NAB Convention Supplement See Section B

Radio World®

NAB Convention Supplement See Section B

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No Support for Multimode

by Alex Zavistovich

Washington DC ... In the wake of the National Telecommunications and Information Administration (NTIA) decision to test the "technical viability" of multmode AM stereo chips, receiver manufacturers have spoken out against the dual system concept.

And, in at least one case, the NTIA report has had no impact—Sony Corporation, which had been an advocate of multisystem technology, announced that it will abandon its line of automobile AM stereo products.

In mid-February the NTIA released a report on the state of AM radio, which skirted the choice between the Motorola C-QUAM and Kahn ISB AM stereo systems as a de facto standard in the AM stereo market.

The study instead held that more research should be done in the area of multisystem chips and increased receiver compatibility for the systems.

NTIA spokesperson R. T. Gregg said the decision to give multisystem technology further study was made because "we'd like to explore all the possibilities before we decide to foreclose on the dual (AM stereo system) track."

Gregg noted that "there have been a number of allegations and counter-allegations about possible signal degradation" resulting from multisystem technology. To determine the validity of those allegations, the NTIA's Institute for Telecommunications Sciences in Boulder, CO will launch a 90-day study of multimode chips.

The NTIA said it received responses from 26 receiver manufacturers on the issue of multisystem chips. Out of those responding, Gregg said, only one indicated it would not *consider* producing a multimode receiver.

Gregg declined to give the names of the manufacturers contacted by the NTIA.

The two remaining AM stereo competitiors—Motorola and Kahn Communications—have agreed to participate in the NTIA study. Sanyo, which has developed a multisystem chip, has also been contacted.

Despite the NTIA report's contention that a large number of receiver manufacturers would still consider the issue of multimode receivers, companies contacted by **RW** indicated they have little enthusiasm for the concept.

In at least one case, a manufacturer has a gloomy forecast not only for a multimode plan, but for the future of AM stereo. According to Sony National Sales Manager for Automotive Entertainment systems Matt Frankel, his company has decided to "phase out of" automobile AM stereo in the US because of "lack of sales."

"There is no market for (AM stereo)," Frankel said. He added that, although a number of manufacturers have tried to merchandise the receivers, "no one has been successful."

Frankel maintained that Sony has been "the last holdout" in multisystem automobile AM stereo, but that the company's non-AM stereo model has been outselling its counterpart "by 100 to 1."

"Sony will not be bringing (car AM stereo products) into the US anymore," he commented.

Lack of demand for the technology has also prompted other receiver manufacturers to stop offering AM stereo merchandise.

Sansui Electronics spokesperson Arnold Singer said Sansui is no longer including AM stereo in its new products. The company in late 1985 introduced its own multichip technology for car and home audio equipment, he said.

Since then, he said, Sansui has reduced its inventory of AM stereo receivers to two older products: one car and one home audio receiver.

Sansui's decision to remove the AM stereo option from its new products was due to weak consumer demand, Singer maintained. The market was hurt by the absence of a single standard and "slow growth rate" of broadcasters moving to AM stereo, he said.

Singer had no comment to make about the NTIA's decision to pursue multichip technology, except to say, "if anything, it shows that Kahn is still doggedly in there."

Sanyo's National Merchandise Manager for Home Audio, Isaac Levy, noted that Sanyo dealers "have not, in general, been requesting AM stereo as a feature" in receivers. He noted that "AM stereo may not be where the market is."

Performance features most frequently

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Harris and Allied Sign Marketing Deal

Quincy IL ... The Harris Broadcast Division of Harris Corporation and Allied Broadcast Equipment have agreed on a new marketing arrangement which will allow each company to sell the other companies' products.

The agreement was announced on 2 March by Harris Broadcast.

The arrangement allows Allied, a distributor of a broad line of broadcast equipment, to also handle Harris AM and FM transmitters, exciters, audio consoles and STL microwave equipment.

It also allows Harris salesmen to sell products from other manufacturers now distributed through Allied, although exactly which products were involved was not available at press time.

The agreement is a dramatic departure in marketing for Harris, which up until now sold only direct through the firm's own national sales force.

See the 1 April issue of **RW** *for a closer look at the Harris-Allied agreement.*

Calls Rule Looked At

by David Hughes

Washington DC ... The FCC's policy of issuing broadcast station call letters starting with "W" in the eastern US and "K" calls in the west, may be eliminated.

In a rule proposal issued 4 February, the Commission said it may remove the "geographical restriction" for call letter assignments.

With a few noted exceptions such as Philadelphia's KYW, Pittsburgh's KDKA and KQV, Kansas City's WDAF and Ft. Worth's WBAP, the FCC uses the Mississippi River as the dividing line between K's and W's. If the plan is approved, K and W calls could be selected by stations anywhere in the US.

The FCC said that there is "no public interest justification for maintaining this geographic restriction" and it added that it had observed "no problems" in cases where waivers had been granted.

Reusable calls

However, in a potentially more controversial move, the Commission has also proposed ving the rules that prohibit the use of the same call letters by other stations owned by different parties.

The FCC said that its current rules allow only "commonly controlled stations

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Regulatory News

FM Boosters May Raise Power

by David Hughes

Washington DC ... FM stations may soon be able to increase the power of their FM booster facilities and feed them via microwave or satellite.

In a proposal issued 4 February, the FCC said it wants to permit FM boosters to be licensed to output powers of greater than the existing 10 W maximum limit, while also eliminating the restriction that they be fed only over-the-air from the original, full-power facility.

"These changes would provide opportunities for more efficient and effective use of on-channel FM ... facilities to provide service to underserved and unserved areas and populations," the Commission said.

Boosters vs. translators

FM boosters are employed in order to eliminate areas of poor coverage within a station's coverage area. According to the FCC, boosters operate with a 10 W power limit on the *same* carrier frequency as their parent station.

FM translators, on the other hand, are low-power FM (or TV) facilities that retransmit the received signal on a *different* frequency. They operate from 1 to 10 W, depending on their location.

In response to a 1986 request from Evansville, IN-based Brill Media Company, which owns five FMs and five AMs, the FCC said it has proposed allowing booster transmitter output power to exceed the 10 W limit.

"There are many parts of the country where there are terrain situations that create a gap in an FM station's coverage area," Brill Media Company President Alan Brill told **RW**. "A mountain could block adequate reception from an area."

Brill said that existing booster rules, which limit the maximum power to only 10 W, make it difficult to overcome the coverage gap problem. He added that boosters have an advantage over translators in that they broadcast on the same frequency as the original station and cause less confusion for listeners.

No interference created

The FCC maintained that "properly engineered boosters should be able to operate at increased power without expanding the predicted service contour of their primary FM station or causing more interference to other stations beyond that of their primary station."

The power hike proposal also calls for limiting booster power and service area "under a general requirement that the predicted 1 mV/m contour of such stations may not extend beyond the area covered by the 1 mV/m contour of the primary station," the Commission maintained.

Marcia Glauberman, of the FCC Mass Media Bureau's Policy and Rules Division, said the Commission will not set a specific maximum power limit for boosters.

Co-channel stations would be protected, the FCC added, by subjecting boosters to a requirement that the signal of any co-channel station must exceed the signal of the booster by 20 dB at all points within the protected contour of the co-channel station.

Brill stressed that the booster plan his firm suggested would not extend a station's coverage area beyond its predicted contours. "The plan would not expand the coverage area. It would just fill in coverage gaps," he said.

Satellite and microwave feeds

Brill Media Company also asked the FCC to allow boosters to be fed, as the FCC put it, "by whatever technical means the licensee wants, not just over the air."

FM translators, including boosters, have been restricted to rebroadcasting signals received directly off the air. However, TV translators can be fed via microwave or satellite feeds.

The FCC said in its proposal that FM licensees should have "full discretion to feed signals to boosters by whatever technical means they wish." It also proposed allowing stations to use aural broadcast auxiliary facilities on a secondary basis to relay signals to their booster facility.

Glauberman added that changes for FM translators were not addressed in this particular docket. However, the FCC in Docket MM 86-112 has proposed satellite and microwave feeds for non-commercial translators in response to a request from the Moody Bible Institute.

At **RW**'s press time, no comment or reply deadlines had been set. FCC docket number is MM 87-13. For more information contact Marcia Glauberman at the FCC, 202-632-6302, or Alan Brill at Brill Media Company, 812-423-6200.

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FCC Clips

Cuban List Available

The latest updated list of Cuban broadcasting stations is now available from the FCC.

The document features Cuban AM radio stations known to be operating—including their locations and powers. Data was gathered through off-air observations. Changes since previous lists are also indicated.

A copy of the list can be obtained by contacting Wilbur Thomas at International Transcription Services, 2100 M St. NW, Suite 140, Washington DC 20037, or by calling 202-857-3800. A fee will be charged.

For more information on the Cuban interference situation, contact Louis Stephens of the FCC Mass Media Bureau at 202-632-6955.

WARC Starts

Shortwave spectrum allocations will be the key topic during five weeks of meetings of the World Administrative Radio Conference (WARC), which got underway in Geneva, Switzerland, 2 February.

Sponsored by the International Telecommunications Union (ITU), the WARC session has attracted representatives from about 120 countries who will attempt to decide how to more effectively use the shortwave spectrum—3 to 30 MHz.

The existing shortwave broadcast bands are already severely crowded, forcing some nations to broadcast out of band on frequencies reserved for non-broadcast uses. One issue that will be explored involves stations converting from the current double sideband transmission to a single sideband system, which would result in greater spectrum efficiency.

The US is represented at the conference by the State Department, the National Telecommunications and Information Administration (NTIA) and the Voice of America. The FCC's representative is Jonathan David.

For more information contact the FCC's international branch at 202-632-6955.

New FCC OCPA Chief

Sarah Mott Lawrence, formerly special assistant to the director of the Office of Congressional and Public Affairs (OCPA), was named 9 February as the new chief of the News Media Division.

Before joining the FCC in 1983, Lawrence had served as executive assistant to the president of the US Synthetic Fuels Corporation, and before that as an energy policy analyst with GRC/National Journal.

For more information contact the FCC news media information office at 202-632-5050.

Station Totals

According to the Commission's broadcast station totals released in early February, there were 4867 AM stations and 5209 FM stations (1,263 were noncommercial).

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RF Levels Exceed Local Rules

by Alex Zavistovich

Washington DC ... Although results of a joint FCC/Environmental Protection Agency (EPA) survey of RF radiation levels in Portland, Oregon show levels considerably below the standard set by the American National Standards Institute (ANSI), local residents and physicians remain concerned.

The findings were summarized in a EPA-prepared report on the joint survey, which took place in late July 1986 at the Healy Heights broadcast antenna farm. The survey was prompted by a request from Portland residents and city officials.

Measurements were taken in Healy Heights, and two other nearby areas—Sylvan Heights and Mount Scott—according to Robert Cleveland, a physical scientist with the FCC's Office of Engineering and Technology (OET).

The main sources of RF radiation in the Healy Heights area were found to come from FM radio broadcast antennas.

Broad-and narrow-band measurements, made following the installation of a new FM antenna at the Healy Heights site, indicated that the highest power density anywhere in the area was less than 700 $\mu W/cm^2$. An area open to the public near the base of the broadcast tower showed a contour of 500 $\mu W/cm^2$, the study indicated.

The ANSI RF protection guide recommends a limit of 1,000 $\mu W/cm^2$. This guideline is used by the FCC in "evaluating" environmental impact with respect to RF radiation, the FCC noted.

Approaching local standards

Measurements made inside homes near the antenna farm registered maximum levels near 200 $\mu W/cm^2$, the study indicated, but "typical levels" were below 100 $\mu W/cm^2$. Readings in some other residential areas were below 40 $\mu W/cm^2$.

The FCC acknowledged that, while the readings were below the ANSI guidelines, some of the data "may approach or exceed" local standards, which range from 100 to 200 $\mu W/cm^2$.

Bill Conley, a member of the Southwest Hills Residential League, which had requested the survey, said the findings confirmed his apprehensions of significant increases in general densities in the area. He pointed out that 200 $\mu W/cm^2$ is the RF radiation limit set by Multnomah County, in which Portland is located.

Biological effects cited

The reported RF levels in Healy Heights "remain of concern to people who live in the area," according to Dr. Bill Morton, of the Oregon Health Sciences University.

Morton, a professor of environmental medicine, told **RW** that there is a "growing amount of evidence" of the harmful biological effects of RF radiation.

"The medical community in this country is hampered by a lack of support" in the study of nonionizing radiation, Morton said. He added, however, that some effects have been established.

Morton indicated that "asthenia"—a general condition characterized by headache, lassitude and faintness—has been known to be caused by exposure to high levels of energy from a variety of sources.

The condition is a "recognized cause of compensable occupational disability in the Soviet Union," he added.

RF radiation may also affect tissue growth in situations where tissue is developing rapidly, such as fetal development, or is out of control, as in cancer, he said.

Morton maintained that the ANSI standard "is not regarded as a valid guideline for limits of safe exposure," and that citing the standard as a "cause for pleasure" over RF levels "is not particularly reassuring."

Exclusion from RF evaluation

In other news, the FCC on 12 February moved to categorically exclude some FCC-regulated services and facilities from RF radiation evaluation, although radio broadcast stations are not among them.

The Commission held there was "no evidence of excessive RF radiation exposure during routine and normal operation of land-mobile and fixed communication services."

The services include cellular radio, microwave point-to-point radio, and most auxiliary broadcast services.

Services and facilities which will not be excluded from evaluation include experimental broadcast stations, satellite communications facilities, and radio and television broadcast facilities.

Experimental and developmental broadcast stations and low-power television stations are also not exempt from RF evaluation, the FCC said.

Applications for facilities excluded under the Commission's decision will not be required to include information on RF radiation exposure, Cleveland said.

FCC docket number for categorical exclusion in GEN 79-144. For additional information on it or the Portland survey, contact Robert Cleveland at 202-653-8169.

New FM Band Studied

by David Hughes

Washington DC ... The FCC and the National Telecommunications and Information Administration (NTIA) are studying the "FM2" proposal that would create a second FM band to be used by AM daytimers.

According to Larry Roberts, the Washington DC attorney who represents Radio New Jersey (RNJ), which submitted the plan to the FCC last November, the Commission's Office of Engineering and Technology (OET) and the NTIA are examining the feasibility of creating a second FM band that could be used by AM daytimers.

"They definitely are interested in it," said Roberts, who added that the FCC was still deciding whether to issue a rulemaking proposal on the plan. "We'll probably hear a decision in the next few weeks," he added.

Aid for daytimers

RNJ, owner of WRNJ, a 2.5 kW daytimer in Hacketstown, NJ, asked the FCC to allow daytimers and fulltime AMers with poor nighttime signals to move to the 225-230 MHz portion of the FM band—the "FM2" band—and eventually discontinue their AM operations.

The affected stations would benefit by having fulltime operations on the FM2 band, while the AM stations that re-

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FCC Battling Pirate Stations

by **David Hughes**

Washington DC ... The FCC has recommended a fine for a Louisville, KY man who operated an illegal FM translator station. This is the Commission's latest action in its on-going battle to catch "pirate" broadcasters—those that operate without a license.

While US pirate broadcasters continue to be heard on the FM, AM and shortwave bands despite the FCC's constant attempts to track them down, the situation is not as bad as in other nations.

The 1987 edition of the *World Radio TV Handbook*, commonly referred to as the "Bible" for radio DXers, especially shortwave, reported that there were approximately 50 "unlicensed" AM and FM stations in Ireland.

In addition, France, Italy and England have all had their share of pirate broadcasters—some of whom operate full service, commercial stations in competition with the European state-backed radio networks.

However, in the US, with its extensive system of private, commercial stations, the pirate is said to be more often a "frustrated DJ" or a college student interested in electronics.

Louisville case

In January, the FCC notified Robert Baker, 20, of Louisville that he must pay a $750 administrative fine for operating an unlicensed FM station.

According to the Commission, Baker used a Zenith FM receiver, a graphic equalizer, broadband amplifier and a signal generator to receive station WSTO-FM, 96.1 MHz in Owensboro, KY, and rebroadcast it on 98.5 MHz.

Baker told **RW** that he calls himself a "two-wire technician"—someone who has had no formal radio station experience who "plays around with electronics."

He maintained that he had no idea that his homemade FM translator station was being relayed across Louisville.

Baker said that he listened to WSTO "quite a lot," but reception was only good on the radio in his bedroom. He could not receive the station well on his living room receiver. Therefore, he said, he decided to build a low-power relay on a different frequency to boost the signal into the next room.

"I didn't think it was being transmitted," Baker said, adding that he was surprised when the FCC paid a visit to his home.

Tip of iceberg

Commission officials concede that radio pirates who get caught are just the tip of the iceberg.

The vast majority of pirates, according to Jeff Young, an FCC engineer with the Enforcement Division, operate with very low powers or so sporadically—often one night a week, or for only a month or two at a time—that they are difficult to confirm and catch.

"Most pirates turn out to be frustrated DJs or college kids that want to get on the air and run their own station," he said.

Young maintained that the Commission nabs about 20 pirates a year. Although there are no firm figures as to how many US pirates there are, most sources agree that the number of pirates caught is a very small percentage of the total.

Pirates publicized

Several radio DX-oriented publications devote space to pirate broadcasters. *Popular Communications*, a monthly magazine, has a regular section entitled "Pirates Den—Focus On Free Radio Broadcasting."

Of the 11 pirates highlighted in the magazine's February issue, six broadcast on shortwave (most in the 7400 kHz range), four on AM (most in the 1600-1700 kHz range) and one on FM (in the educational band).

Station names ranged from WRIP/Rip Radio, Radio EXP, Zepplin Radio Worldwide, to WQO Radio and Radio Deadman.

Young conceeds that the public often does not report pirates to the FCC.

Pirates that operate on FM often are of such low powers that they cannot be heard by many people. "It is hard to judge how many FM pirates there are," he added. "Hundreds of FM (pirates) go unnoticed."

Many of the AM pirates broadcast above 1600 kHz—thereby avoiding the crowded band conditions and assuring that their weak signals have a relatively clear channel.

Pirates will generate complaints from the public, Young admitted, when they start interfering with existing broadcasters. Broadcasters will often strike against pirates when they find out that the pirate is selling commercials, or has "too professional" a sound.

Warnings, fines and jail

Those accused of operating an illegal broadcast station can get off with only a warning from the FCC. However, Young said that the Commission usually also recommends a fine—up to $2000.

That usually stops 95% of the pirates, Young said. However, if the pirate continues operating, the FCC will then turn the case over to a US attorney who will prosecute the violator according to the criminal code, Young said.

He added that the FCC cracks down especially hard on pirates who interfere with public safety services such as police and fire departments.

Apart from having equipment seized, the pirate ultimately can face a maximum penality of a year in jail and a $100,000 fine, according to Section 301 of the Communications Act.

While the radio pirate industry has remained relatively stable in recent years, Young predicted a growth in the number of TV pirates. He said plentiful VCRs and devices that relay a VCR's signal through a household can be modified to act as mini-TV transmitters.

For more information on the Baker case contact Russel Monie at the FCC's Chicago office: 312-353-0195. For more information of the FCC's anti-piracy rules, contact Jeff Young at 202-632-7014.

FCC May Change Rules on Station Call Letters

(continued from page 1)

in different broadcast services" to have similar call letters. For example, CBS owns KCBS-TV in Los Angeles, and KCBS-AM in San Francisco.

The proposed rule would allow an FM station in one part of the country to use a call sign also being used by an unrelated TV or AM station in another part of the country. Or, an AM station could use an FM or TV call being used elsewhere, regardless of who owned the FM or TV facility.

The Commission maintained that its current call sign policy results in the "reservation of many call signs for the exclusive use of owners of stations in multiple broadcast services and limits other owners from using those call signs in the same or different markets."

While it said that the rule was originally implemented in order to "prevent public confusion" as to who owned which stations, and to "prohibit one broadcaster from trading on the good will of another," the FCC said it now stressed that "this type of protection was not necessary or desirable."

However, the FCC said that if a station selected a call sign that was already in use in the same market, written consent would need to be obtained from the other station(s) using the call sign.

Such a situation recently occurred in the Hartford, CT, market when a UHF-TV station took the WTIC calls after receiving permission from WTIC-AM. The two stations have separate ownership.

NAB comments

While most broadcasters contacted by **RW** said they had not had time to study the Commission's proposal, NAB VP/Radio David Parnigoni said the plan to allow other parties to use a station's call letters may face stiff opposition from broadcasters.

He acknowleged there would be "serious problems" for the Commission to allow, for example, a corporation not related to NBC to use the WNBC-FM calls. NBC operates WNBC-AM and WNBC-TV in New York City, but does not use the WNBC-FM calls on its New York FMer, WYNY.

Parnigoni said that theoretically the FCC new plan would allow another company to use the WNBC-FM calls, and that company may use the calls for a station in nearby New Jersey or Connecticut, thereby confusing listeners and ratings services.

On the K/W issue, Parnigoni said apart from tradition, the plan would have little serious impact on broadcasters. However he stressed that the NAB, at press time, had yet to formulate a formal position on either call letter issue.

The FCC docket number is MM 87-11. At press time, no comment or reply dates had been set. For more information contact Sharon Briley at the FCC: 202-632-6302.

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).

Near-field methods questioned

Dear **RW:**

Frank S. Colligan's article, "Running a Proximity Analysis," **RW**, January 15, presents a misguided application of near field computations in the analysis of directional antenna measurement data.

Mr. Colligan's method of analysis is valid if and only if one condition holds true: that the directional array has been adjusted to produce exact theoretical radiation in all pertinent directions.

As any engineer experienced in the field adjustment of directional arrays knows, such a condition is seldom realized.

Under any other conditions, the use of the correction factors derived by Mr. Colligan is wholly inappropriate.

If actual radiation departs from theoretical values, operating parameters must have departed from theoretical values, as well. Consequently, the appropriate correction factors are expected to change.

The validity of this statement can be checked by computing the theoretical unattenuated (near) field radiation at hypothetical measuring distances, taking into account array geometry, for several small changes in theoretical parameters.

One method of checking the validity of the method of proximity analysis used is to construct the unattenuated "standard pattern radiation limit" field strength versus distance curve, plot actual measured field strength values on the same paper, and compare the measured data to the computed limit curve.

If the measured data falls consistently above the computed curve, yet numerical analysis suggests that radiation is below standard pattern limits, the correction factors employed are inappropriate.

The "standard pattern radiation limit" for each measurement point is computed readily.

First, the theoretical radiation at a point, taking into account full array geometry, is computed. That value is normalized by multiplying it by the point distance from the transmitter site.

The resultant value is substituted into Equation (2) of Section 73.150(b)(l)(i) and the equation of Section 73.152(c)(2)(ii) of the FCC Rules. That value is, finally, denormalized by dividing by the point distance to obtain the limit at each point.

Although the proliferation of small computers allows more in-depth analysis of antenna system behavior, the results are still no better than the engineering assumptions upon which programs are based.

Ability to compute values to eight significant digits is no substitute for sound fundamental reasoning. Acceptance of faulty methodology by an overworked and understaffed FCC is no justification for its repeated application.

Karl D. Lahm, P.E., VP
A.D. Ring & Associates, P.C.
Washington, DC

Frank Colligan will reply in the April 1 issue of **RW.**

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Tradeoff in Dallas

This year's NAB Convention promises to be bigger and better than ever, with more sessions planned, abundant exhibits and new technology, such as the NRSC preemphasis standard which will be the subject of an engineering demonstration.

Every engineer who can manage to take in all or part of the convention should do so.

This year, in an effort to make the task somewhat easier, the show has been expanded from three-and-a-half to four full days, with engineering sessions starting the day before the floor opens.

Unfortunately, the additional half-day, instead of being added to the Wednesday half-day, forced the convention to be pushed up to begin on Saturday and end on Tuesday. This means that half of the convention now falls on a weekend.

The decision to make this change seems to be more for the convenience of exhibitors than necessarily in the best interests of attendees.

While exhibitor concerns about additional union costs for weekend labor have been addressed, attendees may not care to give up an entire weekend for what is supposed to be "work."

The real question is whether the extra half day will draw better attendance, or will the fact that it now falls on a weekend cancel out any benefit?

Also, while the concern about extra costs for weekend labor is important, there are other matters that exhibitors would like to see resolved, such as better space allocation and questions of seniority.

Almost everyone leaves the NAB convention feeling that there was not enough time to accomplish as much as desired, and that added hours are needed.

And perhaps because the decision to extend the convention happened so late last year, the full day Saturday was the only workable solution.

But the NAB should see how much of a trade-off the Saturday-for-Wednesday change makes in the way of floor traffic, and if needed, reevaluate the schedule for next year's return to Las Vegas.

—RW

Guest Editorials: NTIA Report

Kahn: Pro Multimode

by Leonard Kahn

Westbury NY ... *We, at Kahn Communications, welcome the new Editor of* **Radio World**, *an old friend. We now look forward to improved relations.*

The NTIA (U. S. Department of Commerce) on February 10, 1987, took an action which literally has had repercussions around the world and is a major step in establishing freedom for all AM broadcasters.

The NTIA has now made it clear that Motorola is not the *de facto* standard in the United States, and that there is, and there will be, freedom of choice for broadcasters to pick the AM Stereo system that best serves their listeners.

This means, that what may be the most lavish and one-sided marketing effort ever directed at broadcasters, has failed, and Motorola must now face the reality of free competition.

The NTIA report also indicated that the only viable solution to the AM Stereo problem is the multisystem radio, that puts the choice of systems where it should be, in the hands of broadcasters.

Motorola is now left with one untenable argument, multisystem radios are not practical ... the Sony, Sanyo, Sansui and now Kenwood radios do not work.

Motorola will have as much success in arguing against the viability of multisystem radios as it has had in arguing that there is no such thing as 'Platform Motion', that its system does not create splatter, and that C-Quam does not degrade mono reception.

I have been receiving congratulatory calls ever since the NTIA announcement.

Some of these calls indicated surprise that Motorola is not in a favorable position. But, there is nothing so surprising about the situation. The true odds were never against us.

After all, Motorola was attempting to frustrate the laws of physics while we were only attempting to compete with large firms.

If there was any "Tilting at Windmills", I maintain it is by

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Payne: IC Not Needed

by Chris Payne

Washington DC ... Multisystem AM stereo ICs and receivers are nothing new.

The first AM stereo receivers which were offered to the marketplace were a form of "multi-system " (manually switched) and had 100 percent of the market for AM stereo receivers for almost a year. However, since that time the multi-system share of the AM stereo receiver market has plunged from 100 percent to now *less than 2 percent.*

C-QUAM only receivers now occupy *more than 98 percent* of the market with an estimated 8,000,000 receivers sold, and they are now selling at the rate of roughly 5,000,000 a year. Less than 100,000 multi-system designs of all kinds have been sold *in total* since their early head start.

Have you heard about the Sanyo multi-system chip? Have you been told that it's going to turn the AM stereo receiver market upside down? Why should it? Several manufacturers have offered multi-system chips and Sony's multi-system ICs have been available for several years now. Remember this?

"Sony's automatic switching ICs will lead to low cost receivers that will drive single-system receivers out of the marketplace" (From TV Digest paraphrasing Leonard Kahn's comments, December 24, 1984)

That was over two years ago, and since then the multi-system share of market has continued to decline. Remember, the vast majority of AM stereo receivers in the hands of the public are sold as part of a new car purchase.

All automobile manufacturers offering AM stereo produce C-QUAM receivers only. None provide multisystem receivers.

Is there something special about the Sanyo IC that is dramatically different than all of the previously offered multi-system ICs?

The answer is no. It is bigger, more expensive, doesn't work as well, requires significantly higher patent royalties than a single system approach, and its complexity is likely to preclude future high performance AM receiver developments. Furthermore, with about 80 percent of the U.S. AM stereo broadcasters using the C-QUAM system, (which now covers an estimated

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EXTRA

ALLIED BROADCASTER

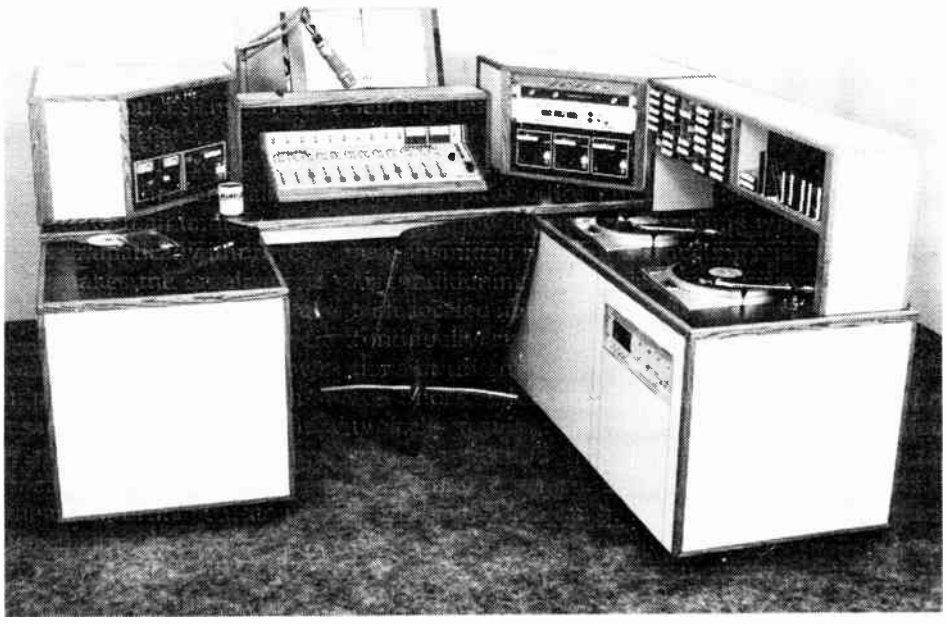
EXTRA

Vol. 1, No. 1 MARCH 1987 Late Edition

Allied Hits of 1987 NAB

Modulux Studio Cabinetry

An entire studio in just days



Modulux is built by Arrakis Systems exclusively for Allied Broadcast Equipment. Modulux gives you all the quality of custom-built cabinetry, at about half the price.

With Modulux your money goes for quality materials and construction, not for inefficient manufacturing methods. All panels are ¾" wood polyboard, permanently laminated on both sides at the factory and guaranteed *not* to de-laminate in the field. Access panels are securely attached, yet easily removed with quarter-turn fasteners.

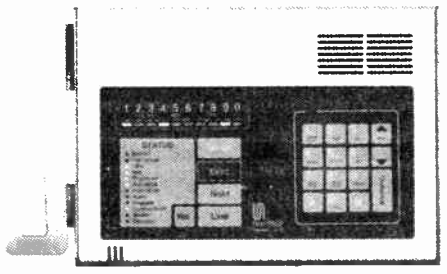
Shipped U.P.S., Modulux assembles fast and easy with just a few hand tools.

Modulux's .125 inch thick aluminum post and solid wood panel construction provides superior durability. No other cabinet - not even the most expensive - is stronger. Plus, the clean, classic styling and natural solid oak trim of Modulux cabinetry gives your studio a look visitors will admire and station personnel will appreciate.

We will have a complete, assembled Modulux Studio set up at the show. We really don't want to bring it back home with us - we'd rather *you* take it - for that reason we'll offer it at a super price!

There's A New Way To Spell Telephone

Telnox L-O



The last thing you want to worry about is your system. The Telnox L-O takes care of itself so you can get down to the business of broadcasting.

For years, broadcasters have been looking for a telephone system designed specifically for their industry. A system flexible enough to cope with the pressures and unpredictability of studio work.

The Telnox L-O is especially designed to meet your needs for on-air telephone talk shows and conferences. Compact and modular, the Telnox L-O accepts up to 10 lines and 8 consoles. Each console is portable, automatic, self-programmable and comes with an amazing range of possibilities.

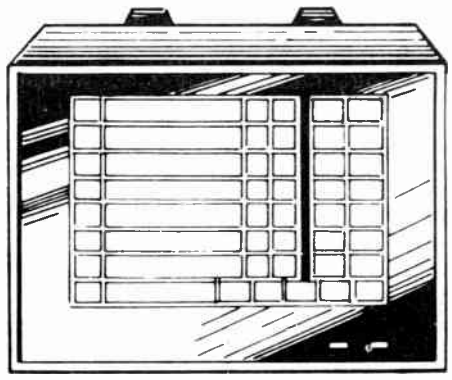
The Telnox L-O has not only resolved the problems that crop up with telephone broadcasting, it is shaping its future.

Touchstone

by Media Touch

Look. Touch. It's that simple! It puts programming control right at your fingertips.

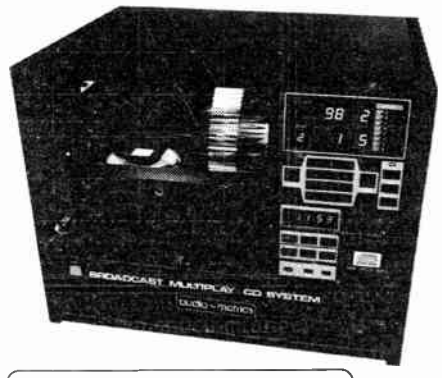
The Touchstone System reduces programming to its simplest elements, starting right in the announcer's booth. First, it puts your entire log on a computerized touch-sensitive screen.



Operating the Touchstone System is a simple matter of "Look and Touch." Announcers, producers, editors, engineers and any other users are guided through procedures via progressive menus. The system is so simple, users can be proficient within a few hours.

Allied has the Touchstone System by Media Touch in NAB Booth 3414 for your fingertip, hands-on enlightenment.

The Future Is Here Today!



audio~metrics

Programmable CD Player

This broadcast multiplay CD system is rugged, tried and professionally proven, with over 2,000 units in use. It is the ultimate tool for broadcasters.

Imagine 100 CDs under lock and key (that's 1,000+ songs), completely programmable to randomly select disc and cut. Not only that, but it cues to music. It's a dream come true for program directors who know the future is compact discs. The AMCDS-1000A is equipped with an on-board main microprocessor for system control and sub-microprocessor for CD playback operations.

Additional features include remote start capability, memory retention of selection being played in the event of a momentary power failure, and a bi-directional carousel for automatic rapid disc location.

We guarantee you'll be impressed! Come to Booth 3414.

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530k AM Spans Across Ocean

by David Hughes

Niagara Falls Ontario ... Radio listeners across North America, and as far away as Europe, have reported hearing a new 270 W AM station from Niagara Falls, Ontario.

The main reason CJFT's relatively weak signal carries so far is that it operates on 530 kHz, just below the end of the AM broadcast band.

Well, at least the station is just below the low end of the *US* AM broadcast band at 540 kHz. In *Canada*, 530 kHz is now part of the broadcast band, according to Bill McDougall, CE of CJFT, and co-owned CJRN, another AMer that operates from the same location.

"The Canadian government opened the frequency to broadcasters about a year ago," he said.

CJFT signed on in mid-1986. The station utilizes two towers of the 12-tower array used by CJRN.

Unlike the current US AM duopoly rules, Canadian rules permit two AM stations in the same market to have a common owner, McDougall said.

He told **RW** that CJFT, which partly relays CJRN's programming and partly generates its own, has been heard at night by listeners throughout the northeastern US and as far away as Washington state, Montana, and even Finland.

While 530 kHz is technically a clear channel, CJFT does receive co-channel interference from Travelers Information Service (TIS) stations which use the frequency.

Many airports and other facilities in the US operate very localized transmitters on 530 kHz (and 1610 kHz) to give parking and traffic conditions.

McDougall says a particular problem is the Toronto airport's TIS station which operates with 70 W on 530 kHz. "During quiet moments on CJFT, I can hear the Toronto station," he added.

His station has plans to request that the Toronto TIS station be moved to a different frequency, McDougall maintained, thereby allowing CJFT to increase its power to 1 kW. "But that is about a high as they'll let us get."

That is because, while 530 kHz is more-or-less wide open to broadcasters in Canada, interference considerations to stations on 540 kHz must be taken into consideration. Canada has four stations operating on 540 kHz including 50 kW day/10 kW nights CJSB in Ottawa.

Because of the interference potential to stations on 540 kHz, McDougall said that there will probably be only a handful of new Canadian stations joining CJFT on 530 kHz.

For more information on CJFT's operations, contact Bill McDougall at 416-356-6710.

Multimode Radios Lack Supporters

(continued from page 1)

requested by Sanyo dealers include "power and flexibility," Levy said. He suggested that AM stereo "is not a priority item. If it were, there would have been much more action on it by now."

"It may be revolutionary, but it is not in demand," he said.

Although some receiver manufacturers were disenchanted with AM stereo as a whole, others expressed doubts only of the workability of multisystem receivers.

Delco staff engineer for electronic design, Bill Gilbert, was skeptical about the NTIA's testing of multisystem chips. Delco, which maunfacturers C-QUAM AM stereo receivers for automobile use, "has not yet seen a performance- and cost-effective multi-system solution" to the AM stereo dilemma, he said.

"To decode both systems in the same set of circuitry," Gilbert commented, "you would have to compromise each system."

Gilbert also indicated that there are a number of considerations in automobile radio design which do not come into play in home audio, such as blending back to mono.

Another car AM stereo receiver manufacturer, Chrylser Corporation, was also against the notion of multimode systems. Frank Andrews, the company's manager of radio production, design, and development, said he would recommend that Chrysler not convert its C-QUAM receivers to multisystem design.

Added costs and increased probability of system malfunction due to "falsing," or incorrect system identification, were cited by Andrews as reasons to avoid multimode design.

"I don't see that the world needs both (ISB and C-QUAM) standards," he maintained. Andrews added that, "this far out of the starting gate, it would take quite a bit to convince me there is a need for multisystem receivers."

For more information, contact R. T. Gregg at the NTIA: 202-377-1551. Contact Arnold Singer for Sansui: 212-302-5500 or Matt Frankel at Sony: 201-930-6463. Contact Frank Andrews at Chrysler: 205-895-1884 or Bill Gilbert at Delco: 317-451-7275, or Isaac Levy at Sanyo: 213-537-5830.

FM2 Band Under Study

(continued from page 3)

mained behind would face less band clutter, RNJ contended.

The NTIA in mid-February recommended that the FCC issue a Notice of Inquiry on the FM2 proposal, according to R.T. Gregg, an NTIA spokesperson. "We believe that attention should be given to the idea," he said.

One key issue the FCC is examining, Roberts maintained, is whether the plan to reallocate that band segment, which is just above TV channel 13, for FM broadcast would displace existing users on those frequencies.

Military users

A major user of the band is the military, Roberts added. "While the frequencies are not heavily used, the military does guard its (allocated) frequencies."

Ray LaForge, a senior electrical engineer with the FCC's OET, said the Commission's reaction to the FM2 plan—whether it dismisses the proposal or places it up for public comment—is currently "in a hold" pending a determination of whether the government's "classified usage" of the frequencies can be reallocated.

"Right now, it's all still a question mark," LaForge said.

Roberts added that the FCC has asked for comments on a plan to reallocate frequencies adjacent to the FM2 band, in the 220-225 MHz range—for land mobile and amateur services. "We (RNJ) may file comments on that issue," he added.

For more information on the FM2 proposal, contact Larry Roberts at 202-659-4700, or RNJ President Larry Tighe at 201-659-4700.

Services Seek Lower SCA Fees

by Alex Zavistovich

Washington DC ... The FCC is asking for comment on a proposal that would require noncommercial FM licensees to allow radio reading services to use their subcarrier capacity on an "incremental cost justified basis."

The inquiry was sparked by a petition for rulemaking filed in May 1986 by the Association of Radio Reading Services (ARRS), according to Barbara Kreisman, chief of the FCC Mass Media Bureau's Legal Branch.

According to the FCC, the ARRS petition held that "allowing public radio stations to use subsidiary channels for remunerative puposes has had unanticipated negative effects on reading services for the visually impaired."

The ARRS had complained that many reading services disagree with their sponsor stations over "allegedly improper charges," the FCC said.

The group also maintained that the Commission has no guidelines for appropriate charges for the services, Kreisman said, and that there was "great variance" in the charges.

Limited protection

The Commission noted that the ARRS requested rule amendments because the present rules provide "only limited protection to radio reading services."

In its petition, the ARRS proposed having public radio stations carry reading services on request on one of their subsidiary channels.

According to the FCC, the ARRS "believes this would reverse the allegedly negative effects the current rule has on radio services, while preserving the ability of public stations to use their subcarrier capacity for remunerative purposes."

The ARRS also contended that the suggested amendment would "impose a duty on reading services to pay incremental costs added to station operation," while assuring that the radio reading services are being fairly charged.

In a 3 February memorandum opinion and order, however, the FCC said that ARRS "has provided little evidence that allowing public radio stations to use their subsidiary channels for remunerative purposes has adversely affected reading services."

The Commission also opposed the ARRS's suggestion that reading services have mandatory access to public radio subcarriers, citing the fact that a "significant number" of the services are already carried on public radio subsidiary channels.

Great disparity

Still, the FCC held, "there appears ... to be a great disparity among stations in the amount of the charges imposed on the reading services."

Comments have been requested by the Commission as to why the disparity exists and whether it would be resolved if the Commission required stations to use a particular method in determining costs.

Kreisman noted that the issue of incremental costs was "of great concern" the reading services.

At press time, the FCC's deadline for filing comments was 12 March; reply comments are due by 27 March.

FCC docket is MM 87-9. For additional information, contact Barbara Kreisman or Freda Lippert Thyden at the FCC: 202-632-7792.

Kahn ISB

(continued from page 5)

those who ignore the reality of mathematics and physics.

There can be no more ludicrous "tilting" than ignoring "Mother Nature."

The cold objectivity and inevitability of the cruel U.S. marketplace, and the probing thoroughness of the full scale tests now being conducted in Japan, means that Motorola will be forced to face the certainty of failure. There is no way to force the public to stay tuned to bad signals.

This is an excellent time for broadcast engineers to revisit the subject of AM stereo with management.

With the advent of multisystem AM stereo receivers, there is no valid argument for not implementing the system that best serves both your present listeners in mono and future listeners with new QUALITY AM stereo receivers.

See you at the show.

Leonard Kahn is president of Kahn Communications. He can be reached at 516-222-2221.

C-QUAM

(continued from page 5)

92 percent of the U.S. population) ... who needs it?

Motorola will be providing the NTIA with additional information, it apparently did not previously have, including drawbacks of multi-system receivers.

We close with a quote from a long term AM stereo participant, Leonard Kahn:

"Multi-system receivers, like all products will follow normal market demand. They will serve an important short term function, but once the best system drives out the poorer systems the need for the multi-system receiver will disappear and so will that product. This is the way the free marketplace always functions." (From Sept. 16, 1984 Kahn Communications Inc. Press Release and Q & A attachment).

With the vast majority of receiver manufacturers and broadcasters involved with AM stereo committed to the C-QUAM system, the need for a multi-system receiver has virtually disappeared. The marketplace has made its choice.

Chris Payne is AM stereo broadcasting manager for Motorola. He can be reached at 202-862-1549.

Sat Firms Pursue Joint Venture

Atlanta GA ... Telecommunications manufacturer Scientific Atlanta and Advanced Communications (Adcom), a data communications company based in Melbourne, FL, agreed in early February to "jointly pursue the private network market" for satellite-based two-way interactive data communications.

According to Scientific Atlanta's Satellite Communications Division GM John Lappington, his company made a "major financial investment" to cover development and implementation costs for Adcom's Very Small Aperture Terminal (VSAT) two-way communications system, Microsat.

Henry Caldwell, Adcom VP/marketing, said the VSAT Microsat system, a single channel per carrier radio satellite system, was similar in architecture to a two-way data communications project Scientific Atlanta was developing for its Echelon terminals.

Lappington said that Scientific Atlanta chose to invest in Adcom rather than pursue its own project because Microsat "is the most flexible cost-effective VSAT system on the market."

Neither company would comment on the size of the investment made by Scientific Atlanta. Caldwell, however, noted that Adcom would remain an independent, privately-held company.

As part of the deal, the two companies may also take part in joint radio product ventures. Although neither company would comment on the possible ventures, Caldwell speculated that the "next generation" of satellite radio communications would incorporate the "best of both worlds" of analog and digital technology.

Adcom is a "major player" in analog radio, Lappington said, and Scientific Atlanta is a prominent digital supplier. With the new agreement, he added, "Scientific Atlanta and Adcom customers will be able to get a complete line of products from either company."

Lappington noted that Adcom will be a "more viable growth-oriented company" with Scientific Atlanta's financial backing.

For additional information, contact John Lappington at Scientific Atlanta, 404-449-2506, or Henry Caldwell at Adcom, 305-242-0272.

Correction

An article on the auctioning of AM stations in the February 1 issue of RW contained an incorrect phone number.

The correct number for Michael Fox Auctioneers is 800-722-3334 and not in the 301 area code as reported.

NRSC Group Tackles RF Mask

by Alex Zavistovich

Washington DC ... The National Radio Systems Committee (NRSC) has published its recently-approved preemphasis standard, and, in its efforts to improve AM broadcasting, will next tackle a maximum permissible level of RF emissions from AM antennas—the so-called "RF mask."

On 3 January, the NRSC approved an interim voluntary national standard for AM transmission and reception.

Included in the standard are a 75 μS AM broadcast transmission preemphasis and a complementary 75 μS receiver deemphasis, a 10 kHz AM transmission stopband provision and a five-year review stipulation.

The NRSC authorized the NAB and the Electronic Industries Association (EIA) to publish the interim standard during a meeting held at the recent Consumer Electronics Show in Las Vegas, according to NAB staff engineer and NRSC member Mike Rau. The standard has since been published, Rau said, and will be available at the NAB convention in March.

At press time, the NRSC subgroup on methods and procedures was to begin deliberations on RF masking at a 25 February meeting in Washington, DC.

The NRSC standard currently defines only the signal going into the transmitter and attenuation on the receiving end.

The late February subgroup meeting is expected to be the first in a series in which RF emissions out of the transmitter will be scrutinized for "anything spurious which might cause interference," said NRSC Co-chairman John Marino, VP/Engineering for New City Communications.

The worst case of RF emissions coming off the antenna, based on the 10 kHz bandwidth limit, will be the mask, he said.

Future discussions on the issue of RF masking have already been scheduled—a second subgroup meeting will be held on 26 March, just prior to the NAB convention in Dallas, Rau said.

During the NAB show, several prototype NRSC receivers will be displayed, Rau added. GE, Delco and Sony have agreed to supply examples of receivers incorporating the group's suggested 75 μS deemphasis standard, and others may also be on hand, he said.

The NRSC display will also feature a closed-circuit system which duplicates off-air reception, Rau said. A mini-transmitter will feed RF to a number of different receivers, to allow for comparison of their various audio responses, he added.

A report on the NRSC standard will also be presented at the NAB show by Marino and Bill Gilbert, a staff engineer at Delco. Marino said the paper will address the NRSC's past year of meetings, and may touch on the subject of why a 10 kHz audio pass filter was decided on in the standard.

Marino said that the 10 kHz stopband, which some broadcasters have considered too stringent will "not destroy AM," but will allow receivers to be better matched to the preemphasis curve.

Stan Salek, engineering manager for Circuit Research Labs (CRL), an audio processor manufacturer, also noted that the filter was necessary to avoid problems of second adjacent interference.

"It won't sound like FM anymore when you listen to your mod monitor," Salek acknowledged, but he pointed out that the filter suggested may "triple the bandwidth," meaning that 10 kHz of interference-free band is an improvement over the 3 kHz response most AM radios offer today.

Salek added that CRL will be upgrading all of its equipment, regardless of age, to conform to the NRSC's guidelines. The company will introduce four new products in March which will likewise conform to the standard, he said.

In January, CRL sent a mailing to a number of AM stations, offering copies of the NRSC standard, as well as associated papers, Salek said.

To date, the company has received "several hundred responses, including a couple hundred phone calls" about the NRSC measures, all of which have been "very positive," he commented.

For additional information, contact Mike Rau at 202-429-5346, or John Marino at 203-333-4800. Contact Stan Salek at 602-438-0888.

Circle Reader Service 44 on Page 22

Static Discharge to Cut Noise

by Ron Nott

Farmington NM ... The first massive use of airborne radio communications was during World War II. From time to time flight crews encountered what came to be known as communications blackouts during which the radio equipment was worthless because of high levels of "static."

It wasn't until several years after the war that it was proven that the aircraft skins and antennas became highly charged during certain atmospheric conditions with the result of corona, which led to a discharge of a very high voltage threshhold.

This discharge was of such a high level of wideband energy that it effectively "blanked out" all but the strongest radio signals, and in some cases all signals were covered up, regardless of strength.

Measurements were made and experiments conducted which ultimately led, by the late 1950's, to two results:

1. Aircraft antennas were (and still are) insulated to prevent the direct effect of corona on metal surfaces of the antennas.

2. Static dischargers were developed to "bleed off" the high voltage static accumulation from the skin of the aircraft.

These dischargers consist of many sharp pointed wires or conductive fibers which can, under certain conditions, cause the surrounding air to ionize and thereby become conductive.

They can be seen on the trailing edge of wings in the form of a small black cylinder.

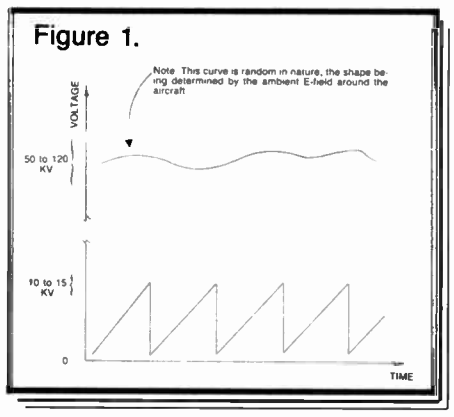
The charge drains off the aircraft through the conductive ionized air channel to the surrounding atmosphere which effectively neutralizes the voltage on the plane. Well, almost.

In series with the sharp points are placed resistors which increase the threshhold voltage to a pre-determined design value. Why the resistor?

It was found that sharp points without a resistance will, during conditions when the sharp points cause ionization of the surrounding air, instantaneously discharge the capacitance of the aircraft after which the aircraft will then recharge and the cycle is repeated (Reference 1).

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

Figure 1.



In principle it becomes a simple relaxation oscillator, generating a frequency (plus harmonics) which often falls into the radio spectrum used in aircraft communications and navigation.

Placing a resistor in series with the points effectively increases the time constant to a value which prevents this oscillation and causes the points to cause a continuous ionization discharge of the aircraft, rather than a pulsating discharge.

The result is that the aircraft is not discharged to the minimum electrostatic voltage possible, but the charge will be reduced below the point where corona, a source of radio noise, will no longer occur.

So much for solving radio noise problems on airplanes.

Using dischargers for other sites

With minor variations, the same principles may be applied to ground-based receiving sites.

Since most antennas or their mounting structures will have a ground return path for the static electricity, the resistance mentioned above may be dispensed with.

With a decent ground, the capacitance is effectively that of the planet earth or at least a very large portion of real estate. The capacitance of the aircraft mentioned above is not in reference to earth, but to the sum total of charged particles (ions) in the atmosphere surrounding it.

At 30,000', the capacitance of plane to earth is insignificant, but it is flying through an ocean of air which is composed of gas atoms and molecules, some ionized and some neutral.

This value of capacitance has been determined to be from a few hundred picofarads for small planes to a few thousand for large ones.

The capacitance of earth is so large that we don't have to worry about the pulsating effect generating spurious frequencies.

Design for ground-based receiving antenna dischargers then becomes functions of:

1. Rugged mechanical design to survive the most severe weather conditions while not causing undesireable effects on the reception.

2. Providing adequate discharge capacity during the most severe atmospheric electrical conditions—usually thunderstorms.

Antenna height and structure

The second factor must take into account the height of the antennas and/or structure and the type of antennas to be protected.

Receiver noise during severe atmos-

(continued on page 13)

Circle Reader Service 7 on Page 22

Mic Processor Gives Vocal Punch

by Tyree S. Ford

Baltimore MD ... If you're the type of audio person who believes that the only devices which should exist between a microphone and a tape recorder or transmitter should be a mic preamp and the pot on the console, this month's "Producer's File" will probably put you over the edge.

On the other hand, if you view audio processing as waveform modification instead of distortion, read on as we take a look at and listen to a new mic processing unit—the Symetrix 528.

In one rack space, the Symetrix 528 incorporates a mic preamp, a de-esser, a compressor/limiter/expander and triband parametric EQ.

The list price for all of this mono processing is $649. If you are now using a standard broadcast console with little or no processing and need some, read on.

First, it should be noted that setting the controls requires some expertise and understanding.

To get the *most* from the 528, you must adjust it to the individual voice. And as most people who work with the human voice know, the resonance and timbre of a voice changes to some degree from hour to hour and day to day.

If you're a compulsive tweaker with a big budget and a lot of time, you'll probably get one of these for each mic or voice.

More moderate settings can be made which, while not as precise, *will* increase your overall vocal punch considerably.

For example, set the compressor at 2:1 and adjust the threshold for 4 to 6 dB of gain reduction, as shown on the LED display.

Even without EQ, the compressed voice will sound much more powerful. If your on-air voices lack the punch of your music, the 528 can give you the punch, without effecting the other sources in your audio path.

It can be especially helpful in operations where music is processed before carting. The three band parametric equalizer gives you plenty of flexibility to adjust EQ for a funky sounding mic or for someone's voice.

Although your natural inclination may be to add EQ, try reducing frequencies that are overly present.

Through experience, and with the help of the onboard spectrum analyzer of an SSL console, I found that my voice has a hump at about 125 Hz.

This visual reinforcement coincided with settings I had developed "by ear" at another studio equipped with a parametric equalizer, but no analyzer.

By reducing those frequencies around 125 Hz by 1 or 2 dB, my voice filled the spectrum more evenly. Without the removal of those lower frequencies, I had to overcompensate by boosting the 5 kHz to 6 kHz range 4 or 5 dB to get the edge and definition necessary to make my voice really stand out.

After reducing 125 Hz by 1 or 2 dB, I only needed 1 or 2 dB at 6 kHz. The spectrum analyzer confirmed what my ears were telling me by displaying a much flatter response.

If you've read any of my previous equipment review columns, you know how much I appreciate a good manual. The Symetrix 528 manual gets high marks for good information laid out in a logical manner.

To quote from the manual: "With its variety of functions and associated controls, the 528 can be used effectively in a large number of situations. However, the level of performance you are able (to) extract from the 528 depends entirely on your understanding of the relationship between the individual functions and controls."

In addition to being well written, the manual also provides well thought-out graphic explanations for a wide variety of applications and control settings.

Producer's File

This combination of written and graphic information, while fairly simple to the advanced user, does not overlook the entry level user.

The Symetrix 528 accepts mic input via XLR, or line level inputs via ¼ TRS or rear-mounted terminal strip. Outputs are either via balanced terminal block or unbalanced ¼ TS.

The inputs and outputs of each different section of the unit are also accessible on the rear-mounted terminal strips, making it easy to wire each individual section to a patch bay.

Because all of the sections are in series, a normalled patch bay is required. You can also leave the jumpers in place on the terminal blocks and simply use the I/0 buttons on each section of the front panel to determine which sections you want in line.

Also on the rear-mounted terminal strip is a stacking input which can be used to combine several units or as a return for any additional processing.

Since there is no level control on the stacking input, any device you use in this configuration will require an output level control if a proper mix is to be made.

The 528 includes a +48 VDC supply for phantom powering applied to pins 2 and 3 of the XLR input connector. The supply is switchable, with the switch discreetly placed on the back of the unit. The manual goes into easily understandable detail concerning the potential hazards of phantom and T System powering.

Another feature of the 528 is a built-in side chain in the compressor/limiter/expander circuit. The side chain is a separate buffered audio signal, identical to the signal audio, that can determine the threshold of the compressor/limiter or expander via a VCA.

The manual gives a good explanation of how to use an equalizer in the side chain to make the operation of the circuits frequency dependent.

Starting from the left, the front panel features the mic preamp with screwdriver adjustable gain of up to −3 dB, and a clipping LED that fires when the preamp output exceeds +16 dBm.

The de-esser corner frequency is continouusly variable from 800 Hz to 8 kHz, and can reduce its designated frequency from 0 to 20 dB.

The interactive compressor/limiter/expander offers compression ratios from 1.4:1 to 20:1 (limiting) with a threshold variable from −50 dBm to +20 dBm. The expander threshold is variable from 0 dBm to −60 dBm.

The three band parametric equalizer allows a boost of +15 dB and a cut of −30 dB, with bandwidths variable from 0.05 octave to 3.3 octaves. The frequency sections from the bottom up are; 16 Hz to 512 Hz, 198 Hz to 6.3 kHz, and 686 Hz to 22 kHz.

The output of the 528 is a maximum of +24 dBm balanced or +18 dBm unbalanced. The clipping LED in the output stage fires at 3 dB below clipping. Output gain is adjustable ±15 dB. Output impedance is 100 ohms and requires a 600 ohm load or better.

The LED output display reads from −20 to +6, and the gain reduction LED display reads from −40 to −3 dB. The gain reduction display, when switched, also shows gain reduction in the de-esser circuit.

As I became more familiar with the unit, I noticed a small glitch each time the compressor/limiter/expander and parametric EQ sections were punched in and out. I called Doug Schauer of Symetrix about this and he told me it wasn't supposed to happen.

The glitch seemed to coincide with another minor intermittent problem which showed up about the same time. A second unit was sent which worked better. The compressor/limiter/expander could be engaged without any glitches, and the parametric EQ only glitched when the I/O button was hit in the middle of a word.

After extensive practical use and testing, I found the 528 very easy to work with. The expansion circuitry works well in gating out unwanted noises. It can be set to eliminate or reduce ambient sound. Lip smacks and breaths can be eliminated from narration by careful adjustment of the threshold.

Because the amount of compression is variable from 1.4:1 to 20:1, the unit can be used in an air studio at a moderate preset ratio, or in a production studio where being able to record a wide variety of dynamic sources is essential.

If you decide to buy one of these, don't forget to ask your dealer for what kind of discount you can get from the $649 list price. Sometimes showing your deal to your boss can make it easier to get that purchase order signed.

That's it for now. The Production Seminar on 28 March from 11 AM to 2 PM at the NAB convention in Dallas is still on. It will be a great session where I hope we can exchange a lot of ideas and information. I hope you can make it.

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

Optimize Bandwidth

by Tom Osenkowsky

Brookfield CT ... During the past two months, we have examined networks as possible causes of power lost. Now, we can begin to adjust the networks with a purpose in mind.

That purpose will be to obtain the proper match with the lowest Q. In later installments, though, we'll see that some Hi-Q networks can be advantageous.

We know by actual measurements what value of ATU phase shift is required to produce the proper antenna monitor readings. Is each value 90°±20°?

If it is not, problems may develop in certain areas, namely stability. Values of phase shift departing greatly from 90° can cause high voltage or high current in the shunt leg. Corona and heating, respectively, are undesireable effects in each case.

We do not need to maintain our pattern, though. Let's examine a typical two-tower phasor in Figure 1.

The network consisting of L4, L5, and L6 and C2 is a phase-shifter with a 50 ohm input/output impedance. This network is designed to afford part of the necessary phasing in the system.

Adjustment of this network is fairly straightforward. Usually L4 and L5 are ganged together. Before making any adjustments, note all settings, just in case you need to return to the original values.

I usually start by setting L4/L5 to the center of their range. Now, with the transmitter off, place a 50 ohm dummy load in place of the transmission line.

If you are using an OIB in the "hot" mode, a Heath "Cantenna" works fine. Use a carbon or non-inductive resistor if you are using a cold bridge.

Your bridge will be inserted prior to L4. The adjustment here consists of setting L6 for a 50 ohm input impedance. The L4/L5 combination can be reset for the proper phase shift i.e., the proper phase angle on the antenna monitor. Hopefully this is not too far from the center range.

If the setting of L4/L5 is far off center, we can reconfigure the ATU for the proper phase shift. Any other such networks are similarly adjusted.

Although not shown on the antenna monitor, the reference tower does have a relative phase angle. For the sake of simplicity, it is always set at zero at the antenna monitor. Consider the examples in Table 1.

All of these parameters will produce the same pattern. In "B" we set the reference phase to 0 and algebraically added the −3° to each tower. In our two-tower example, the same would be true if we adjusted either ATU to compensate for the other.

Tom Osenkowsky, a regular **RW** *columnist is a radio engineering consultant and president of MASTER Software. All referenced software is licensed for sale and available from MASTER Software: 203-775-3060.*

Figure 1.

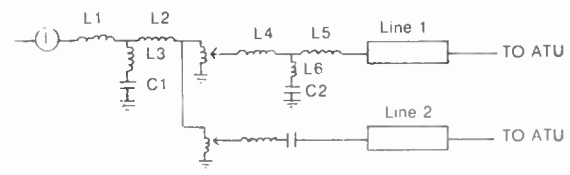


Figure 2.

$X_L = +j100$ $X_L = +j900$

$X_C = -j100$ $X_C = -j900$

Figure 3.

Tower	A	B	C
1	0.584/142.5	0.584/139.5	1.168/142.5
2	1.0/−3	1.0/0	2.0/−3
3	0.684/−142.5	0.684/−142.5	1.368/−142.5

In any array, we would endeavor to keep the network phase shifts close to 90°. Overall system phasing is determined by tower spacing, transmission line length and velocity factor, ATU and network phase shift and power divider phase shift.

Moving on in our example, we will look at the L10/C3 series resonant network. The phase shift produced by this network is determined by, 0 = arctan X/R, where X is either positive or negative and R should be 50 ohms, the load resistance. L10 is normally set to equal and thus cancel the Xc of C3.

This network is simply a fine tuner. A noteworthy point: The L/C ratio here, if excessive, can affect bandwidth. Let's examine the examples in Figure 2.

Both of the above networks will resonate at Fo, however the stability of "B" would be questionable, the corona would likely develop, and most important, the impedance slope would change drastically. Remember, only at Fo would $X_L = Xc$.

At the sideband frequencies we could

(continued on next page)

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Static Dissipation in Receivers

(continued from page 10)

pheric conditions called "static crashes" is often the result of small flares or streamers induced by the high electrostatic field.

The voltage and subsequent energy contained in the flares is a function of the shape and radius of the metal from which they emanate. The larger the radius and the smoother the surface, the higher is the voltage at which they occur.

Even paint (particularly epoxy) can increase this voltage as it becomes a thin layer of insulation on the surface of the metal.

Assuming no sharp points, the charge has a large effective area over which it may distribute, thereby providing a large capacity of stored energy to contribute to a flare—hence, the large value of RF noise energy that it may radiate.

On the other hand, the charge will concentrate at sharp points, initiating ionization at relatively small energy levels.

That's why some manufacturers put plastic caps on the ends of the elements of their Yagi antennas. If you took them off, order a new set and climb up there and replace them.

The loudest crashes are usually a result of flares right on the structure or in the near vicinity. Although they are often the initiating factor in lightning strikes, many occur without lightning, attempting to discharge the tall structure in the high voltage electrostatic field, so mostly they are just a nuisance generating radio noise.

Handling lightning

Lightning is certainly not to be dismissed lightly, so when designing a static charge dissipation system, whether for noise reduction or lightning prevention, care must be taken to provide plenty of dissipation capacity under the worst conditions, otherwise the dissipator itself might cause a flare which could initiate or invite a lightning strike.

The solution here is to provide *plenty* of sharp points. This is a case where overkill apparently does not exist, however, a point of diminishing returns is eventually reached at which additional sharp points contribute little to the prevention of a lightning strike.

Each sharp point has a finite capacity of dissipation current at which it limits. When the killer storm that occurs once every 10 or so years comes along, there must be enough capacity in the dissipation system to handle it.

Rented antenna space on a tall tower

If only the region around the antenna is to be discharged for noise reduction,

(continued on page 19)

Bandwidth

(continued from previous page)

expect some dramatic changes. Inasmuch as we show this to be undesireable in this case, we can take advantage of this situation where we want to cancel out an equal-and-opposite slope at the tower, common point, power divider, etc.

It is desirable to keep the shunt leg, output leg, etc., L/C ratios as low as possible as well.

At this point, we should have the phase shifters adjusted in good order.

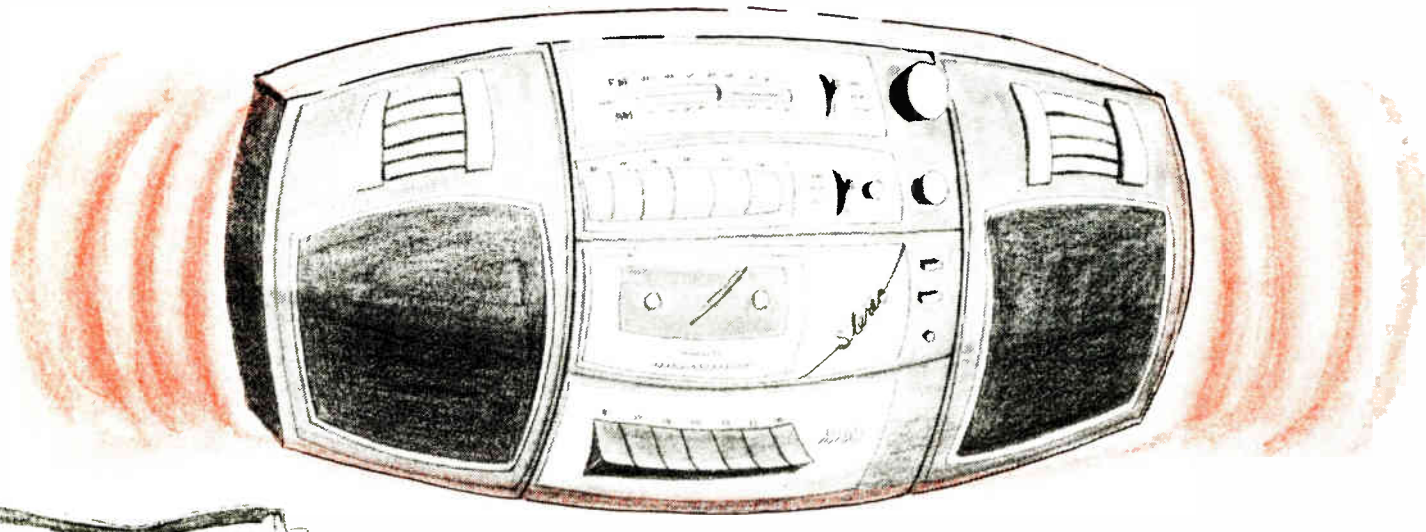
Remember, we may need to trim their phase shift a bit to compensate for the adjustments we made this time. Included in this month's article is a BASIC computer program designed to analyze TEE networks.

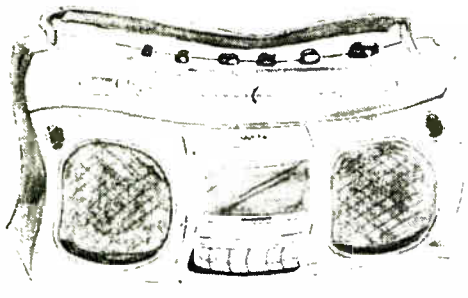
TANALYZ is written to determine the actual phase shift of an arbitrarily adjusted network. By changing the frequency to the sidebands, you can determine the effects of L/C ratio changes.

A fact to bear in mind is that we are concerned with current phase shift, not voltage phase shift. This is important in that the current phase shift is what the antenna monitor is seeing.

If you intend to use an oscilloscope to look at network phase shift, a current probe must be used. Until next time.

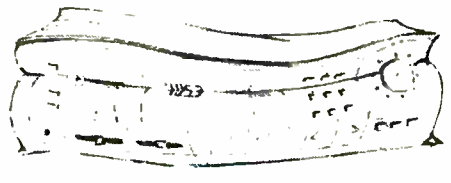
Once Your Station Gets *StereoMaxx*'ed,





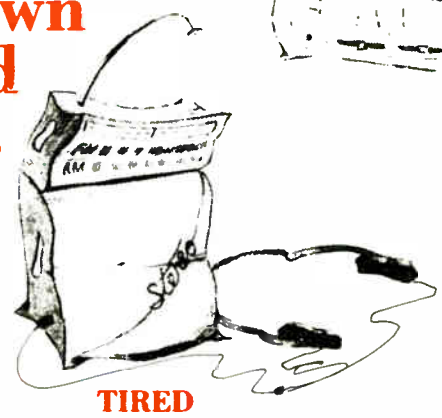
LIFELESS

Every other station in town will sound a little . . .



FLAT

DEFLATED



TIRED

StereoMaxx, The Spatial Image Enlarger From Modulation Sciences, Gives Your Station An Extra Edge . . . Without Extra Problems.

• *StereoMaxx* Makes You Bigger, Not Just Louder.

StereoMaxx™ enhances and enlarges your music's stereo image, for a dramatically Bigger, Fuller sound. It works *with* any loudness processor you use — Optimod, Texar Audio Prism, CBL, you name it. The spatial image enlargement impact of *StereoMaxx* is compatible with — **but completely different from** — loudness processing. From Rock to Easy Listening, *StereoMaxx* adds punch and excitement to *any* AM or FM stereo music format. *StereoMaxx* makes your station *stand out* on every kind of stereo radio — from large hi-fi systems to portable boom boxes and headphone radios, and in the car . . . **WOW!**

• Many Have Tried. *StereoMaxx* Succeeded.

With *StereoMaxx*, you get the added punch and impact of stereo image enlargement with *No* phase problems, *No* increased multipath problems, *No* problems for mono listeners, in fact, no problems at all. Radio professionals know Modulation Sciences is a company that keeps its promises: Our CP-803 Composite Clipper is on the air at over 1200 stations, keeping them loud, clean and legal. And our Sidekick is *the* industry-standard SCA generator. So when we say *StereoMaxx* enlarges your stereo image, with no problems or side-effects, you can believe it.

• There's No Downside Risk With *StereoMaxx*.

The idea of making a station stand out by enhancing and widening the stereo image is certainly not new. Enterprising engineers at competitive stations have tried a number of schemes. Everything from simple matrixes to consumer hi-fi ambience gadgets. Unfortunately, these attempts have always yielded unacceptable side effects: No-no's such as mono incompatibility, increases in multipath, and jet-streaming D.J. voices. But the potential benefits of stereo image enlargement are too good to ignore, so Eric Small and the Modulation Sciences design team went to work. And we succeeded!

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Once your station starts broadcasting with *StereoMaxx*, all the "ordinary" stereo stations in town will sound like just that . . . ordinary! Of course, since *StereoMaxx* is brand new, no one else in your market has it — yet. So now's the perfect time to check it out. Call Modulation Sciences for your **FREE** demo cassette and more details about *StereoMaxx*. Our Toll-Free number is **(800) 826-2603**

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Removing Transmitter "Dirt"

by Floyd Hall

Crestline CA ... Did you know that ...

In October of 1928, the Federal Radio Commission issued the first list of Broadcast Station assignments in the US by frequency, and with the names of the licensees and the operating power?

Well, I did, and I'm sure I must have had a copy once, but have not seen it for like 59 years! An engineer friend from over in Arizona—Richard Haskey—has sent me a copy with the brief note in which he hoped this would jog my memory! Boy, does it ever!

There are situations in this you wouldn't just believe, and that I had completely forgotten about. For example, there are many cases that existed then, in which two stations were assigned the same frequency, in the same town, and specified to "share time!"

The list doesn't specify their individual operating hours, and I only remember one or two. One operated daytime, and the other night! Sort of Sunrise to Sunset—and vice versa!

This list of assignments was before the big frequency reallocation. Some of you may remember my telling you of a young friend and I building KGER in Long Beach, CA. We put it on the air in early 1926 with 100 W on 1370.

When the big shakeup came, they wound up on 1390, where they are now. KGO Oakland was on 790, and was shifted to 810; WBAP in Fort Worth was on 800 with one of the first 50 kWs—they were moved to 820.

In this list only six stations were shown as operating with 50 kW, and two with CPs to increase to 50 kW. There were three or four operating with 25 kW, and surprisingly, one with 30 kW.

Most of the stations on regional and local channels were operating with less than 1.0 kW, and in fact the majority with 100 W or less. Some were at 10 W or 15 W, some 30 W, and many 50 and 100.

By the way, the highest channel at that time was 1500 kc/s, and 550 was at the bottom.

It was most interesting to me to read the names of the licensees listed, many of whom I knew—Ben McGlashan, Don Lee, Earl C. Anthony, Mervin C. Dobyns, C. I. McWhinnie, Warner Bros. Radio, and many other early radio pioneers.

These were all in California, but it was interesting to pick out Westinghouse Electric Co., KDKA, General Electric Co., WGY, Woodman of the World Life Insurance Assn., WOW Omaha; Crosely Radio Corp., WLW, one of the first 50 kW, and The Tribune Co., WGN. The newspapers were getting on the bandwagon even that early, as also did the educational institutions and religious organizations.

Oh yes, additional stations moved in the frequency changes: KNX, Hollywood, CA—from 1050 to 1070; and WCAU, Philly—from 1170 to 1210.

These frequency changes created a terrific furor for months, with many cases of legal protests, but in the end the FRC won out and most people learned to live with it. A rough count of the stations in this list of 1928 is 625!

Oh well. So much for nostalgia. If any of you want to know the frequency licensee or power of a station at that time, give me a call or drop me a line, and I will read it to you.

Alright, back to the grind! I know that most of you have heard me say, if a transmitter room and transmitter are physically clean, then it probably follows they are electrically clean also.

I don't mean to belabor the point, but I have discovered that some of you do not understand what I mean by electrically clean. This surprises me a little, and believe me, only the first step is keeping the dirt and grease out of it. There is much more to it than that.

Old Timer

I recently worked on a 10 kW FM transmitter, and in the course of shooting trouble in the high voltage circuits, had occasion to check the air switch. This thing was stuck closed! The microswitch was frozen tight.

In other words, air or no air, the filaments would have stayed on, and the PA tube would have soon turned nice and black. I don't know how long this situation had existed, but I would guess for a good long while. How often do you check the operation of the air switch?

This is only one small bit of electrical dirt. I remember one a few years back, a 10 kW FM transmitter. It would run for a week, and then suddenly blow, burn out the coupling line from the exciter, short out the screen bypass condensers, and just generally create havoc.

I checked the thing one night up on the mountain, replaced the feed line from the exciter, tuned it up, and got it back on the air.

About a week later, they called me again at night, and I went up and found the same damn things! Now, this was a little ridiculous. After I replaced the grid line to the PA, I decided to have a good look at this thing, and see if I could make it go haywire again.

So ... I checked the tuning contacts, fiddled with the drive and then gave the PA tube a good jolt or two, and wow! This thing took off in self-oscillation and the fire flew!

Now, I took the PA tube out, and looked down in the socket. The finger stock for the screen contact was bent, and burned, as was the screen ring on the tube. So, with vibration the screen contact on the tube loosened up, and she ripped into parasitics.

I soon discovered there were adjustable stops on the bottom of this socket, and the tube was not dropping far enough to make good contact to the screen finger stock. I wonder how often you have looked into the tube socket on your transmitter; and cleaned and adjusted the contacts.

By the way, the finger stock on these sockets are silver plated phosphor bronze, and you don't use sandpaper or emery cloth on them.

Go to your local hardware and get a couple of sheets of crocus cloth. If he doesn't know what it is, find the nearest job machine shop and ask them. This is the best polishing material there is, but you should always wipe it off with a rag with a little mineral spirits on it.

I still find guys with bottles of isopropyl alchohol patented head cleansers and even carbon tetrachloride! None of this junk is any good. Most of it won't dissolve grease, and it usually leaves a detrimental residue.

Go down to your local hardware or paint store, and get a gallon of mineral spirits for a dollar and a half. Be sure you don't get any synthetic paint thinner—just pure mineral spirits.

This stuff will clean anything, and will harm nothing. Soak a rag with it, and rub the rubber idlers on your turntables,

(continued on page 21)

Floyd Hall is a regular **RW** *columnist and an engineering consultant at Consulting Radio Engineers. Call him at 714-338-3338.*

65 Years Ago in Radio World

Editor's note: The **RW** *of today and the* **RW** *of old fortuitously share the same name. The* **RW** *of old was printed for a period of time in the 1920s and 1930s, when radio was first becoming popular.*

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

There is nothing gained by detailing other weak spots in the receiving station. Each one of them is a potential wrecker of ranges.

There is the poor crystal with few sensitive molecules; there is the poor ground connection on the radiator pipe; there are the cheap and often unsatisfactory head phones; and there is the so-called operator.

After considering all these points it is possible, even if not permissible to make a formula for the receiving range of any set, as follows:

The receiving range of a receiving set is equal to the Power of the Transmitting Stations plus the design quality of the receving set minus the poor aerial, poor ground, poor adjustment and plus or minus the operator.

Reprinted from Radio World, 1922

Here's why Blane Webster bought Auditronics for WLAK–FM

Blane Webster,
Chief Engineer, WLAK–FM

"When I prepared the budget for our new facilities on Chicago's Michigan Avenue, I could have included any console I wanted, be it Ward-Beck, Neve, you name it. So I looked at and listened to everything the industry had to offer, from the Harrison to the Harris Medalist, and I bought Auditronics.

I bought the Auditronics 200 primarily for its audio quality, by which I mean its waveform integrity, freedom from distortion and low noise floor. The quality of its sound is remarkably transparent. I think Auditronics' VCA technology is really good too, maybe the best on the market.

I also looked for reliability. The console's the most important link in the studio chain because it's on the air all the time. We just can't afford a failure, and I recalled that our old Auditronics console at Sears Tower never had an on-air failure.

Features were important too, like the modular concept that lets me pull a module out and pop another one in almost as fast as making an Indianapolis pit stop. If I need another mike channel or cart machine channel, I've got it right here on the shelf for immediate use. The layout of the Auditronics 200 is almost self-explanatory so our on-air people can use it without making mistakes, and the 200 is rugged enough to withstand the jocks' abuse and coffee spills.

One of the things that sets WLAK apart is that we're the number 1 adult contemporary station in the Chicago market, and to us being number 1 means more than just winning in the ratings. It means being the best both on and off-the-air. This includes the kind of equipment we buy and the way we use it. We're a winner and we're proud of it."

If you'd like to know more about why Viacom's Blane Webster specifies Auditronics consoles for *both* on-air and production, call 800-638-0977 toll free, for complete information and a demonstration near you.

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At Issue with Correction Method

by Jeffrey M. Bixby

Washington DC ... As one who has had the responsibility for the adjustment of a number of AM directional antenna systems, many with very tight requirements, I would really like to believe Mr. Colligan's article which appeared in the 15 January **RW**.

I could have saved my clients countless dollars. However, I fear he has fallen into a trap, a seductively baited trap to be sure, but a trap nonetheless.

It seems that there are as many approaches to proximity correction as there

> *"We often joke that we'd like to have a 'Finagle Factor,' ..."*

are engineers employing a correction. In evaluating this particular approach, let's postulate three imaginary radio stations.

The three stations will be constructed and adjusted precisely alike in areas where there are no external objects to interfere with the pattern. All three will be two tower arrays with spacings of 89.73°.

Jeffrey Bixby is a senior engineer with Moffet, Larson & Johnson, Inc., a telecommunications engineering firm. He can be reached at 202-841-0500.

They will be constructed in areas of identical ground conductivity and the proof measurements will be taken at the same distances.

Since all the conditions are alike, all the measurements will be the same. The only difference will be the theoretical parameters as filed with the Commission in their applications for Construction Permit (CP).

We'll call them Radio Stations A, B, and C. The theoretical parameters as filed in their applications are:

		"A"	"B"	"C"
Tower 1	Ratio	1.00	1.00	1.00
Tower 1	Phase	0.00	0.00	0.00
Tower 2	Ratio	0.886	1.01	.001
Tower 2	Phase	96.10	101.86	101.86

We will look, in particular, at a null radial 29.3° off the tower line.

Radio Station A constructs and adjusts its array strictly in accordance with its theoretical parameters so that they actually achieve the field ratios and phases shown above.

Since we have hypothesized that all three arrays are adjusted identically, Stations B and C also achieve the same parameters.

Table 1 is a conventional log ratio analysis of the measured data. Since all three stations operate under identical conditions and reported identical measurements, the same conventional analysis applies to each.

This would lead to the conclusion that each station had a radiation in the DA mode in the pertinent direction of about 82 mV/m/mi.

Table 1.

Conventional analysis of proof data

#	Dist	N DA	DA	Log Ratio
1	0.37	570.00	1900.00	0.5229
2	0.47	430.00	1050.00	0.3827
3	0.57	280.00	600.00	0.3320
4	0.67	210.00	380.00	0.2576
5	0.77	128.00	180.00	0.1481
6	0.87	105.00	170.00	0.2095
7	0.97	100.00	110.00	0.0414
8	1.07	77.00	80.00	0.0170
9	1.17	98.00	19.00	0.7085
10	1.75	94.00	19.00	0.6934
11	1.50	69.00	16.00	0.6576
12	1.84	58.00	17.50	0.5211
13	2.00	51.00	11.50	0.6506
14	2.17	49.00	11.00	0.6421
15	2.43	42.00	10.00	0.6232
16	2.49	34.00	7.80	0.6374
17	2.88	31.00	6.70	0.6621
18	3.16	15.00	2.90	0.7144
19	4.47	11.50	1.90	0.7846
20	5.51	9.70	1.85	0.7196
21	6.24	7.00	1.10	0.7824
22	7.87	4.40	1.10	0.6053
23	8.47	4.60	0.98	0.6681
24	9.75	2.25	0.52	0.6378
25	11.74	1.20	0.28	0.6274
26	11.57	1.20	0.31	0.5873
27	12.17	0.90	0.17	0.7195
28	15.53	0.57	0.11	0.7184
29	15.64	0.45	0.11	0.6084
30	15.86	0.51	0.12	0.6251
31	16.54	0.58	0.10	0.7683
32	17.43	0.48	0.11	0.6545
33	17.57	0.37	0.10	0.5657
34	18.18	0.34	0.08	0.6256
35	18.69	0.32	0.06	0.7241
		Average		0.3651
		N-DA Inverse		279
		DA Inverse		82.47

Table 2.

Radio Station A

Analysis of data using proximity correction based on parameters as adjusted

#	Dist	N-DA	DA	Kp	Adj DA	Log Ratio
1	0.37	570.00	1900.00	1.210	2299.57	0.6058
2	0.47	430.00	1050.00	1.208	1268.72	0.4699
3	0.57	280.00	600.00	1.189	713.40	0.4062
4	0.67	210.00	380.00	1.169	444.07	0.3252
5	0.77	128.00	180.00	1.151	207.11	0.2098
6	0.87	105.00	170.00	1.136	147.61	0.1479
7	0.97	100.00	110.00	1.125	123.71	0.0917
8	1.07	77.00	80.00	1.112	88.97	0.0627
9	1.17	98.00	19.00	1.103	21.01	0.6586
10	1.75	94.00	19.00	1.090	20.71	-0.6570
11	1.50	69.00	16.00	1.081	17.30	-0.6009
12	1.84	58.00	17.50	1.066	14.40	0.6052
13	2.00	51.00	11.50	1.061	12.20	0.6695
14	2.17	49.00	11.00	1.054	11.59	0.6260
15	2.43	42.00	10.00	1.040	10.40	0.6128
16	2.49	34.00	7.80	1.249	8.18	0.6186
17	2.88	31.00	6.70	1.042	6.98	0.647
18	3.62	15.00	2.90	1.074	.00	0.6993
19	4.47	11.50	1.90	1.027	1.95	-0.7702
20	5.51	9.70	1.85	1.025	1.89	-0.7101
21	6.24	7.00	1.30	1.020	1.33	-0.8227
22	7.87	4.40	1.10	1.016	1.12	0.5951
23	8.47	4.60	0.98	1.014	0.99	-0.6657
24	9.75	2.25	0.52	1.01	0.52	-0.6708
25	11.74	1.20	0.28	1.011	0.28	0.6274
26	11.57	1.20	0.31	1.011	0.31	-0.5873
27	12.17	0.90	0.17	1.010	0.17	0.7195
28	15.53	0.57	0.17	1.008	0.17	-0.6785
29	15.64	0.45	0.11	1.008	0.11	0.6084
30	15.86	0.51	0.12	1.008	0.12	-0.6251
31	16.54	0.58	0.10	1.007	0.10	-0.7683
32	17.43	0.48	0.11	1.007	0.11	-0.6545
33	17.57	0.37	0.10	1.007	0.10	-0.5657
34	18.18	0.34	0.08	1.007	0.08	-0.6256
35	18.69	0.32	0.06	1.007	0.06	-0.7241
		Average				0.3654
		N-DA Inverse				239

Table 3 is Radio Station B's data. The proximity corrections shown on this tabulation were calculated using B's theoretical parameters.

This analysis indicates a radiation of 35.9 mV/m/mi along that radial. This is about 56% below the radiation based on a conventional analysis, again, based on the same measured data. (Note that the proximity corrections are close to, but not precisely the same as, those shown in the article. The difference is primarily due to the selection of a different frequency as well as slight changes in array spacing, phasing and radial azimuth.)

Finally, Table 4 is the data as would be reported by Station C.

Again, the proximity corrections were calculated using C's theoretical param-

(continued on page 18)

Method Questioned

(continued from page 17)

eters. Here we find that the radiation is 15.58 mV/m/mi, a rather significant 81% reduction below the field as analyzed by conventional means.

The only difference in conditions for the three stations was in the theoretical parameters as submitted in the application for Construction Permit which would have been filed long before any construction began or any adjustments or measurements were made.

In all other respects, the arrays and the measured data were identical, but by using this proximity correction technique, vast differences in the analysis were possible.

This results from the fact that Stations B and C submitted theoretical parameters which produced very deep far field nulls.

Since the correction factor is a ratio of the far field prediction to the near field prediction for each point, as the far field approaches 0 (or as the theoretical field ratio approaches unity), the correction factor approaches 0.

In fact, with unity field ratios, the far field radiation would be 0, the correction factor at all points would be 0, therefore all the adjusted fields would be 0 (X×0 =0) regardless of the actual measured value of field.

Note, by the way, that Station A's correction factors are all greater than 1 while B and C have factors less than 1.

This results from the fact that Station A reversed the field ratios. Had they used a ratio at tower 2 of 1.125, they would have achieved the same pattern but with correction factors less than 1.

The data for Station A (Table 2) were chosen because they were actually reported to the Commission in a station's recent proof.

The station's theoretical parameters were those shown for Station C, and, except for round-off error, Table 4 is a reproduction of the data filed in their proof.

The reported base ratio (0.886) tracks quite closely with the antenna monitor ratio (0.895) and the towers are of equal height. There is every reason to believe that the actual field ratio is very close to the base ratio, 0.886:1.

Since the sample system employs equal length lines, it is reasonable to assume that the indicated phase is quite close to the actual phasing.

That being the case, we would expect a radiated field along this azimuth of about 65 mV/m/mi based on the far field calculation.

Their standard pattern limit was less than 20, so if their proximity corrections had been based on the parameters as adjusted (Table 2), or even on theoretical field ratios of 1 and 1.01 (Table 3), they would not have been able to show compliance with their standard pattern.

Table 3.

Radio Station B

Analysis of data using proximity correction based on theoretical ratios of 1.01 : 1

#	Dist	N-DA	DA	Fp	Adj DA	Log Ratio
1	0.37	570.00	1900.00	0.0913	173.47	-0.5167
2	0.47	420.00	1050.00	0.1152	120.96	0.5588
3	0.57	280.00	600.00	0.1379	82.74	0.5294
4	0.67	210.00	380.00	0.1596	60.65	-0.5794
5	0.77	128.00	180.00	0.1802	32.44	0.5962
6	0.87	105.00	130.00	0.1999	25.99	-0.6064
7	0.97	100.00	110.00	0.2188	24.07	0.5186
8	1.07	77.00	80.00	0.2368	18.94	0.6090
9	1.17	98.00	19.50	0.2540	4.95	1.2964
10	1.35	94.00	19.00	0.2872	5.38	1.2431
11	1.50	69.00	16.00	0.3059	4.89	1.1491
12	1.84	58.00	13.50	0.3526	4.76	1.0858
13	2.00	57.00	11.50	0.3726	4.28	1.1179
14	2.27	49.00	11.00	0.4076	4.44	1.0424
15	2.47	47.00	10.00	0.4287	4.21	1.0995
16	2.49	74.00	7.80	0.4768	7.35	1.0092
17	2.88	71.00	6.70	0.4679	7.11	-0.9689
18	7.62	15.00	2.90	0.5227	1.52	0.9954
19	4.47	11.50	1.90	0.5767	1.09	1.0017
20	5.51	9.70	1.85	0.6277	1.16	0.9218
21	6.24	7.00	1.70	0.6578	0.85	0.9156
22	7.85	4.40	1.10	0.7072	0.78	0.7552
23	8.47	6.60	0.96	0.7176	0.71	0.8120
24	9.75	2.25	0.52	0.7514	0.39	0.7683
25	11.34	1.20	0.28	0.7789	0.22	-0.7485
26	11.57	1.20	0.31	0.7825	0.24	0.6947
27	12.17	0.90	0.17	0.7911	0.13	0.8056
28	15.52	0.57	0.13	0.8289	0.11	0.7574
29	15.64	0.45	0.11	0.8299	0.09	0.6928
30	15.86	0.51	0.12	0.8320	0.10	0.7087
31	16.54	0.58	0.10	0.8380	0.08	0.8482
32	17.41	0.50	0.11	0.8446	0.09	-0.7709
33	17.57	0.77	0.10	0.8464	0.08	0.6486
34	18.18	0.34	0.08	0.8509	0.07	-0.6965
35	18.69	0.32	0.06	0.8539	0.05	-0.7956
			Average			0.1584
			N-DA Inverse			279.00

Table 4.

Radio Station C

Analysis of data using proximity correction based on theoretical ratios of 1.001 : 1

#	Dist	N-DA	DA	Fp	Adj DA	Log Ratio
1	0.37	570.00	1900.00	0.0214	40.66	-1.1467
2	0.47	420.00	1050.00	0.0276	28.98	-1.1714
3	0.57	280.00	600.00	0.0338	20.28	-1.1401
4	0.67	210.00	380.00	0.0399	15.16	-1.1415
5	0.77	128.00	180.00	0.0461	8.30	1.1882
6	0.87	105.00	130.00	0.0522	6.79	-1.1896
7	0.97	100.00	110.00	0.0585	6.41	-1.1929
8	1.07	77.00	80.00	0.0643	5.14	-1.1752
9	1.17	98.00	19.50	0.0704	1.37	1.8576
10	1.35	94.00	19.00	0.0812	1.54	1.7448
11	1.50	69.00	16.00	0.0901	1.44	1.6800
12	1.84	58.00	13.50	0.1102	1.49	-1.5989
13	2.00	57.00	11.50	0.1194	1.31	1.6182
14	2.27	49.00	11.00	0.1350	1.49	-1.5185
15	2.47	47.00	10.00	0.1440	1.44	-1.4751
16	2.49	74.00	7.80	0.1474	1.15	1.4709
17	2.88	71.00	6.70	0.1692	1.17	1.4259
18	7.62	15.00	2.90	0.2091	0.61	1.3797
19	4.47	11.50	1.90	0.2557	0.48	1.3797
20	5.51	9.70	1.85	0.2827	0.56	1.2786
21	6.24	7.00	1.70	0.2956	0.44	-1.1057
22	7.85	4.40	1.10	0.3212	0.44	0.9987
23	8.47	4.60	0.96	0.3255	0.42	1.0426
24	9.75	2.25	0.52	0.3405	0.24	0.9659
25	11.34	1.20	0.28	0.3591	0.15	0.9168
26	11.57	1.20	0.31	0.3620	0.16	0.8667
27	12.17	0.90	0.17	0.3695	0.09	0.9994
28	15.52	0.57	0.13	0.4099	0.08	0.8496
29	15.64	0.45	0.11	0.4113	0.07	0.8178
30	15.86	0.51	0.12	0.4132	0.08	0.8518
31	16.54	0.58	0.10	0.4189	0.06	0.9568
32	17.41	0.50	0.11	0.4253	0.07	0.8426
33	17.57	0.77	0.10	0.4269	0.07	0.7468
34	18.18	0.34	0.08	0.4317	0.05	-0.7997
35	18.69	0.32	0.06	0.4364	0.04	-0.8968
			Average			0.0652
			N-DA Inverse			239

However, since the theoretical ratios filed in the CP application were 1 and 1.001, the correction factors were quite small and the resulting analysis showed a DA radiation of about 15.5 mV/m/mi, within the CP limit.

Unfortunately, there is nothing about the theoretical parameters which can alter the real world performance of an array. The theoretical parameters only serve to tell the Commission what the applicant intends to construct.

To the extent that the actual adjustment differs from the theoretical, it is a different array. If we propose to analyze an array, we must use the parameters which refer to that array as it is, not as it might have been!

If this were the only problem, we might still have a useful tool. After all, if we were to specify near unity field ratios and adjust the array accordingly, we would still have very small multipliers with which to correct our data.

Unfortunately, the entire premise is highly dubious. To the extent that the field meter is accurate, the measured data do not require correction. In fact, the measured fields often represent the only "correct" data we have.

Contrary to the article's opening assertion, the meter is *not* saying "which tower do you want me to concentrate on?" (Indeed, if the meter is capable of "concentrating on" one tower rather than another, then we are entirely too close to the array and the directivity of the meter's loop antenna prevents accurate measurements.)

Rather, the meter is simply responding to the intensity of the field at the measurement location. Assume for a moment that we are dealing with a potential interference situation, say the overlap of the 0.5 mV/m contours in a first adjacent situation.

Radios located at any measuring point will respond to the same field as the field meter does. Sadly, radios simply cannot be trained to ignore interfering signals by multiplying them by some correction factor. This is true no matter how neatly contrived the correction factor may be.

If the value of measured field is higher or lower than our theory would predict, then it is our theory which requires cor-

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Using Static Discharge for Noise

(continued from page 13)
it's only necessary to install dissipators above and below it to protect it.

But if the antenna is mounted on a tall tower and the goal is complete lightning elimination, the penetration of the structure into the electrostatic field must also be considered (Reference 2).

Discharging the electrostatic field in the vicinity of the antenna is what eliminates flare discharges directly from the antenna metal and the nearby supporting structure, thereby reducing RF noise.

There may be the case where space on a tower is being rented from the owner by the antenna owner and the tower owner does not want to invest in dissipation equipment.

The antenna owner can still protect his antenna (including high power transmitting types) from noise and lightning by discharging his own antenna and its surrounding region.

This will by no means place the tower in greater jeopardy from lightning strike than it was before, but protects what might be described as a roughly spherical zone around the dissipators installed to protect the antenna.

The old "cone of protection" theory, while not being thrown out entirely, has been shown to be inadequate for very tall structures. Side strikes, while not common, have occurred on many towers, indicating that the potential gradient can reach the value required for a strike (Reference 2).

With this value of potential, sometimes several kilovolts per meter of distance (which may be laterally from the tower since it is at ground potential), flares may occur on the structure and the antennas mounted thereon. This generates RF noise which gets into the receiving antennas, interfering with the received signals.

Studies and experience of many years have shown that the spectral energy from lightning is greatest at low frequencies, tapering off as the frequency increases.

Except in rare cases, most of the noise energy has tapered down to a small value at the bottom end of the FM broadcast band.

However, perfectionists may say that the energy can extend well beyond this range, causing problems for RPU and communications receivers. And then, some broadcasters still use the old frequencies in the 25 to 26 MHz region and others make use of the CB for communications.

Many stations must monitor an AM EBS station that, of course, is very susceptible to such noise.

A very high level zap can damage the front end stage of a receiver on any frequency.

A high DC static voltage may get into a receiver, causing strange biasing problems in diodes and transistors as well as damaging components.

Static charge dissipation can benefit almost any receiving antenna that a broadcaster might employ. A properly designed system can eliminate a great many problems, some of which may appear to be from entirely different sources.

Corrections Questioned

(continued from previous page)
rection, not the data.

As the article correctly points out, our theory makes the simplifying assumption that the array is a point source when indeed it is not.

This assumption serves us well most of the time, but in *very* deep suppressions and very close to the array, we may be well advised to consider the array geometry, not to correct our measured data, but rather to correct our expectations of the field at each point.

This is most readily done by plotting two inverse distance lines on the ground wave field intensity graphs of the measured data. The first is the conventional ID line based on the far field or point source calculations. The second is based on the near field calculations, that is, taking into account the array geometry.

The appropriate conductivity curve, corrected for proximity can also be plotted. This method is discussed in the NAB Engineering Handbook, Seventh Edition, pages 2.4-70 and 71.

If the proximity correction is calculated using the array parameters as actually adjusted and if there are no other factors to effect the readings, this proximity corrected conductivity curve should closely match the measured data.

To the extent that it doesn't, we must assume either that the reason lies outside the array, or that our assumptions regarding the array adjustment are incorrect.

We often joke that we'd like to have a "Finagle Factor," a number which, when multiplied by the measured data yields the desired result.

But we must also bear in mind that if we can use it, so can the station down the road. The result will, of necessity, be more interference. The only way to adjust an array is to adjust it. Number crunching, no matter how elegant, will not do it.

Broadcast Computing

De-bug Studio Sound

by Ronald F. Balonis

Wilkes-Barre PA ... Generally, you only get to choose one of your relatives. The rest you inherit, and they you. But, when it comes to the studios of your radio station, most of us don't even get a chance to choose one. You have to live with the ones that come with the station and the job.

Fortunately, like relatives, the studios are not all the same either. Each has its own personality—a certain sound, a certain ambiance.

Sometimes it's considered good and liked by all, sometimes it's considered bad and disliked by all who use it.

Studios sound different because of their size, shape and surface treatments. For a studio with a doesn't-sound-right sound, there's not much you can do about either its size or shape, other than to reconstruct it. So, the surfaces are usually all you get to work with.

For an engineer, debugging a studio "sound" problem is as perplexing a task as any. There are no easy rational ways to measure what the announcers and/or you may hear. And if the problem's not equipment related it may not be, from an engineering standpoint, too important.

But from the standpoint of any announcer, a studio is as much a workplace tool as the equipment is. And, due to the different perspectives, a studio "sound" problem oftentimes becomes bigger than reality. However, the situation is not hopeless.

Even though you may not be able to measure it, there is a way to define a reason for a studio's room-caused sound problem with some practice and theory from the domain of acoustic engineering.

Ron Balonis is CE at WILK, Wilkes-Barre, PA and a frequent contributor to the broadcast computing section of **RW.** *He can be reached at 717-824-4666.*

Wave theory of acoustics

There is a theory of room acoustics, called the wave theory, that is based on a concept familiar to radio engineering. That is that sound waves behave like radio waves in their respective transmission media—sound waves in a closed environment in air and radio waves (electromagnetic) in a transmission line.

The behavior is alike in that the waves, AF or RF, bounce and reflect to form standing waves in the transmission media that depend on the physical characteristics of the media and that they exhibit the detrimental effects of frequency discrimination in the transmission media.

It is the same problem for a good studio or for a bad studio. All studios (rooms) have resonant modes which cause standing wave patterns to exist in the studio.

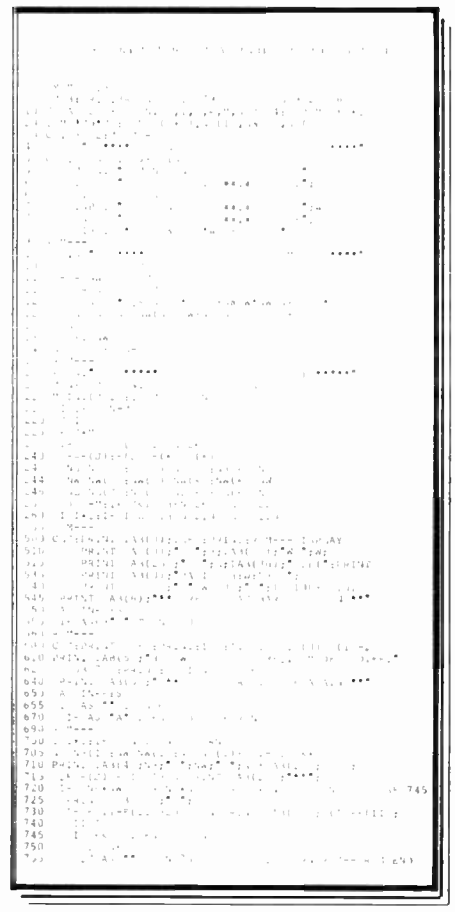
The resonant modes are a direct function of the shape and size of the room: the height, the width and the length.

For each of the studio's dimensions there are resonant modes, frequencies and multiples of them, at which a standing wave will occur.

The effect can be one of smooth diffusion: a good sounding studio. Or the effect can be one of severe frequency discrimination: a doesn't-sound-right studio. Or the effect can be somewhere in between, yielding persistent notations on your Trouble Log.

Minimizing the effects

Acoustical theory says that to minimize the standing wave frequency discrimination effects in a room, the room dimensions between parallel wall surfaces should be chosen so that none of them are an integral multiple of each other.



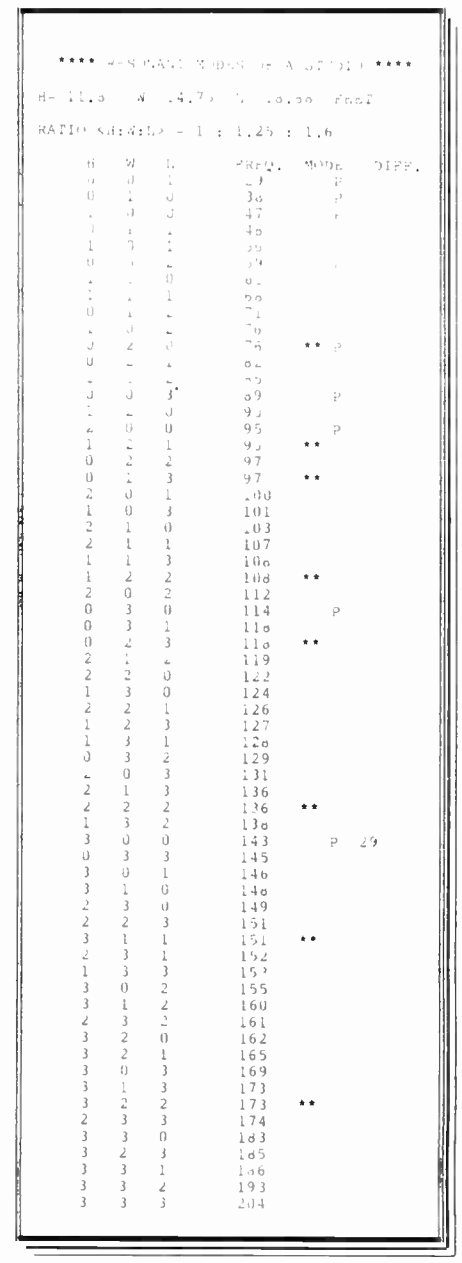
To that end, most of the experts recommend that the room dimensions should be in the ratio, or multiples, of the cube root of two.

And, the preferred dimension ratios are (height to width to length): 1 to 1.25 to 1.6 for small rooms; 1 to 1.6 to 2.5 for average rooms; and 1 to 1.25 to 3.2 for long or low ceiling rooms.

We are in the age of computing, so you don't have to be an acoustical engineering expert to use the concepts and practices of the field. Your computer can use them to help you identify, if not solve, the problem of a studio that just doesn't-sound-right.

The program

The MODE.BA program computes the theoretical resonant modes of a studio below 250 Hz, the acoustically critical frequency range.



Given a studio's height, width and length, it computes the room mode resonance frequencies for all combinations of each dimension at three multiples.

It tells you which are the "theoretical" problem surfaces. It marks the parallel resonance modes (P), multiple resonance modes (**), and the frequency difference between adjacent parallel modes when the difference exceeds 20 Hz.

MODE.BA's program and algorithm follow the way you would manually do it: Lines 100 to 150 compute resonant frequencies for all combinations of the three modes for each direction.

Lines 200 to 260 put the computed frequencies and modes in an increasing order by frequency. And, lines 500-755 sequentially display the studio's frequency distribution of resonant modes for interpretation and analysis.

The Resonant Modes of a Studio Calculation Example is for an average size studio with the preferred ratios of 1:1.25:1.6. It shows the frequency distribution of the resonant modes with multiple modes marked by a **, the parallel modes by a P, and the adjacent parallel modes with a frequency difference greater than 20 Hz marked by the frequency difference (29).

Different ratio and dimension combinations will give different resonant mode distributions. The example is relatively smooth and diffuse compared to some found in the real world of broadcasting.

Other factors in the room

In wave theory, the basic idea and the sign of a good sounding studio is to have

(continued on next page)

Electrical Dirt in Transmitter

(continued from page 15)
and tape machines; and the cart heads. It will clean 'em nicely, and leave no residue or gum.

OK, I've described a couple of kinds of clean. Clean and tight RF connections are another. Take a good look inside your transmitter; your phasor; and the ATU's. If you find something you don't understand, take it apart and clean it up.

If you find a black coil, you may have a circulating current problem, which is usually caused by a mismatch to the line, and/or the antenna, or both. This situation will require the use of an RF bridge, and some readjustment of the phase and current ratio.

There is, however, something not commonly talked about, and that is the method of tapping the coils in the ATU or the common point networks, i.e. the circuit connections are made to the ends of the coils, and adjustment of inductance accomplished by shorting turns on one end, with a strap and a clip.

In this method, voltage induced in the shorted turns by induction from the active end of the coil will produce circulating current, and loss by heating.

If you have a two or three tower array, using 1.0 kW or less, this loss will usually be negligible. For power of 5.0 kW and up, these losses could be sizeable, and the shorted turns might turn black from heat.

Obviously, the best method is to tap the coil, leaving the unused turns open. This requires an open mounting stud on the coil for the interconnection and the strap for the tap.

There have been several articles in the last few months in **RW** regarding DA bandwidth, and its effect on AM stereo. Stereo or not, a narrow band load on the transmitter is sufficiently detrimental to non-DA operation.

With the prevalence of all solid state transmitters, a narrow band load results in increased THD, poor modulation linearity—and besides, these transmitters just don't like it!

Even a non-DA operation with the transmitter looking into a transmission line feeding a network, and hence an antenna, must see a load substantially nonreactive over a range of at least ±10 kHz; and of course, the resistive component must remain close to 50 ohms.

You would be surprised how often this is not accomplished, either in the non-DA operation or the common input to a DA phasor.

I remember one I ran into a year or so ago. I set the common input network at 50+j0.0 at the station's operating frequency, then swung the generator frequency over 10 kc/s and remeasured.

The resistance dropped to about half, and the reactance came up to about 90 ohms! Certainly this was an extreme case, and it took about three weeks of nights to cure the high VSWR on the lines to the three towers, and retune the array.

I remember real well how the common input impedance came out: at −10 kc/s it measured 48.6+j4.8; and at +10 kc/s it measured 51.2−j2.8. That to me is pretty broadband, and this was accomplished by simply flattening out the transmission lines. I told you some time back what that meant, and how we used to do it in the 30's!

Room Sound

(continued from previous page)
a smooth, even distribution of the natural room resonances with few, or no, peaks in its response.

That is, the distribution should have a minimum of coincident frequency modes and a minimum of adjacent parallel modes widely separated in frequency.

A room not too small or too large will help. An optimum shape will help. An odd shape, such as non-parallel walls will help too, but that's only if you're in on a studio from its very beginning.

Otherwise, the application of acoustic treatment (rugs, tiles or drapes) is usually the only recourse you have. And, the problem with them is a matter of degree, too much on the wrong surface will kill a good or a bad room.

The objective is to find an optimum, just right, amount for a given room. And, being aware of the troublesome room modes (surface/dimension) can help you scientifically apply the sound treatment to the troublesome surfaces/dimensions.

The program calculates studio resonant modes based on the simple assumption that a theoretical or ideal exists in reality. In real life, the things in and of a studio will cause the room mode resonances to be at some variance to the calculated ones.

The real advantage of the calculations is that they give you a known starting point for solving the problem of the studio that doesn't-sound-right.

I've only presented a brief essence of the theory and the practice. For more information and understanding about the concept and how to use it, I recommend that you look to the experts.

Here's a couple of the experts and expert sources on room resonance as it applies to broadcast studios: (1) **NAB Engineering Handbook**, Fifth Edition, "Planning AM/FM Studio Facilities", pages 6-27; (2) **Audio Encyclopedia**, Second Edition by Howard M. Tremaine, questions 2.39 to 2.41; (3) **Sound Recording**, by John Eargle, pages 29-32; (4) **Recording Studio Handbook**, by John Woram, pages 183-188; and, (5) DB **Application Notes**, October 1981 DB, pages 62-63.

Circle Reader Service 30 on Page 22

Radio World Marketplace

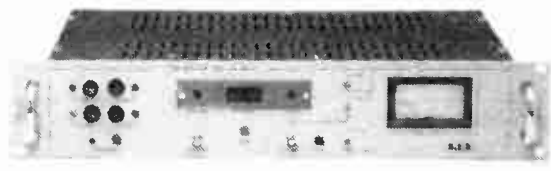
If your company has a new product you which us to consider for inclusion in *Radio World Marketplace*, please send a press release and black and white photograph to Radio World Marketplace, P.O. Box 1214, Falls Church, VA 22041.

Laser turntable for vinyl

A turntable that uses laser beams to play LP vinyl records is being developed by Finial Technology. The Laser Turntable™ employs light from solid-state laser diodes to track the LP record grooves, generating a reflection containing the music signal.

Nothing but light touches the vinyl record. This non-contact approach preserves LP life.

For more information, call **Michael May at 408-720-9800**, or circle **Reader Service 49.**



Solid state exciters

Bext's exciters come in different power levels, including the unusual 80 W. They require no tuning. The operating frequency, adjustable power and deviation level are all externally programmable from the front panel. All feature a built-in low pass filter.

The exciters are especially appropriate for multi-purpose emergency transmitters, stand alone low power stations or backup units.

Bext also carries a line of compact solid state broadband amplifiers (up to 1000 W) and composite STL systems.

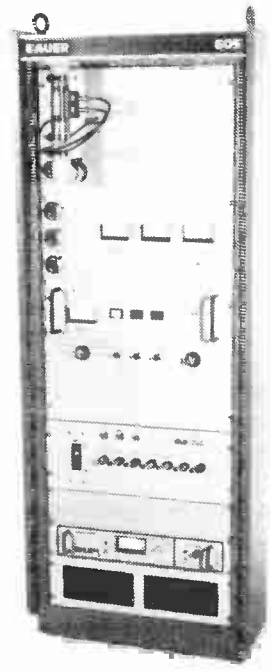
All products feature easily replaceable standard internal parts and widely used components.

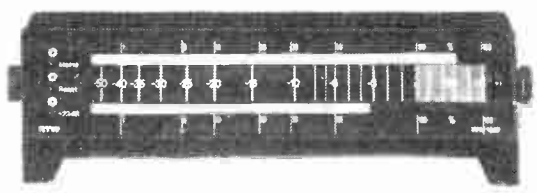
For more information, call **Dennis Pieri at 619-239-8462**, or circle **Reader Service 47.**

FM transmitter

The newest Elcom Bauer FM transmitter is the Model 605 FAT, a frequency agile transmitter capable of 5000 W power output into loads of up to 1.7:1 in the standard 88-108 MHz FM band. A frequency synthesized exciter, a broadband solid state IPA module and logging type tuning controls on the PA amplifier permit quick frequency change.

For more information, call **Paul Gregg at 916-381-3750**, or circle **Reader Service 48.**





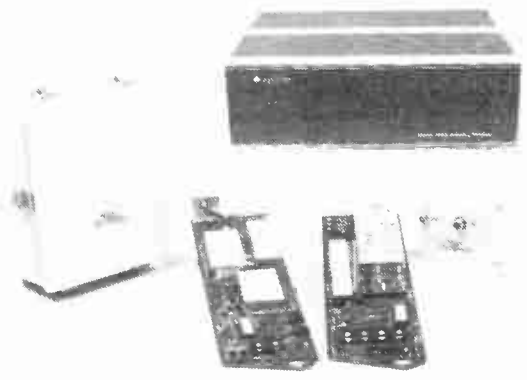
Peak program meter

RTW's Stereo Peak Program Meter 1227 allows visual monitoring of audio levels, and is especially appropriate for monitoring final program material in the production or transmission stage.

The RTW 1227 is self contained. It includes 10 " displays with 201 segments each, peak memory and input level 20 dB offset. The peak memory feature requires only one glance at the end of a production session to see if maximum output level was ever exceeded.

RTW is represented by Electronic Systems Laboratories, Inc. in the U.S.

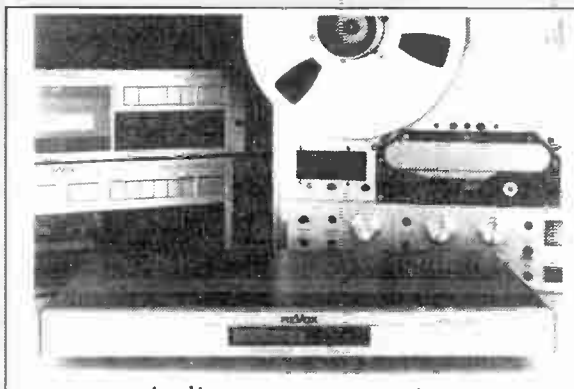
For more information, call **Lutz Meyer at 305-791-1501**, or circle **Reader Service 46.**



Satellite receiver

Adcom's Synthesized SCPC Frequency Agile Satellite Receiver Model 7550 is capable of receiving any channel on any transponder on any satellite by use of thumbwheel switches. It has plug-in slots for one downconverter and up to six demodulators, and is available with a highly stable C/L or Ku/L band downconverter.

For more information, call **Jerry Hutchko at 305-242-0272**, or circle **Reader Service 45.**



Audio source automation

Studer Revox recently introduced its new B203-I RS232 interface/controller, designed to control eight Studer Revox audio units.

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For more information, call **Bruce Borgerson at 615-254-5651**, or circle **Reader Service 50.**

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Circle Reader Service 12 on Page 22

Buyers Guide

Mics, Turntables & CD Players

Cueing Up With CD Players

by **Marlene Petska Lane**

Falls Church VA ... Stations vying for the top have been quick to realize that playing their music on compact disc might help them get there. But those who made that decision early in the game had to settle for consumer decks; professional players were nowhere to be found.

Now that companies are coming out with professional players, more stations are making the switch. But others are still asking, "Just what is the difference between professional and consumer players, and is making the switch worth it?"

Professional units, besides being sturdier, have several features geared specifically to the broadcaster. Among these are balanced outputs, cue wheels or buttons, hard wire remote control, digital filtering and twin DA converters.

Consumer units may have one or two of these "broadcast oriented" features—or they may have none at all.

But no matter whether these features are present on professional or consumer machines, the ways in which the features function may differ from manufacturer to manufacturer.

Thus the question becomes not only, "What is the difference between professional and consumer players?" but, "What is the difference between one professional unit and another?"

One important consideration is the physical design of the CD player. Most consumer players are fashioned much like a turntable, with controls on the top. The controls and displays are many and small.

Manufacturers of pro players tend to view them as either relatives of the cart machine or of the turntable, and have designed them accordingly.

Overview

The Tascam CD501 and the Studer A725 (as well as the new A727) are front-loading and rack-mountable, much like cart machines. The idea, say the manufacturers, is to save space in the studio.

"In talking with broadcasters, there seems to be a preference for front loading because they keep their turntables and there's no tabletop space in a lot of studios while they're in this transition between sources," said Bruce Borgerson, product manager for Studer Revox.

On the other hand, models like the Philips LHH2000, the Sony CDP3000/CDS3000 and the Technics SL-P1200 are top loading, with control functions on the top. These manufacturers see CD players as turntable replacements.

"The SL-P1200 has been designed to directly replace an SL-1200 Mark II turntable," said Bruce Adams, product planning manager for digital audio equipment and turntables at Technics. "The base of the pro player is the same size (as the turntable)."

The Philips LHH2000 and the Sony CDP3000/CDS3000 are multiplayer systems. Two or three CD drives may be controlled by a single controller, allowing the operator to preprogram several discs ahead.

All the pro models have large, easy to read controls and displays.

Methods of cueing

Cueing systems are an important feature found on the pro players that consumer players generally lack. The systems, however, differ from player to player.

"People are still trying to figure out what exactly they want in cueing," said

(continued on page 28)

CE Says Prepare for Digital Now

by **Lloyd Berg, CE**
WDAE-WUSA Gannett Radio

Tampa FL ... Things have changed since the old days when we all played 33s and 45s directly on the air. Record vinyl was good and we all had a couple of spare styli tucked way in the corner of each control room (to get us through the weekends).

Our only headache was keeping the cart machines working well enough to get the commercials on the air (my apologies to you purists who refused to use those early inferior quality carts and relied instead on reel-to-reel tape for spots).

These were the days when mono AM was king. The network came in on a 5 kHz phone line, the hot stations played music 2-5% overspeed, echo was popular on jock mikes and often on the whole station. Distortion? To be legal we had to keep it below 7½%. No problem!

FMs were either simulcast mono, beautiful music, religious or classical. They were occasionally in stereo, but always with mono production since the production room belonged to the AM side. Remember inventing ingenious methods and devices to kill the stereo pilot during voice, network and spots?

TV audio was nearly intolerable, the network audio also came on a 5 kHz line, studio mics were thin and echo-y, and the telecine operator would often leave the lights on so the usually muffled film material had an underlying hum.

Nearly all consumer electronics came equipped with the industry standard 5" speaker. In the old days if you could understand the audio at all, it was considered competitive enough.

Then one day someone noticed that the record vinyl did not seem to last as long as it used to. About this same time a new company calling themselves ITC started marketing a reliable cart machine, the Premium Line.

This unit was reliable enough for spots and music. These two events caused an almost overnight jump to carted music.

Most stations went so far as to take one or more turntables out of the on-air control rooms. Cart machine numbers jumped from between zero and three units to between four and six decks per room.

The station program director was delighted because it was now more difficult for the jocks to sneak in a few of their personal favorites that were not on the play list.

Also, the turntable speed did not need to be switched between 33s and 45s, slow intros could be cut off, and long songs could be edited down. And while carts occasionally died on the air, they did not skip.

In the old days the jocks were terribly overburdened with studying for their "First Phone" license, frequent meter readings, logging exact spot times, adjusting transmitter power, deciphering the format clock, digging through reams of record shucks, day-night critical hour pattern changes, playing with the air conditioner, answering the phones at night and on and on.

How things have changed! Now the jock's license is a post card, a computerized remote control watches his transmitters, adjusts power, does the pattern changes, alerts the engineer to problems and automatically prints the log.

Another computer has printed the program log and a third has printed out the music play list. The night answering machine fields the off-hour calls.

At many stations all the jock has left to do is check off the logs and read *Radio & Records* between intros. The zone controlled heating, ventilation and air conditioning system keeps everyone cool, calm and collected.

AM, FM and TV audio is now high fidelity stereo. Multi-thousand dollar stereos are common, and cars come equipped with cassette players.

Most people walk, jog, drive, shop, fly, work and play to the sound of electronically reproduced music! Walkmans and "Boom Boxes" come in AM, FM, TV, cassette and compact disc versions.

The aural broadcast medium we call radio now has some serious competition! To keep up, we engineers spend too much of our precious time and vast amounts of station money setting up and maintaining the banks of cart machines in the AM, FM and music mastering rooms.

We labor daily over phasing, alignment, guide heights, motor speeds, pads, tension, equalization, oxide formulations, tape slitting, pressure rollers, shaft polishing and sticktion.

We spend a huge portion of our en-

(continued on page 29)

Buyers Guide

Neumanns Set Mic Standards

by Rob Meuser, CE
CHAM

Hamilton Ontario ... Microphones are as subjective as any topic in the world of broadcast engineering. Hard test data is difficult to achieve with typical equipment in even a very well-equipped engineering lab.

That is probably why you find so many different types of microphones in recording studios. Each one has its own sound signature and therefore its own specific use.

User Report

The Neumann series of condenser microphones is no exception to this rule. Having long ago set the standard for microphones, Neumann has left no doubt as to the overall performance of any of its products.

Two specific models appropriate to broadcast use are the U 47 FET and the KM 88i. While most broadcasters are familiar with the U 47, the KM 88, although less well known, is also very useful in the broadcast environment.

The KM 88 is a small, slender microphone that offers excellent voice reproduction. Its small size eliminates one of the first problems of on-air broadcast microphones—that of blocking the announcer's view of copy.

The microphone has three separate adjustable patterns: omni, cardioid and figure 8. Other than its size, the outstanding feature of the KM 88 is its bright, crisp reproduction of voice. This is due in part to the rugged nickel membrane used in the condenser capsule.

In the cardioid mode, the microphone provides a defined boost at 5 kHz, coupled with a gentle roll-off just below 200 Hz. The net effect is crisp, clean voice reproduction.

The U 47 FET is another great performer for voice. This microphone has a boost all throughout the 2 to 8 kHz range and is flatter on the bottom end. The U 47 offers a powerful reproduction of male voices as well as a sound flattering to female voices.

The use of either of these microphones, or any other condenser microphone for that matter, requires some consideration.

Consider the increased cost of these microphones compared to less expensive dynamic units, and you will not want to place them in a situation where abuse will likely occur.

Both of these microphones are sensitive to popping at close range. Windscreens will help solve this problem, but poor announcer technique will limit your ability to totally overcome it.

Having had the privilege of placing both these microphones in a leading station that has won more awards in the last two years than I knew existed, gave me some latitude in solving the problem.

In this rare case, the announcers were all told as they were being hired that the station was building strictly a "class" act. The microphones were a part of that act and the "sound" we wanted.

To use the microphones, the announcers were required to learn the correct technique. Many of these announcers are now quite happy 6-12" away from the mic, with a live feedback reinforcing the room.

The windscreens, however, will always be necessary. The KM 88 has a small WNS 21 windscreen and a larger WS 21 for the heavy breathers in the bunch. The U 47 only fits the WS 47, which is somewhat large.

Both microphones have suspension systems available. I recommend them highly.

For day-to-day use, I favor the KM 88 for on-air because of its size, increased ruggedness of the nickel capsule and its crispness.

The U 47 is great in production. It also is a good general purpose recording mic for one or two instruments. The KM 88 is handy in production if you need adjustable patterns—in the omni mode. It has the same response as a U 87 (the quasi recording standard).

There are times in production where all this super fidelity, high tech hardware backfires. Announcers with deep, boomy (but raspy) voices are often difficult to record with any microphone.

The excellent transient response of a condenser mic allows the very "peaky" voices to accurately reach the tape machines with peaks intact! This invariably leads to distortion which is difficult to trace down.

To solve this problem, turn off your Neumanns and break out an old ribbon microphone. I have RCA 77 and 44s as well as Altec 639s ready for the occasion.

As I said in the beginning, a microphone's sound is in the ear of the listener.

Editor's note: For more information about Neumann mics, contact Russell Hamm at Gotham Audio Corp.: 212-765-3410. Rob Meuser, a consultant to several broadcast equipment manufacturers and technical support groups throughout North America and Europe, specializes in audio systems as well as AM and FM modulation systems. He can be reached at 416-526-8200.

Technics SL-P1200 Plays Like a Pro

by Lloyd Berg, CE
WDAE-WUSA Gannett Radio

Tampa FL ... In our continuing effort to find a truly broadcast oriented CD player, the staff and I have installed and tested many different machines. I recently received one of the first Technics SL-P1200 compact disc players shipped to the US.

After reading over the manual and setting up the machine in our music mastering station and playing with a couple of dozen of our "problem" CDs, the staff and I realized that this was not just another CD player!

This machine seemed to correct for the shortcomings of all earlier consumer, semi-pro and so-called pro machines that have been adapted for broadcast and production use. In addition, the SL-P1200 contains several new and sorely needed features, and is very competitively priced at $1295 list.

The first thing that you will notice when you unpack one of these machines is its sheer size and weight.

The unit measures 17" wide by 14" deep. It stands 7" tall but requires another 2" of clearance to open the disc compartment door. It weighs in at a record-breaking 32 lbs., and is designed to be set on a level surface.

This unit includes all the usual features that are of minimum value to broadcasters, such as a repeat selection

User Report

function, wireless infrared remote control, 20 event memory replay and headphone volume control.

The real advances of interest to us are:

- Dual speed fly-wheel search with 0.1 second resolution—accuracy without any drift of the actual "in" point.
- Variable speed of ±8%.
- Auto Cue function to find the exact point of first audio, then holding in stand-by until start button is hit.
- Elapsed time in/out of selection.
- Large calculator style buttons to enter track selections.
- Rear mounted DIN socket for momentary contact closure remote control of Start, Stop and Pause functions.
- Audition check of your "in" point that will not drift or jitter.
- Excellent immunity to pit track skipping from mechanical shock.
- Will play discs with some surface blemishes.
- Front panel display of the automatic internal de-emphasis on/off function. Note: We found that some CDs such as the CBS-Sony (Michael Jackson) and West German Polygram (Lionel Richie) triggered the automatic insertion of the de-emphasis network.

Some things can be improved upon, including balanced outputs, RS-232 interface, and more radio frequency interference filtering. (A 5 W hand-held two-way radio operated within a foot of the machine caused audio pops.)

Notice that I did not include a reduc-

(continued on page 27)

TP-84 Improves Your Sound

by Bill Betlej, DE
WKDW

Staunton VA ... Although many radio stations use some sort of a tape medium for the playback of their programming, and the CD player is fast becoming the playback vehicle of the future, the turntable is still doing yeoman's work when it comes to playing music on the air.

Whatever your reasons for choosing a turntable to play your music, you must not forget that the turntable preamp is an integral part of that playback system.

In fact, along with the cartridge and stylus, the preamp has more effect on the sound of the turntable product than the platter itself.

Many economically priced, high quality preamps are available today that put older units to shame. True, the RIAA curve is the same today as it was years ago, but designs now allow a curve track within 0.5 dB.

User Report

If you are searching for a way to improve your on-air sound, then consider replacement of your preamp units.

Gentner is one of the many engineering firms that are making turntable preamps. The Audiometrics TP-84 is manufactured by them and marketed exclusively by Allied Broadcast Equipment. Gentner is among the leaders in the recent telephone/remote control systems explosions.

Physically, the TP-84 is average in size. The enclosure fits nicely under a countertop secured by the flange ears that are included with the unit or can be placed on the floor of a turntable pedestal cabinet.

The unit can also be rack mounted using the available rack mount kit. It occupies one unit of standard rack space (1¾").

Input connections are made via RCA phono connections, which is the standard tone arm output. Output connections are made on No. 6 barrier terminals and not with some weird connector available only from the manufacturer.

Electronic options include a rumble filter and dual primary power supply. The rumble filter, which removes low frequency rumble from the record, may be jumpered. The unit is shipped set up for 110 VAC service but can be changed to operate with 220 VAC service.

The maximum output level is +21 dBm and the amp is delivered set for +4 dBm. The output level can be adjusted to meet other needs by adjusting the level controls recessed into the front panel.

Audiometrics specifies that their unit follows the RIAA frequency response curve within 1 dB. When we measured our four units, none measured less than 0.75 dB deviation on track.

Distortion is specified at less than 0.08% THD with 0.1% IMD. The noise figures are just as impressive—greater than 70 dB below full output level. Separation is greater than 70 dB.

Installation created no problems in our case. It should be pointed out that we are not in a high RF environment so we cannot attest to how the preamp operates in RF zones.

The design does include many components, along with a ground plane style PC board, that are there just for the purpose of RF suppression. These components were chosen for maximum protection in the commercial AM, FM and TV bands.

In the pricing department the TP-84 falls in the middle of the pack. The suggested retail is $270. You can spend quite a bit more, or you can spend less, for other units.

But, for the money, you will be hard pressed to find a unit as good as the Audiometrics TP-84.

The first thing I noticed after installing the preamps was the reduction in noise. Programming commented on the fullness of the sound, saying it seemed to be more complete.

Both our AM and FM stations (new units were installed for each) received unsolicited calls from listeners saying they noticed a difference in our "on air" music sound.

And I received a call from a competing engineer who tried to find out what we had done "to our audio processing." I didn't tell him then; I guess he knows now. Those kind of results speak for themselves.

Editor's note: For more information, contact your regional Allied Broadcast Equipment office. The author may be reached at 703-943-2377.

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Probase III Can Cure Turntable Vibration

by Tim Schwieger, VP
Broadcast Supply West

Tacoma WA ... Until now, attempts to eliminate or reduce vibration inherent in turntable bases and tone arms have been largely unsuccessful.

Probase III solves the noise and vibration problems that have been plaguing the broadcast industry since its inception. The cure was a combined effort of Sims Vibration Systems and Broadcast Supply West.

The result is a vibration-less turntable system at a reasonable cost.

In fact, the isolation of Probase III, combined with proper tone arm alignment and properly maintained cartridge and stylus dramatically improves on-air sound. It makes the on-air mixing of records and compact discs a reality.

Probase was originally created by Broadcast Supply West to house Technics turntables inexpensively and without the necessity of carving up studio cabinetry to install them.

Years ago, the main turntable used by broadcasters was the rim drive turntable. It was known for its tank-like durability. But it created excessive rumble, wow and flutter.

When sophisticated audio processors were incorporated into the air sound, they brought out all the problems inherent in rim drive technology.

Then came the next generation of turntables, the direct drive from Technics. The Technics line of turntables solved these problems and at the same time presented a product cosmetically more attractive.

Mounting turntables is only part of the solution to a significant problem that exists at every radio station. That problem is vibration and feedback which is being transmitted through the turntable and tone arm.

In a typical operating environment, a broadcast turntable is subjected to four types of vibration which affect sound reproduction quality:

- Transit Vibration: Transit vibrations are vibrations which are continually present in a building. These vibrations are transferred to a turntable operating in the building.

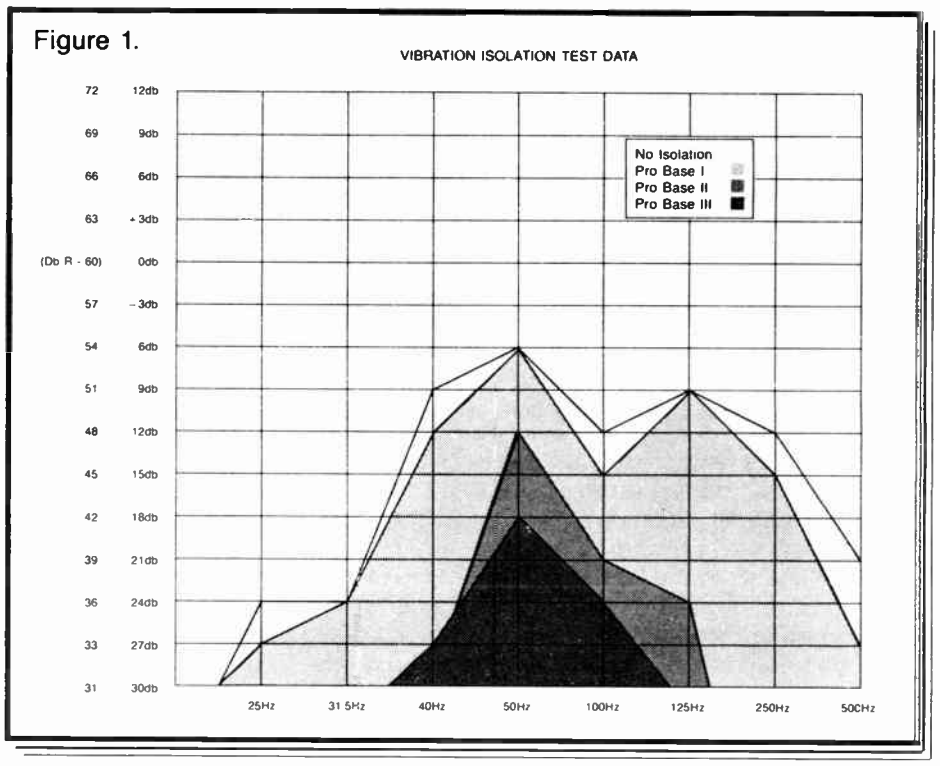
In a typical office environment, for example, low frequency vibrations will be transmitted through the heating and air conditioning system blowers. A turntable located in this environment will be continually subjected to transit vibrations at this frequency level.

- Shock Vibration: Shock vibration typically results from vertical shock or impact applied to the surface on which the turntable is resting.

Shock vibration can be caused by floor deflections in older buildings or by accidental impact such as finger thumping, or dropping items on surfaces where the turntable is mounted.

- Feedback Vibration: Feedback vibration can cause undesirable interference with sound reproduction quality. Under appropriate conditions such vibrations are generated by the amplifiers and speakers commonly used with a turntable. In some instances, transit vibrations and shock vibrations can induce or enhance feedback.

Figure 1.



- Airborne Vibrations: Airborne vibrations are transmitted to the turntable from the surrounding air, rather than through the support system, as in the case of transit and shock vibrations. Loud noises in the room in which a turntable is located, for example, can send vibrations through the surrounding air which will impact the turntable components.

The reduction of these types of vibrations is important when a stereo turntable is used in broadcasting. Such operations typically use highly sensitive processing equipment to obtain the best sound quality possible.

Prior to the development of Probase III, attempts to eliminate or substantially reduce vibration to improve broadcast quality have been relatively unsuccessful.

Probase I is composed of dense particle board and uses Audio-Technica feet as an additional means of dampening. The unit works well where floor movement is constant, such as walking on the second floor of a two-story building.

But the unit does not decouple the turntable from the environment, which limits its workability and classifies the Probase I as a narrow band isolation system, i.e., it works within a specific range of the audio frequency bandwidth.

Probase II is composed of the same dense particle board as the Probase I. It widens its bandwidth of isolation by using a new Neo-Gas foot designed by Sims Vibration Dynamics, Inc.

This unit widens its range of workability, cutting down on feedback and transit vibration problems. It is still classified as a narrow band isolation system but has a wider spectrum of isolation than Probase I.

Probase III uses a new technology which incorporates dynamic balancing as well as harmonic balancing to expand the range of isolation further than any other turntable base.

The accompanying graph, prepared by Sims Vibration Systems of Seattle, displays the performance of the Probase III. It shows the progressive differences between the three Probase models.

Probase III solves the long-sought-after solution to turntable and tone arm noise and vibration problems. And it does so at a cost that will please the most rigid and demanding budget.

Editor's note: For more information, contact the author at Broadcast Supply West: 206-565-2301.

Technics Pro CD Player

(continued from page 24)

tion of size in the list of improvements.

While data storage continues to evolve smaller, human fingers do not. Because of this, I do not believe that a user-friendly CD player that is smaller in size than the the SL-P1200 is possible without compromises such as tiny control buttons and micro-miniature readouts and indicators.

These compromises can lead to operator error and fatigue, especially in fast-paced operations.

The other major benefit to us is the ability to accurately and exactly cue to any desired point and hold at that point until called for.

Since the beginning of a track is often not the point of first audio, a dead area of 0.2 to 3 seconds must be cued past for tight air presentation. This machine gives the operator the ability to easily and quickly cue tight to first audio (or any other "in" point), and audition it if needed.

The published audio specs match all the usual digital levels. However, we have noticed tremendous differences in sonic quality when listening between various brands of machines that check out identically with the Denon test disc.

This machine produced the most consistently clean and pure sound of any CD player that we have critically listened to. There was no annoying harshness or brittleness in the high end.

Most well-engineered FM broadcast stations provide technical specifications that are vastly better than cart tape. However, tape cartridge machines offer the air staff convenience for music handling and are still necessary for commercials.

While the practice of airing CDs directly on the air is becoming more common at classical and album rock stations, tightly run adult contemporary and country stations continue to dub their CDs to carts at the cost of quality, extra time, extra equipment and extra maintenance.

I predict that many more stations will reconsider their decision to stay with 100% carted music once the operations people are offered a CD machine that is appropriate.

The Technics SL-P1200 is the first of the new breed of truly broadcast-oriented CD machines. I have already placed my order for two more machines that will be installed in production and air positions.

Editor's note: For more information, contact Panasonic/Technics at 201-348-7671. The author may be reached at 813-876-0455.

Buyers Guide

UTC Offers a Remote Solution

by Tom Koza, CE
KPWR-FM

Los Angeles CA ... It's always a welcome relief to discover an easy and inexpensive solution to a common engineering headache. This is how I'd describe a device called the Universal Turntable Controller manufactured by Henry Engineering, Sierra Madre, CA.

The Universal Turntable controller is a logic converter, or interface, that solves the problem of adding *synchronized* remote control to all Technics turntables common in the broadcast industry (SP-10, SP-15, SP-25 and SL1200-MKII).

The Technics turntables have become the standard of the industry for broadcast application. Despite their excellent performance, they have always lacked a means of reliable remote control.

In the past, many engineers hooked up a momentary pushbutton in parallel with the start/stop button on the turntable itself, only to realize that this usually created more problems than it solved.

Just push the button to start the turntable, but hope that it doesn't bounce, or the record will stop dead in the middle of the intro!

The other problem becomes evident if you try to connect the turntable to the "remote control" facilities on your audio console.

Since most consoles provide separate start and stop circuits, you can't connect the single-wire remote switch on the turntable to the console!

The Stop function has to be eliminated, and the turntable will usually get out of synch with the console logic: pushing the Start button on the board will make the record *stop*—perhaps on the air. Rather embarrassing!

What is needed is a means of converting the single-button logic of the turntable to two-button control, with *separate* circuits for Start and Stop control, plus Run and Stop status outputs for tally lights or console "handshaking."

This is exactly what you'd have on a cart machine or most other professional equipment. This is the purpose of the Universal Turntable Controller. It permits a Technics turntable to be installed, controlled and operated like a cart machine.

User Report

The UTC is a "black box" about the size of a phono preamp. It has no controls or adjustments on it per se, and can be mounted below the turn-table.

Since one UTC can control two turntables, there are two ten-pin connectors on the unit, one for each TT. The UTC is connected to the turntable with three wires.

The manufacturer provides a minijack and plug for this. I have installed UTCs on Technics SP-10s, SP-15s, and SL1200 turntables.

Installation in the SP-10 is the easiest, because there is a remote jack already on the turntable. It is easily removed, and replaced with the one provided with the UTC.

The difference is that the UTC jack is a three-circuit unit. The three wires from the UTC are connected to ground, to the internal start/stop switch and to the brake solenoid.

Henry Engineering provides detailed instructions on where to connect the wires within the turntable. The installation in the SP-10 took about 5 minutes.

The other Technics models don't have a remote jack, so a small ¼" hole was drilled adjacent to the AC power cord strain relief to mount the jack. After that, the three wires were connected as above.

Since the SL1200-MKII doesn't have a brake solenoid, the instructions specified where in the braking circuit to connect this third wire. Installation took about 10 minutes on these models. (Note: The SP-25 is identical electrically to the SL1200-MKII.)

The remaining seven pins on each ten-pin connector are for connection to your console or any "outboard" remote control buttons. There are Start and Stop pins, and Run and Stopped tally light outputs.

The Start and Stop control pins are CMOS buffered, and will interface with just about anything: switches, relays, NPN open collectors, other CMOS, opto isolators, etc. The Run and Stopped tally light outputs will directly drive 24 volt indicator lamps if illuminated pushbuttons are used.

I have connected the UTC to various consoles (Auditronics, Soundcraft, etc.) and have had no problems. In one case where an Autogram console was used, we elected not to use the button on the console (there is only one—no Stop).

Instead, I installed a metal panel in the cabinetry with two pair of illuminated pushbuttons for connection to the Turntable Controller.

The advantages of using the Universal Turntable Controller are twofold: It provides reliable remote control of both Start and Stop modes, and always gives the operator (DJ) indication of what the turntable is doing!

When the Start button is pushed, it always starts, and the button lights up to confirm it. The old contact bounce problem is eliminated, and the turntable *always* remains in sync with the console audio switching logic.

Incidently, the start/stop switch on the turntable can still be used, for cueing records for example, and the UTC will still sense the mode of turntable and switch the Run and Stopped tally lamps accordingly.

This device is indeed a problem-solver. If you don't want to hear jocks complaining about the "flaky buttons" on your turntables, the UTC is the quickest solution!

Editor's note: For more information, call Hank Landsberg at Henry Engineering: 818-355-3656. The author may be reached at 213-467-1224.

Professional Players

(continued from page 23)

Borgerson. "That's why I think you're going to see a lot of software control options. Different operators want different cueing systems," he explained.

Borgerson predicts that disc jockeys will determine which cueing system they like best, and that manufacturers will follow their lead.

Some of the pro players, like the Philips LHH2000, use search wheels to cue, much like an open reel recorder or turntable is cued. Others, like the Studer A725 and the Tascam CD501, use buttons to accomplish the same purpose. The Technics SL-P1200 has an autocue, or cue to music feature.

The SL-P1200 also has a rocker switch which can advance or sustain the laser pickup by 0.1 second. The Tascam CD501 has a jog wheel which works in much the same way.

There are a few consumer models which, although lacking in other "broadcast" features, do have cue to music—Technics SL-P720 and SL-P520 are two of them. This feature alone may be enough to sell a small station on the virtues of a consumer model.

"We believe these machines will be used by lower budget radio stations. High-powered, high-budget radio stations will probably go with the SL-P1200 because it has more features that a pro is interested in," said Adams.

Remote control capability is another feature to consider before you purchase a CD player. Hard wire remote capability is found on most pro players. Consumer players are controlled by infrared wireless remote. The disadvantages of infrared remote are obvious.

"You can imagine what it'd be like if you were on air or in production, and you had to reach for a different infrared remote control every time you wanted to input information in a unit to get it to do what you wanted," said Dave Oren, director of product planning for Tascam. The Tascam CD501 hard wire remote can control up to two machines with the same remote.

Other features

Many other features are available on pro players which may be lacking altogether on consumer models—such as pitch control, RS-232 ports, vibration control, even locks on the disc compartments.

While some stations may cringe at the thought of spending anywhere from $1100 (for the Tascam CD501) to $12,285 (for the three unit Philips LHH2000), a professional CD player may be worth the expense.

Buyers Guide

MD-421 Likened to Ribbon Mic

by Mike Callaghan, CE
KIIS AM/FM

Los Angeles CA ... Selecting a pleasing announce mic is often a difficult task for broadcast engineers. Different announcers often sound better on different mics, and reaching a final decision often requires compromises that make some people happier with the end result than others.

At KIIS we have used the Sennheiser MD-421 for years—it was chosen after a complex series of tests involving everything from new dynamics to outdated condenser units.

Many of the surveyed mics either added an unnatural or hollow midrange or produced a stridency or "edge" in the highs that harkened back to the days of the early electret mics that ran on "AA" cells.

The Sennheisers were finally chosen because the presence effect they offer adds just enough "macho" undertones to please our announcers, and they are still realistic yet distinctive enough for female air personalities. The MD-421 approximates the sound of those old, fragile RCA "ribbon" mics that you blew into and then rebuilt.

User Report

A five-position switch activated by a ring surrounding the output connector selects either "M" for Music response, "S" for speech, or any of three positions in between.

Despite the inclusion of a ball detent, it's not unusual for this switch to be inadvertently moved, resulting in an obvious and easily corrected change in the microphone's response.

Forcing the ring past the end stops can break the linkage between it and the switch, leaving you with a mic with just one equalization setting until it's repaired.

The mic stand adapter features notched slide-in mounting with a locking button which must be slid forward for the mount to be released. The European mic stud is converted to our standard 5/8-32 mic thread with a supplied adapter.

Weighing 13 ozs., the MD 421 is hefty enough to require the optional extra-heavy springs when used with a Luxo mic arm. The mic is mounted well back of the "center of balance" and wants to "flop" down, so the tension knobs on the supporting arm must be tightened frequently.

Standard finish is matte black. Optional grey foam windscreens are available at minimal cost.

The MD-421 is phased to the so-called "European" standard, with pin 2 of the output going positive with an increase in diaphragm pressure.

Being a true dynamic mic, no external or internal power is required. It is extremely tolerant of loud sound levels and resists "popping" when worked closely.

The mild cardioid response pattern is virtually ideal for booth work, with no strong off-axis effect coming through when the personality moves his head.

Despite the apparent success of the MD-421, we still have some announcers that prefer the Electro-Voice RE-15.

So we added a second mic boom on the other side of the console to support an RE-15, and it is wired to the "8" input of the Pacific Recorders BMX-3 mic module. By pressing input "A" or "B" the announcer can select whichever mic is preferred.

Editor's note: For more information, contact Tony Tudisco at Sennheiser: 212-944-9440. The author may be reached at 213-466-8381.

Time to Prepare for Digital is Now

(continued from page 23)

gineering budgets on the latest tape formulations, case designs, replacement carts, cart rewinding and related equipment.

We want our station to sound as good or better than our competition (broadcast and non-broadcast) and so we have become bound by the tyranny of carted music!

All with the unobtainable goal of trying to make outdated cart tapes come close to the old 1940s FCC minimum performance standards. (Our AM plant can beat the best cart specs, our FM can beat it many times over.)

The currently outdated cartridge tape must be continually and expensively maintained to come close to the minimum specifications for broadcast stations.

The cart tape at properly maintained broadcast stations has become a set of concrete overshoes for the engineering staff. Think of the technical and operational enhancements that would be gained if these resources could be used more efficently.

There is no doubt among radio programmers that the majority of radio programming will continue to rely on music. Let us make sure this music is as clean and as cost effective to run as possible.

Competitive modern technology has kept up with the public's demand for an improved product, the digital audio compact disc. The CD has been around for several years, has proven itself technically and has found consumer acceptance.

CDs are common in the control rooms of most classical stations, and at a few forward thinking classic rock, and album rock broadcast stations.

Sadly, many stations have delayed converting to digital because of operational fears, lack of user friendly players, or because in the past not enough product was available to completely program a station.

It is true that the gradual introduction of CDs into the control room will cause the jocks to again become conscious of the music they are about to play. This will no doubt produce a major side benefit of more thoughtful jocking!

Secondly, easy-to-cue control room equipment has just come on the market. And finally, current music is now available almost instantly, and the record companies continue to release "the greatest hits of ... " CDs (a great reason to replace your old worn radio station LPs, and simultaneously quadruple your storage space).

Additionally, Drake-Chenault and Century 21 have introduced extensive CD music libraries. Production music and sound effects on CD are available from many sources.

Engineering, operations and management must take a very serious look at what the CD has to offer. Practical and broadcast compatible CD players are here and they have proven themselves at our broadcast stations.

Start preparing for digitally recorded and preserved audio. It will benefit broadcasters in terms of consistent superior sound quality, ease of operation, reduced equipment and maintenance expense, and better utilization of engineering time. The time to start installing this technology is now.

Editor's note: The author can be contacted at 813-876-0455.

Carts Take the Heat

by Art Constantine, VP Mktg
Fidelipac Corp

Moorestown NJ ... Things have changed since the old days when we first started using tape cartridges. No longer are we saddled with machines which require you to pull a lever before you can play a tape.

No longer do we have to live with machines that require constant maintenance, alignment and recalibration. No longer do we have to be content with the old 160 nWb/m standard recording level because it's difficult or impossible to switch to elevated level and/or matrix recording formats.

No longer do we have to carve large chunks of broken plastic out of the head assembly areas of our machines, or constantly tweak machines while on the air to keep them in phase.

We've come a long way technologically since the 50's, and today's cart machines can do a lot more than just record and play tape.

They can warn jocks to read live tags, automatically switch from mono to stereo formats, vary their playback speeds for special effects or up-tempo music, carry logging information on a separate data track, even synchronize to video using SMPTE time code. But how's the sound, you ask?

Sure, we all love the convenience of the cart format, but can we really put the CD player in the production studio, away from the panic of real-time rock-and-roll and let the cart take the heat?

Can a cart sound as good as a CD? Ask the engineers who attended a recent SBE meeting in Columbus what they heard. Ask enlightened CEs and programmers from Los Angeles to New York City. Ask the pros at the Voice of America.

They'll all tell you the same thing: today's new design cartridge machines are an order of magnitude better than what has gone before. Unfortunately, some people just haven't gotten the word!

Buyers Guide

AKG Mic Yields Superior Sound

by Douglas W. Fearn, CE
WKSZ

Media PA ... Radio stations most often use dynamic microphones, and for good reasons: they are rugged, simple, relatively inexpensive and available in many configurations.

Professional condenser microphones, on the other hand, tend to be fragile, expensive and susceptible to a variety of special problems. However, condenser mics provide a sound quality unequaled by any other microphone type.

User Report

The AKG C-414 is typical of high-quality European condenser microphones. It is not inexpensive, typically close to $1000 with shock-mounting suspension. But the high quality of its sound makes it a reasonable choice for certain applications.

Mic features

The C-414 features four switch-selectable directional patterns: omnidirectional, bidirectional, cardioid and hypercardioid.

There is a three-position bass roll-off switch for flat response or roll-off at either 75 or 150 Hz at 12 dB per octave. Another switch provides 0, 10 or 20 dB of attenuation to prevent microphone electronics and/or console microphone preamplifier overload in close-miking situations.

The bass roll-off feature is necessary because microphones of this type usually have significant proximity effect—as the announcer moves closer to the mic, the bass becomes more pronounced.

This may be desirable, but when working close, it does require above average microphone technique for consistent sound. When one of the roll-off positions is used, distant noises will tend to sound thin—also possibly desirable.

Condenser microphones usually have higher output levels than dynamic mics, and the built-in attenuator in the C-414 may be necessary to prevent console preamp clipping.

Except for real screamers, it is unlikely that the microphone itself will distort on speaking voices.

Low frequency response

Large diaphragm condenser mics like the C-414 have exceptional low frequency response. Structure-borne rumbles, air conditioning and other mechanical equipment vibrations, traffic and even footsteps in the building can become audible if certain precautions are not observed.

The companion H-17A elastic shock mount and windscreen is a necessity for broadcast use of the C-414. Even with the shock mount, the 75 Hz roll-off will be necessary in many radio studios, especially those with wood floors.

These microphones also tend to be more susceptible to popping than many dynamics. The supplied windscreen helps, but the windscreen in the H-17A shock mount works even better. Still, some announcers will pop a microphone like this no matter what.

There are active electronics in a condenser microphone and this requires a source of power. "Phantom powering" is the most common way of powering professional condenser mics, and many modern broadcast consoles provide the necessary 48 VDC on each microphone input.

> *Except for real screamers, it is unlikely that the microphone itself will distort on speaking voices.*

On consoles without built-in phantom powering, a separate power supply can be used. AKG makes several models, or one can be built.

On consoles with transformer inputs, power is introduced on the microphone side of the transformer. On transformerless inputs, it is more difficult but it can be done.

With all these problems and complications it hardly seems that condenser microphones are worth the trouble. But the big advantage of these mics is their sound.

Sound worth the expense

They are smooth and easy to listen to, without the harshness frequently associated with dynamic mics. They exhibit a warmth and presence not attainable with dynamics.

The C-414 really comes into its own with live pickup of music. The clarity and fullness is astonishing to those accustomed to using dynamic microphones in this application.

This is not the type of microphone to be casually thrown into the bottom of a remote case. It requires care.

It is not the mic for every application. But when superlative audio quality is needed, the expense of the C-414 is justified.

Editor's note: For more information, contact Richard Ravich at AKG Acoustics: 203-348-2121. The author may be reached at 215-565-8900.

Buyers Guide

Getting More from NAB Carts

by Carl Martin, Pres.
Audi-Cord Corp.

Part III

Normal IL ... There is hope for satisfactory use from the NAB Cartridge System if one learns how to get the most out of the equipment's capabilities.

It is often assumed that all NAB cartridges are the same and that all function equally no matter what the application or need. Nothing could be further from the truth.

The number of posts vary depending on where the tape is removed from the supply hub and the length of the horizontal tape path chosen by the manufacturer. The direct path, single corner post designs, inherently provides easier tape pulling qualities but may not be the best for accuracy of tape guidance to the recording head.

Each extra post is a source of extra tension and wear to the tape lubricant. Unless they can increase performance in other areas, they should be avoided.

Some cartridge designs have removed the center post or wrap member between the heads. In these designs the pressure pads and their ability to wrap the tape on the head is very important.

Increases in excess tape pulling tension can easily overcome the pad pressure, causing dropouts of audio and failure of cueing due to loss of tape contact. Conversely, the pad pressure required for maintaining tape wrap can add significantly to head wear and increase the tension of the tape at the pressure roller and capstan resulting in wear.

Some cartridges' designs use mechanical brakes to stop the supply hub, while others use a pressure pad along the tape input side. The latter method adds to tape lubricant wear and pulling tension, while mechanical devices sometimes catch on the supply hub and can cause tape breakage or fouling.

The pulling tension presented to the capstan is in direct proportion to the surface area (number of turns) of tape on the supply hub and increases significantly with long tape loads.

Tests using a precision frequency input and counter output on the master recorder while changing tape and loads can help in determining the degree of slip and timing accuracy changes.

When tests indicate that the tape type and load are causing excess slip or loss of timing accuracy, a few things can be readily done:

Remove the braking loss at the dummy head of the playback by removing or moving the dummy head well back to just touch the pad used.

Consider the head penetration. The less the pressure of the pad on the tape, the less head wear will be experienced.

Can the extra friction members such as sponge side brake devices be removed, especially on long tape loads? This may be possible on machines that don't use high speed cue advance.

Are the tapes too tight on the supply hub? Leaving too much loose loop, of course, will cause the tape to foul, but ensure that there is some freedom between layers of tape—about 4" extra tape for each minute of length. Up to a maximum of 10" is standard practice.

Recording or reproducing drop out of audio or cue tones occur when the tape and head gaps fail to remain in intimate contact as the tape travels across their surfaces. These failures occur for several reasons.

It may be that the changing tension of the tape overcomes the pressure pads' ability to hold the tape in contact with the head. This is especially critical in cartridges which do not have the center wrap member.

The angle of the head may have shifted such that it does not meet the tape path squarely.

The heads may be severely worn. This, in combination with grooving can cause the tape to lift off the gap as the tape moves through the path. Cue failures at intermittent times are often related to these wear conditions.

The cartridge spring may not keep the cartridge held forward fully against the heads, causing a loss of penetration.

Transport pull capability is especially critical to long tape lengths. These failures show up first as a minor tape slip on the capstan and pressure roller.

The standard fix for pull difficulties is often erroneously assumed to be due to solenoid pull and an adjustment is undertaken. In fact, the solenoid must simply keep the pressure roller force sufficient to maintain the proper indent of the rubber.

Adding extra indent force without precise repositioning of the motor to maintain the roller vertical to the capstan will only cause poor tape guidance or force the tape to foul over or under the roller.

Just as important is the extra force effect upon motor bearing life. It is simply illogical to assume that tape pulling problems are always due to some design fault or failure of the transport. The load of the cartridge and the tape length or quality must be contained within the ability of the transport to perform. When failure occurs:

a) Look for pressure roller wear, softness and contamination.

b) Measure the pressure roller pressure with a spring scale for abnormal solenoid pull.

c) Look at the capstan surface where the tape runs. If it is very polished or worn, resurfacing or replacement will be necessary to restore its friction.

d) Observe any looseness in the cross shaft pivots which may cause it to push away, relieving the roller indent or wrap. The typical position of the roller shaft center is such that the pressure roller is slightly right of center, allowing a slight tape wrap on the output side of the capstan.

e) Watch for keyhole collision in the cartridge. If the cartridge does not have freedom to move front to back, the keyhole may be hitting the pressure roller shaft.

The purpose of this series has been to provide information helpful in understanding the various interacting components of the system and the role of each. There is no intent to degrade or enhance one product over the other or to find fault in others.

Editor's note: For more information, contact the author at 309-452-9461.

Shure Accentuates the Positive

by Dave Shedlock, Chief Oper.
WYDD-FM/WKPA-AM

Pittsburgh PA ... It's too easy to get lost in the numbers when the time comes to invest in a new microphone. After all, we've all experienced the dramatic differences in sound quality, even among mics that have similar specifications.

We recently decided to upgrade our production facilities, and based on my prior experience with the product I had no reservations about recommending the purchase of another Shure Model SM-7 microphone.

Enhancement and cover up

If every announcer had perfect mic technique and the type of resonant voice in demand today, perhaps a top-notch mic wouldn't be essential. The SM-7 seems to accentuate the positive qualities of each voice, while its design tends to cover up operator errors.

Subjectively, I'd describe the overall sound quality of the SM-7 as ultra clean, smooth and natural. The microphone includes selector (recessed under an access plate) and switches for bass roll-off and midrange emphasis.

I've found that leaving the bass setting flat allows the full-bodied, rich qualities of the mic to come through, while the mid-range boost adds a little extra kick to the vocal presence. It's a subtle but nice effect in heavily processed situations.

Among the most outstanding features of the SM-7 is its truly effective pop and wind screen. Having personally worked on the air with this microphone for the past six years, I can say the SM-7 is the most pop-resistant mic I've ever used, and the entire air staff is in agreement.

Frankly, I've heard nothing but praise from the folks who have been using this microphone on a daily basis. I'm sure our listeners prefer not hearing the pops as well.

The pick-up pattern of the SM-7 provides us with three valuable voice reproduction characteristics. First, the acoustics of the studio have a minimal effect on the end product. The mic sounds consistently good in our on-air and production studios, although the construction of the two rooms is completely different.

User Report

Secondly, pickup of any background noise is minimal. I noticed a definite decrease in the relative level of room noise after we installed the SM-7 in our production studio.

Last, but not least, is the impressive degree to which the microphone negates proximity effects. I've experimented with different mic techniques, and the SM-7 is very forgiving when it comes to being worked from near or far or from unusual angles. This is a user-friendly microphone!

Shure has taken a major step in the right direction of reducing the transfer of mechanical noise as well.

With our old production studio mic, it sounded like we had a cheap spring-type reverb unit on line. Our old mic was literally picking up the vibrations of the springs in the mic stand. The SM-7 eliminated the problem.

Never fails

Over the past six years, I've worked with three SM-7 mics that were in constant use, and I've yet to see one fail. It's great to see that quality and reliability can still go hand-in-hand, especially in an item that some folks would assume would have to be fragile.

All in all, I can't express anything but complete satisfaction with the Shure SM-7. If I'd had the opportunity to sit down with an engineer from Shure, I couldn't have thought of any improvements ... it even *looks* good!

In these days of hype and exaggerated manufacturer claims, it's a breath of fresh air to find an item that performs as well as its maker claims.

Editor's note: For more information, contact John Phelan at Shure: 312-866-2573. The author may be reached at 412-362-2144.

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CTR124, CTR34 and CTR14 shown

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