessary to allow the detector to get near the surface of the ground, and it is essential that it get very near the surface to detect the radiation of the radial. And, of course, to walk out each radial requires constant close proximity to the ground for the full distance. If you are fortunate enough to have short grass over your site, you are the exception.

Besides inspecting radials, this device is very good at locating buried transmission lines. It can also be used to find reradiating wires or structures, such as the ground wires on power poles. Once the unwanted reradiation is found, the device can aid in the detuning process.

Anything that reradiates will have enough current flowing in it to be detected by the ground system inspection device. After detuning, there should be little or no detectable radiation from it.

Exceptions

As mentioned previously, curious exceptions sometimes occur. During very dry weather, the signals sometimes fall off on some radials so that their ends are difficult to locate. I suspect that this may be due to very small conduction currents into the dry soil.

Also curious is the fact that sometimes on one side of a tower the signals from the radials are very strong, but by the time you work around to the other side, the wires—and particularly their ends—are difficult to locate.

I haven't done any field strength measurements to see if there is a relationship, but it would be interesting to do so. Theoretically, the wires could be insulated, and only displacement currents rather than conduction currents would be adequate to reflect the tower.

Perhaps an imbalance in the conduction currents could affect the theoretical omnidirectional pattern. I know it's not supposed to, but who has measured it?

Although it's not perfect, it surely beats the alternative of digging up or completely replacing the entire ground system. Used periodically at different seasons of the year in tandem with well-kept notes, you can learn an enormous amount of information that will either give you confidence in your ground system or help in making decisions on repairs or replacement. If most of the system is found to be healthy but there is an obvious gap, you can just repair the gap instead of doing a complete rebuild.

Peace of mind

A broadcast engineer faces a continuing sequence of fires to put out, and is often aggravated by mysterious hums, pops and equipment failures that are sometimes difficult to explain to management. When one of these unknowns can be laid to rest by some means of inspection or measurement, it can often provide peace of mind so that all the other mysteries can then be pursued without that particular nagging problem.

AM radio is increasingly plagued by RF noise from many sources that were

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The 'Hall Kid' Aids Pacific Fleet

by Floyd Hall

Crestline CA . . . DID YOU KNOW THAT . . . ?

In the '20s and '30s, the entire US Pacific Fleet was based at an anchorage just off Long Beach, CA? Well it was, and thereby hangs this tale!

About 1931, I found no takers for the sale of my engineering degree, and in desperation, made my own job on only a half a shoestring. A mutually-starving friend had an auto machine shop, and he let me salvage anything I could use out of his junk pile and use his lathe. So, I made myself a couple of coil-winding machines and went into the transformer rebuilding and manufacturing business. I repaired meters, fixed most any kind of apparatus and went anywhere for a buck.

In a couple of years I was making a living—not much of one—but I had paid off my grocery bill and no longer had to

Old Timer

beg from my folks. One pleasant summer afternoon, I looked up to see, standing in front of the counter, a dignified-looking Navy officer and a young sailor in whites.

The officer—who turned out to be a Chief Warrant Officer and Radio Materiel officer for the Pacific Fleet—introduced himself as Mr. Smith, and handed me a small power transformer, and said he wanted it rewound.

"I'll check it," I said, and took it over to my test bench and ran load tests on its several windings.

"I don't find anything wrong with it," I said, as I walked back up to the counter. Smith, whose first name I never did find out, since everyone just called him "Smitty," replied: "I want it rewound anyway. Here is a ship's supply order. All you have to do is fill in the amount. Now, when can I get it?"

A little surprised, I answered: "About 10 o'clock tomorrow morning."

"Fine", he said, "I'll see you tomorrow", and they both left, leaving me a bit flabbergasted.

I tore the thing down carefully, measured the wire sizes and figured the voltages on the various windings. At 10 o'clock the next morning, when Smitty and his sailor walked in, the transformer had been baking in the oven for over an hour.

Curious, I asked him what kind of equipment this was out of, and what seemed to be the matter with it.

"I can't tell you that. The equipment is classified 'Secret.' It has been driving me crazy for weeks, and the fleet is held up from maneuvers until we get it fixed."

"Well," I kind of chuckled, "get me cleared for classified information, and I'll come out and fix it for you."

He looked kind of serious for a minute, then asked for my vital statistics, and said he would see what he could do. I laughingly told Mama at lunch, and immediately forgot the whole thing.

Dispatch from Pacific Fleet

Four days later, a young sailor boy rode up to my shop on a motorcycle, and handed me a Navy Dispatch. It said in essence, for me to be at the Long Beach Navy landing the next morning at 8 AM, and there would be a boat there to take me out to the USS Arizona! Nothing else. Not what I was to do, or bring or whatever.

Well, anyway, I packed up a small toolbox, threw in some resistors and condensers, and some of the new cardboard electrolytic 8-mic condensers. These were a real godsend to the radio repairmen in replacing the bulky old paper filter condensers, and we could buy the things for $0.39!

Well, I parked my old '29 Chrysler at the Navy landing and was steered down the dock by a CPO, and helped aboard a Captain's gig, no less! Man, this kid was a VIP!

Smitty met me at the head of the gangway on the Arizona, and led me to the chart house abaft the bridge. Here, on a

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Hall Kid Aids Fleet

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sturdy metal frame and post, stood what was simply a huge meter, about a foot or more in diameter.

First sonic fathometer

On the deck below were several chassis in various orientation. Smitty explained that this was the Navy's first sonic fathometer, and then turned it on. The hand on the meter immediately began vibrating and hunting up and down the scale, anywhere from 10 to 100 fathoms or more.

Smitty said this equipment was built in about five sections, each of which was built and supplied from a different manufacturer. So, nobody knew how the thing worked, except maybe some smart engineer back in the Bureau of Ships!

Smitty pointed to the transformer I had rewound, which was obviously in some kind of power supply that was standing on edge with the bottom exposed. He carefully pointed out all the different parts, and explained how they had tested them. I squatted down on the deck, and pointed at a tin can about 1½" × ½" and about 6" long, and asked: "What's that thing?"

"Oh, that's a condenser," he said. "We've checked it and it is not shorted."

Without saying anything, I dug in my tool box and came up with one of my $0.39 condensers, stuck the bare ends of the lead wires onto the terminals of the tin can, and bingo! The hand on the fathometer indicator locked in solid, and read something like 25 fathoms. Smitty and the duty officer let out a whoop, and I was at once the boy hero.

I disconnected the tin can, soldered in my $0.39 8-mic, and the next thing I knew, I was back aboard the Captain's gig headed for another battlewagon! I had three more condensers, and I soldered them in on board the Nevada, the Oklahoma and the old Missouri.

The next morning I'm back at the Navy landing with my toolbox and a flock of electrolytics, and got hauled around to the rest of the big boats in the Captain's gig and soldered in my condensers. Then I started on the cruisers!

It took me three days altogether. I had to do it, since no radiomen were cleared for Secret materiel classification. The next day a young Navy dispatch rider rode up to my shop with a US Treasury check, and the day after that the whole fleet set sail for Pacific maneuvers!

For several years after that, I was a kind of unofficial consulting engineer for the Pacific Fleet, fixing balky generators, direction finders and an occasional transmitter.

Dinner, a movie and . . .

Mama and I made a lot of nice Navy friends, and were often invited out to a ship on the weekends for a lunch or dinner with the duty officer and sometimes his wife or other friends.

Several months after the fathometer fiasco, Smitty asked if I would come out, and bring my wife for dinner, and then help him with a radio direction finder that a young striker had got out of whack. He didn't want to put the kid on report, but they hadn't been able to get it fixed.

Sometime before, Mama had said, "The next time Smitty invites us out, ask him if I can bring my sister."

I asked him that, and he said, "Sure. After dinner, the girls can go up on deck and see the movie while we work on the DF." I don't know how it is today, but then, the Warrant Officers' mess on the big wagons was far and away better than the regular officers' mess. Those old boys really lived high on the hog!

After a sumptuous dinner, Smitty got a boy to take the girls up on deck to the movie, and he and I went to work on the RDF.

It took but about five minutes to find out why he hadn't got it fixed. He was taking bearings on broadcast stations around Southern California, most of which had moved their transmitters since Smitty's charts were made! All I had to do then was locate a station's transmitter on a chart, plot a bearing from the ship's position, then calibrate the RDF on that bearing.

While we were working on these problems, the girls had come down from the movie, and unbeknownst to us, had both sacked out on some of his big, soft, leather-covered lounges. Finally, I sat up and stretched, looked around and asked Smitty: "What time is it?"

He looked at his watch and exploded: "Holy smoke, it's 11:30!"

Then he said, "All the shore boats will have been secured. Unless the OD is a friend of mine, you may have to stay all night!" He picked up the phone, and found the OD was a friend, who promised to put a boat and crew over the side for us! I went ashore with a stack of instruction books 6" high, all classified "Confidential!"

The West's greatest!

Now, while I am digging up these old Navy memories, I must tell you how I became the West's greatest DC generator mechanic!

On one of the Navy's huge repair ships, they had just received and installed a huge DC generator which they could not get to work.

Everybody had a hand in trying to fix it, without luck, and somebody said, let's try the Hall kid.

They called me and asked if I knew anything about DC generators, and I said, "Heck, I wrote the book!" or words to that effect. In those starvation days, if somebody called me and asked if I knew anything about a cross-threaded thing-a-ma-bob, model XAS-23, I would say, "Of course. I have worked on many of them," when of course I didn't know what he was talking about.

I had nothing to lose. If I couldn't find

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64 Years Ago in Radio World

Editor's note: The **RW** *of today and the* **RW** *of old fortuitously share the same name. Unlike our publication, the* **RW** *of old was printed only in 1922. We have found no record of it beyond that year.*

The modern version of **RW** *that you hold in your hands has been around (in various forms and names) for nearly 10 years.*

Tips for Fans

To reduce the howls and noises coming through your receiving set, sheath your cabinet inside with copper sheathing, aluminum sheathing, or use tinfoil sheets. Do not use any glue; use paint with shellac, and stick the tinfoil to the wet shellac. Glue is not an insulator.

When this has been done, let the shellac dry so the tinfoil is actually stuck to the cabinet, and then ground the entire sheath to the grounding binding post. If you cannot obtain tinfoil from a store, tinfoil from cigarette boxes will answer the purpose.

Another tip: place between the tubes aluminum or copper sheets and ground these also. This will tend to prevent all body capacity effects from entering your receiver and much of the howling will be lost.

The Sending "Bug"

Paul F. Godley was right when he claimed that 75 per cent. of the amateurs who make or buy their own receiving sets for concerts, get the amateur-sending "bug." The other 25 per cent. are coming along slowly.

P. E. Wiggin, of Pittsburgh, made a pertinent remark when he said that an amateur, in Canada, picked up KDKA on 180 meters just as clearly as on 360 meters. Who was off tune—KDKA or the amateur?

The American Telephone and Telegraph Company has gone into the backwoods even—and installed a wireless phone in a lumber camp in the northern part of North Carolina.

Reprinted from RW, 1922

AM Stereo War is Detrimental

by Bill Sacks

Arlington VA . . . Texar has filed a petition with the FCC asking them to do what we pay taxes for; that is, making intelligent, considered decisions involving use of the air waves. The rationale is that any transmission/reception system must be standardized. This includes choosing an AM stereo system.

The FCC's indecision has allowed the whole AM stereo debate to get ridiculously out of hand. In this era of deregulation, the FCC has abdicated its responsibility, and AM broadcast facilities are suffering. I used to believe in multimode, but now realize that radio manufacturers are not going to add any "unnecessary" costs to their products.

Light the light

I propose that all AM stations immediately place the C-QUAM pilot on their carriers. Just light the light. The 'C-qualm' pilot is the only method that I know for lighting the light in the Delco, Chrysler and Ford radios.

This once technical decision is now a crucial business decision. AM stations are not the income producers they once were, and if the industry doesn't force a standard to be set, jobs will be lost and there is going to be a surplus of land available for suburban putt-putt golf courses.

The battles over AM stereo have been fought and the war is over. Motorola has won. Motorola's separation is excellent, but they would win even if their system were capable of no more than 6 dB of separation (average listener's threshhold of stereophonic perception).

Straight Talk

The simple fact is that Motorola has the chips installed in the car radios. Whether we like it or not, the tail is already wagging the dog.

The average listener

Let's look at this from the listener's point of view. What does AM stereo mean to the average person on the street?

The average person equates the word "stereo" with good fidelity sound. He does not necessarily care about—or notice—the two-dimensional spatial aspect.

An analogy in the consumer hi-fi industry is the current use of the word "digital." Digital has replaced stereo as a buzz word. When stereo was first introduced, it replaced the term "hi-fi" as an indication of quality sound.

The point is that, if a radio has two speakers, it doesn't matter to the average consumer if the sound is true stereo or dual mono. What does matter to a listener is whether the sound is of high quality or not.

Many years ago, an FM station where I was employed had an unreliable stereo generator.

When the stereo gen went out, we would place a 19 kHz tone (from the test oscillator) on the air. We did not want people to know we were not in stereo, and nobody would ever complain that we were in mono if the pilot light were lit. If we did something that blew off the high end (such as having to go to an auxiliary limiter), it would instigate lots of complaints.

Two off-shore views

The off-shore manufacturers of AM radios are about to throw up their hands and forget the whole thing.

They were shocked to see the Harris system abruptly pulled off the air. Harris had all of the key elements covered as far as the radio manufacturers were concerned. It is one of the world's largest manufacturers of broadcast equipment (actually a minor point); it has a respectable silicon foundry (a very major point) and it is well capitalized and could easily support its system worldwide.

I believe the radio manufacturers assumed that it would be between Harris and Motorola in the end.

Imagine their surprise when the FCC reacted so strongly to what it considered to be misleading statements by Harris. Turning the Harris system off had nothing to do with its commercial value or its potential.

Whether Harris misled the FCC is the FCC's prerogative to decide, but in the end only Harris should have been punished, not the industry.

Another tail wagging the dog is the acceptance of Motorola as a national standard in other countries.

All radio manufacturers must depend on the worldwide market to support their operations. We certainly didn't lead the world on this one.

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Radials

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not there years ago when the station was new.

The manager may remember when he could hear the station very clearly over in Podunk Hollow, which leads him to question whether the station is "putting out" the same signal strength today. Typically the ground system is suspected first. Never mind the fact that dozens of new stations are now on the same or adjacent frequencies; he believes that the station should still have exactly the same coverage as it had back then.

But maybe the manager is right. Is the problem of diminished coverage caused by the various sources of interference or by deterioration in the antenna system? The answer lies in measurements of both the field strength and the ground radial system.

A problem may arise in that usually no one ever bothered to measure the field strength in places like Podunk Hollow, so there is no reference to go back to. It's good engineering practice for a new station to take field strength measurements at various points, but nondirectional stations seldom do it because they usually don't have the expensive field strength meter required by directional stations.

Car radios are not adequate, because AM radios today are often far inferior to those of two or three decades ago.

But measuring the ground radial system can still be done with little expense and time right at the antenna site. Seasonal variations can be determined and data tabulated to see if the system changes over the years.

Periodic measurements such as these are invaluable in getting the best performance from the station's RF system over the long term. With some stations well beyond the half-century mark and many more approaching it, the long term is increasingly important.

Consultants

Pseudo-Flange Effect Simple

by Ronald F. Balonis

Wilkes-Barre PA . . . Production audio effects come and go. Back in the '60s, there was one which was very popular with the professional studios that you don't hear much of these days. The effect was called *flanging*, or *phasing*.

Technically, *phasing* or *flanging*, is an audio "sound" effect created by the selective and sweeping cancellation of narrowband, harmonically related audio frequencies. It is, essentially, the sound of a comb filter.

Chief Engineer

The flanging sound effect gives the audio a weird, swishy, whooshy sound resembling the so-called platform motion that plagues some AM stereo systems.

Mechanical method impractical

In the '60s, this sound effect was created mechanically by using two tape recorders. Duplicate copies of a recording of the audio to be phased (or flanged), were made, and then they were played back simultaneously and mixed. As they were playing back, a thumb was pressed on the flange (that's where one of its names came from) of the feed reel of one of the tape recorders.

The thumb press slowed down the one tape's playback speed, putting it slightly out of step (creating a time-delay) with the other tape, and introducing into the mixed audio the phasing or flanging sound. The method, in a sense, created a "mechanical" comb filter with a somewhat randomly variable response that shifts back and forth.

As originally created, it was/is a rather difficult effect to do in just about any studio, then or now. You need at least three tape recorders, and since it can't be done this way in real time, you also need a lot of patience, persistence and time to get it just right.

IC building-block circuits

Even though the effect is not quite the same, it is simpler to do electronically. The "Phaser" produces a pseudo-version of the phasing/flanging effect. However "pseudo" or "real," the device can be, and is, another useful tool to spark the creativity in production.

The Phaser makes the "flanging effect" in essentially the same way as the tape recorders, but by wholly electronic means. The Phaser is basically one of the IC building-block circuits, a band-reject filter modified to have a tunable notch frequency and an adjustable rejection depth.

IC-1 forms the basic circuit that functions as a variable and tunable notch filter (see Figure 1). IC-2 sums (mixes) the input audio with the notched audio to create the flanging sound.

The swishy, swhooshy sound is made by manually varying the frequency and depth controls. The frequency control varies the notch frequency, and the depth control adjusts the amount of "depth" of the sound effect.

> *The swishy, swhooshy sound is made by manually varying the frequency and depth controls.*

The Phaser is designed to interface at moderate audio levels. At WILK it is inserted, by a lever switch, between the summing amplifier and the output amplifier of the production console.

The Phaser circuit is pretty much a misapplication for one of the standard IC building-block circuits; by no means are the values or components I used in the Phaser carved in granite someplace. The purpose of this effect is to "distort" the audio from its normal sound. I would expect that other combinations may even produce a more desirable effect.

Anyone needing some explanation on how it works or how to make it, just call or write, or, better yet, get a copy of one of the many opamp books, such as *Active Filter Cookbook* by Don Lancaster, #21168, or *Audio IC Op-Amp Applications* by Walter G. Jung, #21558, both from Howard W. Sams, 4300 West 62nd St., Indianapolis IN 46268. These guys are experts in ICs and expert in explaining how they do what they do.

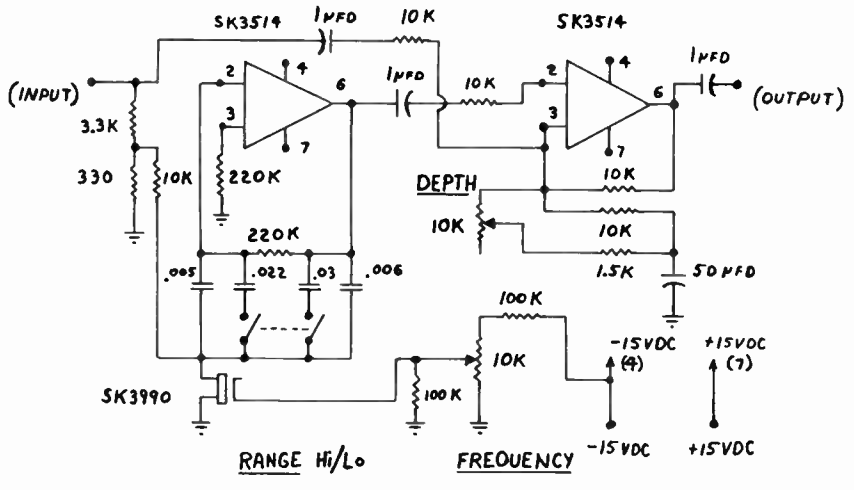
Production devices, custom equipment mods and such are a way to make a positive—more than a mere maintainence—engineering presence at any station. They represent radio engineering that helps the programming and production people be all they can be.

A bottomless budget or an endless amount of time are not really necessary. However, common goals among engineering, programming and production are. But the most important thing of all is a bunch of creative announcers and production people, willing to experiment, willing, as someone else says, to "Search for Excellence."

My 'third best' production device, "A Production Modulator" (uses an IC to make computer-like sounds), will follow in my next column in RW.

Ron Balonis is CE at WILK, Wilkes-Barre, PA and a regular contributor to RW. He can be reached at 717-824-4666.

Figure 1.



Peak Performers Outline Goals

by John M. Cummuta

Chicago IL . . . Every significant study done on peak performance has concluded that, without exception, every man or woman who can be described as a peak performer is also a compulsive goal setter. They are motivated by burning internal goals.

It has also been proven that, as average individuals begin to set and concentrate on goals, their level of achievement rises dramatically. Subconsciously, these individuals become more aware of opportunities to achieve their goals. It brings them ideas, motivation, incentives and inspiration.

Less than 5% of people actually have goals, and less than 1% write their goals down. These percentages correspond directly to the portions of the population-at-large who can be described as superachievers.

In 1953, Yale University conducted a study of graduating seniors. They asked them several questions, including, "Have you set clear, specific goals for your life? Have you written them down, and have you made plans to accomplish them?" They found that only 3% of the graduates had both written out their goals and made plans to accomplish them.

In 1973, 20 years later, they searched out the surviving members of that class and found that the 3% who had set goals when they left Yale were worth more—financially—than the other 97% combined. All other elements were held constant. The only variable was whether or not they had used goal setting to direct and motivate their life's performance.

The goal-setting mechanism

If we don't establish goals, we simply drift with the tide. Every human being has both a failure mechanism and a success mechanism. The failure mechanism goes off automatically, so in the absence of the success mechanism, people just automatically fail.

But the success mechanism is triggered by a goal, so that every time we think about our goal, talk about our goal, visualize our goal or write our goal, we are pushing on our success mechanism.

Some of the reasons people don't set goals include a lack of understanding of the importance of goals. Most goal setters come from families where goals were established as important. Families where goal setting is completely absent produce children who don't understand the concept of accomplishment.

Engineering-Manager

Another reason is that people don't know how to set goals. Our educational system doesn't teach goal setting.

Yet another is the fear of rejection. People hold back from setting goals because they've found that every time they've set a goal somebody steps up and tells them that they can't achieve it.

The fear of failure is another reason. People don't set goals when they're afraid of failing, but that's because they don't understand the importance of failure in true achievement.

Until recently, Babe Ruth had hit more home runs than anyone in baseball, but he also struck out more than anyone in baseball. Thomas Edison failed at more experiments than any other inventor in American history. He also has more registered patents than any other inventor in American history. Success is borne on the shoulders of failure.

Three important areas of goal setting

Each of us must have a balance of goals for a balanced life. We need to have three to five goals in each of three major categories: family and personal goals, business and career goals and self-improvement goals.

It's important to maintain a harmony in setting goals.

For example, we can't set the two goals of working 14 hours a day, seven days a week, while also aiming for a happy home and family life.

Goal setting

Before you actually begin to set your goals, you can help yourself focus on what's really important to you by ask-

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NAB Forges on with Antennas

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be presented at the symposium.

The original antenna design, first proposed 20 September 1985, was "a simple model to illustrate the principle" of combining horizontally and vertically radiating elements, Prestholdt said. The antenna elements could have been arranged in any way relative to each other, he added, including on the diagonal.

Prestholdt is currently investigating the use of inclined guy wires with his antenna concept. He admits there is a tradeoff involved in using the wires—although the the horizontal current moment would be raised to nearly half-wavelength, the vertical current component "affects the circularity of the groundwave in the near field."

NAB antenna project proceeds

Michael Rau, staff engineer for the NAB and member of its AM Improvement Committee, said the NAB AM antenna project is "going forward, regardless" of the presentations at the IEEE symposium.

Adler and Breakall were interested in using the NEC to test actual existing structures, and the NAB project "will give them the opportunity to do just that," Rau said.

ABC Radio's Ken Brown, also a member of the NAB's AM Improvement Committee, was convinced likewise that the antenna test program will continue, although he admitted he recognized some problems in the antennas.

The results of NEC modeling of Prestholdt's antenna came as "no surprise," Brown said. He maintained that Prestholdt's original paper indicated a single point of protection only, from the single horizontal and vertical azimuths of the antenna elements.

Difficulties with Biby's antenna were not as readily apparent, Brown said. The Biby antenna "deals with quirks in mathematics, and depends on the behavior of the emitted waves," he said.

In his own 1985 presentation, Biby had suggested there may be some problems in impedance in driving the antenna, Brown stressed.

But Brown pointed out that discrepancies always exist between mathematical testing and actual field testing. If the papers presented at the IEEE symposium had any effect on the NAB's antenna project, it may have been to provide "a little better idea of what to test *for*," Brown concluded.

Other developments

At press time, Rau said the NAB was scheduled to attend a 22 October public hearing before the Board of Supervisors of Loudoun County, the largely rural county about 40 miles west of Washington, DC, where Biby's antenna will be constructed.

The NAB requires a waiver of the county's zoning ordinances, which usually prohibit large structures from being built on agricultural land, Rau said.

Biby noted that the FAA has granted clearance to use the Leesburg, VA-area test site.

A meeting also was scheduled for 24 October between Prestholdt and radio representatives from Howard University, which has offered a Beltsville, MD site for that antenna test.

FAA and FCC clearance must still be granted, said Prestholdt, who plans to run a series of on-site experiments to prove his antenna's general principle and to obtain specific oprating characteristics.

For additional information, contact Michael Rau at the NAB: 202-429-5340. Contact Ogden Prestholdt at A. D. Ring & Associates: 202-223-6700. Call Dick Biby at CES: 703-522-5722.

Success from Clearcut Goals

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ing yourself a series of questions like:

- What five things do I value most in life?
- What would I do if I won a million dollars?
- How would I spend my time if I learned today that I only had six months to live?
- What one great thing would I attempt if I knew I couldn't fail?

Some of the factors in successful goal setting include:

Desire. This is the great motivator that impels us toward our goal. You can't really put your best efforts into working toward a goal that you don't personally desire.

Belief. You must absolutely believe, beyond a shadow of a doubt, that you have the ability to achieve the goal you've set for yourself. You have to make your goals believable—by you—so it's best not to set them more than 50% beyond where you are right now.

Write down your goals. The writing out of your goal is the most important step that you'll take. Until a goal is committed to paper, it is not a goal—it is simply a wish. Write your goals out in vivid clarity, to the last detail.

Benefits. Determine how you will benefit from the accomplishment of your goal. Write out each benefit that you will enjoy from the achievement of your goal. If your goal is financial, write—in detail—how your life will change after you've reached that monetary level. The more benefits you have from achieving your goal, the higher your motivation level will be.

Analyze your position. Determine where you are right now. If you want to earn a certain amount of money, sit down and write exactly what you're earning today. That's your starting point.

Set a deadline. Determine exactly when it is that you will accomplish your goal. Use the latest outside date. Your major goal should be measurable, and you should, at any given time, be able to determine exactly where you are in relationship to its final accomplishment.

Identify obstacles. You must be aware of the obstacles to be overcome in achieving your goal. If there are not obstacles, it's not a goal at all, but some lesser activity.

Identify knowledge needed. What special knowledge do you need to accomplish your goal? Any goal of consequence will require additional knowledge for its attainment. This may mean anything from additional schooling to just talking to the right people.

Identify the people whose cooperation you will need to attain your goal. Two concepts are helpful here in focusing your energies. The Law of Compensation leads us to ask what we can do for the people whose assistance or cooperation we will require for the successful attainment of our goal.

The Law of Service helps us remember that attaining any lasting success in life can only be accomplished by providing superior service to our fellow man, and particularly to our client or customer.

Most successful people practice the Law of Overcompensation, which says, "Go the extra mile. Do more than you're paid for."

Make a plan. Write out every detail of every step necessary to achieve your goal. Prioritize them. All high-achievers write and rewrite their goals, plan their days, plan their weeks and plan their months.

Look ahead. Get a clear mental visualization of your goal as already accomplished. Every day, every time you get a chance, play that picture over and over again.

Never give up. Back your plan with determination and persistence, and resolve to never, never, never give up. The best plan on earth will not work, unless *you* do. All great achievement can only be accomplished with persistence. Persistence is to success what carbon is to steel. Most highly successful people will tell you that their greatest success came right after their greatest failure. Persist—and you will succeed.

I've dedicated this column to goal setting for one reason. I've found it to be the single most important element in a successful record of achievement. It is the most consistent motivator and coach. It is the map of the yellow-brick road. It is your route to a successful career.

Have a nice trip. My goal is to be there waiting for you.

John Cummuta is RW management editor and GM at WCFL, Chicago. Call him at 312-963-5000.

Hall Kid's Know-How in Demand

(continued from page 14)

out what it was, and fix it, I didn't get paid, but on the other hand, if I got lucky, I made a few bucks.

Right direction

So, I took a voltmeter and my trusty toolbox and was hauled out to the repairship. When I looked at this generator, I had no idea of what the thing was, or what it was supposed to do. The wheel on this thing was much higher than my head, and it was connected to a huge Fairbanks-Morse direct-reversible diesel engine.

Well, they told me that it had been shipped out and installed, and wouldn't build up any voltage. It was supposed to generate some 250 V and some—I don't know how many hundreds, or thousands—of amps!

Ok, now I had to act as if I knew all about these things, and all I could think of was, maybe the residual magnetism in the pole pieces had been knocked out of it in shipping. So, I asked if they had any storage batteries, to which they said yes, and I requested they bring me two 6 V batteries and some leads to connect them.

This was done pronto, and I hooked the two up in series, broke open the field lead to the generator, connected it to one side of my batteries, and held the other lead to the brush holder in my hand. I took a long breath, and said: "Start the engine!"

When the thing got up to speed, I stuck the lead in my hand to the other end of the batteries, and lo and behold!, the generator built up to about 240 V, and by the sheerest stupid luck, in the right direction! I had no idea of what the polarity of the field was, and if I had connected the batteries in the opposite direction, the whole thing would have been a bust!

I held the battery lead on for about three or four minutes, then had them shut down the engine, reconnected the field lead, and started it up again. The generator built right up, and everybody lived happily ever after!

After that, I became the country's expert on DC generators! This was so funny. The average electrician—or contractor—knows a thousand times more than I do about AC, but do you know, none of them know a thing about DC machines—shunt wound, compound wound, series wound, or what have you. So, I was often called in to make DC machines work.

One company—back in Indiana, I think—made most of the DC machines used in theaters to run the arc projectors. Often, when these were received at a new theatre, they wouldn't generate and the National Theatre Corp. would call me in to fix it! The electrical contractor who had the job would watch me connect a battery to the field coils, and see the machine go to work, and shake his head in disbelief. He just couldn't figure it out!

Well, so much for Depression reminiscence. These memories have really taken me back, and remind me of other experiences in those times. I will try to recount some of them next month.

I have a deep feeling for the sea and ships. I sailed as a brass pounder on the Old Man Dollars ships. I am a rag sailor, and have been for many years; Mama and I have covered a lot of territory on ships and boats. The beginnings of marine radio should be interesting to you, and I will get back to those times next month.

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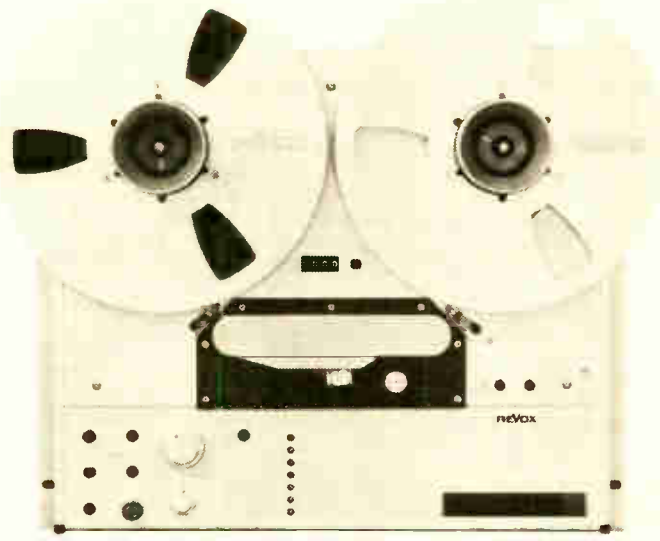

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Contract Engineering

Getting Into Contracting Work

by Barry Mishkind

Tucson AZ ... Getting started in contract engineering can be both easy and difficult. Under the deregulation-driven desire of many stations to reduce their engineering budget, many opportunities are there for you to pick up part-time employment. On the other hand, getting that first satisfied client to recommend you to others involves good planning and hard work.

Since the FCC actions relaxing Chief Operator requirements, some stations, even in the largest markets, have tried to "save" money by eliminating the fulltime engineering position.

They find that it is the easiest place to cut the budgets, since the air staff can't be cut, and the executive secretary is likewise indispensable.

This type of a situation is where the prospective contract engineer can find a slot.

However, there is still the pressure to keep the station "on the air" and sounding competitive. So, most stations don't want to hire just anyone who calls themselves qualified.

While there are some markets that are in such desperate need of engineers that stations will hire virtually anyone with a screwdriver in their pocket (even if they are incompetent, or worse, rip-off artists), most managers are seeking someone they can trust, even if in a limited way.

Being a successful contract engineer requires being able to work without constant supervision and to find ways to maintain the station's equipment promptly without throwing money at every problem.

Beginnings

So how do you start?

Many contract engineers got their start by being asked to moonlight to "help out" a neighboring station. Using your current job as a base, when possible, holds some advantages, because the engineer usually will have access to the test gear and tools of the station where he works fulltime, allowing time to build up his own inventory.

A slight variation on that theme often works in locating that first client. It may even be accomplished without leaving home, so to speak.

When you have made the decision to become a contract engineer, speak to your current GM.

If he is sympathetic to your goals, he might allow you to change your current situation at the station.

You are in an ideal position to know what the basic needs of the station are and, after all, who knows the physical plant better than you? It may be that you

(continued on next page)

Finding Success as Contractor

(continued from previous page)
can agree on a rate that will permit you to have a reduced work week at a reduced salary.

After setting up your company and deducting overhead and expenses from your taxes, you may find that your net income has not dropped too much. A smart course to take would be to visit your accountant and discuss the various tax benefits and liabilities, especially with the tax reform package recently passed.

The sooner you do this, the better, as some deductions may run out at the end of this year.

Being up front with the GM and seeking his support is very important. Even if you have been unhappy (and that is, after all, the reason why you are going out on your own), try not to burn bridges. A smooth transition may maintain your "base," a satisfied first client and—with his recommendation and contacts with area broadcasters—the GM could be invaluable in getting more clients.

What do you charge?

Of course, at this point you must be ready with the answers for several questions. In the above scenario you must know the rate you will charge. This is a critical matter, deserving your serious attention ahead of time, since the first question from many stations is "How much do you charge?" rather than "How can I know that you can take care of our equipment?"

What you charge will depend on many factors. Market size, station budgets, whether the station is all in one location or has several sites, whether it is a stand alone station or an AM-FM combo and whether you are expected to be available during the daytime only or on 24-hour call with a pager.

Another factor is whether you charge by the hour or use a flat rate for a month. Regardless, you must have a "floor," a solid idea of what you are worth. Otherwise, you will be low-balled by stations seeking cheap help, and you will fail as a businessman due to lack of profit.

In some markets, stations still have to be educated, especially where they have used TV techs out for a few extra bucks. You do yourself a great disservice if you try to match their rates.

First of all, the GM will not respect you for selling yourself cheaply. Secondly, such stations will inevitably be the source of continuing disagreements over budgets that sap excessive amounts of your time.

Remember, you are a trained electronics technician with expensive tools. Your local carpenter cannot work for $3.50 an hour and survive as a businessman. You can't either!

For whom do you work?

If you have your GM supporting you in your new business, there are likely to be stations that he will not want you to work for—stations that are direct format competitors.

At the same time, he will want to know what you will do if two or more clients call simultaneously. It *does* happen, so you need a clear policy, explained ahead of time to your clients as to where they stand on the totem pole.

Having a reciprocal agreement with another engineer has often provided me with needed backup when I've been buried in troubles. I recommend it highly.

In addition to the possible contacts set up by your current GM, you can seek additional clients by sending out letters to area stations and following up with phone calls. However, this can set up yet another type of potential conflict of interest.

As you acquire clients, you will learn many things about your client stations, much of which the respective General Managers would rather not have known "across the street."

You must learn to walk the tightrope and keep confidential what you know.

Your discretion, or lack of it, will go a long way in determining how successful you'll be in contract engineering, as no GM will want to hire a conduit to the "competition."

It is no exaggeration to say that your reputation for discretion is as important as any technical ability.

Stay with RW as this section on contract engineering presents more tips on how to be successful in being your own boss.

Barry Mishkind, aka **RW***'s "Eclectic Engineer," is a contract engineer and consultant in Tucson, where he just completed building "yet another" radio station. He can be reached at 602-296-3797.*

AM Stereo Debate Defies Rationality

(continued from page 15)

If the FCC and the industry were to choose to base a decision on technical merit, they would only need to form an impartial body—similar to the MTS committee that worked on TV stereo—which would closely examine all systems with real-world and simulated adverse reception conditions.

System proponents would have to agree to sit down at a table together and demonstrate the real technical merits of their systems.

Another consideration has to be the cost of manufacturing receiver chips and the true large-scale availability of such chips. Adding $1.00 to the parts cost of an AM radio is a major budget item in a $25 receiver. The cost of individual broadcast exciters is an almost-irrelevant issue.

If this kind of rational and methodical decision cannot be reached quickly with the full cooperation of all proponents, then we should just declare Motorola the winner and get back to business instead of bickering. It should be obvious that Motorola already has the pieces in place: auto radio penetration, full-scale, high-volume chip manufacturing, marketing expertise and capital.

My company is a small business and we participated as a proponent in the MTS choice. Armed with an exclusive license to some nice Telefunken companding patents and, relatively speaking, no capital, we jumped into the fray with both feet.

The big boys were playing hardball and had every intention of taking home all the marbles. Our company was treated with respect and fairness by the EIA/NAB group.

When it became obvious to me that dbx had developed a top-notch system, our company withdrew from the competition and pledged to support whoever won. We were asked by another small company if we would like to join them in a lawsuit against some of the big boys. I laughed at them; I am in the broadcast equipment business and prefer to make money the old-fashioned way.

In any competition there must be one winner, and losers. The losers can be consoled by the fact that it was a good fight (and hopefully it was fun) but life goes on. There is always another invention or project to do.

I think the new standard preemphasis will benefit AM broadcasting more than broadcasting in stereo. Just get those lamps lit and clean up the audio.

Happy trails and stay straight.

kiddIII communications

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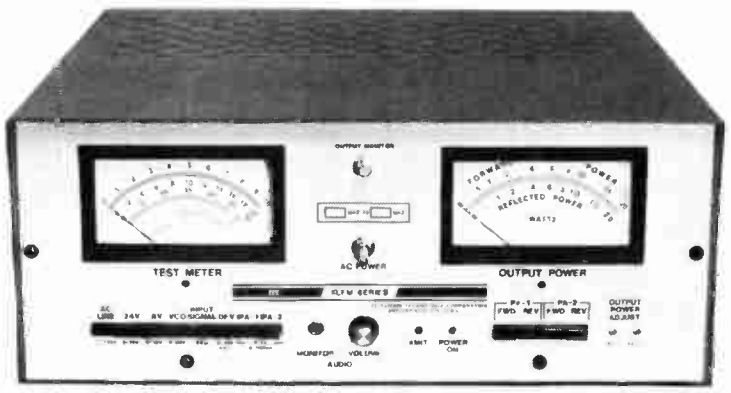

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4096 Bridge Street, Suite 4 **Fair Oaks, California 95628**

Buyers Guide

FM Transmitters, Exciters & SCA

Continental Always Reliable

by Joseph E. Woody, CE
WKLM-FM

Greensboro NC ... Continental's 40 kW combined model 817-R2 FM broadcast transmitter features two 20 kW amplifiers with a hybrid combiner and dual model 802-A exciters. There is automatic switching to maintain maximum power on air, along with automatic failure detection in both the PAs and the exciters.

We chose this system over all others because of the proven reliability of the Continental design.

The PAs in the system utilize a 4CX-15000 tetrode operating in a grounded screen configuration. Parallel 4CX-250s develop drive for the finals.

Under any condition, all stages and power supplies operate well below dangerous levels. Regardless of power level, no tube parameters exceed the manufacturer's recommended potential. Even with little or no drive, the amplifiers remain very stable and react predictably during tuneup.

There are several features about this system that deserve being pointed out.

Loading and tuning

The whole system uses closed-loop feedback to maintain power level. RF is sampled at each amplifier's output flange, detected and brought to the automatic power controller card which controls the gating of SCRs to control PA plate, PA screen and driver voltages for consistent power output.

This system is a little temperature sensitive. I have observed almost a 0.5% differential in output power as the system goes through its warm-up cycle.

User Report

Final tuning and loading is controlled by two momentary switches that operate motor drives to perform actual amplifier tuning. There's not too much chance of breaking out in a sweat tuning this system. The only other external tuning is driver plate tuning (performed by a belt-driven vacuum capacitor).

There are other tuning sections located internally for driver input tuning and coupling, along with driver plate loading and "coarse" tuning. These adjustments rarely ever need tweaking, so they don't need to clutter the front panels.

Filaments are regulated by an intelligent motor driven variable transformer. This circuit watches power line fluctuations to see if little changes last long enough to warrant adjusting filament voltage. This prevents unwanted continuous searching.

The amplifiers feature full metering of all power supply and tube voltage and current. There are 27 LEDs on a status panel that give you logical indications of what is going on and what isn't. There are four red ones (which hardly ever get used) to indicate any system overloads.

At any time you can test the recycle circuitry and the VSWR protector. The system also features a VSWR "foldback" circuit which looks for sudden changes in reflected power and reduces output to safe levels. For instance, if your antenna ices up, the output power will go to an acceptable level and return to full power as the ice melts.

Pushbutton control

The automatic combiner controller permits you to control the whole system with just eight illuminated buttons. You may select automatic or manual operation, place one PA on the air and the other into the test load, put both on the load or on the air, or just shut the whole thing down.

All of this is done with RF levels being watched so no power is present when a coax switch is moving. The exciter controller watches the exciters for any faults and switches to the alternate so quickly

(continued on page 27)

'Sidekick' Gets Rave Reviews

by Lynn Allison, CE
WETA-FM

Washington DC ... The Modulation Sciences "Sidekick" is an all-in-one audio processor and FM SCA generator. It is designed to replace two or more separate units, including an audio DA to raise telco line levels, audio compressors, limiters and the SCA generator.

The combined unit is easier to set up and gives better control over subcarrier modulation. With its internal noise generator, it aids in tuning your transmitter for minimum incidental AM to reduce crosstalk between the main and SCA channel.

The "Sidekick" is a rack-mount unit 3½" high. On the rear panel is a terminal strip for the input lines and the remote control on/off functions. BNC connectors for composite input, composite output with SCA, SCA alone, telemetry input and an RF input for reading wideband noise are also on the rear panel.

The "Sidekick" can handle any audio input level from −30 dBm to +10 dBm, eliminating the need for any amplification for all but the lowest telco levels.

If the input is between +6 and +10 dBm, then an input pad is selected by strapping two terminals. For any other levels, only the input connections are made.

The stereo signal may be connected to the composite input and the output, then run directly to your transmitter's exciter. This is possible because the composite output has both the stereo signal and the SCA. It will also eliminate the need to switch cables for the noise test, since the composite output must feed the exciter.

A separate SCA output is available if you prefer not to run the composite signal through the "Sidekick."

A telemetry input is available which bypasses all of the audio processor chain. It gives direct access to the modulator stage of the "Sidekick."

The RF input will take a feed from any RF sample point, preferably the antenna line, and with automatic level compensation handle from 0.1-2 W.

This input is used when making the wideband noise measurements by feeding the exciter from the composite output and activating the Noise and Read switches on the front panel.

User Report

The transmitter is then tuned for a minimum reading on the meter. While this gives the least noise, it also may not be the point at which your transmitter will be at peak efficiency. The manual cautions that the power will then have to be determined by the direct method.

Audio processor controls for deviation, limiting, HFR (high frequency reduction) and mute level are easily accessed from the front of the unit.

The input level control is adjusted for the amount of gain reduction desired. A low setting of 5 dB will cause the processor to function as a compressor/limiter. A higher setting will begin the automatic level control functions.

WETA's 67 kHz SCA is a reading service, so we use approximately 8 dB of gain reduction to reduce the dynamic range and provide a small amount of automatic level control.

The HFR and limit controls work together. HFR is a high frequency peak controller that adds roll-off to the high

(continued on page 28)

Buyers Guide

Harris Helps Quell Transmitter Panic

by Sam Garfield, Grp Dir
Beasley Broadcast Group

Goldsboro NC ... When an FM station decides to improve its transmitting facilities, some form of panic usually strikes the technical personnel.

Comments and questions ensue, such as: "I'm not familiar with a high power transmitter"; "I don't know how it works or how to hook it up to make it work"; "What if it breaks? Can I fix it?"; and "Is there someone who knows the unit who I can talk to—at any time?"

Beasley Broadcast has the Harris FM 25K at five of its facilities, including: WXTU, Philadelphia, PA; WYAV, Conway/Myrtle Beach, SC; WKML, Lumberton/Fayetteville, NC; WRXK, Bonita Springs/Ft. Meyers, FL and WDMT, Cleveland, OH.

We have found that the 25K's many positive points can quell the panic.

Noteworthy features

Harris has always kept the high voltage supply separate from the RF mainframe. The supply has large access covers on it so that repairs, inspections or transformer replacement may be handled with less difficulty.

The MX-15 exciter mounts either in the transmitter or in an adjacent standard equipment rack. The RF output is "muted" when the high voltage PA plate is off.

User Report

The MX-15 features extensive analog metering, including the modulation level. I have found that the MX-15 meter indicates and tracks modulation better than the modulation monitor. I have no doubt of the MX-15's accuracy.

The exciter is also modular, which minimizes downtime. Harris includes an extender board alignment tool and a 120 VAC power cord for testing and setup ease.

The IPA is all solid state, and consists of one drive module and four IPA amplifier modules. However, all five modules are identical and can be interchanged.

The broadband design presents a low VSWR to the exciter. A broadband combiner output circuit allows continued operation in the event a module loses output power.

LED status indicators on each module indicate the relative condition of each section. A front cabinet selector switch enables the technician to monitor the current of each module, plus regulated and unregulated supplies.

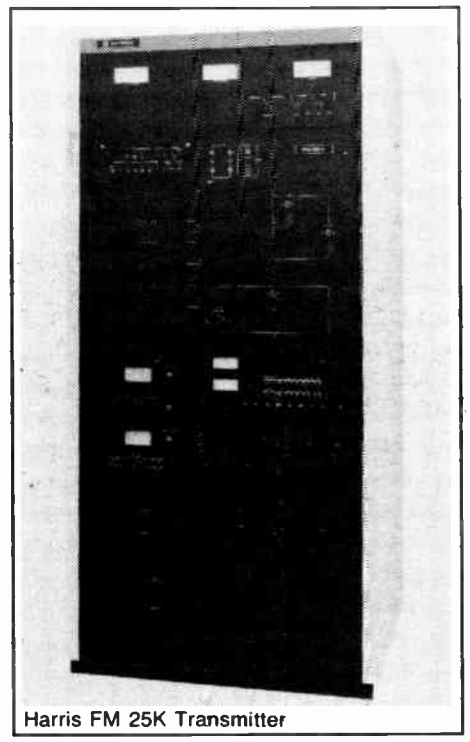
The output circuit of the IPA includes a directional coupler. The reflected power signal is used by the control circuit to initiate amplifier shutdown in case of excessive IPA/PA VSWR. Typical IPA output power is 350 W.

The modules are cooled with an air flow from the main blower. The IPA has only one user-tuning section, which is for matching the IPA output to the PA grid.

The PA stage is a 4CX20000A/8990 and is operated in the Class C mode. The PA grid input is 50 ohms. If there is a PA failure, the IPA can be directly routed to the antenna.

The quarter-wavelength cavity used in the PA stage provides symmetrical wide bandwidth. The plate tuning arrangement has no sliding contacts and consists of a paddle mounted to the PA cavity.

The PA tube is accessed through a door located on the PA cavity. Filament voltage is controlled by a front panel variac.



Harris FM 25K Transmitter

A constant voltage transformer is available for areas where the AC power wildly fluctuates.

The output of the PA passes through a ceiling-hung low-pass filter. I suggest when installing this that you obtain 6" water pipe hangers from your local plumbing supply house.

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Buyers Guide

WKBH Impressed with Philips

by Pat Delaney, CE
WKBH-AM/FM

User Report

Holmen WI . . . When I first uncrated the Philips 1 kW solid state transmitter, I was skeptical at best. Judging the situation by my experience with solid state VHF amplifiers, I could foresee huge transformers and heavy-gauge cables to handle the current requirements of a kilowatt of solid state power.

What I saw was a compact, rack-width cabinet with not a whole lot inside! The exciter, 15 W amp and 125 W amp occupy a space about 10"×19" at the top and are very accessible.

The modulated oscillator is a plug-in module. This top section operates on 115 V and, like most other FM transmitters, can be operated alone as a low power unit.

The 1 kW amp section is truly amazing. There are four RF modules, each rated at about 300 W. The input from the exciter is split four ways to feed the amps, and their outputs are combined to one 1 kW output.

RF modules keep it going

There are several "reject" loads which are part of the combining process. The really neat thing is that the transmitter can be operated with one or more of these modules removed.

At the bottom of the cabinet are two power supplies and, much to my surprise, no transformers! Through solid state magic, they convert 230 VAC to a very stable 28 VDC with about 25 amps capability. Each one of these supplies powers two of the modules, so if you lose one, you're still on at somewhat less than half power.

The transmitter is relay-less, and all control circuits are solid-state—that is, logic controlled. No clicks or clunks!

The exciter section has full metering of all critical parameters. The amplifier has one meter only, which allows you to look at forward power, reflected power, power supply A or power supply B.

> *"The transmitter is relay-less, and all control circuits are solid-state."*

There are status LEDs for each module, as well as a total output LED and a reflected warning LED.

Installation

One of the most frustrating things about installing the unit is trying to decipher the manual! It was written by Europeans, and there are just some things that get lost in the translation.

For example, nowhere does it tell you to turn the unit on. The instructions use the word "inhibit" to mean off and "de-inhibit" to mean on. A circuit is not grounded, it's "earthed." I suggest that an American technician rewrite the manual!

The schematics are otherwise good, except for the various diagrams on module interconnections, which can be a bit confusing.

The RF output is a female type-N connector; I'm not sure of the reason for this. We had to buy an adapter to 1 5/8" EIA, flange and add a short heliax pigtail. Remote control connections interfaced nicely and almost all of the status outputs are available remotely.

One big problem we encountered was the transmitter on/off connection. It required a constant closed or open contact instead of a momentary closure. I was forced to build a latching relay to interface to the Moseley MRC-1600.

With this system, you'll also need access to a calibrated wattmeter to calculate your power indirectly.

The only real problem with the transmitters has been in the power supplies—a failed fan motor in one and a bad transistor in the other. Both were repaired while the transmitter remained on the air at reduced power!

All in all, if this is your year to buy a new low power FM transmitter, the Philips line deserves a good look.

Editor's note: For more information, contact Bob Blair at Philips: 201-529-1550. The author may be reached at 608-526-9302.

Continental Xmtr Predictably Reliable

(continued from page 25)

that you most likely won't know it happened. Of course there are status lights that tell you if there is a failure.

As I mentioned earlier, the entire system behaves with stability and predictability. You can adjust power from zero output to full power with no glitches or earth-shaking arcing, banging or overloads.

System phasing is easily adjusted and kept to well below 100 W, with a small capacitor located in the exciter controller. In fact, the *entire* control system occupies only 11" of rack space!

In the event any of the controller circuits fail, you can operate the combiner complex from a rotary switch on the combiner mainframe. The 10 kW reject load sits quietly with no fan running until its operating temperature dictates the use of the fan.

In the event the reject load overheats, the system will shut down. Of course, with automatic PA switching, this would never happen.

Easy access for maintenance

Maintenance is a breeze since there are more doors and removable panels than the White House. All tubes are fully accessible from the front, requiring only a medium-sized flat blade screwdriver to re-tube the whole system.

The entire back side of the transmitter uses light, easy-to-handle doors that permit arms-length access to all components.

Since we run our transmitter in a closed-loop air conditioned building, it takes me about 15 minutes with a high pressure blower to dust out the whole thing. Sure, there are a few tight spots around the transformers, but you never mess with them anyway.

If I were going to criticize the design, I would probably mention that there is no indicator to tell you when you have reached the end of the tuning paddle travel. But since you rarely ever get to the ends anyway, it isn't that big a deal.

I suppose since I am an "RF Kinda' Guy," I could complain about how these things just run and run and never go off the air. I mean, if Maytag ever built a transmitter, it would be like this.

So, if you are looking for a transmitter that doesn't hold you back, and can't be blamed for this month's *Birch* or the loss of a client, this is the ticket. Continental offers this design for 10 kW all the way to 55 kW.

Editor's note: For more information, contact Vern Collins at Continental: 214-381-7161. The author may be reached at 919-668-9450.

Buyers Guide

'G' Line Kept Simple

by Ron Baker, Pres
CCA Electronics

Atlanta GA . . . The new FM "G" Line transmitter, developed by CCA Electronics, has already received a good response.

Because of the transmitter's proven reliability and the positive response it evoked from satisfied customers, CCA retained many of the basic concepts from the "E" Line in its manufacturing of the new "G" Line, including the grounded grid technology and the simple relay control circuitry.

The new users have reported that the "G" Line is both simple and reliable, and that the changes have been beneficial. Users especially like the new relay control circuitry, additional metering, the new control layout, the new 20 W exciter and the lack of harmonics and spurious emissions.

"It's clean and simple," says Mike Fawcett of Broadcast Technical Services, Vancouver, BC.

The major change in the FM "G" Line is the entire control circuitry. The simple relay technology was retained, but the type of relay was changed to a more commonly available one—the Potter Brumfield KHU17 series.

The change in the control circuitry from high voltage to low voltage is engineered for front panel access while the transmitter is operating. Another new feature is the addition of more (and more accessible) metering.

Editor's note: For more information, contact the author at CCA Electronics: 404-964-3530.

'Sidekick' is All-in-One

(continued from page 25)

end if the peaks exceed the threshold.

The limit control sets both the point at which the broadband limiter will clip peaks and the instantaneous deviation limit. If either limiter is pushed too hard, it will reduce the compressor gain to keep levels below its threshold.

The next adjustment is the deviation control. With the meter set to deviation, you can adjust it for whatever deviation limit you wish. We have set ours at 5 kHz and have had good results.

The last two controls are the injection level and the mute threshold. The injection level sets the level at both the composite output and SCA output. Mute sets the threshold below which the SCA carrier will be shut off. A mute defeat switch will keep the carrier on at all times whether or not there is audio present.

I found the "Sidekick" to be an excellent SCA generator. I especially like the fact that it is a combined audio processor and generator.

The setup is easy and takes less time to do than to read about. Setting your SCA deviation could not be easier.

Okay, I have praised it enough. Now for the bad part: They don't give them away!

Editor's note: For more information, contact Eric Small at Modulation Sciences: 718-625-7333. The author may be reached at 703-998-2790.

Buyers Guide

695's Good Sound Inexplicable

by Bill Hoezel
QEI Corporation

Williamstown NJ ... There are a few excellent FM exciters available in today's marketplace; the QEI model 695 is one of them.

So what separates the 695 from all the others? The on-air sound. Again and again, we hear from the broadcaster, "I don't know why, but it sounds better."

I wish that I could point to a specification or combination of specifications and dazzle you with the wizardry of QEI engineers, but the truth is it just isn't that simple.

True, the model 695 exciter has an extremely linear and stable FMO. True, it has distortion numbers (any type distortion) virtually too low to measure. True, noise numbers are also very low. This is all very nice, but it does not account for the "on air" results.

For example, a broadcaster in the central United States who had a model 695 on order was sure that his new QEI exciter would sound as good as the other brand that he had borrowed to stay on the air.

But after he used the 695 for a few weeks, he called us to express his delight with a sound that was much better than anything he had heard before.

Typical comments are, "The highs are more realistic in the presence of heavy low end," or "The low frequencies don't sound boomy."

These are not exactly technical reasons to choose one product over another, but they can be significant to your listeners.

Perhaps the most pleasing endorsement, from our point of view, has come from one major market broadcaster. This particular station is a monument to redundancy. Everything is duplicated.

Since we had this luxury, we could test and operate with no loss of on-air time and during normal programming times. The exciter was installed in very little time and comparative tests were run between the existing equipment and the model 695.

As we expected, there were no significant differences in technical performance. There were differences to be sure, but they were so small as to be accounted for by measurement error or even normal production differences in identical equipment. We then switched the model 695 on the air.

Within a very short time, we were approached by several on-air personalities and programming people. Their comments ranged from "The sound has an extra fullness" all the way to "This is what we have wanted. Whatever you did, don't change it!" These were unsolicited comments from professionals who had noticed a change and liked it.

The improvements in some applications have been more noticeable than in others. However, one fact remains: How well you do in your market depends on how well you sound to your listeners. The model 695 can improve your on-air sound.

We are convinced that the difference is real in view of the results that have been obtained in different geographical areas and formats. The only thing remaining is the improvement in your sound!

Editor's note: For more information, contact the author at QEI Corporation: 609-728-2020.

KNIS Expounds on NEC Virtues

by Paul Lierman, CE
KNIS

Carson City NV ... The first NEC FM transmitter placed on the air in the continental United States has proven its reliability for KNIS, serving the Carson City-Reno-Lake Tahoe area with a contemporary Christian format.

The KNIS unit is a model FBN-7150E designed for 10 kW output and has been producing 9.5 kW for us consistently since being placed in service in 1979.

Overall design of the Japanese manufactured product is typically European, using the building-block concept and keyed AC power access along with standard interlock circuitry for improved operator protection.

Documentation by NEC is probably the most thorough in the industry, consisting of two 2" thick volumes.

In addition; there are supplementary manuals for assembly, frequency change and modification. The instruction manuals are obviously written by someone

User Report

using English as their second language, and some sentences require several readings for full comprehension.

The FBN-7150E is completely solid state up to the 4CX15000 final.

Early problems with poor efficiency (50%) were corrected when the company redesigned the IPA to provide more drive to the final. Efficiency for the KNIS unit was improved to 65% at full power output.

NEC service has always been more than adequate. The company provided support personnel at the construction site to help solve our few start-up problems.

We have found several desirable features lacking, namely, no external adjustment of filament voltage, immediate automatic restart after momentary AC power loss, soft-start capability and power foldback with rising VSWR. Hopefully these features have been added to more recent models.

All things considered, the KNIS NEC transmitter has been the most reliable and stable FM transmitter I have worked with in 15 years of CE experience.

Editor's note: For more information, contact Joe Engel at NEC America: 312-860-7600. The author may be reached at 702-883-5647.

Buyers Guide

Get Rid of SCA Trash with '0'

by Howard Mullinack, Mktg & Sales Mgr
and Robert Orban, CE
Orban Associates, Inc.

San Francisco CA ... The FM Filter Card Model ACC-22 (also known as the "0" Card) offers two forms of improvement to users of the Optimod-FM. The first is greatly reduced processing-induced "trash" in the SCA region, and the second a 6% increase in average modulation level without any increase in audible processing or distortion.

The ACC-22 is offered as a factory-installed option in new Model 8100A/1 Optimod-FM units, and as a Field Retrofit Kit for existing Model 8100A and 8100A/1 Optimods.

SCA improvement

The Optimod-FM Model 8100A was originally designed to fully meet the FCC's main-to-sub and sub-to-main crosstalk rules (−40 dB) extant at the time.

It does so with any program material, static or dynamic, and with any setting of the front-panel controls.

To achieve this crosstalk performance, the 8100A uses overshoot-compensated low pass filtering followed by safety clippers.

However, audio processing operating styles have changed; stations are using increased amounts of compression and clipping, and in many instances, multiband processors such as the Orban XT and XT2 (or others) have been added.

The uses for SCA have also changed. When the 8100A was designed, SCAs were used only for narrow dynamic range background music. Now they are transmitting wide dynamic range audio, data and paging.

With today's more aggressive audio processing, the 8100A's safety clippers are driven harder. Thus, "splatter" into the SCA region also has increased, and can sometimes cause audible interference to aural SCAs or data errors in digital subcarriers.

At the request of several subcarrier operators, Orban developed a filter that protects the baseband above 61 kHz by 20-25 dB better than a stock 8100A.

With the ACC-22 installed in an 8100A Optimod-FM, spurious trash above 61 kHz produced by the processing does not exceed 75 dB below 100% modulation (as measured on a baseband spectrum analyzer in "peak hold" mode over long periods).

It turned out that the filter offers an additional advantage as well.

The new filter reduces residual processing overshoot by about 6%, resulting in 6% greater average modulation and loudness. With this new technology, overshoots are virtually eliminated; typically they are only 1-2%, and never exceed 3%.

In the quest for maximum loudness, many broadcasters have resorted to composite clipping to clip processor overshoots and thereby increase loudness. Unfortunately, such clipping, even in very small amounts, dramatically increases trash in the SCA region.

In addition, as clipping is increased to "bite" into program material below the overshoots, significant audible distortion is produced.

For L+R material, the distortion increase is *identical* to that produced by simple audio clipping.

To make matters worse, a live announcer (which is almost always pure L+R) is the program material most vulnerable to added clipping, even in small amounts.

The filtering in the FM Filter Card can achieve loudness within 0.3 dB of that provided by composite clipping (of the variety that does not clip the stereo pilot tone), while inducing about 40 dB less "trash" into the SCA region.

Installation in the 8100A

The FM Filter Card consists of a pair of phase-corrected, overshoot-compensated 10th-order low pass filters for the left and right channels, inserted in the audio path between the output of the existing processing and the input to the stereo generator.

Their typical frequency response is +0/−0.1 dB, 30-15,000 Hz. The safety clippers in the existing processing are defeated as part of the installation procedure.

This card resides in the furthest left slot (slot #0). It is a fairly easy task to install an edge connector, card guides and minor wiring to the back-plane. No metal work is required.

When new 8100A/1s are ordered with the ACC-22, the card is factory-installed at no charge for installation.

Editor's note: For more information, contact Howard Mullinack at Orban: 415-957-1067.

Making a Good Thing Louder

by Robert Orban, CE
Orban Associates, Inc.

San Francisco CA ... In response to evolving user needs, Orban recently introduced the XT2 Six-Band Limiter Accessory Chassis for the Optimod-FM Model 8100A.

The 8100A/XT2 was designed for those stations that need a "louder" or more processed sound than that provided by a "stock" 8100A set up according to our recommendations. The XT2 provides the means to fine-tune the sound on-air through precise control of bass and treble sound texture, program density and program dynamics.

Further, the XT2's circuitry is fully integrated into the 8100A, avoiding the inevitable side-effects that result when outboard processors are added before the 8100A.

The XT2 is primarily applicable to high-energy contemporary music formats, although its ability to achieve improved consistency through "automatic equalization" makes it applicable to "gold" and even "beautiful" formats as well.

The XT2 is an accessory for any 8100A Optimod-FM. Functionally, it replaces the 8100A's high frequency limiter with a combined six-band limiter/multiband distortion-cancelled clipper system.

When the XT2 is in use, the 8100A's dual-band compressor is converted into a slow "hand-on-the-pot" AGC amplifier to ride gain ahead of the XT2 so that the desired amount of six-band limiting (and the resulting increase in density) can be consistently maintained.

Control flexibility

The XT2 gives the station's engineer a wide variety of user controls:

Density determines the input drive level to the six-band limiter, to vary the sound from open and transparent to solid and dense.

Clipping adjusts the drive level into the multiband clippers, determining the loudness/distortion tradeoff.

Bass EQ provides up to 10 dB peaking boost at 65 Hz with a bandwidth of

(continued on page 32)

Model X Saves Signal Integrity

by Dale Schiesser, CE
Hicks Broadcasting

Battle Creek MI ... What can you do when the general manager says he wants a "louder, fuller sound" and there is no unused range on your modulation monitor's meter?

Well, you have already compressed and limited your audio to get as much RMS energy as possible. You know any more will only degrade the original musical dynamics.

User Report

Besides, you've got all the processing you can stomach. You've got to keep the noise content of that RMS energy down as low as possible.

The Wilkinson Model X exciter can do just that.

All of the equipment in the audio chain at WKFR was at least 10 years old and in need of attention. We went through each stage and repaired or replaced equipment in order to get a good quality signal.

When we reached the final stage and found our exciter was not going to do the job, we went shopping.

I was impressed with the Wilkinson specs for FM SNR and composite THD, TIM and IMD—90 dB and 0.01% respectively.

The GM, however, cares not for specifications and wanted to *hear* the difference. The sales manager at Wilkinson was so confident of his product that he let us try it out.

Upon installing the X model, I was impressed with its external power supply and five SCA inputs.

All adjustments are made at the front panel, which includes a LED modulation meter and RF and audio test point outputs.

The final output is adjustable up to 30 W and automatically compensates for any change in output impedance. Internally, its design is modular and its frequency is programmable in 2.5 kHz steps and fine tuned on the front panel. All modules can be easily removed or opened.

All intermodule wiring and connections, as well as circuit boards, are very accessible. All controls can be operated remotely, and the power supply comes complete with an external relay to operate associated equipment.

Since the exciter operates on 28 VDC and is adjustable up to 30 W, it could easily be used as a standby transmitter.

After the exciter had been in service a few weeks, I noticed that the operating frequency was fluctuating too close to limits for comfort.

I contacted Wilkinson and the factory shipped a new synthesizer module out overnight. It was a breeze to install. The people at Wilkinson were very helpful. We have had no problems since.

The GM likes what he hears, and especially likes the X model's five-year warranty. I'm sure he believes it is money well spent.

With all of today's digital audio sources and processing equipment, the Wilkinson Model X FM exciter has the frequency response, distortion and S/N characteristics to ensure the integrity of your signal.

Editor's note: For more information, contact Bill Kitchen at TTC/Wilkinson: 303-465-4141. The author may be reached at 616-964-7174.

Buyers Guide

Orban Offers Six-Band Limiter

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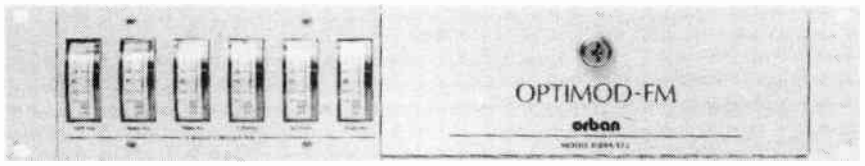
approximately one octave. This equalizer can produce solid "sock" or "punch" without exciting the midbass dashboard resonances found in many cars.

Presence boosts the 3.7 kHz band up to 6 dB, controlling upper midrange balances.

Brilliance boosts the 10 kHz band up to 6 dB, increasing the "air" and "transparency" in the program. Its effect is sonically similar to a "psychoacoustic exciter."

Both HF equalizers use a special curve shape with 18 dB/octave slopes to ensure minimum interaction between bands.



Orban Optimod-FM Model 8100A/XT2 Limiter

Need for multiband processing

"Spectral gain intermodulation" refers to an audible change in loudness in one part of the frequency spectrum due to dominant energy in another part. A classic example is audible pumping of the midrange and highs by heavy bass transients in a wideband compressor or limiter.

The faster an AGC system operates, the more it is subject to spectral gain intermodulation effects. The 8100A was originally designed to be operated relatively slowly and to produce an output that was reasonably faithful to the input signal. In this mode of operation, the 8100A's dual-band compressor is free from audible spectral gain intermodulation.

However, the 8100A was not designed to be used as a fast density-increasing processor following other compression.

Although the 8100A acquits itself surprisingly well in most cases, certain music produces audible and offensive spectral gain intermodulation under these conditions; two bands are simply not enough to avoid the problem.

In these circumstances, no amount of tinkering with time constants or other parameters can compensate for the failure of energy in one band to psychoacoustically mask the large, quick gain changes occurring in the other band.

This is the justification for the use of six bands in the XT2. Each band can operate quickly to increase density as desired, while each band processes only a fraction of the spectrum to avoid spectral gain intermodulation.

Most importantly, there is no wideband or dual-band gain reduction after the XT2 to introduce spectral gain intermodulation and to negate the XT2's advantages!

"Integrated" multiband processing

Placing the XT2 *after* the slowed-down 8100A AGC is radically different than placing a three- or four-band compressor in front of the 8100A system.

When the latter is done, it is necessary to use the 8100A's dual-band compressor to compensate for crossover buildup and other errors. If the output of such a three- or four-band compressor were merely applied to a clipping system directly, these errors would prevent the clipper from being driven hard enough to produce competitive loudness, lest certain program material produce egregious distortion.

The XT2's multiband distortion-cancelled clipper solves this problem. It is an extra peak-controlling stage located between the six bands of gain reduction and the final peak-controlling clipping system.

Thus, no additional gain-reduction stage is required to control clipping distortion, and "spectral gain intermodulation" is radically reduced by comparison to a system that places its multiband processing *before* the 8100A.

Some have tried placing *wideband* compression ahead of the 8100A. However, this achieves little by comparison to the "integrated" six-band approach.

If the wideband compressor is operated slowly enough to avoid introducing spectral gain intermodulation, it cannot increase density and serves only to very slowly gain-ride ahead of the 8100A. But the 8100A's dual-band compressor is quite capable of subtle gain-riding without external compression!

If the 8100A's dual-band compressor (following external wideband compression) is speeded up in an attempt to aggressively increase loudness and density, it can then introduce audible spectral gain intermodulation itself. The desired density increase is thus far more effectively and subtly achieved by the full integrated six-band system.

This system has yet another advantage. Because live voice concentrates its energy in only a few of the XT2's bands, peak voice levels out of the XT2 are lower than they are out of the 8100A's dual-band compressor for a given music level.

When the XT2 and "outboard compressor prior to 8100A" systems are adjusted for equal on-air music levels, the XT2 processing will clip voice less than the latter system and voice will sound substantially cleaner on the air.

Significant difference

The XT2 differs from its predecessor, the XT, in two important ways.

First, to increase user control over sound texture, the XT2 adds 3.7 kHz and 10 kHz high frequency equalizers to the XT's 65 Hz peaking bass equalizer.

Second, the control circuitry in the high frequency bands has been refined to improve the system's high frequency power-handling capability: less high frequency limiting is now produced and the system can sound significantly brighter with program material having substantial high frequency content.

This is done simply by applying both the band 5 and band 6 VCA gain control voltages from the band 5 VCA control circuit. Despite the reduction in HF limiting, the multiband distortion-cancelled clipping system prevents sibilance "spitting" and other offensive high frequency distortion even with large amounts of high frequency EQ.

While experimenting with the XT2 system, we discovered that playing off the 8100A's Release Time control against the XT2's Density control can produce significant audible benefits.

We originally recommended that the 8100A's Release Time control be set very slow ("8") to produce virtually no increase in density. However, if its Release Time control is set between about "4" and "6," the 8100A can moderately and

(continued on next page)

Buyers Guide

FME-30L Boasts Standard Parts

by Lewis Page, E. Reg'l Sales Mgr
Larcan Communications Equipment, Inc.

Laurel MD ... Larcan Communications Equipment's new solid state FM exciter Type FME-30L operates at 30 W power output with Larcan FM transmitters and existing FM transmitters.

The output amplifier of the exciter is broadband, requires no tuning and is convection cooled, thus requiring no cooling fans.

In addition to the normal 600 ohm balanced mono input, the exciter has three wideband 100K ohm inputs to accept signals from a stereo generator and two SCA generators.

All Routine on-air adjustments are screwdriver adjustable from the front panel.

The modulator employs direct frequency modulation and PLL circuitry, ensuring superior performance and simplicity of operation. An ultra-linear VCO is used to provide very low levels of intermodulation of baseband frequency components for excellent stereo and SCA performance.

The modulator output is fed to a 30 W broadband, solid-state, two-stage power amplifier. The input stage is a thin-film integrated circuit amplifier operating class A and requires no tuning or adjustments.

The output stage is a single-transistor stage operating class C, and also requires no tuning. The exciter output power is continuously adjustable from 0 to 30 W. A harmonic filter is provided to reduce harmonics and other out-of-band spurious emissions.

A strip line bidirectional coupler, located at the power amplifier output, samples both forward and reflected RF power. After detection, these RF samples are applied to the control board and used for AGC control, VSWR protection and power metering.

The power supply is a conventional linear supply employing a ferro-resonant transformer to maintain a constant output voltage over large fluctuations of the input line voltage. The transformer has secondary windings, each of which is rectified by a full-wave bridge rectifier and filtered to provide the various DC voltages required by the exciter.

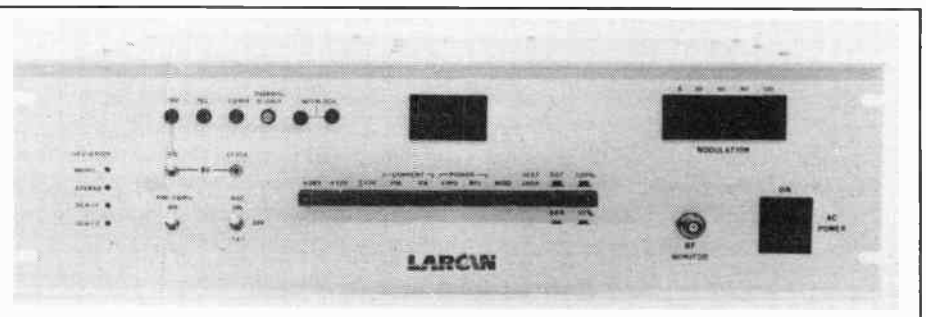
All important operating parameters are monitored and displayed on a digital meter built into the exciter. The digital meter, in conjunction with a pushbutton selector switch, can display: driver and output amplifier DC current; power supply voltages; forward power; reflected power; modulation levels; and DC voltages selected by a floating lead

An additional bar-dot meter provides a continuous indication of modulation.

The exciter, which is 5¼" high (3 RU) and designed for easy maintenance and service, is mounted on slides in Larcan FM transmitters, providing excellent accessibility.

The simplicity of design and the use of standard, readily available components enhances its serviceability.

Editor's note: For more information, contact the author at Larcan Communications: 301-490-6800.



Larcan FM Exciter Model FME-30L

Orban XT2

(continued from previous page)
subtly increase density prior to the XT2 without introducing audible spectral gain intermodulation.

The XT2's Density control (which determines the amount of gain reduction in the six-band limiter) can then be backed off so that 5 dB (or less) gain reduction is produced in the middle bands, achieving a more open, less dense sound while not compromising loudness or consistency.

Editor's note: For more information, contact the author or Howard Mullinack at Orban: 415-957-1067.

Buyers Guide

Harris Quells Transmitter Panic

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Two sample loop connections are provided for, as well as an RF output indicator with forward and VSWR readings. In areas where icing is an expected occurrence, the FM 25K has VSWR foldback, which lowers the power in the transmission line to a safe value until the VSWR problem is cleared.

RF power control of the transmitter, either manual or automatic, is accomplished by varying the screen voltage of the PA through a motor driven variac setup. Automatic power control maintains your preset power level to 2%-4%, depending upon window selection.

The control circuitry is located on two printed circuit boards accessed through a fold-down front panel on the transmitter. One circuit board is mainly assigned to logic and timing; the other to analog interface. Extender boards are also provided for ease in troubleshooting.

Part of the control circuitry is the interlock system. This includes air, fault, transmitter cabinet, high voltage cabinet and external. This interlock is extremely effective.

First, the plate contactors are opened. Then, a "crow-bar" solenoid drops on the high voltage mechanically. It is guaranteed to wake you when you are servicing the transmitter at 2 AM and you open an interlock. An LED display tells you which interlock has been activated.

Several parameters are monitored by the overload system and displayed by front panel LEDs. This includes exciter AFC loop unlock, IPA VSWR, PA VSWR, PA screen and PA plate. Also provided is a port for an external overload. During an overload, the transmitter attempts to reset itself one or three times, depending upon internal jumper selection.

> *"The control circuitry is located on two printed circuit boards accessed through a fold-down front panel."*

Remote control hookup is fairly easy. Terminal strips are provided for standard remote hookup or, for those who want more diagnostic data, a multipin connector is provided, which includes not only the standard remote functions and indications, but the status diagnostic display data as well.

Other displays include metering of PA plate voltage and current, multimeter selection of PA filament, PA grid bias voltage, PA screen voltage and current.

Other hidden niceties are:

- Power line phase monitoring. The loss of any phase shuts the transmitter off until the phase is restored;
- Continuous running of the blower to cool off the PA tube for a predetermined time, even though the "filament off" command is given;
- For simplicity to operators, when "plate on" is commanded, the transmitter will be cycled to a full on condition (bring on the filaments and time out the high voltage delay).

(continued on next page)

Buyers Briefs

CCA Endorses New Eimac Tube

The response from CCA Electronics' customers has been very favorable to Eimac's new YC-121 tube (an improved version of the 3CX20000A7). One customer reported that he has exceeded 10,000 hours of operation at 28 kW.

The 3CX20000A7 had been the cause of problems for CCA's broadcast customers. Their main complaint had been the short life span of the tube. Eimac's improvement of the anoide has eliminated this longstanding problem. CCA is now using this tube and recommends it highly.

For more information on the YC-121 tube, contact Reid Brandon at Eimac: 415-592-1221.

Elcom Bauer

Elcom Bauer, a manufacturer of FM and AM transmitters, recently introduced the Model 690B FM exciter. The exciter is fully synthesized and broadbanded for operation on the 88-108 MHz band.

It utilizes the same circuitry introduced in the more expensive Model 6020 exciter, thus offering broadcasters an economy version with excellent performance specifications.

The Model 690B FM exciter has distortion less than 0.08%.

Elcom-Bauer also offers "ET," an emergency FM transmitter that can serve as a fast backup for any station that is operating in a multistation facility.

ET provides 300 W of broadband output at virtually any FM frequency. Operation is simple; it works as soon as the AC cord, audio and antenna are plugged in.

The ET comes in its own rugged, portable case and weighs in at only 85 lbs. Cost of the emergency transmitter starts at $8,650, depending on power level and exciter options.

For more information, contact Paul Gregg at Elcom Bauer: 916-381-3750.

Harris 25K Exceeds Specs

(continued from previous page)

Documentation by Harris is complete. Two technical books are provided, one on the MX-15 exciter and one on the transmitter itself.

Factory test data and settings also are included. The factory data came in handy at one installation in which the moving crew had "tightened" all the loose handles on the transmitter.

Installation aids

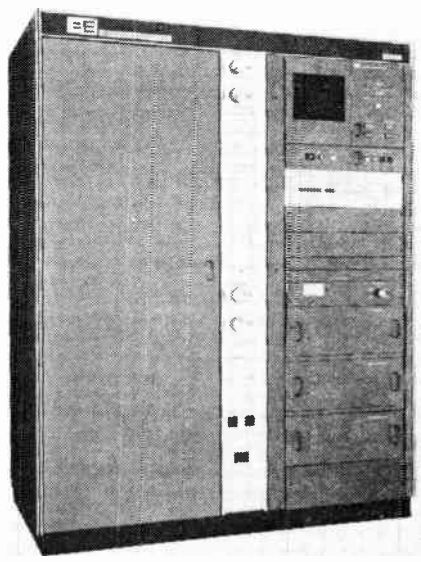
To overcome any apprehension, I suggest you take advantage of three things offered by Harris:

- Visit Quincy and get to see your transmitter on test. That's the time to ask questions on how it goes together.
- The Harris training seminar is 4½ days of learning. I suggest this seminar even if you don't have a Harris transmitter. Since sending our engineers to the Harris class, our down time has been cut by 90%, with the right part being diagnosed as faulty. The cost of Federal Express charges can easily justify the training class.
- The Harris support group is available 24 hours a day. We have found this to include parts and technical information.

We have found the FM 25K to be a reliable transmitter. Tuning is easy. Troubleshooting is accomplished with little difficulty because of the "tools" provided by Harris.

The 25K transmitter meets its performance specifications without any doubt and plenty of margin.

Editor's note: For more information, contact Joe De Angelo at Harris: 217-222-8200. The author may be reached at 919-734-8000.



Broadcast Electronics FM-35A

Broadcast Electronics has begun delivery of its new model FM-35A single-tube FM transmitter. The FM-35A features a rated output of 35-38 kW and incorporates a patented folded half-wave output cavity, an optional MVDS (Microprocessor Video Diagnostic System), modular slide-out IPAs, a modular automatic power control and an ultra-quiet air-cooling system.

Foremost among the unique features of the FM-35A is its single-tube PA design. The FM-35A uses one Eimac 4CX-20000C tetrode to produce full RF output on any frequency between 87.5-108 MHz.

The 4CX20000C is fundamentally identical to the 4CX20000A/8990 with the exception of its higher anode voltage rating. It features the highest emission capability and the largest physical size of any tube in the Eimac 20000 family. This translates into longer operating life and overall durability in the FM-35A.

A new grid circuit in the FM-35A design takes advantage of the power gain capability of the Eimac tetrode while providing maximum signal bandwidth.

Installation or removal of the power tube can be performed from the front of the transmitter, and is easily accomplished within minutes. With the FM-35A's broadband screen neutralizing technique, neutralization readjustment is normally unnecessary when changing tubes.

For more information, contact Bill Harland at Broadcast Electronics: 217-224-9600.

FREQUENCY RANGE: 87.5 to 108 MHz., tuned to specific operating frequency. Exciter programmable in 10 kHz. steps.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request)
OUTPUT CONNECTOR: 3 1/8 inch EIA flange
VSWR: 1.8:1 maximum. (will operate into higher VSWR with automatic power reduction.
FREQUENCY STABILITY: ±300 Hz., 0 to 50 Degrees C.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, model FX-30; incorporating a digitally programmed synthesizer. (10 kHz. increments)
PRE-EMPHASIS: FCC 75 uS, CCIR 50 uS (where specified) or 25 uS (Dolby)
ASYNCHRONOUS AM S/N Ratio: 55 dB below reference carrier with 100% AM modulation @ 400 Hz., 75 uS de-emphasis. (no FM modulation present)
SYNCHRONOUS AM S/N RATIO: 45 dB below 35 kW reference carrier with 100% AM modulation @ 400 Hz., 75 uS de-emphasis. (FM modulation ± 75 kHz. @ 400 Hz.)
TUBE COMPLEMENT: (1) 4CX20,000C
RF HARMONICS: Suppression meets all FCC/DOC requirements and CCIR recommendations.

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The DYNAMAX® family of cartridge machines

New models, good looking, great listening

Thirty years of experience is working for you. In 1954, Fidelipac invented the endless loop tape cartridge, and we've been in the business ever since. We've focused our experience to develop a complete line of innovative, state-of-the-art cartridge machines.

CTR100 Series

The ultimate cartridge machine. You can intermix standard, high output, mono, stereo, matrix and discrete format cartridges using our Cartscan™ system. Even warn a jock to read live tags or automatically turn on external functions. Create special effects with Vary Speed. Time carts with ease, even in fast forward, with our real time digital clock. Other features include DC servo motor. Blackout status display. Splice finder. On-board diagnostics. SMPTE time code compatibility. Phase correcting matrix system. Optional Maxtrax® format. And audio you'd never expect from a cart machine.

CTR10 Series

Our idea of basic utility. 3 cue tones. Automatic fast forward. Audio search. Audio switcher and mixer. 1 kHz defeat. Constant current recording. Low voltage 2-inch air damped solenoid. Ball-bearing self aligning pressure roller. Azimuth independent head bridge assembly. Superb audio.

CTR30 Series

A 3-Deck that records. The recording system is standard, and the complete unit is priced below most play-only 3-decks. The CTR30 Series offers 3 cue tones, audio switcher and mixer, and a constant current recording system for the cleanest audio you'll ever put on a cartridge.

ESD10 Eraser/Splice Detector

Cleanest erasure ever! Dual constant current precision erase heads. No heat generating, tape stretching degaussing coils. Continuous duty operation. Reliable, adjustment-free, patented splice finding.

All you'll ever need

The inventor of the tape cartridge has invented a complete family of cartridge machines. Let our experience work for you. For more information, contact Fidelipac or your authorized DYNAMAX distributor.

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DYNAMAX products are designed and manufactured in the U.S.A.

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