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New Metric Deadline Set

Washington DC ... The effective date for the implementation of the new metric AM groundwave curves has been delayed from 1 January to 1 February.

The Commission said it decided to defer the deadline because broadcasters were having problems with the availability of materials, especially documents specifying the curves and related graph paper.

"Owing to delays in steps needed to make those (metric) curves and related materials available, there is insufficient time to enable users to employ them for studies filed on or after the previously established effective date of January 1, 1987," the Commission said in a 15 December announcement.

According to FCC Engineer William Meintel, there has been a delay in printing the curves. "With the January 1 deadline," he said, "we just had no time to get the curves out."

Meintel commented "The NAB's curves have only been available recently."

On 5 December, the NAB announced that it would make the new metric curves available for purchase.

For example, a set of 19 graphs with graph paper and an instruction sheet costs $45 for NAB members or $60 for nonmembers.

However, Meintel said that the Commission decided that the less-than-a-month time frame in which the curves have been available before the original deadline was not sufficient.

The latest delay is not the first for the implementation of the metric curves.

In May 1985, the FCC adopted a partial stay of the metric ruling after some broadcast interests complained that more time was needed to increase the availability of the curves and to use them in studies.

The new curves were approved by the FCC in March 1985 to replace the old English-unit curves contained in Rule Section 73.184.

The Commission is making available negatives of the new curves and associated graph paper to groups that want to sell the materials.

In addition, a source listing of the computer program that was employed in calculating the points used in plotting the curves, along with a 650-page listing of those calculated points, can be obtained from the FCC's records distribution contractor, International Transcription Services (ITS) at Suite 140, 2100 M St., NW, Washington DC 20036, or by calling 202-296-7322.

For more information contact William Meintel at the FCC: 202-254-3394, or Bob Hallahan at the NAB: 202-429-5350.

FCC Freezes Daytimers

by David Hughes

Washington DC ... In a move that has been praised by many broadcasters, the FCC has imposed a freeze on the acceptance of applications for new AM daytime-only facilities.

The Commission, in an 11 December ruling, said that, effective immediately, it was issuing a "temporary freeze" on the acceptance of new applications for daytime-only stations.

The action, the FCC added, is "taken in contemplation" of a future formal rulemaking proposal to impose a permanent ban on applications for new daytimers.

However, the freeze will not affect pending applications. New daytime facilities that had been applied for by 11 December will be processed as usual, according to Lenore Cunningham, with the FCC Audio Services Division.

Although she had no figures on how many daytimer applications were pending, some FCC sources indicated that the figure may be about 40.

Also unaffected by the freeze are daytimer applications filed after the adoption date that are mutually exclusive with applications listed on an "A" cutoff list, the FCC said.

AM difficulties

"The difficulties facing AM daytime stations are compounded by the limitations on their hours of operation and the attendant inability to effectively compete with fulltime radio broadcasters," the FCC maintained in its December order

Procedures to allow many daytimers to operate at night, such as the recent Canadian and Mexican clear channel decisions, have been adopted by the Commission during the last two years. More than 400 daytimers on foreign clears have reportedly gained night operations. The FCC has also expanded presunrise and postsunset authorizations for daytimers.

The Commission said it previously had in effect a ban on new daytimer applications for the Canadian and Mexican (and one Bahamian) clear channels because the authorization of more stations could prohibit the creation of new fulltime stations and hurt FCC efforts to provide relief for existing daytimers.

In its December ruling, the FCC said that "for these same reasons" it will extend the daytimers prohibition for new clear channel operations to affect all AM band channels.

"In continuing to authorize new AM daytime stations, we not only complicate the task of offering relief to such existing

(continued on page 2)

EPA Comments Support ANSI

by Alex Zavistovich

Washington DC ... In comments filed in December with the Environmental Protection Agency (EPA), broadcasters and engineers supported implementation of a national radiation exposure standard equivalent to that set by the American National Standards Institute (ANSI).

Most supported the ANSI guideline, which recommended a specific absorption rate (SAR) of 0.4 W/kg—one of four alternatives suggested by the EPA in a proposal filed in the Federal Register last summer.

The first alternative would limit SARs to 0.04 W/kg for frequencies above 3 MHz. The second would limit exposure to 0.08 W/kg above 3 MHz. The third was the ANSI-based limit of 0.4 W/kg.

The EPA had also suggested a fourth "nonregulatory" alternative, in which other activities would be established "in lieu of adopting federal guidance for RF radiation, such as ... public awareness programs to distribute information on health effects and environmental measurements, and providing technical assistance to states and federal agencies."

ANSI alternative favored

The Society of Broadcast Engineers (SBE) supported the adoption of the ANSI protection standard. The standard ensures a "no effects" level of RF exposure by protecting against thermal effects in humans, SBE contended.

The ANSI protection guides are applicable to both workers and the public, SBE said. The broadcast engineering industry would be able to comply with the guidelines with "little difficulty," it added.

The National Association of Broadcasters (NAB) also supported the current ANSI standard, stating that it provided adequate radiation protection.

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Regulatory News

FCC Puts Freeze on Daytimers

(continued from page 1)
stations, but we also perpetuate the very problem we are seeking to address," the FCC said.

It added that it would be in the "public interest to restrict future applicants to proposing fulltime operation since this generally results in more efficient use of scarce spectrum space."

Broadcasters praise plan

"The freeze is probably a good thing," said NAB Senior VP/Radio David Parnigoni. "There are already enough problems with the crowded conditions on the AM spectrum. There is not a lot of room for new daytimers."

Parnigoni said that 2,300 of the approximately 4,800 AM stations are daytimers. He added that the NAB would also welcome a permanent FCC ban on new daytimers, which he said was a "strong possibility."

Jim Wychor, owner of KWOA, a daytimer in Worthington, MN, and past president of the Daytimer Broadcasters Association (which is now the NAB Daytimers Committee) said the freeze is "long overdue."

He said that since daytime-only stations are not allowed in the TV or FM services, they should also not be allowed on AM. "The FCC has been creating a whole new class of broadcaster—the daytimer," he said.

"The Commission should be working to upgrade all daytimers to fulltimers, and not creating more," Wychor said. He added that if new daytimers are created, they will eventually organize and put pressure on the FCC to become fulltimers, thereby further crowding the existing AM band.

"We do not need to shoe-horn in more daytimers. That is not in the public interest," he said.

While Wychor said he supported FCC efforts to expand daytimer hours on foreign clear channels, he said there are other possibilities, such as allowing AM daytimers to use FM translators. He also said the recent proposal to create a second FM band in the 225-230 MHz range is worth "serious study."

"The freeze is a good idea—a very logical step," said David Palmer, owner of WATH, an Athens, OH, daytimer, and head of the NAB Daytimers Committee. "It's long overdue."

He said that the freeze indicates that the FCC is "serious" about AM improvement. "You can't have the Commission looking at numerous proposals for the relief of daytimers and also advocate creating new daytimers."

"There is a lot of congestion on the band already. Any new signal placed on the spectrum will create even more interference," Palmer said.

He said that the freeze—in conjunction with Docket 80-90 daytimer preferences for FM stations, proposed daytimer preferences for the new 1605-1705 kHz AM band segment, and even the FM2 plan—increases the possibility that more daytimers will be able to operate fulltime in the future.

"I welcome any creative thinking on the issue," Palmer added. "One idea tends to promote others."

DST update

In a related issue, Palmer added that he is confident that the FCC "in the near future" will unveil a remedy for daytime-only stations that will suffer the loss of an hour of key full power morning drivetime for three weeks in April when Daylight Savings Time (DST) expands.

While Palmer said he did not want to comment on the exact method the FCC will choose, other observers indicated that the Commission may place a 50 W minimum power level—or some other minimum level of power—in effect. That would mean that stations with pre-sunrise authority of less than the limit would be able to increase power up to the limit.

Last summer, Congress approved a plan to start DST three weeks earlier in the spring. Beginning in April 1987, DST will start on the first weekend of the month rather than the last weekend.

Because sunrise will occur an hour later than normal during those three weeks, daytimers say they will not be able to operate at full power during an hour of morning drivetime. Current rules call for daytimers to be limited to their much lower presunrise power levels.

Palmer said he expects an announcement from the FCC by early 1987.

For more information on the daytimer freeze, contact Lenore Cunningham at the FCC, 202-632-6485, David Palmer at WATH, 614-593-6651, or the NAB public affairs office at 202-429-5480.

Featured this issue

FCC Clips

Fixed Service Rules

The FCC, in an action announced 25 November, has proposed coordination, licensing procedures and technical standards for shared government/nongovernment fixed service use of the 932-935 and 941-944 MHz bands.

In November 1984, the Commission allocated the bands for government/nongovernment use, but it did not address procedural and technical rules. According to the latest announcement, the FCC has now proposed a sharing arrangement that will give government and nongovernment users equal access to the two bands.

For more information on the plan, which is contained in docket GEN 82-243, contact Rodney Small at the FCC: 202-653-8116.

Personnel Changes

The Commission has announced a number of recent personnel changes.

Diane Kilroy has been named FCC general counsel. She had been senior legal advisor to FCC Commissioner Dennis Patrick.

Alan Schneider has been appointed chief of the Auxiliary Services Branch in the Audio Services Division.

Bradley Holmes has been appointed chief of the Mass Media Bureau's Policy and Rules Division.

Steven Kaminer has been named acting legal assistant to FCC Commissioner Mimi Dawson.

Dale Brown, Chairman Fowler's special assistant for Congressional affairs, has assumed duties as chief of the legislative division of the Commission's Office of Congressional and Public Affairs.

Thomas Holleran has been named deputy associate managing director for operations of the FCC's Office of Managing Director.

Robert Pepper has become senior advisor to Commissioner Patricia Dennis.

For more information on the personnel changes, contact the FCC's News Media Information Office at 202-632-5050.

Station Totals

The FCC has released its latest figures on the number of radio stations in the US. As of 30 November 1986, the Commission reported 10,052 licensed stations—4,856 AM stations and 5,196 FM stations. The FM total includes 1,258 noncommercial stations.

The figures indicate that no new AM stations have been licensed since 30 October; however, six FM stations were licensed during the period.

For more information, contact the Commission's News Media Information Office at 202-632-5050.

New Mailing Address

Effective immediately, the FCC's Columbia, MD, laboratory has a new address: Authorizations and Evaluation Division, FCC Laboratory, 7435 Oakland Mills Road, Columbia MD 21045.

NAB Seeks New FMX Partner

by David Hughes

Washington DC ... The NAB is currently negotiating to find a new partner to take the place of CBS as co-developer of the FMX FM stereo extension system.

"We are looking for someone to replace CBS," said NAB Science and Technology VP Tom Keller, who developed the FMX system with Emil Torick, formerly audio technology VP of the CBS Technology Center.

Keller told RW in mid-December that he is "very confident" a deal can be worked out by early 1987. "At this point it is just a matter of finding the right party."

The FMX system allows listeners equipped with FMX receivers to receive a clean stereo signal in fringe areas without the "stereo penalty" hiss.

Center closed in December

In a cost-cutting move, CBS closed its Stamford, CT-based technical center on 15 December. When it first announced the closing in September, according to Keller at the time, CBS maintained that it wanted out of its deal with NAB to develop the FMX system.

Keller said that, since then, the NAB has been negotiating with "a lot of companies" to find a replacement for CBS's FMX stake. "We're looking at everything from small venture-capital firms to very large, established companies."

The NAB had "actively" sought out some possible FMX partners, he said, while other firms that had not been on the NAB list of potential partners have contacted NAB about an FMX partnership.

"There is a lot of talk going on," Keller added. He said he expects a "shakeout" among the interested firms in the near future, although he had no firm timetable.

Keller said that, despite the forthcoming deal, two things were "most likely"—one, that NAB would continue its partnership in the FMX project, and, two, that Torick will remain involved.

Torick was less willing to reveal any details about the negotiations. The release of details at this point, he told RW, would be "premature. There are still many business decisions to be made."

He said that he and the seven other technicians working on the FMX project are still on the CBS payroll. "We are the last remaining vestige of the tech center."

> *"We're looking at everything from small venture-capital firms to very large, established companies."*

The FMX project is temporarily housed in a CBS publishing facility in nearby Greenwich, CT, a short distance from the former technical center, according to Keller.

Even though CBS has decided to get out of the FMX project, the firm "still has confidence in the technology," Torick maintained. That is evident, he added, because CBS has kept the FMX project going despite the closing of the tech center.

Research continues

The CBS decision to close the tech center has definitely delayed FMX research and development, Keller said. However, it has not halted it completely.

He said that FMX work continued during the gradual phase-out of the tech center in late 1986. "The work is taking place, although it's not as fast as we would like to see it. It's definitely been slowed down."

"General research and development is occurring," Torick added.

Before the demise of the technical center, multipath-type quadrature rejection problems on non-FMX receivers had been reported during on-air tests of the FMX system at various stations around the country.

Keller reported that results will be available by late winter regarding a reduction of FMX-related multipath problems on automobile radios. He said details about the tests may be available at the Dallas NAB show, scheduled for late March.

Manufacturer waiting

In related news, Inovonics President Jim Wood said his firm has dropped plans to manufacture its "X-tra" FMX generator, which was unveiled at the NAB show in the spring of 1986.

Inovonics, along with Circuit Research Labs and Aphex Systems, was one of a handful of firms that had announced plans to manufacture and test FMX generators. NAD Electronics has shown an FMX receiver it manufactured.

Instead, Inovonics will market a new, redesigned box, the Model 705 FM/FMX stereo generator, which is an FM stereo generator with an FMX plug-in option. Wood said that the plug-in FMX option is available immediately. However, he said, few stations have been interested in it.

"I've noticed a cooling off regarding station interest in FMX," he added. "We're all set to go (with the plug-in option), but we're hard-pressed to find anyone who wants to try it."

"If the FMX system falls, we will make the (Model 705) with one less hole," Wood said.

Inovonics has tested the system at some stations. Wood reports that he had not seen much of a multipath problem, "but most of the tests were done in valley locations that are not prone to multipath interference."

Despite the "bad press" about some of the FMX tests and the problems caused by the closing of the CBS Technology Center, Wood said that Inovonics is still backing FMX. However, he predicted that "no one will get rich on it."

For more information on the FMX situation, contact Tom Keller at NAB, 202-429-5346, Emil Torick at CBS, 203-622-2500, or Jim Wood at Inovonics, 409-458-0552.

New FCC Policy Bans 'Lavish' Luncheons

by David Hughes

Washington DC ... FCC officials have been warned to think twice about accepting "lavish" luncheons given at industry functions.

On 25 November, the FCC amended its rules which govern "employee responsibility and conduct" to permit Commission officials "to accept meals and other refreshments, not lavish in kind, offered at group functions given by regulatees or persons who can directly benefit from the FCC's regulatory activities."

However, the FCC reminded its staff that they should check with the Commission's legal counsel before attending group events in order to avoid the appearance of a conflict of interest.

FCC officials are allowed to attend industry functions, the Commission maintained, "so long as a prior determination is made" by the Office of General Counsel "that attendance is desirable to assist Commissioners or staff employees in performing their official duties."

Event organizers, as well as other interested persons, can also seek advice from FCC counsel as to whether the event is appropriate, the Commission added.

A luncheon in question must "have some business nexus, such as providing for an informal exchange of views of problems affecting the industry." However, it may not be "just a small party for a few FCC officials," the ruling states.

The FCC said that the policy was made in order to "help employees (to) avoid engaging in any activity that could result in, or create the appearance of, impropriety or undue influence."

While the November ruling affects group events, the Commission stressed that its rules still "prohibit Commissioners and staff from accepting meals or refreshments proffered in individual meetings with regulatees or other interested persons, unless an investigation or inspection tour continues through a mealtime or an employee is asked to speak at a breakfast, luncheon or dinner meeting."

The policy does, however, permit the FCC staff to accept gifts of "nominal value" which are given for participating in a seminar or conference. However, the gifts must be "of the type usually given by the particular sponsoring entity."

For more information, contact Sharon Kelley at the FCC: 202-632-6990.

Comments Support ANSI Guidelines

(continued from page 1)

The association contended that a SAR of 0.4 W/kg provided a safety factor of 10, relative to a whole-body averaged SAR of 4 W/kg, which NAB decribed as the "threshold adverse effects level." A safety factor of 10 is supportable, given that no harmful effects have been known to occur in humans exposed to levels of 0.4 W/kg or less, NAB claimed.

"Adoption of this standard will provide more than adequate safety for the American public, yet will not impose unnecessary restrictions on electronic communication systems," NAB said.

The FCC, in its comments, stated that it was not "competent to recommend an appropriate exposure threshold to protect the public from potentially hazardous RF fields." The Commission noted, however, that the current ANSI guidelines have been sufficient for FCC evaluations of corrective actions.

Nonregulatory option rejected

The "nonregulatory" approach was rejected by the NAB as the group felt it would foster increased state and local RF radiation regulations.

The association urged federal preemption of such local standards, contending that "unnecessarily stringent restrictions" have been put on electronic communications by "nonfederal authorities possessing little scientific expertise."

The FCC was also opposed to the EPA's nonregulatory alternative. If the EPA chose not to recommend an exposure standard, the FCC noted, there would be a "serious impact" on telecommunications services.

"Lack of uniform federal guidelines has already led to the beginning of a proliferation of local and state guidelines which could result in a regulatory maze . . . ," the Commission held.

The FCC added that this "patchwork of standards" could be, in many instances, "inconsistent, unreasonable, and unsupportable from the standpoint of protecting safety and health."

Two-tiered standards

The NAB rejected a differentiation of general and occupational standards as well. A "two-tiered standard" would provide no more safety than would a single standard, NAB said.

The FCC noted that official federal guidelines are needed for both occupational and general RF exposure. Occupational exposure standards, the Commission noted, would eliminate worker and employer apprehensions about safe exposure levels in the workplace.

The SBE, citing a study conducted by the TV Broadcasters All-Industry Committee, said the electric field level established in the ANSI guidelines would be exceeded only if a person came within two meters of the radiator, "assuming that the radiator operates at 500 watts." For 450 MHz equipment, SBE claimed, ANSI levels would be exceeded only within 1.6 m.

"Broadcast personnel would have to be *extremely* close to the base transmitter" to be exposed to radiation levels beyond the ANSI standard, SBE maintained.

The group stressed, however, that all radio and TV installations and operations may not necessarily be able to comply with the standard.

"The goal (of the federal government) should be to determine the upper limit of exposure and encourage the broadcast industry to achieve the exposure reduction to values as low as are reasonably achievable," SBE said.

The Electromagnetic Energy Policy Alliance (EEPA), a group of manufacturers and users of nonionizing, electromagnetic-energy-producing equipment, endorsed a "hybrid" standard of the second and third option proposed by the EPA.

EEPA urged the EPA to adopt the SAR of 0.08 W/kg, time-averaged for 0.5 hours, "for protection in areas regularly occupied by members of the public (homes, schools, nursing homes, hospitals)."

The level, based on an SAR of 0.4 W/kg, should be used "for random and transient exposure" at frequencies above 50 MHz, EEPA said.

Norm Hankin, an environmental scientist in the EPA's Office of Radiation Programs, said the agency had originally expected to resolve the exposure guideline issue by the latter part of 1988. That schedule "may no longer be realistic," Hankin stated.

For additional information, contact the EPA's Office of Radiation Programs at 202-475-9630. Contact the SBE at 317-842-0836, the NAB at 202-429-5430, and the FCC at 202-632-7000.

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).

Get real!

Dear RW:

The last time I wrote to you, I wrote in agreement with John Shepler's article on professionalism in engineering. Perhaps I was wrong.

John "Low Q" Shepler's article in your 1 November 1986 issue about dropped me through the floor. Get real, you guys! This approach to radio engineering sounds like an outtake from a Marx Brothers' movie. Professional Engineering? Snort, snort, chortle, chortle.

I seriously doubt that anyone sane or sober would really take to rapping on their transmitters, would they? I wouldn't.

It stands to reason that the HV wiring and connection points in your transmitter(s) should be checked as a part of your maintenance routine. The guys who built the HV caps, transformers and standoffs all have very strict torque standards for the fasteners used on this stuff—standards which should be adhered to.

The crimping of the cables should be checked, along with the cleanliness of the wire bundles and the general cleanliness of the rigs themselves. When I say clean, I mean *clean*. Not just Hooverized, but sanitized.

As far as watching your meters shaking when you pound on the cabinet, I would not be surprised if some of those jitters are caused by jarring the little bitty jewels right off their bed bolts. Of course, the new meters you use to replace the ones you just broke will be "factory accurate."

Let's remember that intermittents have to follow the same laws of nature that we used to design the stuff in the first place. They cannot make up the rules as they go along.

If we have enough education and sense to get into this racket in the first place, we should apply that same education and sense to fixing these problems. Jiggling, jerking, and hammering won't solve anything, with the exception of venting your spleen on a piece of inanimate machinery which is broken because you aren't smart enough just then to fix it.

Get real. This approach is likely to send some good gear to the boneyard for no good reason, and possibly to cause injury to someone who doesn't know any better and follows this advice. I know that John put in the usual stuff about HV circuits and transmitters, but people often jump on articles like this as a fast, *cheap*(!) and easy solution to maintenance problems.

I think that both John and I agree on the need for high degrees of professionalism in our craft, and on the need for improved industry respect for engineers. A "Three Stooges" approach to servicing delicate, high tech equipment doesn't get it.

Rather than get out the rubber mallet, get out the books and brush up on why this stuff does what it does in the first place, then brush up on your troubleshooting techniques and tips.

If that fails, call the manufacturer. It might just be that they have had a similar

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Freeze is Good FCC Policy

The FCC's freeze on new daytimer applications is laudatory. A freeze is the only consistent stance the Commission could take in light of its continued efforts in promoting AM improvement.

One of the FCC's goals has been to upgrade existing daytime-only services, with the ultimate goal being fulltime status. To simultaneously allow new daytime-only licenses is a step backward, and is inconsistent with the Commission's overall AM policies.

Today's sophisticated technologies make it possible to squeeze in yet another station. Practice has been to add stations simply because it is physically possible to do so. A large number of marginally profitable operations have been added to the AM band which are now sorely in need of these AM improvement efforts.

In the meantime, what lucrative channels AM offers already exist—though in limited numbers. This has encouraged speculative buying and selling sprees of both AM and FM stations in the last decade. Increasingly inflated prices for these stations has caused a record turnover in ownership, and prompted talk of a reinstatement of the three-year rule, which would require new owners to retain their licenses for three years after purchase.

There is roughly one radio station for every 20,000 people in the US. This multiplicity of stations ensures a wide variety of programming for the public, and it is doubtful that there is any programming *not* getting on the air.

Competition with FM is at an all-time high. The latest surveys indicate that 72% of listeners favor FM. Docket 80-90 will further create a source of competition for AM. The AM improvement effort is designed to make AM audio fidelity equal with FM. The interference-prone nature of the AM band will only further detract from these efforts and from the quality of those existing AM services if more stations are added.

A shutdown on daytimer applications gives the Commission's AM improvement efforts an integrity and credibility that it could not otherwise have. The Commission should stand firm in its decision until it and the industry, through their combined efforts, bring some life back into the AM band.

—RW

Engineering Role Undervalued

by W. Barrett Mayer

Oceanside CA ... Addressing owners and General Managers, I have the temerity (after 35 years in broadcasting) to state that virtually 80% need to reappraise their thinking concerning broadcast equipment, engineering—*true* engineering—and the "product" that they put on the air for sale to audiences and to sponsors.

Frequently, GMs and owners relate only to ratings, excusing bad "product" on the air as the "wrong format." It's entirely possible that the format *is* right, but the execution of that format is terrible!

The fact is that more attention is paid to gimmicks and promotion than to the actual *sound* and *imagination* that is being projected to (or inflicted upon) the audience.

Management might well consider that they are "manufacturing" a product that must be *quality* in order to succeed in sales. As we have seen in the auto business, the foreign car makers got ahead in the USA via quality, where doors fit properly, gas mileage was low, etc. In like manner, "today's audience" is sophisticated and recognizes quality sound because of three major factors:

- Their receiving equipment has improved vastly.
- Many competing stations deliver quality sound.
- In most markets, there are *choices* in the same format.

One must start from the basic premise that you use the best equipment that can possibly be afforded—since the "*sound*" has become king!

W. Barrett Mayer, president of Barrett Associates, Inc., 3205 Production Ave., Oceanside CA 92054, can be contacted at 619-433-5600.

Guest Editorial

Equally important is the engineer, who should be considered "Top Management"—which is where many stations make a grave error.

In the "Manufacturing" analogy, surely you would hire the best-affordable, most-knowledgeable person to be the "Foreman" of your production line, having an appreciation of "Quality" within the budget lines set. After all, he is "making" the product you will sell—(both to the audience and to clients).

If your engineer is making the product that you will sell—is he not "key" in top management?

My experience at the NAB shows—and as recently as the SBE show in St. Louis—reveals an owner/manager's continuing lack of both respect and understanding of the proper role of engineers in broadcasting. Some engineers visiting our booth frankly stated that, "Management doesn't provide us with business cards."

Even before the convention, which helped engineers catch up on current rules, common problems and state-of-the-art equipment, some engineers told us that their station would not allow them to attend because "it wasn't in the budget."

The "budget?" With 40% off airfare and $55 (double) rooms for a short three days? What budget?

In the final analysis, it probably would have been a heck of a lot cheaper than "promotions," "incentives," client lunches and golf sortees—and, much, much more productive for your station. Even the mechanic at the car dealership must learn the intricacies of the new models.

Where was *your* engineer? Where is he in your management team? Does he know (and he should) that when you switch formats, a whole new examination of your equipment is necessary to *produce* that new sound? Does he have a management voice in your station?

Do present management structures realize that his attire is frequently worn because he must get "up the hill" to the transmitter to keep it going, or dive into a cart machine, console, carousel or reel-to-reel machine daily to keep the sound

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More Readers' Forum

(continued from page 5)
failure in the model run of whatever you got and can give you a good clue on where to start.

Rather than take an air-hammer to the transmitter site with you, take some grey matter and put a little forward bias on it.

James L. Sorensen, CE
WJQY-FM
Ft. Lauderdale, FL

Vigilante engineering

Dear RW:

I would like to take issue with a couple of things John "Q" Shepler alluded to in the 1 November 1986 issue.

He wrote, "It's amazing how often a good rap to the side of the cabinet will get things running again." He continues the thought in the next paragraph. "Actually it's good policy to kick or at least shake the equipment once in a while."

If Mr. Shepler practices what he preaches, the equipment at his station must look pretty hammered. Especially if he encourages station personnel to practice vigilante engineering. In other words, when the engineer isn't around, beat up what acts up.

Not only does that kind of abuse cause immediate cosmetic damage (broken and dented housings), but it often leads to other problems that wouldn't otherwise occur. I have repaired several pieces of gear with broken boards and smashed connectors, all because some Dirty Harry decided to wail on the equipment.

I realize that an occasional love tap can do wonders to unjam a mechanism or unstick a relay. A trained engineer should know where to hit something, and how much force to use, but a "schmo" indescriminately pounding around can create a lot of unnecessary repair work. I don't know about John Shepler, but my time is valuable. I don't appreciate fixing abused equipment.

Kicking and rapping is *not* good policy; it is poor engineering. Connections can be tested and equipment fixed in much safer ways. Does Mr. Shepler hit a sledgehammer on the motor of his car to see what might shake loose?

There is a version of Murphy's Law that goes something like this: "If it sticks, force it. If it breaks, it needed repairing anyway." For my money that is a weak philosophy. I've always gone by the wise words, "If it ain't broke, don't fix it." May I add, if it is broke, don't hit it. Fix it right.

David C. Ostmo, CE
KNGX-FM/KXON-TV
Claremore, OK

RW *replies:* RW *columnist John Shepler responded: "I know what's coming next . . . . 'Hey Shepler, when did you stop beating your transmitter?'*

Honestly guys, I'm not advocating the strong-arm approach to equipment repair. Any raging bull who indiscriminately attacks a poor defenseless equipment rack deserves to pay for the damages out of his own pocket. I believe that rule applies regardless of which side of the studio window you work on.

However, I'll say it again. There are some things a VOM won't find. Intermittent connections show perfectly normal resistance, voltage and current readings. That's because Mr. Murphy says they ain't-a-gonna-go-bad while you're watching.

If you expect to get to the bottom of these mysteries, sooner or later you'll be forced into wiggling, jiggling, probing, poking, shaking, vibrating and tapping the packages to locate the culprit. Note that the word is tap, *not bludgeon. If you have to beat the living •'##@ ÷ Θ out of it to cause a failure, you probably wound up breaking the wrong part.*

So, friends of battered transmitters, I say try a little tenderness but don't be afraid of gently waking up those nasty intermittent gremlins that normally come alive in the wee hours.

After all, if your faithful power amp is so fragile that you're forced to tippy-toe back and forth to the shop just so it might stay on the air another hour . . . hey, be a little assertive. High-tech equipment does not have to act high-strung."

Lip service

Dear RW:

I read with interest the many articles in your publication and others about the improvements in AM broadcasting. We talk about AM stereo, preemphasis, widebanding arrays and all the other new electronic black boxes that will rush in to save the day, but I feel we are all just paying lip service to the real problem in AM broadcasting.

What will the public listen to on a consistent basis? If the guy trying to shave at 6:30 AM in the morning has to turn his radio dial in a die-hard attempt to hear your station, he will push the button marked "FM" and the "marketplace approach" takes over. Chances are you will never get him back.

The same thing happens in the pre-(and post-) sunset hours. If this same listener is trying to hear you, and the class I, II, III dominant station on your channel has you protecting a skywave 750 miles from your hometown, the same thing happens.

We wonder why FM has dominated in the past 15 years. It is very simple. Joe Listener can *hear* the FM stations consistently. And with the advent of the 80-90 channels and the deregulation of channel spacing, this will make as many as 2,500 different channels and upgrades possible.

Let's not kid ourselves. Until we come up with a system of engineering that will give us equal, interference-free signals that will compete with the FM signals in each market, we will start to see a lot more AMs just going dark.

As one of my colleagues said in a recent reply comment before the Commission's AM committee, "Let's save the Whales." I say if we do not do something to save the AM band now, it will not be the whales that will be extinct, but all the other little fish in the AM sea. We have the engineering know-how to cure the problem. Now if we can just use it . . . .

W. Lee Simmons
Broadcast Telecommunications Consultant
Hilton Head Island, SC

AM problems continue

Dear RW:

I enjoy reading RW; it is very informative. Keep up the good work and engineering feedback.

In the 1 November RW, Mr. George of WSHL-FM expressed some good views on the overcrowding of the AM

(continued on next page)

CBS AMs to Convert to Stereo

by David Hughes

New York NY ... As of mid-December, CBS maintained that it will definitely convert its six AM stations to stereo, while Group W/Westinghouse said it planned to have its seven AM stations converted to Motorola's C-QUAM system by the end of 1986.

Helene Blieberg, director of media relations for the CBS Radio Division, told RW that the network definitely plans to convert its AM stations to stereo, but that it has not decided on a timetable or on an AM stereo system.

Her comments follow an article in the 1 December issue of RW in which she was quoted as saying that CBS had not decided to convert its AM stations to stereo.

However, she maintained that the article "erroneously state(d)" the CBS position. "While we have not committed to a particular system, it is our intention to convert the six stations in the CBS AM Group to stereo," she said.

She did not deny that CBS's 50 kW Los Angeles station, KNX, has been broadcasting in stereo using the C-QUAM system for at least a year. Motorola said that it features the all-news KNX on its official list of the more than 300 C-QUAM stations. KNX does not publicly promote the fact that it broadcasts in C-QUAM stereo, however.

Industry rumors have held that CBS is planning to convert its AM stations—including 50 kW operations in New York, Philadelphia and St. Louis—to Motorola's C-QUAM AM stereo system.

The decision in principle by CBS to convert its chain of stations to AM stereo followed the recent conversion of the seven Group W/Westinghouse-owned AM stations to C-QUAM stereo.

At RW's mid-December press time, Group W AM Engineering Manager E. Glynn Walden said that he hoped to have the final conversion of the last station in the chain, 50 kW KYW, Philadelphia, accomplished by 31 December.

The other Group W AM stations, including 50 kW operations in Boston and Pittsburgh, have already been converted, according to Walden. New York's 50 kW WINS was converted to stereo in early December. "Everything is on track," he said.

Denver's 5 kW KEZW reported a large number of calls from listeners on not only the switch to stereo but on an overall cleaner sound, Walden reported. He added that Pittsburgh's KDKA, which went stereo about a year ago, received a call an hour regarding stereo for the first few days, even though the station had not yet announced the switch.

Group W is planning a major AM stereo marketing and promotional campaign for early 1987, including spots for all seven stations," Walden said. "We want to get something in return."

In other AM stereo developments, a report on AM stereo being prepared by the National Telecommunications Information Agency (NTIA), an arm of the Department of Commerce, will be finished in late January or early February, according to R. T. Gregg of the NTIA public affairs department.

Originally, the final report, which will focus on the status of AM stereo both nationally and internationally, was due to be released by the end of December.

As of mid-December, the NTIA was in the process of examining replies to an AM stereo survey it is conducting of AM stations, Gregg said.

The NTIA report will examine whether a de facto AM stereo standard exists in the US and whether the FCC should abandon its marketplace approach and become actively involved in setting a formal standard.

No new developments have been reported on Canada's attempts to set an AM stereo standard. In October, the Canadian Association of Broadcasters (CAB) recommended that the Department of Communications (DOC) pick the C-QUAM system as Canada's official AM stereo standard.

While the CAB's recommendation is expected to carry a lot of weight, the DOC is not scheduled to decide the matter until the first quarter of 1987, according to CAB Senior VP/Radio Pierre Nadeau. He said the CAB expects a DOC decision by March.

For more information, contact Helene Blieberg at CBS, 212-975-3771, E. Glynn Walden at Group W, 215-238-4894, R. T. Gregg at NTIA, 202-377-1551, or Pierre Nadeau at the CAB, 613-233-4035.

'Dear RW' Continued . . .

(continued from previous page)

band.

In our part of the country in north-central Kansas, the skywave propagation is not at the point of frustration that it seems to be from my reading about other states. Over the last few months, however, skywaves are on the increase with the US/Mexico agreement settled.

Our AM frequency is on 1190 kHz and the skywaves only hit us in the early morning hours for two or three hours, and then in the late afternoon from 4 PM on.

We are a daytimer with a power of 2 kW, directional. We protect the east and stations on our frequency are miles and miles away.

The problem in our part of the country was that no AM station could service this area properly after sunset. Without PSSA operation for our AM station, the nighttime listening was very limited.

Skywaves at nighttime come and go, with stations running together; and now with the US/Mexico agreement cleared up, the Mexican stations are up and down the AM band.

As far as the open plains of Kansas go, our daytime power could just as well be used at PSSA in the evening hours, since it would hardly interfere via groundwave with other stations on our frequency. But skywaves at nighttime might be a problem to some degree at 2 kW.

For some areas—with the overcrowding of the AM band and now stations with PSA—it would be just a little too much for a listener to stay tuned with the mixed stations on some frequencies.

The FCC deregulations have helped us in our area, where we can service the public now with PSSA.

AM stereo still has a way to go. There is still the noise that rides the AM signal, and who wants to listen to that garbage?

The audio on monophonic AM radios sounds good with the stations that are broadcasting AM stereo, but is the expense of putting in AM stereo the only way to dress up your audio chain?

How many listeners are going to go out and buy an AM stereo receiver when they become available?

Any music fan who likes clear and clean reception will be on the FM band in stereo, or they will be using cassettes in their automobiles or home units. And now add to that CD players.

We have not seen anything yet; the AM/FM battle has only begun!

Radio Shack has come out with an AM stereo receiver/tuner in C-QUAM only; but for distant stations, it will require an outdoor antenna.

Marvin Hoffman, CE
KVSV Radio
Beloit, KS

WBIG Silenced by Signal Woes

by Alex Zavistovich

Greensboro NC ... In late November, Jefferson-Pilot Communications shut down WBIG, its standalone AM station in Greensboro, NC, citing an inability to compete in an expanded market.

WBIG, a 5 kW station on 1470 kHz, served Greensboro and surrounding Guilford County listeners for more than 60 years, according to WBIG's former GM, Mary MacMillan.

The station's efforts to remain competitive were foiled by "unsolvable signal problems" which restricted WBIG's coverage of the seven-county, Greensboro-High Point-Winston-Salem market, MacMillan said.

The decision to close the station came only after every other possible alternative had been exhausted, she noted.

As a fulltime station, directional at night, WBIG required two towers and 15 acres of land to provide a nighttime city-grade signal over Greensboro, explained Jefferson-Pilot Communications President Wallace Jorgenson.

Jefferson-Pilot could not find a new 15-acre location within the appropriate signal parameters which would also conform to FAA regulations, Jorgenson said.

FM companion sought

The company sought to purchase an FM companion for WBIG, but discovered that available stations either had an insufficient coverage area or overlapped with WBCY, a Jefferson-Pilot-owned FM in Charlotte, NC. WBIG became a standalone, "but a standalone that had lost money for the past five years," Jorgenson said.

Jefferson-Pilot Communications did not want WBIG to go off the air permanently, Jorgenson stressed. The company has not yet returned its license to the FCC, asking instead for 30 days "to work something out."

"We're talking to some nonprofit groups which have expressed interest in the station and may have the land for it," Jorgenson said. He declined to identify the groups with which the company is negotiating.

Closing the station "was a sad experience for all of us," MacMillan said, noting that WBIG had supported a staff of 16 fulltime and four part-time employees. However, she added that the parent company was working to find new employment for those affected by the closing.

Jefferson-Pilot is assisting some former WBIG employees with interviews at other radio stations, MacMillan added. Many either already have new jobs or have been given offers, she said.

MacMillan also has a new position as Jefferson-Pilot's VP of marketing.

As was the case with WBIG, the expansion of radio markets often puts standalone stations at a competitive disadvantage, many broadcasters maintain.

Markets outgrowing signal

John Marino, VP of engineering for New City Communications, said the problem was generally more common in markets served originally by smaller, low-power stations.

In many cases, Marino said, there may be nothing a station can do to increase its service, which in turn decreases the value of the station.

Susquehanna Broadcastiing Engineering VP Charles Morgan acknowledged that "standalone stations have a tough road." In the quest for advertising dollars, he said, larger stations usually get more business.

Morgan maintained, however, that there are some options for AM stations fighting to remain competitive in a growing market, including purchase of a "standalone" FM station. Even if the FM's signal is not especially strong, "having one of each is better than having only one," he said.

AM will soon see a "weeding out" of weaker stations in various markets, according to Morris Blum, GM of WANN-AM, Annapolis. The FCC's Docket 80-90 proceeding has produced "a proliferation of community-type AM applications," Blum noted, and "the economics of the situation" dictate that not all will succeed.

For more information, contact Wallace Jorgenson or Mary MacMillan at Jefferson Pilot Communciations: 704-374-3500.

NRB Show Features Technology

Morristown NJ ... The 44th annual National Religious Broadcasters (NRB) convention, slated to take place 31 January-4 February at the Sheraton Washington Hotel in Washington, DC, will feature AM and FM technical sessions, along with a number of equipment companies exhibiting their wares.

An AM radio technical session, "How to Make AM's Brightest Days," will address conversion to AM stereo, use of synchronous transmitters and broadbanding AM antennas, said NRB Convention Coordinator Robert Bowen. The session will be moderated by Dick Harris, KGNW-AM, Seattle, operations manager. NAB Engineer Michael Rau will also discuss new AM antenna designs, Bowen said.

"FM's Synergistic Values" will cover transmitter multiplexing, station automation and the optimization of subcarrier performance, Bowen said. FCC Engineer Michael Lewis, of the Engineering Policy Branch, will discuss Docket 80-90 and FM allocations issues.

In addition to the convention's technical sessions, more than 250 companies will exhibit their products and services at the NRB's "Media Expo '87," the three-day trade show held in conjunction with the other convention activities. The exhibit floor opens 2 February.

The exhibit area will feature 100,000 square feet of floor space for participants, and will include equipment manufacturers, publishers and program producers, according to Michael Glenn, expo director.

More technology

More than 150 exhibitors from the 1986 show decided to return for the 1987 show, Glenn said. Harris Corporation, Broadcast Electronics, Audio-Technica, Fidelipac and Electro-Voice will be among those equipment companies represented, he added.

Recent NRB show attendees have become more knowledgeable about technology, Glenn noted. "Secular industry representatives" have noticed exhibit attendees showing more interest in technology, he said.

Still, he stressed, the NRB floor will be "more than a pure equipment or hardware show." National Public Radio, Hanna Barbera Productions and Associated Press will also provide displays.

Special features

The show will feature remote broadcasts from Chicago's Moody Broadcast Network, which has petitioned the FCC to allow noncommercial translators to be satellite fed, rather than using over-the-air signals.

The St. Paul-based Skylight Satellite Network is also scheduled to make three live broadcasts each day from the exhibit hall.

At press time, more than 90% of the Media Expo 87 floor space had been sold, Glenn said. Exhibit organizers expect a sellout of the display area.

Also, NRB officials could not confirm that President Ronald Reagan and Vice President George Bush would address the show's "1987 Presidential Plenary." Both Reagan and Bush have spoken at past NRB conventions, Bowen pointed out.

For more information, contact NRB Convention Coordinator Robert Bowen or Expo Director Michael Glenn at 201-428-5400.

Engineers

(continued from page 5)

alive?

Blue jeans or three piece suit—the competent engineer does not have his rightful place in station management, which is the prime reason many stations are struggling. He is easily equal to the sales manager, comptroller, program director, traffic manager and even the station manager—for without his expertise, they have no "quality" to sell. Think about it!

Since deregulation and the FCC "Chief Operator" (lack of) title, neither broadcasters nor engineers have filled the void. We have long recommended to the Society of Broadcast Engineers that they should work in closer coordination with the NAB in establishing an A/B/C testing procedure so as to qualify the "Grade Level" of engineers who handle billions of dollars worth of equipment daily.

If management/ownership can have a standard by which the engineer is qualified at a specific level, they must, in the final analysis, give him the long-deserved position he should have on the management team.

Multidimensional Sound Debuts

by Alex Zavistovich

Los Angeles CA . . . Two new sound recording techniques are being developed which, their inventors claim, could change the perception of the stereophonic effect and may also improve the quality of broadcast signals.

The techniques, Holophonics and Optiphonics, each are said to be capable of recording and broadcasting sound in "four dimensions"—left and right, up and down, front and back, and near and far.

Both systems have been tested at radio stations on the West Coast, and although listener reactions have been generally favorable, broadcasters remain somewhat skeptical of their applications in the industry.

The Holophonics recording technique was invented in 1981 by Hugo Zuccarelli of Los Angeles. Holophonics is an active system, Zuccarelli claimed, in which a reference tone interacts with the source information.

The interference patterns of the two sounds provide localization of the source, and produce a recording of "the subjective experience of hearing, rather than the mechanics of sound waves," he claims.

In playback, Zuccarelli said, the sound information "will reach the auditory cortex of the listener's brain and recreate the same sensations as if listening to the original event."

Zuccarelli stressed that his system uses a "proprietary sound processing technique" rather than traditional microphones "to put an artificial human hearing system in the acoustic environment to 'digest' the environment and transfer it to impulses."

Zuccarelli's Holophonic technique was broadcast in June 1986 on KLOS-FM, Los Angeles, in a one-hour program called "Headsets." During the show, host Jim Ladd demonstrated the spatial characteristics of Holophonics by sitting on the floor and "speaking up" to the audience, whispering in their ears and rolling dice on a table.

Phone response to the technique was largely positive, Zuccarelli said, with listeners claiming, among other things, that the sound was "better than compact disc."

Bob Leembruggen, chief operator at KLOS, said that Zuccarelli's three-dimensional sound technique may have limited broadcast applications because headphones must be used for maximum effect. Full stereo separation, he added, is not present in Holophonics.

Still, Leembruggen said, the effect transmitted very well over the air. He questioned Zuccarelli's claim that the Holophonic system could provide full 360° spatial localization.

"(Holophonics) has a definite rear sound," Leembruggen said. "It has good 180° coverage, but lacks full frontal sound."

The true application for Holophonics would not be for "dry" sound, but on effects such as reverb returns, Leembruggen suggested. The addition of front and back to the left and right of the reverb would add a greater sense of depth to the effect, he said.

Another multi-dimensional sound technique, Optiphonics, was developed approximately five years ago in Sylmar, CA by John Bedini, of Bedini Electronics. According to Bedini, the Optiphonic system employs two lasers to scan the source information.

The difference between Holophonics and Optiphonics is that the latter is an optical system, Bedini said.

Bedini's patented Optiphonic system uses a specially designed optical head and an amplifier capable of reading the light spectrum. Source information (recorded or live) is first digitally reduced to mono, Bedini said. Lasers then determine the phase locking of the information.

The optical head digitizes the phasing of the analog system and reassigns the source information to the left and right channels, out of phase. The degree of phasing is variable, Bedini said, up to 180°.

The result, he claimed, is fully three-dimensional sound, without degradation of the signal. The effect can be broadcast not only on FM or AM stereo, Bedini said, but on AM mono as well, as long as the mono station has a sideband.

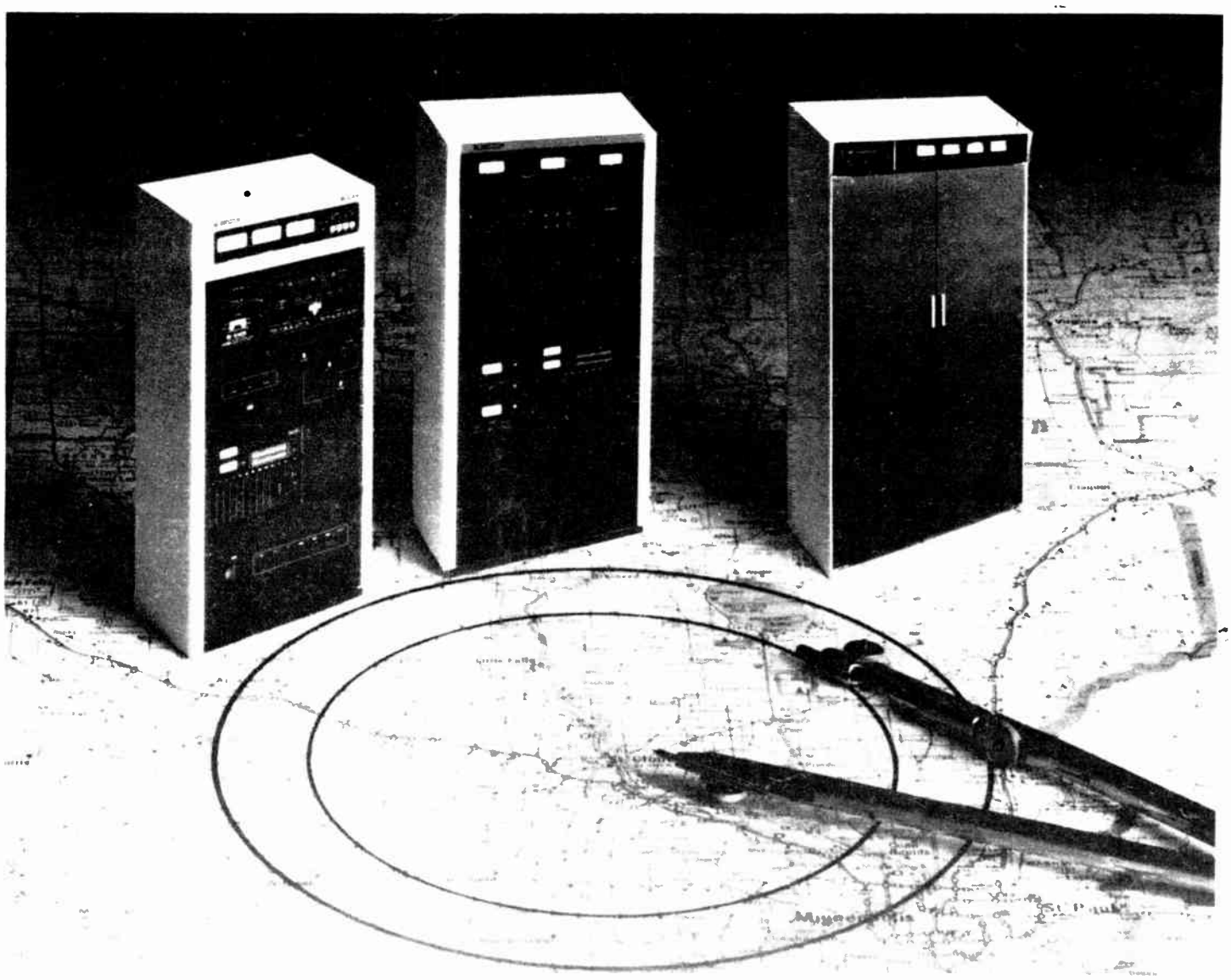
Bill Jenkins, host of the talk show "Open Mind" on KABC-AM in Los Angeles, first featured Optiphonic technology on his program in September 1986.

Bedini's system has applications in broadcasting, Jenkins claimed, noting that during demonstrations, Optiphonics "brightened and added depth" to his AM stereo station's transmission.

The scalar element of the Optiphonic sound "built up the high end of the square wave," Jenkins said. The result was a perception of higher fidelity than might normally be expected of KABC's signal, he added.

Jenkins also suggested that by sending monophonic signals through the Optiphonic processor before transmission, the spectrum of sound would be brighter.

Both Zuccarelli and Bedini have sample tapes of their systems available for purchase. Contact Hugo Zuccarelli at 213-838-7466. Contact John Bedini at 818-367-7762.



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Allied Shows 'Future of Radio'

by Suzanne Langle

New York NY . . . On 4 December, Allied Broadcast Equipment invited New York metro area engineers to a showing of new and advanced broadcast technology products.

The event, held at the Manhattan headquarters of Media/Scan marketing and advertising, was staged by Allied under the overall theme "the future of radio."

The show gave New York area engineers their first hands-on demo of the Touchstone touch screen computerized broadcast controller, from John Connell and Jim Waterman of Media Touch Systems.

Full Touchstone installation

In a full-blown Touchstone installation, such as the setup currently on-air at Boston's all-news WEEI, the traditional audio console is replaced by an IBM-PC-compatible computer's CRT, equipped with a touch-sensitive screen.

The broadcast log appears on-screen, allowing the operator to: start carts, CDs and other music sources; call up network, remote or phone line sources; change levels; preview events, and perform other functions simply by touching the appropriate entry listing onscreen.

The system can also be programmed to bring up commercial scripts or news copy to be read live from the screen.

In a more limited application, another Touchstone CRT controller was shown interfaced with two of Allied's Audiometrics programmable multiplay CD players.

Each Audiometrics CD player stores 100 compact discs in a carousel-style system.

In a configuration with two Audiometric players plus a Touchstone controller, any of 2000 music cuts can be retrieved and played, either manually random-accessed or in preprogrammed sequence.

StereoMaxx

Modulation Sciences used the occasion to premiere its new StereoMaxx spatial image enlarger. StereoMaxx widens and enlarges the stereo image on all music formats, and is designed to give stations extra audio excitement and impact on the dial.

Eric Small and Richard Schumeyer of MSI were quick to point out that StereoMaxx is totally mono-compatible, works with all existing audio processors, and uses special audio-sensing circuitry to avoid undesirable over-enhancement effects.

Auditronics 400 series console

Auditronics' Steve Sage brought along several consoles, including the company's newest, the 400 series, scheduled for February/March 1987 delivery.

The new 400 offers many of the features of Auditronic's larger 300 series production console, but in an intermediate size.

The 400 board will be available as an 8-bus console, or as a 4-bus unit which can be economically upgraded to 8 busses at a later date.

The unit handles an 8-track tape recorder, with optional monitoring facilities for a 16-track recorder.

Auditronics also plans to make "on-air" modules available, making the 200 suitable for on-air as well as production applications.

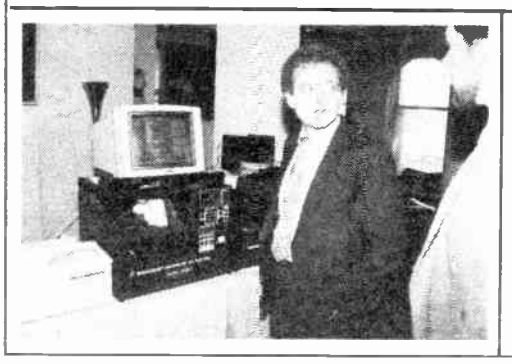
New technology products aimed at talk stations were also shown.

Michel Ponton flew in from Montreal to demonstrate the Telnox L-O, an integrated telephone system designed from the ground up for the special requirements of broadcasters.

Eventide's Gil Griffith demo'd the new delay entry/exit modes and superior catch-up quality of its BD980 Stereo

(continued on page 14)

For more information, contact Dave Burns at 317-962-8596.



Allied Broadcast's advanced equipment display attracted area engineers (top); Eventide's Gil Griffith (2nd from l) and Modulation Sciences' Richard Schumeyer (2nd from r) demonstrate their latest gear (center); Media Touch System's Jim Waterman shows how the Touchstone touchscreen can access 2000 CD cuts using Allied's Multiplay CD Player.

How to Use Time 'Competently'

by John M. Cummuta

Chicago IL . . . I walked up to a guy about a week ago to inform him about a certain business opportunity which could make him upward of $100,000 a month, with very little financial investment.

He said, "I don't have time . . . I'm too busy making a living!" As ridiculous as it sounds, that's all too true of many people, especially professionals. They're so tied up in certain patterns of activity, buried in information, that they don't have time to really achieve anything. They simply tread paper, trying not to be swept away in its tide.

There is a set of skills, however, which can bring meaning to the maze of time. They're collectively called *Time Competence*, and they relate to the ability to use time strategically, to get the most out of it, in terms of worthwhile results. That's what this article is all about.

So let's not waste time

The *time-incompetent* person falls into the "Activity Trap" and stays there, letting circumstances dictate the order and content of things he or she does. Whether urgent or trivial, whatever presents itself next is what's handled next; and after any given length of time, many insignificant things have been accomplished, but few significant ones.

The *time-competent* person, on the other hand, has a strategic attitude about time. He is the executive of his life, and consciously decides "what is the most valuable thing I can do with my time . . . right now?"

Time management

The most critical element of successful time management is the consistent use of lists of important tasks or activities. Note

Engineering–Manager

the fact that I said *using*—not just writing—lists.

The first step in list using is itemizing all the significant things you feel you must accomplish. This should be a weekly list, preferably written on Sunday for the upcoming week. Then divide the weekly list into daily segments. This gives you bite-sized chunks of accomplishment that you can build on.

Next, you'll want to prioritize the lists, ranking activities according to each item's relative importance. Importance should be determined by the total payoff of accomplishing the task in question. In other words, you look at the list in terms of payoffs, and rank the highest-payoff item first, the next-highest payoff listed second, and so on.

In prioritizing your list of activities, I suggest you implement the "80/20 Rule." This rule states that approximately 80% of the payoff potential of any list of activities will result from the accomplishment of the most important 20% of the listed activities. Do that 20% first, and use any leftover time to work down the rest of the list.

If you follow that rule alone, you're nearly assured to stand head and shoulders above your coworkers. They'll likely be muddling their way through the 80% of their activities that will give them only a 20% payoff.

It goes without saying that when you're determining the relative importance of activities on your list, that your personal perspective is not the only one to consider. Some activities might not be important to you, but may seem critical to your boss or employer.

I suggest that for longevity in your position, use their level of relative importance as your guide—not your own. The same goes for putting a customer's values before your own, unless you're willing to lose his business over the decision.

The next step is to get to work, favoring those activities with the highest payoffs. A good question to ask yourself, right after you cross a completed task off your list, is "What would be the most valuable use of my time *right now?*"

Sometimes there will be perfect opportunities to quickly accomplish a lower-priority task in the midst of more important ones. Go ahead. But remember to keep conscious of your progress on the things that really count.

Time structuring

Lastly, use time structuring to maximize the efficiency of your activities, minimizing wasted time. Remember, time management means maximizing accomplishment, not conserving time.

Plan your important activities for those times of the day when you'll be most able to accomplish them. Activities requiring creative thinking should be done when you'll be most alert, while routine activities can be lumped at the end of the day, when your brain is out for a walk.

Minimize the amount of time you spend with paperwork by handling each item only once, if possible. Anything that requires no more than a glance and a signature should be disposed of immediately. Putting it on a pile somewhere just fosters a feeling of slipping further behind.

If your job involves dealing with others regularly, you may want to give some thought to how much you let other people encroach upon your time. If someone asks you if you have a minute, be honest. If you do, give it to them, if you don't—don't. If you have five minutes, say, "I can give you five minutes, then I must get to another project.

Delegate, as much as possible, and

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

Avoid Common Style Crutches

by Tyree S. Ford

Baltimore MD ... OK, so maybe you weren't surprised that the E-V RE20 and the Shure SM7 turned up tops in our microphone poll. I don't know how things are in every market, but in those markets I have been consulting, this was not a major revelation.

If you've tried both these mics and decided that they weren't for you, I'd appreciate a call as to why. We went through a test of both a few years ago and found the SM7 worked best for us. Most of the airstaff had moderately full resonant voices. We felt the SM7 was a better choice due to the presence boost and bass rolloff characteristics.

On the RE20 we sounded a bit boomy and a little soft. Even with the bass-tilt position, the results were not as crisp as the SM7. The SM7 has a tighter bottom and is a lot less susceptible to proximity effect. (The "proximity effect," in case you're just getting into microphony, is the nature of some microphones to pick up more low frequencies as you get closer to them.)

Of course, the best thing to do is to get several mics on loan from your broadcast supply house and conduct your own comparison.

Get your airstaff to record some scripts using the different mics. For the most consistent results, have each person try all mics at one session. This will prevent those minor changes in voice quality from throwing off your results. The best time to test is just after a person comes off the air, when their voice boxes are fully warmed up.

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

Mutant voice character styles

In last month's "Producer's File," we talked about the mechanics of thinking, speaking and operating the equipment, all of which combine with a few other elements to become style.

Of equal importance in this mix of elements is the character of the voice. This character usually varies according to individual, format energy level and the particular persuasion of the consultant or program director.

If you're very lucky, the program director will be an excellent example from whom you can learn. If you're not so lucky, your career may be scarred for life by misdirection into any of the three mutant character styles so prevalent today.

The first mutation began sometime in the late '50s or early '60s. Although it can be heard on any station with any format, you are most likely to hear it on a CHR station. In the industry, it has become known as "The Puker" delivery. There are masters of this misdirection in almost every market.

How this epiglottal arhythmia got started no one knows for sure. It was probably the result of some attempt to raise the energy level which got out of control.

It is still around today because long ago, as a child, "The Puker" of today heard someone on a radio sound this way. Then at an impressionable age, the seed was planted that speaking this way was acceptable, because it was on the radio.

When our young sprout came of age and began his career in radio, he was already programmed as a result of that early listening experience to emulate those early sounds. (Either that, or a lot more people who ended up on the the air were heavily influenced by Joe Penner's "Wanna Buy A Duck?" than I ever imagined.)

Because "More Is Better," our fledgling announcer creates a caricature of what he remembered hearing so long ago, not realizing that being able to out-puke the rest of "The Pukers" is a goal of questionable worth.

Unfortunately, even as the words gush from his mouth, there is another small boy in a darkened bedroom somewhere with an earphone jammed to his ear. There's a certain thrill about listening to the radio after your parents have told you to go to sleep.

At the moment that his alligator clip hits the bedspring and the audio reaches his ear, the cycle is completed. Another Puker is born.

What started so long ago as an effort to sound more energetic has become a self-perpetuating style of mutant speech. It is the crabgrass of radio delivery, easy to cultivate and difficult to get rid of. As it spreads, it chokes out normal energetic deliveries because it is an easy crutch for people who dimly remember how they think an energetic voice should sound.

If you're on the airstaff at a station where your PD is a "Puker," be careful. I have had conversations with people who have told me that their PDs *want* them to become "pukers."

If this is their wish, and you don't comply, you may be history. On the other hand, the PD who may be asking for more energy might settle for "Puking" because it's so prevalent. Hope that they will be aware of this delivery and guide you away from it.

For ladies only

The second mutant style is reserved for ladies only. Unlike "The Puker," women announcers are often misdirected to sound as if they are on the very brink of orgasm. "The Big O" or "Wet Panty" delivery joins "The Puker" as a caricature.

The projection of a true positive ener-

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Loud, Clean Signal Takes Effort

by David P. Hebert

Pasco WA ... If your Program Director or General Manager complains that, for some reason, your station just "doesn't sound as loud" as "brand X" down the street, what do you do?

The local gentry all have theories as to which transmitter, audio processor, exciter, etc., offer the best loudness results on the air, but in reality, it is more of a system problem that one must take rather than a "piecemeal" approach. Remember, you cannot compromise audio quality in order to achieve loudness. After all, when you listen to your home stereo, you still keep the volume level below distortion, don't you?

I am of the belief that loudness is more a matter of sticking to the basics than simply adding complicated audio processing equipment until your signal approaches the threshold of pain.

Let's look at some of those basics, and see how effective they can be.

Studio sources of loudness

When you think about it, loudness really begins at the studio within the control console. A key point to remember is that any audio processing equipment is meant to process audio, not distortion. When a processor has to deal with hum, noise, distortion, "clicks and pops," as well as poor frequency response and phasing problems, the results can be difficult to predict; you may not always get what you want.

Quite frequently, I find grossly worn, misaligned tape heads that keep audio performance poor from the very first step.

Old, antiquated turntable preamps improperly matched to pickup cartridges will make music sound raspy and clipped. Ambient room noise that finds its way on the air will only compete with your announcer's voice for the attention of the listener.

Incorrect phasing from studio to studio will provide high positive modulation from one source while the next recording or announcement will have high negative modulation. A reasonable goal would be to keep the audio performance (as perceived by simply listening with a monitor speaker) the same from source to source.

One popular manufacturer of audio consoles of the '60s and '70s had audio program amplifiers that experienced severe crossover distortion. While the harmonic distortion of these consoles was not overtly high, there was a listener fatigue associated with them. Simple modifications can correct this problem.

Furthermore, replacing the input and output transformers can improve the situation dramatically. Of course, one can also find great success with differential opamps as line drivers and input amplifiers. Distortion from the console should not exceed 1% at the very most, and should normally be much less than half this much.

Next, the AGC system is an area where some important, basic points can be offered. Many stations utilize either a telco line or STL to convey programming to the transmitter site. It is important that an AGC device be placed between the console and this outside path, so that whatever method is used, overdriving is prevented.

An innocent STL can turn into a real monster when excessive high frequency preemphasis causes drastic clipping due to the normally restrictive IF bandpass. Unless path noise is a problem, it is wise to keep audio levels conservative at this point.

It is important to keep whatever device that provides peak clipping, peak rotation or other peak modification as close to the transmitter, electrically, as possible.

Any peak clipping utilized at this point can be lost, or degraded, if it still must

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Dave Hebert is president of Dave Hebert Engineering, Pasco, WA. He can be reached at 509-545-9672.

Loud, Clean Signal Takes Effort

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go through another amplifier (with its attendant distortion, phase nonlinearity and limited frequency response) before it gets to the transmitter. Sometimes, if this clipping is done preceding a telco line or STL system, any clipping or asymmetry will be lost in the signal path.

At the transmitter

Now, we are entering the transmitter with a high energy signal that we hope will be faithfully transmitted to the public in the same manner that we intend for it to sound. Unfortunately, it can be all lost here unless care is taken to ensure the RF system is linear.

The transmitter should be maintained to original factory specifications to as great an extent as possible. Normal maintenance procedures can include periodically checking and replacing coupling and bypass capacitors in the audio section. Of course, tubes should be replaced at regular intervals (weak tubes are not your friends in the land of "super modulation").

With many plate-modulated AM transmitters, a common practice is to transfer the normally weak RF amplifiers to the modulator section. High performance audio demands that all the stages of an AM transmitter be working at top levels, and this practice is only self-defeating.

Check with the transmitter manufacturer from time to time to see if certain changes have been made to your transmitter to improve audio performance. Don't forget, though, that some of the older transmitters were never meant to "super modulate."

Obviously, there are still other areas for improvement: they can include system grounding, the antenna and matching system bandwidth.

There is another area where one is not inclined to look when trying for loudness: the AC power line feeding the transmitter. AC power sag can be the enemy of the engineer striving for the best overall performance. Adequate service is imperative!

> *"Weak tubes are not your friends in the land of 'super modulation.'"*

A rule of thumb is to allow for a minimum of eight times your maximum carrier power when planning for new service. (Don't forget to allow for other items, such as air conditioners, etc.)

Power companies like to cut costs when providing 3-phase power by providing open-delta, or "tee-pee," connected transformers. Such a practice can be harmful to the health of your transmitter and should be changed where possible. A desirable goal for adequate power service would be a less than 1 V drop in AC voltage at the moment the transmitter high voltage is turned on.

Our FM friends are also concerned with obtaining a maximum signal on the air, and many of the points I have described here will also apply, but there are some others.

A composite STL system can, in theory, be a most effective way to deliver a stereo signal to a transmitter site. In practice, many composite STLs are victims of overzealous "tweaking," poor maintenance, improper signal levels and poor paths.

Conducting a "proof of performance" by taking the station's stereo monitor to the hill and analyzing the stereo generator/STL system can be revealing. Often, a degraded STL system will have other weaknesses such as noise in the subchannel (ccntrol or subcarrier audio), poor crosstalk or separation figures, noise or distortion.

One popular composite STL system made today utilizes a small RF preamplifier within the receiver to increase sensitivity. Many times, this preamp will be inoperative without any further indication. Since the antenna signal will still be passed to the first mixer stage, the only symptoms can be noise, loss of signal with snow on the antennas, unreliable control signal presence on the subchannel or other symptoms.

Since audio levels through the link are important, I normally recommend supplying a 400 Hz tone to the composite input of the STL transmitter (at the manufacturer's recommended level for 100% modulation of main program channel) and adjusting the FM exciter for 100% modulation of the baseband. This method will provide an optimum S/N level through the entire system.

The FM exciter can also be a source of audio degradation. If there are any on-channel "spurs" being generated within the exciter (or transmitter), they will degrade your modulation and compromise your overall loudness and quality.

The best weapon in fighting this problem can be a spectrum analyzer. Examine your signal both with and without modulation to be sure no undesirable sidebands are produced that an audio analyzer would not reveal.

Back at the studio, the phase integrity of all audio sources must be maintained for proper stereo performance and overall audio loudness. If telco lines are used to feed the transmitter, they should be checked for their phase characteristics from time to time.

If you employ active signal equalization within your processing scheme, take care that any high frequency preemphasis you add doesn't allow excessive signal outside the bandpass of a radio that would be used by most listeners. Adding too much high-frequency energy to an AM signal can result in transmitter damage, as well as put modulation outside the bandpass of most radios—creating a waste of modulation, a signal that is difficult to tune in, and, even worse, interference to other services.

A loud, clean signal takes effort (and money). I have felt that many audio processors are installed for the wrong reasons, and therefore, ultimately, are more expensive in the long run than just sticking to the basics.

You must define your goals, then be sure you have the guns and ammunition to achieve them . . . you can't just use larger bullets.

Allied Show

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Broadcast Delay, and also displayed its H969 Harmonizer and SP2016 Effects Processor units.

In addition to the Audiometrics CD Laser player, Allied also showed several Technics CD players, as well as Otari's new full-featured cart machine system.

Peter Burk was on hand to promote his Advanced Micro-Dynamics TC-8 transmitter remote control, which has garnered a reputation among engineers as a reliable, flexible problem solver.

David Burns, national sales manager of Allied Broadcast Equipment, was extremely pleased with the turnout and response to the one-day show.

Good Editing Takes Practice

by Ronald F. Balonis

Wilkes-Barre PA ... Editing, as a discrete skill and procedure, is the unifying process in good, creative production—that is, putting all the other production sounds, sound effects, devices and processes together into a complete, creative product.

"Editing" can refer to the simple, specific task of fixing or repairing a commercial or program, or it can serve as the general label for the holistic process of creative audio production itself. This overall process deals not just with sounds, but with the *context* of the words and sounds in the audio material.

Editing requires skills that are at once scientific and physical and yet artistic or intuitive. Like many other things in radio, editing is a skill in which almost everyone, with practice, can acquire.

For the purpose of creative audio production, there are two kinds of editing methods: mechanical and electronic.

Mechanical editing

Editing tape by cut and splice is fairly simple, and can be mastered with some practice (and then some more practice). The equipment is simple and uncomplicated: a splicing block to hold the tape, a sharp razor blade, a marking pen and some splicing tape.

The simplicity of the tools makes cut-and-splice tape editing seem simple, but it's not. Finding the "just-right" place to cut the tape is easier said than done.

Chief Engineer

Before making any editing cut, you need to study—to listen to—the sound on the tape. Listen to the sound on the tape as you rock the tape back and forth to find the exact point. Then mark the point at the center of the playback head with the marking pen.

A simple way of becoming expert at the "right-cut" location is to mark the tape with the words and letters of the sound before and after the edit point. The extra time spent marking the sound will minimize the aural ambiguity of the sound for you. In addition, you'll have a linear record of what is on the tape and where it is.

Then do the same to find the other end of the sound you want to edit and mark it in the same way. Lift the tape from the head and pull enough slack to reach the splicing block.

Press the tape in the block (oxide side down), align the mark over the block's cutting guide, and draw the razor blade through it to cut the tape. Now lift the takeup side of the cut tape from the block and find the other splice mark on the tape. Put the tape in the splice block, align the mark over the block's cutting guide and draw the razor blade through it to cut the tape.

Remove the excess tape from the block. Make sure both ends of the tape butt together, and place a ¾" or ½" length of splicing tape directly over the tape, press it firmly onto the tape and smooth away any bubbles.

Remove the spliced tape from the block and trim any splicing tape excess to the width of the tape.

Now listen to it. If it's not right, then do it over. That's the only way to acquire the skill of getting it right. As with most other radio station skills you can acquire, tape editing is one where practice does make perfect.

The mechanical aspects of tape splicing (editing) are easiest to acquire. Acquiring the skill to find and locate the "just right" point to cut is much more difficult. It requires the almost proverbial critical ear and an intuitive and technical sense of sound.

Cut-and-splice tape editing allows you to deal with the sound in a linear storage medium. Sounds—speech or music—occupy time as well as having their frequency and intensity. The time or the distance of tape over which a sound is stored on tape can be used to ease the editing task while improving the quality of the actual edits.

Splicing at 15 ips is easier than at 7½ ips, and easier at 7½ ips than at 3¾ ips. The higher the speed, the more tape a given sound uses. To make the task easier and to improve the success of the edit itself, use the highest speed tape you have.

The tape splice cut I recommend, from a technical and mechanical point of view is the 45° angle. The 45° cut makes a mechanical fade at the splice, whereas a

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

Common 'Crutches'

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getic attitude comes from within an individual. Attempts to contrive such qualities result in a quick fix, for those who are willing to settle for less.

The Big Smile

Suppose you're currently working one of the many soft rock, AC or Classic Rock formats. In these formats "The Puker" has been replaced by "The Big Smile."

"The Big Smile" sounds as if a large, preformed plastic device has been inserted into the mouth of the airperson. Every word spoken—whether about the last song played, the upcoming "after work party" at the local BMW dealership or the tornado that's just ripped up another trailer park—is spoken with "The Big Smile."

The most popular rumor concerning the origin of "The Big Smile" is that a frantic PD, faced with a quick format change from CHR to Classic Rock, ordered frontal lobotomies for the entire airstaff. During some recent research, even women, for whom "The Big Smile" is supposedly targeted, are turning it off.

It's easy to lose sight of the importance of voice character and delivery. PDs have enough to worry about with new rhetoric from consultants, new music manager software packages for the playlist, and then there's Arbitron . . . well never mind.

The bottom line is this: The airproduct demands a 110% positive delivery. Since most of us are human, there are times when airshift and 110% output do not coincide.

Those who have learned how to reach inside of themselves, to make themselves *feel* positive, will *sound* positive. Those who haven't learned how to make themselves *feel* positive will use a crutch.

Within the next two weeks, we'll be conducting a comparison of a dozen or so of the best mics from AKG, Beyer, EV, Neumann, RCA, Sanken, Sennheiser and Shure. Three of the top recording engineers in the market will join me. Keep your eyes open for that report in an upcoming edition of "Producer's File."

I understand that some of my columns have made it out of the engineering office and as far as to the PD and Production Director. Thanks!

My next goal is to become a regular feature on the wall over the urinal and on the inside of the stalls in station bathrooms. You never know when that extra paper could come in handy.

Using Time

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hand out projects in packages, a practice which encourages the recipient to complete the whole group of activities before interrupting you again.

If you spend more than an hour a day with the TV, unplug the power cord, then cut it in half.

Avoid time thieves like the plague. When you're buried in trade magazines (other than RW), skim the table of contents, mark the articles that sound relevant to you, then spend your time with them.

Set aside certain parts of your workday for returning phone calls.

Don't let the phone control you. Have the receptionist or someone else screen your calls, giving you the opportunity of not taking them immediately. Then, as you review the messages periodically, you can delegate some of the responses to subordinates, if possible. Some you just throw away.

The main attribute of a good time manager is that of being a "doer," not just a "talker."

Self-discipline is the cornerstone of successful time management, and that can only come from within you.

If you find it, you'll become one of those people that others marvel at, saying, "I can't imagine how he gets so much done."

If you let circumstances rule your day, and you operate as a "Reactor" rather than an "Actor," you're headed for the "Mediocrity Hall of Fame." Take charge of, and responsibility for, your life. That's not only the first step in becoming a good time manager, but it's the genesis of all personal success.

Once you've made good time management a part of your life, I may ask you if you're interested in a little $100,000-a-month business.

Birth of Maritime Telephony

by Floyd Hall

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

Ship-to-shore and ship-to-ship telephony is a comparatively new radio communication system?

Back in 1912, Congress passed the "Ship Act of July 23, 1912," which provided that, on 1 October and thereafter, "Nineteen Hundred and Twelve, it shall be unlawful for any steamer (etc.) to leave a US port unless equipped with an efficient apparatus for radio communication, in good working order, capable of transmitting and receiving messages over a distance of at least 100 miles, night and day."

Incidentally, the US Department of Commerce was directed to administer the act.

The act required that auxiliary power be available to operate for at least four hours after the ship's supply had failed, and that certain spare parts were to be maintained, including a spare set of headphones!

> *Many vessels were already carrying 'efficient apparatus,' and the 600 m (500 kc/sec) calling and distress frequency was already established.*

Of course, even prior to the Ship Act, many vessels were already carrying "efficient apparatus," and the 600 m (500 kc/sec) calling and distress frequency was already established. Now, of course, all of this was prior to any form of voice communication.

In the September 1929 issue of George Sterling's "The Radio Manual," he describes an RCA Type ET-3626 transmitter, with a model AT-829 telephone attachment!

The range of this transmitter was 600-960 m, and I don't know how to imagine who they ever talked to!

Many years later, the FRC allocated some frequencies in the 2 to 4 mc/sec band for maritime Mobile Telephone Communication.

The 2128 kc/sec frequency was designated as the calling and distress frequency, while several specific frequencies in this band were designated for ship-to-shore and ship-to-ship telephony. Nowadays, of course, most all ship telephone communication is conducted in a VHF band between 150 and 160+ mc/sec.

Most large vessels almost immediately installed this "short wave" telephone equipment, but none of the big manufacturers built a small, low-powered unit suitable for installation in a small fishing vessel or yacht which could be operated off the ship's power, i.e. 12-32 VDC.

So, this is where many of us kids got into the act! We put together 10-50 W transmitters, and in most cases powered them with a dynamotor, or sometimes a small engine-driven generator.

They worked pretty good—most of the time—but a lot of us made the mistake of building them on aluminum chassis and cabinets, and you wouldn't believe what happened to that early pure aluminum, in that salt air! It just literally crumbled to dust!

Aiding and abetting . . .

I built some transmitters, which I installed in three big rum-runners! These ships were really something. They were 75' to 80' long—three screws, the center of which was driven by a large Fairbanks-Morse diesel, and the other two by Canadian Liberty engines! Nobody ever caught one of 'em!

Old Timer

When the 18th amendment was repealed, they were all sold to the US Fish and Game Commission. I went out to work the radios when the ships were demonstrated.

The Fish and Game boys were given quite a ride. These things would do over 30 knots, and accelerate to that speed in about five seconds, it seemed to me! They left a big hole in the ocean when they took off! In a manner of speaking, you might say this was back in the "good old days!"

A young buddy of mine and I filed an application for a ship-to-shore telephone station, but PT&T had beat us to it.

They already had a grant, and had been sitting on it for two or three years. When the FCC rejected our application, they notified PT&T they had just 90 days to construct and put a system in operation!

Their service was lousy (and still is), but they have held the license for about 55 years! (PT&T stood for Pacific Telephone and Telegraph Co., now Pacific Telephone.) So much for nostalgia.

More on transmitter cooling

I have had several queries about my bit on transmitter cooling in summer—and especially in the hot South, and I want to try and answer some of the questions.

Well, the phone just rang, and it was a station engineer from somewhere in Wisconsin, I think, who questioned me about my forced air system! He wanted to know if he should put a duct on top of the transmitter to direct the hot air up to the exhaust blower opening in the ceiling.

No, never. Don't put any duct on top of the transmitter. If you do anything, cut the top out of the transmitter to let the hot air out faster!

Remember, it's the accumulation of heat that's the problem. The hot air coming off those tubes won't hurt anything, unless it builds up in the cabinet and in other metal components.

Most equipment manufacturers recommend that the cabinet temperature be kept below 50° C. That's only 122° F, so if you have an ambient of about 100° F, you had better keep that air flowing fast through the tubes, and the cabinet, at such a high rate that little of it will be dropped inside.

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Floyd Hall is a regular RW *columnist and an engineering consultant at Consulting Radio Engineers, Crestline, CA. 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. Unlike our publication, the* **RW** *of old was printed only in 1922. We have found no record of it beyond that year.*

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

Making Fixed Condenser Work

For best results with a receiving set, be sure to have a small, fixed condenser connected across the head set. This will sometimes help a crystal set considerably. A fixed condenser of this type may be made from two pieces of tin foil about 2×2 inches.

Place a piece of paper between the tin-foil sheets and roll it up tightly. Before pulling it up, however, insert two small pieces of wire, one from each end, in such a way that each wire makes contact with one of the pieces of tin-foil.

Care must be taken to see that the tin-foil pieces do not touch each other; also that the paper is not torn by the wires. The tin-foil sheets must not touch each other at any point.

After the condenser is finished, it is a good plan to immerse it in hot paraffin until it is thoroughly impregnated. This will strengthen and increase the condenser.

Reprinted from Radio World, 1922.

Building New FM Site Exciting

by Kirk Harnack

Part I of a series

Richmond KY ... Not often does an engineer have the opportunity to build an FM transmitter facility and studio "from the ground up." And although the budget isn't limitless, at least we don't have to cut every corner and sacrifice good engineering practices, as is so often the case.

> *At present, the new 700' tower, lighting system and transmitter building are all up.*

Here's the scenario in a nutshell: put a Class C1 FM transmitting facility about halfway between Osceola, AR (the city of license) and Memphis, TN (the city of financial interest). The cities are about 50 miles apart.

The new FM site will be fed audio by STL and will be remote controlled from Osceola while the new studios are being built in downtown Memphis.

Once the new studios are operating, audio and remote control will originate from downtown Memphis. We'll maintain the STL from Osceola for daily or weekly news/public affairs programming, with the switch between studios being controlled by the Memphis remote control.

At present, the new 700' tower, lighting system and transmitter building are all up. The transmitter is being shipped from CSI (it's a 25 kW model), the 10-bay antenna from Shively Labs is on the way, and the remote control, audio processor and other items are now being shipped.

The next order of business is to free up one pair of STL dishes we currently have in order to set up the link from Osceola to the new FM site. At the moment, we're using two pairs of Mark 4' grid dishes: one pair for our AM station and the other for FM.

Currently, both AM and FM transmitters are at the same site, with the FM side-mounted on the AM tower.

Marti Electronics has shipped us a second combiner to use with the one we have in order to combine three STL transmitters (two for FM, one for AM) into one antenna. Then, at the current transmitter site, we'll simply split the feed from one dish into all three receivers. While all this isn't very elegant, it will work temporarily while we move some antennas.

The unused FM STL receive antenna will be moved to the new tower site and mounted about 300' up; the unused FM STL transmit antenna will simply be turned toward the new FM tower.

After our new FM transmitter is installed and ready to go on the air, we'll just remove the extra combiner and put the FM STL on our pre-aimed STL dishes for the new FM site.

Next time, we'll install the STL system and the new FM transmitter, plus set up the audio processing.

Kirk Harnack is president of Kirk Harnack Engineering, Richmond, KY. He can be reached at 606-624-2181.

Maritime Telephony Offered Opportunity

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That's not too hard to do. We do it all the time out here in the desert, and some times with ambients of 122° F!

While I'm on this subject, I wonder how often you have serviced the blower in your transmitter? Is the air switch working?

And when (if ever) did you last service the bearings in the motor and the blower? When you're shut down, get a good light and examine the vanes in the blower.

Chances are 10 to 1 they are coated ¼"-thick with dirt and grease. This stuff unbalances the rotor, causes vibration in the motor bearings, and reduces the air output.

You can't blow this stuff off with a vacuum cleaner, or even a dust brush. It takes a wire brush, and even some thinner and solvent to clean it off. It may save you a couple of sleepless nights!

Here's something that rather amazes me—I found out recently that most engineers don't take the tubes out of their transmitter until the tubes are dead!

Heck, take one out once in a while, and look through the fins toward the light. You might be surprised. Clean 'em out.

Check the sockets for good contact to the finger stock. Some PA sockets are mounted on a piece of Teflon insulating material. This is about the best RF insulation we have, unless it has a coating of dust and dirt on top of it—then it arcs over just about like a piece of molded mud!

I expect that some of you are beginning to think I believe the CE is mainly a glorified janitor. Well, basically, he is! I've said this before, and by long experience and observation I know it to be true; if I see a transmitter and room that are physically clean, chances are 10 to 1 they are electrically clean.

What do I mean by electrically clean? Well, the equipment is operating efficiently. The currents and voltages are accurately adjusted. The losses are low. The audio is clean. *It is electrically clean!* That's what you are hired to accomplish and maintain!

Good Editing Takes Practice

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vertical one does not.

With the 90° cut, the sound before and after the cut is abruptly OFF and then ON in a square wave fashion. With a 45° cut, the sound (at 7½ ips) takes 10 msec to fade out of one sound and then into the other. The sound levels will be continuous on the tape, rather than disjointed.

Whether either way ultimately proves to be good or bad depends on the audio on the tape. Some sounds are easy to edit, such as speech, while some sounds, such as music, are not.

Electronic "real-time" editing

It is also possible to edit in real time by recording over and recording at an exact time, or simply by mixing sound elements. The success of electronic methods and acceptability of the end product depends as much on editing skills as on the characteristics of the equipment and the sound material being edited or produced.

The ubiquitous cart machine can, with some minor modifications, be made to do real-time electronic editing. At WILK the method and technique was devised and is primarily used for news actuality editing. Its use on other types of audio depends on how significant the editing record-start artifacts are to the finished product.

I call the modification "Cue Defeat"; it allows you to defeat the stop cue on a cartridge machine, giving you the ability to make multiple recordings on a cart. On playback, the recordings run together with a slight editing artifact (dull click or change in the background sound) between the cuts on the tape.

The modification differs for different makes of cart machines: I'll only describe generally how it's done. My cue defeat modification consists of a double throw relay and a normally open pushbutton (see Figure 1).

The relay is energized from the cart machine's record-set relay or indicator and, when enabled by pressing the pushbutton (cue defeated/disabled), one set of the relay's contacts electrically latches the relay on, and the other set of contacts connect, as necessary, to the machine to mute the stop cue oscillator.

For older cart machines, such as those of the Collins, ATC or Gates Criterion designs, you must connect into the cue oscillator to mute it. For the newer cartridge machines, such as the UMC Beaucart or ITC 99B, just connect to the terminal already provided.

The cue defeat modification can be made with only a toggle switch, but I prefer a pushbutton/latching relay design which requires it to be enabled each time it's needed. That way the machine always returns to normal when it stops. The added complexity eliminates a potentially troublesome source of operator error that can result from a modification such as this.

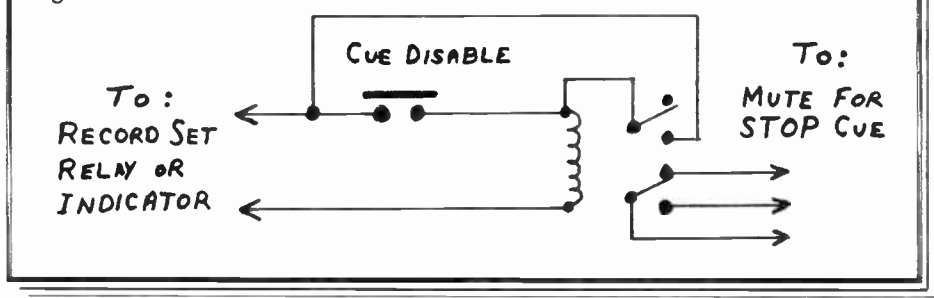
Editing speech

The structure of speech makes editing it relatively easy when compared to music. Speech is staccato in nature, and consists mostly of short sounds with steep wavefronts and trailing tails. But a mixture of two voices or other sounds can make it as difficult as music, so to learn the basic skills of editing, it is best to start with speech.

For transparent editing of speech, select, if you can, a point on the tape immediately preceding the word or group of words to be edited out or in. (Whole sentences are the easiest to do because of the longer pauses before and after.) The abrupt start of the first sound of a word will mask any change in background atmosphere on the tape.

Sometimes, due to speech which is run together, it is impossible to edit out words without losing some articles and letters. We speak in contractions; the tape does not. Speech is only truly distinct and discrete on paper, but on tape and in real life, it's neither exact or discrete.

Figure 1.



Editing music

Editing music, or any complex sound, for that matter, requires a lot of skill and patience. Most of all, however, it requires both a critical ear and sense of music—the "born-with" qualities.

In music, the individual notes and sounds blend together into a sound continuum. Therefore, gaps for editing may not actually exist, and may have to be made by physically rearranging the melody on the tape so that editing breaks are evident only to another critical ear.

Whether speech or music or a mix of both, it is best—since even for an expert there are elements of chance, and of trial and error in the editing process—that editing be done on a copy, or dub.

With audio production on tape, there's no excuse for a not-quite-right product. Bloops, "umms," "ahhs," and "errs" are acceptable when live (just barely), but on tape they're not (not at all). On tape, its supposed to be and sound right.

Tape editing allows everyone, novice or expert, the opportunity to produce a creative and professional product—the opportunity to become known for only your best work, to be known as an expert.

Coming up in my next column will be some thoughts, ideas, and practice on fires in a radio station. The topic was one of the engineering sessions at a recent PAB (Pennsylvania Association of Broadcasters) convention. Fire in a radio station means danger and trouble for all, but for engineering when it's out, depending on the fire or the way it was fought, your troubles may just be beginning.

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Circle Reader Service 33 on Page 39

Running a Proximity Analysis

by Frank S. Colligan

Washington DC ... AM directional antenna arrays are not true point sources of radiation! Close in to the array, near-field parallax effects set in.

The field strength meter, in effect, says, "You have so much field here. Which tower do you want me to concentrate on?"

In too close? Welcome to the Fresnel zone. (Both the Fresnel and Fraunhofer zones are fully discussed in the antenna classics by Kraus, Schelkunoff and King.) No antenna is "exempt" from it.

"10 times" rule

In the specific area of broadcasting there has been a longstanding rule that directional field strength measurements be made no closer to the array than 10 times its largest dimension. It's a fairly good rule-of-thumb, but *only* a rule of thumb.

Though near-field effects were not unknowable in the past, the "10-times" rule assumes that, after that distance down-radial, near field and point source inverse distance field converge to equality.

But now that we are well into the computer age, laptop machines can easily handle the simple mathematics of proximity correction followed by the vast quantity of processing arithmetic. In the "old days," proximity correction would have worn a slide rule down to sawdust!

Running a proximity analysis

As an alternative to the old "10-times" rule, running a proximity analysis on a DA pattern can often yield some surprises. In any case, we can now make DA measurements right on into the first two-tenths of a mile or so.

The FCC does not require that you use it; its use is at the field engineer's option. The FCC will accept it under certain conditions.

It is extremely helpful in the field where it can be used on short radials that head into rough ocean, swamps and the like, within the first few miles. A minimum of 20 good DA measurements in such short distances, proximity corrected, can be used in a proof of performance. Be sure to include a short statement on the hardship factors, such as the swamps, ocean, vast stretches of roadless mountain territory and dense forestry.

The greatest surprises show up in DA systems with very deep nulls. Whether you elect to use it or not in a proof of performance, it will pay you to check it out before you head out on a tuneup job —otherwise you may be fighting down deep nulls that truly were already well under limits before beginning the "fight"!

Beginning the analysis

The mathematics are quite simple. The arithmetic is rather vast for a whole set of radials. On each measuring point, the Cosine Law must be used and must be used once per pair of towers.

It all begins with the reference tower set at 1.0 at an angle of zero phase. Radials must begin from that tower, and that tower should be used for the non-directional measurements.

First we compute the point source field relative to the reference tower in the usual way. There is no need to use the millivolts K factor for the reference tower. Just assume 1.0.

Next we compute the near field in the same units. Taking the ratio of the two gives us a correction factor, Kp, by which we multiply the measured DA field to obtain the corrected field.

Let's look at Figure 1 for an example.

A simple two-tower array is shown. A point, P, is shown at a known distance along radial 194°T. For this one bearing, the point source field, the usual field, will remain constant with varying distance. On this bearing, with the array as shown, this field is 0.0111 relative to 1.00 for the reference tower.

Near field varies with distance

On the other hand, the near field will *vary* with distance. In the example of Figure 1, the point P is two miles away from tower 1. The point is a little closer than that to tower 2.

The ratio of both distances will vary with distance along the radial. The near field will vary with distance, and we must compensate for it. Knowing the frequency, we can easily calculate these distances in terms of electrical phase.

In Table 1, the distances are shown in terms of negative electrical degrees (negative because they are the angles of retarded or lagging vectors). The phase angles of each tower are algebraically added to the geographical phase distances. The ratio of geographical distances is used to correct the towers' field ratios.

The point source field assumes that all towers are equidistant from the measuring point (not really true) and its computation is done in the usual way.

The near field is computed as shown in Equation 1.

The near field is what the field strength meter will *really* see. In the instant example, the point source field is 0.0111, and the near field is 0.047. We can correct our field strength readings simply by multiplying each observed field by the ratio of the point source field divided by the near field.

Kp=0.236

Table 1 is a tabulation of correction (Kp) factors to use as we progress down the radial and collect our data.

In order to use this technique, the following must be observed with respect to FCC policy.

First the theoretical design parameters of the array must be used, irrespective of monitor readings for Form 302. The theoretical values are assumed to exist regardless of the monitor numbers.

Second, everything is to be referred to the reference tower (see Table 1).

Note that 10 times the spacing between the towers is 0.78 miles and that the near fields and the point source fields don't even begin to converge, to Kp=1.0, as far out as 20 miles!

On your next tuneup and proof-of-performance job; take an in-depth look at the near fields of the pattern. Contact me if you have any questions or if you would like an IBM compatible disk containing my computer program.

My thanks to John H. Mullaney, George Lohnes, A. Earl Cullum and Glen Gillete for their contributions made to the broadcast industry on this subject.

Frank Colligan is a telecommunications consultant based in Washington, DC. He may be reached at 301-229-5577.

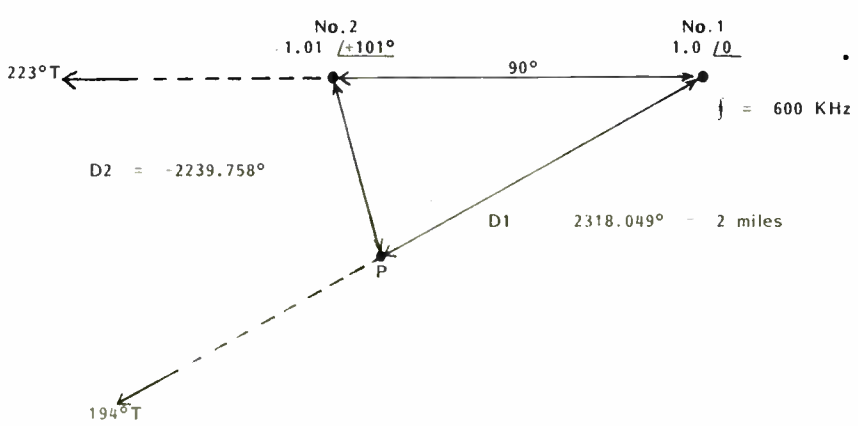
Formula 1.

$$E_N = F_1 \angle\psi_1 + D_1 + F_2\left(\frac{D_1}{D_2}\right) \angle\psi_2 + D_2$$

Table 1. Kp versus distance on bearing 194°T.

D	Kp
0.20	0.022
0.40	0.051
0.60	0.079
0.80	0.105
1.00	0.130
1.50	0.187
2.00	0.237
2.50	0.281
3.00	0.321
3.50	0.356
4.00	0.388
6.00	0.490
8.00	0.562
10.00	0.617
15.00	0.709
20.00	0.764

Figure 1. Parallax Geometry



Contract Engineering

Check FM Efficiency Properly

by John T. M. Lyles

Wilmington DE . . . In the 1 October issue of RW, Thomas Vernon covered several methods used in troubleshooting AM transmitter efficiency problems.

Similar techniques apply for FM transmitters, except for the antenna line current meter, which is replaced by the transmission line directional coupler and wattmeter at VHF frequencies.

A few additional points might be made about the use or misuse of DVMs in high RF environments, such as transmitter cabinets. No matter how well the high voltage, bias and filament feedthrough capacitors are built in tube-type transmitters, it always seems that enough low level RF leakage is conducted into the wiring.

In AM designs it might be bypassed sufficiently with thousands of picofarads of capacitance. But wiring in FM transmitters can be multiple wavelengths long, with resonant voltage rises occurring even at the front panel meters. The typical analog panel meters won't respond to the RF voltage, while digital and electronic meters are often plagued with jittering digits and false readings (usually higher) when the carrier is energized.

Two modifications to Mr. Vernon's procedures are then necessary if RF interference is suspected:

Use high-impedance HV probe

First, when verifying the accuracy of the plate voltage meter, try to use a very high impedance HV probe (Fluke, HP) with a DVM. Always be sure that the ground connection is solid, and wire the probe tip (with bare wire or solder) to the HV metering divider string pick-off point.

Then feed the red probe wire through the slot in a door seal or panel and close it to operate the interlocks while observing the DVM safely from the front. If possible, *mute the RF drive.*

Pull a tube, turn off the exciter, do whatever is necessary to kill the carrier. Be sure to check that your final tube is capable of remaining in or near cutoff condition without drive. Separate grid bias supplies usually indicate this.

Turn the screen voltage to zero if yours is equipped with a control. As a last resort, pull the final tube.

Now apply HV and note the stable reading on the DVM, as well as on the transmitter front panel meter. This method always works for DVM jitter.

Most DVMs (even Fluke and HP) will be upset at some level of RFI, at which time they become useless. But when properly used with pure DC, they are a blessing.

VOM on high-current scale

Second, the plate current meter requires that current be drawn, so the above technique won't work. Instead, since most transmitter currents are lower than 5 amps (except for solid-state rigs), use a plain vanilla VOM (Simpson 260 or equivalent) on the high-current scale.

(continued on next page)

John T. M. Lyles is a former design engineer for Delta and BE, and is working at E.I. Dupont, Wilmington DE, in RF engineering. He can be reached at 302-478-6272.

Toners, Sniffers Simplify Job

by Kirk Harnack

Richmond KY . . . Often you'll have one end of an audio pair in hand and really have no idea where the other end *ends*.

A very quick method for finding where wires go is to use a telco-style "toner."

A toner is a little yellow box with clip leads which puts out a warbling audio tone. All you have to do is connect these clip leads to the wire pair in question and then find the other end of the pair with a telco-style "sniffer." The latter is an inductive amplifier with a built-in speaker which lets you hear the audio on a wire without breaking the insulation.

Depending on the strength of the tone, you can often hear the warbling 6"-10" away from the wire—it gets stronger as you get closer to it. If the wire pair is shielded, it's often helpful to put one side of the tone onto the shield. This technique also works with coax cable.

The "toner" is small enough to toss into your toolbox and is much more convenient than dragging out a huge, low-distortion, stereo audio tone generator, when all you need is some distinctive audio.

My "toner" is a Progressive Electronics model 77M (which includes a modular plug output, too) and the "sniffer" is a Progressive Electronics model 200B (which includes a built-in speaker). The "toner" will also act as a continuity tester. Both are available through most local electronics parts distributors.

Kirk Harnack is president of Kirk Harnack Engineering, Richmond, KY. He can be reached at 606-624-2181.

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Contract Engineering

Learn to Use Meters Properly

(continued from previous page)
The idea is to use the least RF sensitive meter for the actual measurement, after transferring DC calibration points from a higher resolution DVM.

The first step is to calibrate it against your best DVM on a known current/voltage from a bench power supply. Once you know the correction factor for a current near the operating current, insert the VOM in series with the plate supply. This should only be done in ground-leg metered power supplies (most newer models are) and the connections *must be tight*.

Feed the leads outside of the cabinet as before, and don't touch the VOM while it's operating. Vary the power output to take data points at lower than normal currents to verify both that the VOM tracks the front panel meter and that no RF-induced nonlinearities occur in the meter.

> *"Never trust the 'power meter' in the transmitter when troubleshooting efficiency problems."*

If the transmitter has a plate current shunt, connect the meter across it on the mV or V ranges, depending on shunt resistance. Again, check the meter first on DC voltage with a DVM and power supply.

Carefully measure the shunt resistance with the DVM, after it is disconnected from the circuit and the DVM probe resistance is subtracted out. Shunts are typically around 1-5 ohms to give an adequate voltage sample to the front panel current meter. Applying Ohm's Law determines the current measured.

By using the DVM for plate voltage without RF drive and the VOM/DVM substitution method for plate current under RF power, the input power to an FM transmitter can be accurately determined with minimal error due to RF effects.

The output power can best be verified with a second wattmeter of known accuracy while operating into a good VHF dummy load. Never trust the "power meter" in the transmitter when troubleshooting efficiency problems, as it can easily be miscalibrated.

The calorimetric method is the fundamental way to determine the watts dissipated in a water load. Errors in temperature measurement and flow determination can cause variations of 10%-20%, as many factors influence the setup.

While employed at Broadcast Electronics Inc., I built several calorimeters with real-time data acquisition and averaging algorithms which agreed closely with commercial wattmeters (Bird). Since the details are beyond the scope of this article, I won't go into detail, except to say that even the best calorimeters are suspect in RF environments, especially the digital readout type.

Maybe the best method is to use regular thermometers at the water inlet and outlet and a good flowmeter, without any active electronics at all! I'm sure some old-timers will agree with me on that point.

Check Mod Section

by Thomas L. Vernon

Harrisburg PA ... Many engineers find tracking down problems in the modulator section of AM transmitters to be especially tortuous. These problems make their presence known through increased distortion, poor frequency response and/or instability of the modulator section.

Often the troubleshooting process degenerates into a random substitution of components in the hope that sooner or later the problem will go away.

Station Sketches

In this month's get-together, we'll discuss the modulator section of conventional high-level plate-modulated transmitters, and offer some suggestions for a methodical approach to reviving one of the more frustrating sections of the AM transmitter.

Modulators employ negative feedback to reduce harmonic and IM distortion. A good deal of noise is cancelled out as well (see Figure 1). However, improved distortion and linearity are achieved at the expense of system gain.

Gain with the feedback ladders disconnected is referred to as *open loop gain*. Gain with feedback ladders in place is known as *closed loop gain*. Closed loop gain will always be less than open loop gain, and this difference is known as the *feedback factor*.

This feedback factor varies with different transmitters, and is usually listed somewhere in the instruction book. Typical values are around 10 dB.

Figure 2 shows the modulator section of the typical AM transmitter. Basically, it's a large audio amplifier with negative feedback from the modulation transformer primary to the secondary of the input transformer.

So what about the modulation choke and blocking capacitor? Their function is to prevent plate current excursions from saturating the secondary of the modulation transformer. Were the secondary winding to be so saturated, the transformer would be stressed excessively and audio quality would suffer.

The choke acts as a short circuit to average plate current and as an open circuit to audio. On the other hand, the blocking capacitor passes plate voltage and acts as a short circuit to audio.

Troubleshooting any equipment problem should always begin with a good visual inspection. Loose connections and heat-damaged parts are obvious clues. Unfortunately, however, not all problems can be seen with the naked eye.

Since feedback ladders are one of the parts most prone to failure, this is a good place to start. Problems here are often indicated by an imbalance of audio driver cathode currents.

Many times resistors will go out of tolerance, or capacitors will open or short. Begin by measuring the DC voltage from ground to the points where the feedback ladder connects to the input transformer.

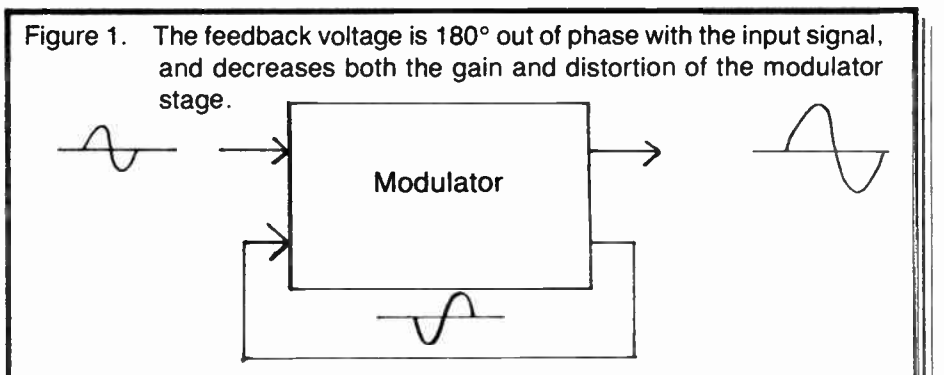

Figure 1. The feedback voltage is 180° out of phase with the input signal, and decreases both the gain and distortion of the modulator stage.

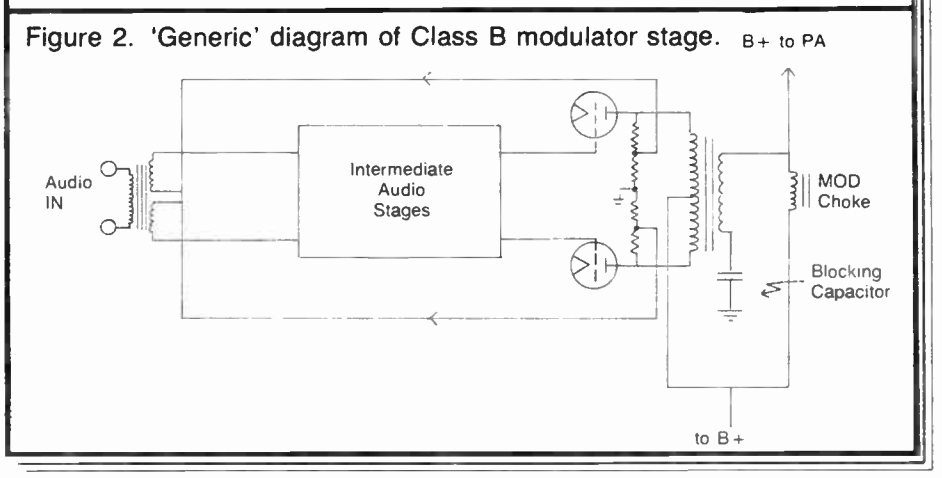

Figure 2. 'Generic' diagram of Class B modulator stage.

These two voltages should agree within 2%. If they don't, start checking feedback resistors one by one.

Now modulate the transmitter to 50% with a 400 Hz tone, and measure the AC voltages at the same two points. If these voltages don't agree within 2%, start checking the capacitors in the feedback ladder.

If everything looks OK so far, it's time to break the feedback ladder and begin more aggressive troubleshooting.

First check the schematic to see if the audio driver stages are biased via the feedback ladder. If so, a bias box of some sort will be needed.

Break the feedback ladder on the modulation transformer end. Apply enough audio for 100% modulation, remembering to reduce gain equal to the amount of feedback. Now prowl around the audio stages and look for similar AC voltages from side to side.

Don't worry too much if the DC voltages are different since, in a non-DC coupled circuit, this is normal.

If you're using an oscilloscope, expect to see more distortion and noise than usual, but again, look for similar waveforms from one side to the other.

If you get to the end of the line and the waveforms still look good, check the modulated RF output waveform. If it looks bad, and everything else is normal, the problem lies outside the modulator stage.

Possible offenders are numerous, and include the modulation transformer, blocking cap, mod choke, high voltage supply and PA stage. Anything that causes poor efficiency will make the modulator work harder to produce a given level of modulation, and this can show up in the form of audio problems.

Modulator problems can be nasty, but by breaking the circuits down into smaller sections, defective components will surrender to your scrutiny.

Next time, some thoughts on tracking down problems outside the modulator. See you then!

Tom Vernon, a regular RW columnist, divides his time among broadcast consulting, computers and instructional technology. His number is 717-249-1230.

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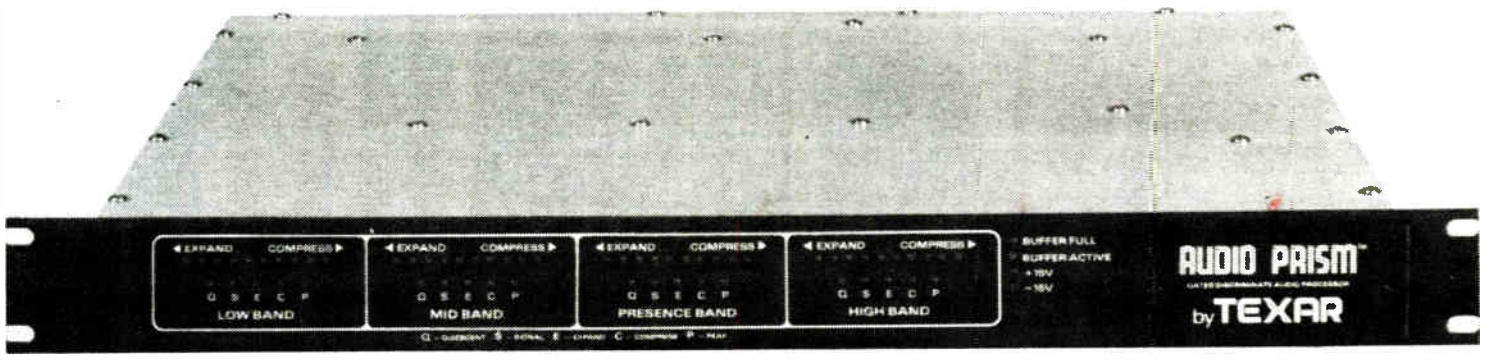

The best audio processing system money can buy just got better! The TEXAR Replacement Card Five (RCF-1), when used in conjunction with your TEXAR AUDIO PRISM'S™ and Orban Optimod 8100*, delivers an additional 1.5 dB of perceived loudness. That's a lot in today's competitive markets! In fact, the RCF-1 has more clean power than anything else money can buy.

We designed the RCF-1 in response to many telephone calls from AUDIO PRISM users over the past 18 months. While each call was unique, two recurring questions emerged: 1)"Sometime ago, we bought AUDIO PRISM'S to stand out from the crowd, but the competition has caught on and caught up. Today, they have AUDIO PRISM'S too. What can we do to re-establish our lead?" And 2)"What can we do to get more low-end bass?"

Exploring ways to further increase the modulation power of the AUDIO PRISM/Optimod combination, TEXAR engineers determined that the limiting factor was in the attack and release times of the Optimod. This is not to criticize the Optimod, a well designed and respected unit, but it is to recognize that competitive market situations require many broadcasters to use it in ways other than for which it was originally designed. Intended to operate on raw, unprocessed, console output, its operation included a generous safety margin to accomodate operator inattention. Face it: not everyone runs perfect levels.

The conservative design of the Optimod prevented these indiscretions from ever getting on the air. But today, many broadcasters precede their Optimod with the digitally controlled AUDIO PRISM. In these cases, the safety margin is no longer necessary. What if you could say to your Optimod, "I'll take care of the ups and downs in average level; you worry about making modulation?" That, in very simplified terms describes the operation of the RCF-1. (Not surprisingly, the RCF-1 should *not* be used in a barefoot Optimod, as there will be no safety margin for an overdriven board.)

Making more low-end bass available to users was a simple extension of the RCF-1. The original card 5 had a predetermined, fixed amount of bass which it would permit. Beyond that, it would reduce the gain of the low frequency stages. As you mixed in more lows on the AUDIO PRISM'S, the Optimod would simply take them right back out. Today, the RCF-1 has a "BASS BOOST" control which allows the user to dial in all the low-end bass one could want.

Card 5 is a plug in board, so installation of the RCF-1 takes less than 3 minutes. Adjustment takes less than one. No readjustment of the AUDIO PRISM is required.

To install the RCF-1, simply open the front cover and access panels of the Optimod. Turn off the Optimod power switch and pull out the original card 5. Slide the RCF-1 in its place and turn the power back on. Replace the access panel with the new one provided and set the RCF-1 controls to the recommended settings. That's all there is to it. No complicated soldering. No complicated modifications to circuit boards. No readjustment of other controls in the system.

Best of all, this additional power doesn't require giving up quality! The RCF-1 is actually *cleaner* than the original card 5 adjusted for the same loudness, so you don't have to sacrifice quarter hour maintenance for more cumes.

See what the power of the RCF-1 can do for YOUR signal. Arrange for a demo of the TEXAR AUDIO PRISM and RCF-1 today! Already own AUDIO PRISMs? You can upgrade to the RCF-1 for only $425, but act fast, because the price goes up soon. Call you favorite distributor, or call Barry Honel at (412) 85-MICRO.

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Geomatrix Saves Studio Costs

by Palmer L. Skoglund, Jr.
and Jeff Renk

Asheville NC ... When banjo pickers and dulcimer players perform their traditional mountain music in the studios of Asheville's public radio station WCQS-FM, they are insulated from the surrounding city noises by an invisible layer of "high-tech" nylon geomatrix material in the floor beneath their tapping feet.

Enkasonic® noise reduction matting was placed under the flooring in "sound critical" areas of the station's new facilities, located in a renovated building in this mountain resort community's redeveloping downtown center. Ironically, Enkasonic is manufactured only a few miles from the radio station by Geomatrix Systems, a part of BASF Corporation-Fibers Division, in Enka, NC.

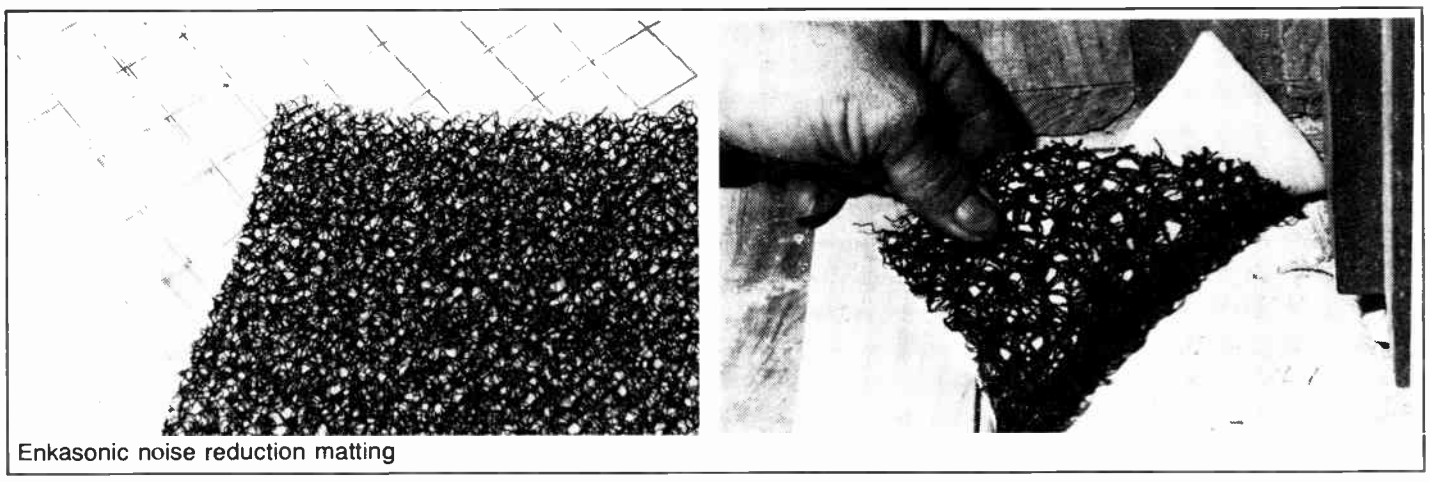
Geomatrix materials

Geomatrix materials, widely used for erosion and subsurface drainage control in highway and building construction, are a category of three-dimensional, lightweight composites usually made of polymers and often combined with "geotextiles" (woven or nonwoven fabrics) that provide for soil filtration and stabilization in construction applications.

The distinguishing characteristic of a geomatrix is the significant amount of open space within the matrix of fibers. The design allows the nylon matrix to absorb sound, channel water from underground structures in drainage applications, or anchor natural vegetative root systems for erosion control and turf grass reinforcement.

For more information, contact Palmer Skoglund, Geomatrix Systems, BASF Corporation-Fibers Division, Enka NC 28728 (704-667-7668).

The Enkasonic "floating floor" that separates the noise from the music at WCQS-FM helped the station avoid more extensive renovations, such as having to tear out the existing flooring, according to station manager Tim Warner. Fortunately for the station, which suffers from the same budget squeezes that do most public radio facilities, the best technical solution also proved to be the most cost-effective one.



Enkasonic noise reduction matting

"The only sound-reduction alternative I saw was to have the floor float on rubber isolating bushings," Warner said, a project that would have cost in the thousands of dollars. The bushings would also have raised the floor several inches, reducing overhead clearance at entrances and internal doorways. But, as installed, the Enkasonic sound reduction treatment raised floors just over an inch.

Sound control in the building was especially crucial because the structure fronts on a busy city street and there is a woodworking shop across an alley in back. Directly beneath the station is an unoccupied basement that engineers worried would act as an "echo chamber," reflecting and transmitting sounds through the floors into production and studio areas.

"We had lots of problems with noise in the old quarters," Warner said, "and I knew it would take a lot of work when we moved." Warner said the floating floors in the new station were constructed in all of the sound control areas: studios and control rooms, master control room, mechanical equipment room where the air conditioner is located, the music library, lounge area and adjoining hallways.

"We used 1,122 square feet of Enkasonic," Warner said. "Our total floor area is about 1,850 square feet."

Warner said the station relied heavily on volunteer labor to install the floating floors and to renovate the building, which was provided by a supportive architect who has an office upstairs. Previously, WCQS had been located on the campus of the University of North Carolina at Asheville, where it began 10 years ago as a student-operated rock station.

Now operated by a community group, Western North Carolina Public Radio, Inc., the station programs classical music, jazz, traditional mountain music, news and public affairs, and "a fair amount of live performances," Warner said.

Warner found the solution to his sound control problems almost by accident. "One of the volunteer workers was familiar with Enkadrain® , which he'd seen used on a local earth-sheltered home. I'd heard there was a similar product for sound control use."

Enkadrain is a subsurface drainage control matting, and has a nonwoven filter fabric bonded to the black nylon geomatrix that is the same basic core material of Enkasonic.

Warner said he then called Geomatrix Systems to see if Enkasonic could solve his sound control problems.

"They described it to me and it made perfect sense. But when I first saw it, I couldn't believe it," said Warner. "It was the weirdest looking stuff I'd ever seen."

Enkasonic looks like a mass of coiled, black wiring but is actually a matting of tough, nylon monofilaments that are heat-bonded together. It was specifically developed to create sound-rated floors

(continued on next page)

Distributor Notes

Sontec Enters National Market

Sontec Electronics, manufacturer of high performance audio components, has appointed Uplink Engineering, a technical consulting firm, as the exclusive broadcast distributor of Sontec products nationwide.

Uplink Engineering is located at 714 Southwest 12th Avenue, Fort Lauderdale, FL 33312. For more information, call Uplink President Doug Holland at 305-522-3303.

JBL Pro Names Market Manager

Hector Martinez has been named to the new position of market manager at JBL Professional, Northridge, CA.

Martinez worked for JBL from 1972-77 as a technical services coordinator. He has also worked as a retailer and manufacturer's rep of consumer and broadcast equipment.

For more information, contact Mark Gander, VP, Marketing, for JBL Professional at 8500 Balboa Boulevard, Northridge CA 91329, or call 818-893-8411.

RAM Opens New Office

RAM Broadcast Systems President Ron Mitchell has announced that RAM has opened its newest regional office, located in San Bernardino, CA.

"The expansion will allow RAM to become closer to its West Coast clients and maker it easier for us to provide a more personal service," Mitchell said.

RAM is a leading specialist in broadcast systems design and engineering, prewired systems and equipment sales. RAM is also the main US distributor for McCurdy Radio of Canada.

Heading the West Coast office is NBC veteran Dave Wolfe. Wolfe was with WMAQ, Chicago, for over 20 years.

RAM is headquartered in Chicago, with regional offices in New York and Tennessee.

For more information, contact Dave Wolfe, 1525 E. Eureka St., San Bernardino, CA 92404 or call 714-884-8119, or Steve Gordoni, RAM national sales manager, at 312-358-3330.

New Pro Audio Sales Rep

Dave Kerstin, VP of Pro Audio General Store, has announced that Todd Harrington, Menasha WI, has joined the firm as a sales representative.

Harrington has over 16 years of experience in the radio broadcast industry.

For more information, contact Dave Kerstin at Pro Audio's headquarters: 2480 S.E. 52nd St., Ocala, FL 32671. Contact Todd Harrington at 1159 Home Ave., Menasha, WI 54952 or call 414-725-8810.

Harrison System Appoints Dealers

Harrison Systems, manufacturer of audio consoles, has appointed three new dealerships for its product line.

The new appointments are: Bradley Broadcast Sales, Gaithersburg, MD; Broadcast Supply West, Tacoma, WA; and Crouse-Kimsey, Ft. Worth, TX.

For more information, contact Harrison Systems, PO Box 22964, Nashville TN 37202 or call 615-834-1184.

Geomatrix

(continued from previous page)

in multistory buildings and multifamily dwellings, where testing by the Ceramic Tile Institute has shown Enkasonic to meet strict municipal building codes regulating noise pollution and sound transmission in such structures.

"Geomatrix Systems sent an applications engineer to show us how to put the Enkasonic in place, and we did the rest," said Warner.

Installation

The Enkasonic matting was placed directly on top of the old floor, which consisted of wooden subfloor, wooden flooring and a layer of masonite intermittently covered with linoleum tile.

"It didn't even matter that the linoleum had huge chunks missing in places," Warner said, "because the flexibility of the matting allowed it to fill the voids."

Two layers of 3/8" plywood were placed over the Enkasonic at right angles to each other, with their joints offset to reduce sound transmission. The sheets of plywood were glued and screwed together, resulting in a solid platform floor that rests atop the Enkasonic matting without touching the adjacent walls. Compressed fiberglass batting was used to fill in around the edge of the new floor to keep it from "bumping" against the wall.

"The way the floor is constructed keeps any sound made within the room from going out of the room and coming back in," Warner said. "There's very little noise made when you walk on the floor, and it has just a slight 'give' to it."

"We're very pleased with the performance of the Enkasonic," Warner said, "and I've recommended it to others. We've had no problems with it. It's done what the specifications said it would do." And just a little more . . . .

"We're using a leftover piece (of Enkasonic) for a doormat," Warner said. "It makes a good one!"

Replacement Capacitor Easy

by Wilson Welch
and Paul Sliwa

Tampa FL . . . Our auxiliary FM transmitter is an RCA BTF-20E. During a weekly maintenance session, the high voltage feedthrough capacitor 1C119 shorted. Because a replacement capacitor cost $508 and the transmitter will shortly be replaced, we looked for an inexpensive fix.

New Tech

After a phone call to RCA Tech Alert to discuss the practicality of the idea, we built up a replacement capacitor.

The first step was to order four doorknob capacitors, RCA stock #215595 at $56 each (this is 1C120 in the BTF-20E). These came with 8-32 mounting studs.

Next, using the mounting plate from the old capacitor as a guide, we fashioned a bus bar per the sketch in Figure 1. All holes provide clearance for an 8-32.

We cut a piece of ¼" thick Teflon the size and shape of the mounting plate. The holes are the same size and location except for the center hole, which is 3/8" diameter.

We drilled and tapped a 2½"×3/8" -diameter aluminum rod at both ends for 8-32, and assembled the parts as shown (see Figure 2). (The capacitors screw into the existing mounting holes.)

As per the advice of RCA Tech Alert, we applied RF drive in increments. Between steps we turned the transmitter off and felt the capacitors for heat. Had there been a problem, the capacitance would have been changed (no less than 1500 pF). Of course, we could have changed the diameter of the aluminum rod to vary its inductance.

The installation went smoothly and was without problems. The total cost of this project was $230.

Wilson Welch is CE and Paul Sliwa is ACE at WFLA/WPDS, Tampa. They can be reached at 813-228-9797 or 813-446-9352.

Figure 1.

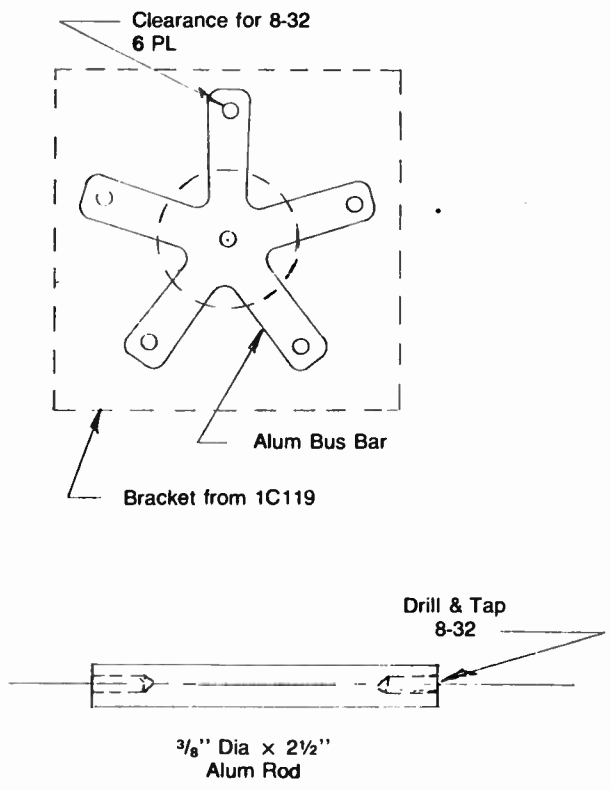
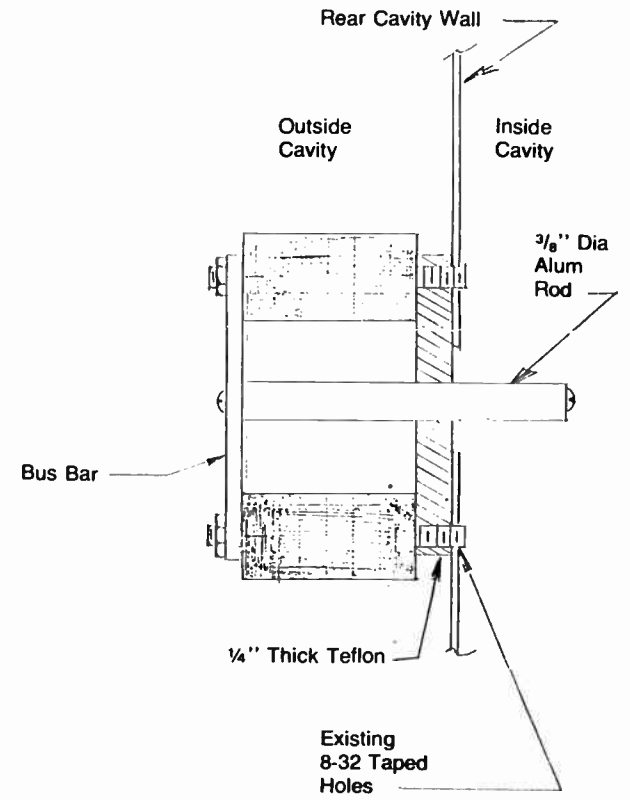


Figure 2.



Circle Reader Service 39 on Page 39

Buyers Guide

Test & Monitoring Equipment

Microprocessors Here to Stay

by Marlene Petska Lane

Falls Church VA ... A quick glance at this month's Buyers Guide on test and monitoring equipment will tell you that microprocessors are in almost everything. And if they're not, they will be shortly.

Rex Stevens, marketing manager for Television Waveform Display at Tektronix, speculated that "there might be a product in the future without a microprocessor in it, but even (our simplest instruments) are microprocessor controlled."

Holaday Industries is getting into the act this year with plans to produce microprocessor controlled broadband test gear, according to company VP Burton Gran.

And Kent McGuire, director of marketing for Sound Technology, went so far as to say, "We won't even make another piece of equipment without (a microprocessor) in it."

Is more better?

In the midst of all this enthusiasm for microprocessors, some CEs have suggested that perhaps something has been lost in the tradeoff of older equipment, namely, ease of repair.

"There's no such thing as a 'minor' failure with a microprocessor; that would be analagous to being 'kind of pregnant,'" said KIIS CE Mike Callaghan.

"And," he added, "If the microprocessor does break, 99.9% of the time it will have to go back to the manufacturer. It takes sophisicated equipment to fix microprocessors, and some engineers don't understand enough about them," he added.

Bill Betlej, director of engineering for Shenandoah Valley Broadcasting Co., agreed that the cost of microprocessor test gear is prohibitive. However, he added that breakdowns are "not that much of a problem if you deal with companies that provide excellent service."

Larry Kay, project specialist for John Fluke Mfg. Co., said his company produces "one of the least expensive lines" of equipment that a CE can use to test microprocessors. But, he said, there "is no one out there writing application software" to find single-component problems.

Although microprocessors seem to preclude, at least for the time being, repair work done by the day-to-day CE, the technology is still met with favor by both manufacturers and CEs.

"Purchasing microprocessor controlled gear is taking a calculated gamble," said Betlej, "but it's well worth the risk."

Use is justified

Microprocessors have resulted in smarter and more accurate test gear. Manufacturers and engineers agree that no conscientious CE is going to continue using an old spectrum analyzer if he has the means to purchase a new one.

"A volt is still a volt, an amp is still an amp, and you can still measure them with the old stuff, but you wouldn't think of it," said Dave Harry, VP of marketing for Potomac Instruments, which produces a remote control system that is entirely microprocessor controlled.

Stevens pointed out that microprocessors have made life easier for the chief engineer. "One of the classic problems of mechanical switches was keeping the parts clean and working. Microprocessors have improved the product's long-term reliability, and the environmental impact is less," he said.

Several manufacturers commented that the advances made in microprocessor technology have also enabled them to pass on another significant benefit to the users of some test gear—a lower price tag.

Making life easier

But perhaps the most controversial reason cited in support of increased microprocessor use is a perception by manufacturers of a downward trend in broadcast engineers' competence—or, as one CE put it, dedication.

"As the level of technicians in radio and TV stabilizes or, in fact, decreases," said Jesse Maxenchs of TFT, "life has got to be made much easier for them, not only from an operational aspect, but also from a troubleshooting aspect." Microprocessors, he said, are the means toward both ends.

Potomac Instrument's Harry was more blunt in his reasoning. "There is a decline in the competence of the engineer, although not necessarily the readers of RW," he said. "As a result, the equipment we produce has to assume some of the responsibilities that the individual used to assume." That, he explained, was part of the dynamics of the technology.

Although CEs may disagree with these manufacturers, the fact remains that microprocessors are here to stay.

Gorman-Redlich CRW Weathers the Storm

by Scott Clark, CE
KMYZ-FM/AM

Tulsa OK ... Cyclonic activity and constantly changing weather make Oklahoma one of the most unpredictable and troublesome areas for those broadcasters lacking anything less than a certified staff meteorologist.

But it's a fabulous testing ground for the Gorman-Redlich model CRW NOAA Weather Receiver!

Selectable receive frequencies

Of the numerous radio stations that I have consulted, the Model CRW has proven itself a real trooper. First of all, the receiver's RF section is a double-conversion superheterodyne, with both local oscillators crystal controlled.

The receive frequency can be selected to be either 162.40, 162.475, or 162.55 MHz by means of a small switch on the rear panel that controls the first local oscillator.

The Model CRW makes good use of its 1050 and 1650 Hz tone signals. The 1050 Hz (the Alert tone) demutes the receiver, gates the audio to "Alarm Audio" at the back, activates the flashing LED and energizes the relay, causing a contact closure between "Relay" terminals at the rear. It also activates the "Relay Closed" LED.

The 1650 Hz tone serves as the special signalling tone. It energizes the relay, causing a contact closure between the "Relay" terminals. Then it energizes the "Relay Closed" LED.

The audio taken from the "Alarm Audio" and "GND" terminals can be used to drive a remote amplifier or speaker.

With the transmission of the 1050 Hz tone, the remote will be demuted and will provide an audible warning.

Notable features

Either the 1050 or 1650 Hz tones will close the relay, so automatic recording of weather updates and information is no problem at all. This particular feature is quite useful, especially for those stations where the jock is also the weatherman.

I find that you can stop deterioration of the relay contacts when switching to the inductive load by connecting a 0.05 μF capacitor across the contacts. If the load is DC, a diode works just as well.

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Another feature that impresses me is the receiver's use of stable components and crystals with a slow aging rate. Realignment is not needed very often.

Overall, the Model CRW passes this engineer's test of approval. It is functional, sturdy, reliable and well-built. All my encounters with the Gorman-Redlich receiver have been good. I would highly recommend it to anyone at any station, especially those smaller market stations with reduced staffs here in "tornado alley."

Editor's note: For more information, contact Jim Gorman at 614-593-3150. The author may be reached at 918-665-3131.

QA-100 Knows What You Hear

by John P. Bisset, CE
WCXR/WCPT

Alexandria VA . . . The PD enters your office, and describes the appreciable difference between you and the competition. You listen, but can't place the effect you are hearing.

You take a sophisticated-looking instrument off the shelf, plug it in and, after several minutes, determine that the competitor has increased his presence band clipping. Then you set up a chart recorder for longterm analysis.

A futuristic dream? Hardly. The year is 1986, and the instrument that allows you to peek inside your competition's processing is Potomac Instrument's QA-100 QuantAural Audio Program Analyzer.

There is no doubt that human evaluation of a station's "sound" is the ultimate decision maker; however, with the advent of the QA-100, such evaluations can be augmented with a quantified visual representation of the audio to be adjusted.

Although such a visual description of what a processor does to the audio is not new, Potomac Instruments is the first

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company to combine several types of audio signal measurement into one product.

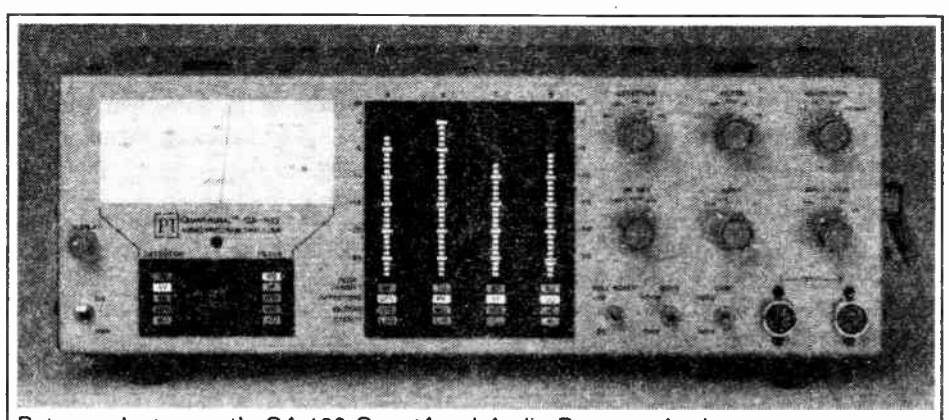
In developing the QA-100, PI felt that there was a need for a more complete means of quantifying audio signals than what was presently available to the broadcaster. With today's emphasis on competitive audio processing, PI's QuantAural is right on the mark.

The QA-100 quantifies what the ear hears, and displays this analysis on two types of readouts—a meter and LED bar graphs.

The readouts allow the comparison of a number of different parameters, each of which make up what we know as "processed audio."

Meters and bar graphs

The front panel meter, calibrated in logarithmic voltage, is selectable to display audio based on Peak, Quasi-peak, VU, Average or Intensity levels. Although engineers are familiar with peak, average and VU time constants and sampling methods, the "quasi-peak" and "intensity" measurements may be new terms.



Potomac Instrument's QA-100 QuantAural Audio Program Analyzer

The human ear does not act like either a peak or an average detector. The Quasi-peak mode bases its sampling on years of psychoacoustical tests.

These tests have placed the integration time of the ear somewhere between 20 msec to 100 msec attack, and 200 msec to 500 msec decay. This Quasi-peak detector follows the reported time constants found in the CBS Loudness Meter (20 msec attack, 200 msec decay).

The Intensity mode is similar to Quasi-peak; however its frequency response is weighted to that of the human ear. The meter indications when operating in this mode would most closely approximate the listener's perception of intensity or loudness.

In addition to the selectable detection described above, the meter can be read in either the wideband or filter mode. A selection from high, presence, mid or low frequency filters can be made.

A series of four LED bar graphs augment the meter by displaying their own set of parameters. The DET (or detectors mode) displays quasi-peak, peak, average and VU levels of the signal being observed.

Although each of these detectors can be viewed independently on the meter, the simultaneous display of these parameters on the bar graphs allows the engineer to compare the average-to-peak ratios of his (and his competitor's) signal.

Audio processing to increase loudness reduces the separation between peak and average values. The net effect is a higher average-to-peak ratio. Unprocessed audio typically has an average-to-peak ratio of −20 dB, whereas some audio processors can tighten this ratio to −10 dB or better.

Peak density and filters

Another useful tool found on the QA-100 is the Peak Density measurement. When operating in this manner, the bar graphs display the percentage of time that the signal exceeds 60%, 70%, 80% and 90% of the peak value. The higher the peak density, the more often the waveform is pushed to higher values.

In order to accurately measure this characteristic, the QA-100 automatically ratios the instantaneous peak value to the wideband peak value over time. Use of this mode is broadened by selecting the insertion of one of four filters that will display where the peaks are occurring.

Like the filters for the meter, these filters are also front-panel-selectable, and provide center frequencies for the following bands: bass, 100 Hz; midrange, 450 Hz; presence, 2 kHz; highs, 9 kHz.

Since tonal enhancement is often used to make a radio station sound louder or brighter, analysis of each band of this "bar graph real time analyzer" is invaluable.

Simultaneous stereo display

Although "stereo" information is available on modulation monitors, the flexibility is not. The QA-100 displays L+R, L−R, and separate L and R simultaneously on the bar graphs.

Not only are cart machine azimuth problems easy to spot, but so are the stations that process their L−R separately.

By switching from the Peak, Quasi-peak, Average, and Peak Density modes while viewing the stereo bar graphs, a detailed picture of the processed signal develops. Perhaps the most useful data displayed by the QA-100 is "what you are buying" by twisting the processor's knob. With the QA-100, processing tradeoffs can now be seen as well as heard.

Simple operation

In spite of the multitude of functions the QA-100 can perform in a broadcast setting, its operation is simple and straightforward.

Selection of the modes of operation are reinforced by back-lit descriptors on both the meter and the bar graphs. The backlighting of the descriptors change as the particular function knob is changed. By reading the lighted descriptors under either the meter or the bar graphs, a quick determination of what one is viewing can be made.

Uses of the QA-100 are endless. It can be used not only in analyzing processed audio, but in troubleshooting problems in your own plant.

Editor's note: In next month's Buyers' Guide, the author will describe the results of field tests of the QA-100, and how it can be used not only to analyze the competition, but also for in-house diagnostic testing. For more information, contact Dave Harry at Potomac Instruments: 301-589-2662. The author may be reached at 703-683-3000.

Buyers Guide

CE Impressed with Sound Tech

by Dennis J. Martin, CE
KOLA/KGUD Radio

Los Angeles CA ... Fifteen years ago, broadcast equipment that touted a frequency response spec of ±2 dB over a range of 30 Hz to 15 kHz with harmonic distortion of 1% was considered state of the art. A VOM and a tube tester were usually sufficient to keep the equipment operating.

Today, a deviation of ±0.5 dB over 20 Hz to 20 kHz and a THD of 0.1% is quite common.

Largely due to the increasing competitiveness of radio, engineers are discovering the advantages and necessity of having high-quality test equipment, especially as the industry enters the digital arena.

More than three years ago we began researching available test equipment. Since we work at a number of remote sites, portability was essential.

After considering performance and features versus cost from a filing-cabinet drawer full of impressive sales literature, we finally selected the Sound Technology 1500A. First marketed as a "Tape Recorder Test System," it was actually a universal audio test set, we quickly realized.

The 1500A is a microprocessor-based instrument that includes a built-in video monitor. This approach allows the unit

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to be used as a stand-alone device. It offers both a numeric and graphic presentation of the test results, and permits control by an external computer.

On power-up, the unit defaults to an AC voltmeter. Front-panel switches allow operation as a single-channel meter —left or right channel—or as an alternate reading two-channel meter. Levels are displayed digitally in volts (3 digits) and decibels (0.1 dB increments) and in analog form as autoranging bar graphs.

The bar graphs assist in making critical adjustments, while the numeric readout prevents meter-reading errors. Meter response is true RMS, bandwidth is 20 Hz to 40 kHz, and autoranging display capabilities are 1 mV to 10 V RMS fullscale in 10 dB steps.

In the AC voltmeter mode, a 1 kHz signal can be output to the device under test (DUT) for reference level adjustment. Output level is adjusted by a 20 dB vernier and −20 and −40 dB attenuator switches.

Once all levels are adjusted, the 1500A's reference level is set by the push of a button. There's no need to memorize operating levels and make mental calculations when making measurements—all subsequent tests will be automatically referenced to this level.

The engineer now has his choice of any one of a number of fully automatic tests such as frequency response, harmonic distortion versus level, channel separation and speed/drift.

Frequency response tests sweep one channel only, or right then left channels in succession, from 40 kHz to 20 Hz in fast or normal modes. When high-frequency-only sweeps are required for equalization adjustments, a low frequency limit can be set as desired.

The monitor graphs the data as it is being measured and, when completed, a movable cursor allows you to interrogate the graph at any of 123 discrete plotted frequencies for a digital readout of the measured data. Four switches set the level offset; frequency response tests are run at the established reference level or at −20, −10, or +10 dB relative to the reference.

Initially, the data is referenced to the level set in the AC voltmeter mode. If, however, you would like to change the reference, the cursor is simply moved to the new frequency and the Display Vertical Reference button is pushed. Immediately, all digital data is normalized to this new standard and the graphs shift vertically as necessary.

To compare the differences between two channels, the plots can be overlaid, or split to study each individually. They can also be displayed as 10 dB per vertical division or expanded to 2 dB per division; 60 dB total can be displayed. To view data that might be off the screen, up/down controls shift the graphs as desired.

The harmonic distortion analyzer section, in effect, provides a wave analyzer function. It is thus possible to measure second or third harmonic distortion levels.

In its automatic mode, the unit plots distortion versus level over a 30 dB range in 1 dB steps. Like frequency response, the cursor can be used to read points on the graph—a digital readout gives readings in both percent and decibels—and a low level stop limit can be set.

Channel separation tests sweep from 20 kHz to 20 Hz; data is then displayed in graphical and digital form with 1/3

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Buyers Guide

Holaday Instruments Meters RFR Environs

by Robert D. Culver
Lohnes and Culver, Consulting Engs

Washington DC ... On 1 January 1986, the FCC changed Section 1.1307 of its rules, titled: Actions which may have a Significant Environmental Effect for which Environmental Assessments must be Prepared.

All applications concerning an antenna tower or supporting structure, including those for license renewal, must now contain a certification stating that the operation does not or will not significantly affect the environment. If that certification cannot be supplied, the application must include a detailed environmental assessment.

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Environmental certification and assessments must now address the topic of Exposure to Radio Frequency Energy, and the ANSI C95.1-1982 guidelines have been adopted by the FCC to define the radio frequency level above which the environmental impact is significant.

Instrumentation exists to measure exposure levels, and one manufacturer of such a device is Holaday Industries, Inc. of Eden Prairie, MN.

The HI-3002 meter

For the past year I have worked with several measurement instruments. I am most familiar with the HI-3002 Isotropic Broadband Field Strength Meter. Space does not permit a detailed discussion of the specifications or operation of this meter, so I strongly recommend a thorough review of the manufacturer's literature *and* instruction manual.

A very good discussion of both instrumentation and measurement procedures is contained in the EPA report, "An Investigation of Radio Frequency Radiation Exposure Levels on Cougar Mountain, Issaquah, Washington, May 6-10, 1985."

The HI-3002 consists of a relatively small, 8″×5″×5″, lightweight (6.5 lbs) battery-powered instrument with a wand-mounted probe connected by flexible cable. The basic design and several other features of the unit make it easy to use.

Features

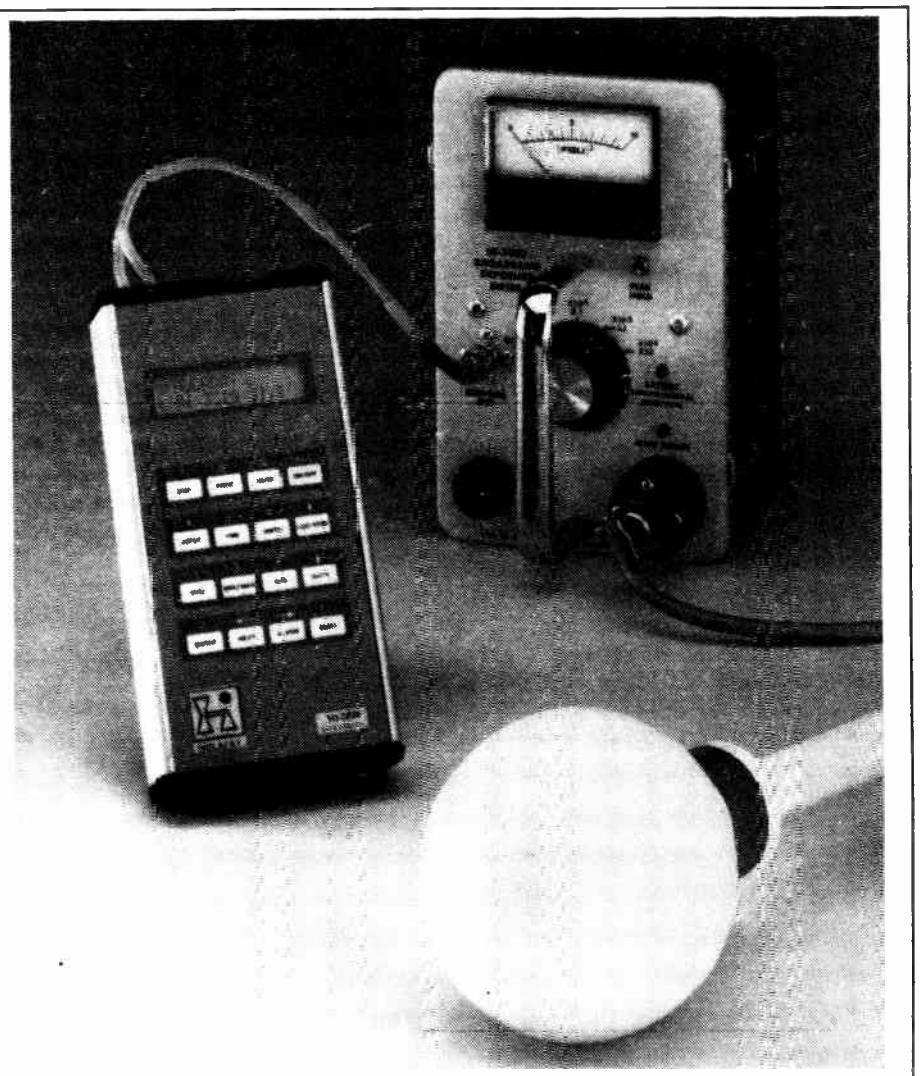
The ease of use and accuracy of the unit are most significantly enhanced by what the manufacturer refers to as "full-time automatic zero." The probe assembly houses a reference load, as well as three active pickups.

All pickups and the reference are sampled each time a reading is made, and a comparison is made between them to compensate for drift. The result is an instant-on, adjustment-free instrument.

The instrument, using either of the supplied electric or magnetic probes, indicates field strength directly in units squared per meter squared (U^2/m^2). Conversion to volts or amps per meter is simply a square root extraction, but this is not necessary or desirable.

The exposure guidelines are written in terms of U^2/m^2 and reference is made to "equivalent plane wave power density" in milliwatts per square centimeter (mW/cm^2) only for convenience in certain special conditions.

(The plane wave condition exists only in areas well removed from radiation sources where the impedance of space, determined by a ratio of E to H fields, has the value of 120π or approximately 377 ohms. In all areas where this condition does not exist, the exposure cannot be determined by measuring E field or H field values alone—both must be measured.)



Holaday's HI-3002 Isotropic Broadband Field Strength Meter and HI-3320 Datalogger.

The HI-3002 comes equipped with two standard probes for the E and H fields. Both probes have a specified isotropicity of ±0.5 dB and a frequency response of ±1 dB over the range of 3 to 500 MHz for the E field probe and 10 to 200 MHz for the H field probe.

Other probes are available. One that is required for any work below 10 MHz, including the AM band, is the Optional Low Frequency H-Field Probe. This has a response of ±2 dB from 0.5 to 10 MHz, and approximately one-tenth the standard probe sensitivity.

Accurately interpreting results

The HI-3002 has several characteristics which should be well understood and accounted for in any measuring program. First, the unit will tend to indicate values from 1 to 2 dB higher than actually present when two or more nearly equal fields are present. This error must be considered when attempting to measure multiple source exposure areas.

Achieving accurate results in that environment is difficult and could be the subject of lengthy discussion in itself. However, if each source can be measured separately with the other source shut off, then the total exposure is the total of the percentages of the exposure guideline contributed by each source.

Another characteristic to be considered is the out-of-band response of the probes. Although response may be relatively uniform within the specified frequency range, it should not be assumed that there is no significant response outside of that range.

In certain cases there can be enough response to show measured levels considerably higher than actual levels. When working where sources outside the specified range will be encountered, the manufacturer of *any* probe should be contacted for the out-of-band response.

Data logging

The best feature of the Holaday meter is the HI-3320 Datalogger, an accessory that is coupled to the meter output to automatically record the measured fields. The unit is manufactured by others and configured to Holaday specifications.

Fundamentally, the unit will take readings either 1 or 4 times per second and record the date, time and any or all of maximum, minimum and average values, over repeating time intervals varying from 1 second to several hours. A total of 3600 values, or 1200 each for maximum, minimum and average, can be recorded.

This automatic logging and average feature makes it very convenient to measure the "spatially averaged" field or the average field within a volume of space. This is done by slowly sweeping the probe through a volume of space during one sample interval and observing the average value recorded by the datalogger.

Retrieval of all the stored data is even easier than recording. The Datalogger generates a formatted report output on a digital port with programmable rate and protocol. This can be dumped to any serial printer or computer input for hard copy output or data manipulation.

Holaday also offers a small, battery-powered thermal printer. Raw unformatted data is also available.

There are some limitations with the Datalogger, of course, the most impor-

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OIBs Not Just for Antenna Work

by Gary L. Diamond
KKOB AM/FM

Albuquerque NM ... An operating impedance bridge is probably not sitting on the back shelf of every AM radio station in the world because it is not a piece of equipment that is used in the routine course of radio station maintenance.

It is a very handy piece of test equipment, though, that larger stations or those stations with complicated directional arrays can put to good use. Clever engineers can use an RF bridge for much more than just antenna work.

Actual capacitor values, for example, can be measured at the operating frequency, should a problem be suspected. Sometimes the failures cannot be seen as trails of goop on a tuning unit shelf!

KKOB purchased a new Delta OIB-3 as a piece of test equipment to be used in tuning up a new directional array in 1984. We have since used it to tune up diplexing networks at our remote synchronous station in Santa Fe, NM.

Applications

We use the bridge with the Potomac SD-31 Synthesizer/Detector, which supplies adequate signal to operate the bridge under most circumstances, and a sensitive detector with which to listen for the nulls provided by the bridge.

The OIB-3 is a self-contained "hot" bridge, just like the older OIB-1. It also contains a network to tune the metering circuit and a meter amplifier. Both of these features may be switched in or out with lever switches.

Specifications

The claimed accuracy of the instrument is within 2% within 1 ohm on both resistance and reactance scales. The

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range of the instrument is up to 1000 ohms of resistance and −900 ohms of capacitive reactance to +900 ohms of inductive reactance at 1 MHz.

The primary measuring range is 500 kHz to 2 MHz. Range adder switches—the self-cleaning type—enable the user to change scale ranges so that the results can be read without having to squint into a magnifying glass.

We have had small problems with the lever-operated range switches which tend, at least here in New Mexico with all the dust, to get dirty. The OIB-3 is enclosed in a good weatherproof box, but perhaps Delta could put rubber boots over the lever switches to stop this particular problem.

The other problem tends to happen at 3 AM when the bridge is generally in use to diagnose antenna problems. The knob positions for R and X/f_o are reversed from the positions of the knobs on the inline common-point bridges.

Reading right to left

On the OIB-3, the R knob is on the right, and the X knob is on the left, so you must make sure you read the impedance values from right to left on the OIB-3. Forgetting this has led to a perfect tower mistuning on one occasion.

As with any other instrument which is used to make important measurements, the accuracy of the bridge should be checked against a known standard prior to making measurements. So far, our bridge has checked out to within its published specifications.

If you make your living dealing directly with RF matching networks, you will find the OIB-3 to be a reasonably priced and handy piece of test equipment.

Editor's note: For more information, contact Bob Bousman at Delta Electronics: 301-354-3350. The author may be reached at 505-243-4411.

Techron Generates Excitement with TEF

by Randy Schell, Pres
Schelectronics

Houston TX ... I always knew engineering was a tough job. Just when you get all your ducks lined up, someone comes along and kicks them over. But I guess if we didn't get challenged every now and then, we'd all get bored and leave broadcasting to open fast food franchises.

Thank goodness for **Radio World**. Just as I was finishing up my plans for "Crabs to Go," they called to ask if I could write a User Report on Techron's TEF System

User Report

12 acoustic analyzer. The fact that I'd never actually used one was a detail I was certain I could work out.

In search of a demo

The first thing I did was contact Larry Shank at Techron. Perhaps I could get a demo unit to check out the 24-track recording studio I had just installed.

Well, at $10,000 each, it seems that Crown International (Techron's parent company) doesn't like to leave too many of these things sitting around on the shelf. And, as helpful as Larry was, he couldn't part with the only unit he had. Perfectly understandable.

He did, however, give me the names of a few people in the area that had been using the TEF, in hopes that one of them could give me a demo. I contacted Allan Seipman, Taft Broadcasting's CE, who managed to do so on extremely short notice.

At the risk of being overly simplistic, the TEF is a modified computer. It has audio interface circuitry and a software-controllable function generator built in.

There are a number of test modes available. Besides the more exotic ones, there's digital voltmeter, sound pressure level and oscilloscope software, and it will measure THD to the 9th harmonic. The TEF is a lot of test gear built into one box that will fit under a standard airline seat (note the word "standard" and watch what airlines you use).

Finding the point of reflection

The test I was most interested in was the analysis of energy versus time. Its function is to locate detrimental reflections in an acoustic environment.

The TEF's internal function generator is amplified into the room, and a calibrated microphone sends audio back to the analyzer, just like an RTA. The room is then "swept" with a sine wave, the upper and lower frequency limits of which are set by the operator.

The resultant display is a graphic representation of energy (or amplitude) on the vertical scale, and time on the horizontal scale. The first significant spike is the direct signal. All others (with one possible exception we'll discuss later) are room reflections.

You can move an absorptive material around the microphone, rerunning the sweep each time, until a spike you want to eliminate diminishes on the display. You've just blocked the reflection, and now you know what direction it's coming from.

Setting the cursor on the first spike gives you a reference point from which the TEF can compute the path length to any subsequent spikes. The CRT will give you a readout of the distance that sound traveled from the speaker's acoustical center to the microphone's acoustical center.

In the case of a small control room, you can actually tape measure the length of that path to find the point of reflection. Holding one end of the tape at the speaker, and the other end at the microphone, pull the center of the tape to a point where it touches a surface. There it is. (Didn't I see this on Mr. Wizard once?)

Obviously, multiple reflections will require a little math to locate, but the TEF provides constants for the equations that you can't get from other types of measuring systems.

There's another extremely useful appli-

(continued on page 38)

Buyers Guide

Modify That FM Mod Monitor

by Terry Grieger, Dir Eng
Emmis Broadcasting Corp

Los Angeles CA ... So, you went out and bought the latest audio processing system with all the attachments. You bought all the boxes that go in front of it, you bought all the boxes that go in the middle of it, and you bought all the boxes that go at the end of it.

But alas, you're still not as loud as the guy across the street, and you can't make those pesky peak lights "on the blink" stay off on your FM modulation monitor. Programming and management want it loud at all costs, but you try to keep it legal. What to do now?

Targeting the problem

After extensive investigations we found that, in our case, the problem was not our audio processing, but the modulation monitor. By connecting an oscilloscope to the composite output of the modulation monitor, we found that the composite signal was squashed and peak controlled to the point of looking like serial data. But for some reason or another, the peak lights look like a Christmas tree in Hollywood, or perhaps anywhere else.

By going on a tour inside the modulation monitor with an oscilloscope probe, we found that the peak indicator circuitry was modifying the peak-controlled signal to give false indications. This resulted in peak light indications when there was no overmodulation, thus robbing one of that valuable loudness potential.

> *"The improved filter design reduces the monitor's susceptibility to multipath interference by offering better selectivity and noise reduction."*

Fortunately, we came across a company called Modulation Index which claimed to have a fix for this problem. We commissioned the monitor out to lovely, lush, subtropical Anaheim Hills, CA. The monitor was returned with modification, fully calibrated and ready to be put back in the rack.

After verifying calibration by the Bessel function method with a spectrum analyzer, and feeding a low frequency band-limited square wave into the exciter at precisely the same peak amplitude, we determined that the modification had fixed the accuracy problem.

The overshoot of the peak indicator circuitry had been reduced to the point of insignificance, indicating around 1% accuracy from our tests.

In the days when almost all equipment seems to arrive pre-broken, it's comforting to know it is possible to get something back in working condition, especially after cleaning up previous design problems.

With the most aggressive audio processing and peak control needed to compete in the Los Angeles market (no, we don't use composite clipping), we were able to achieve maximum loudness without *any* peak lights above 100% modulation.

How it's done

The Modulation Index folks tell us that the peak indicator circuitry gets reworked with a DC-coupled/integrator scheme, which greatly enhances the performance of not only the peak indicator circuit, but the composite outputs as well.

The pulse count demodulator lowpass filter gets replaced with a new-and-improved computer-optimized design, actually improving the separation capability and SNR over the monitor's original performance.

But wait, there's more. This improved filter design reduces the monitor's susceptibility to multipath interference by offering better selectivity and noise reduction. The off-air monitoring capabilities of this monitor are now improved significantly, allowing, for the first time, this monitor to be accurate.

Our only gripe is that the acquisition time going between the calibrate and operate modes is increased significantly. This is not a major problem, since the peak indicator circuitry is so stable it doesn't require frequent calibration. Modulation Index tells us that the long period is necessary to maintain the accuracy.

Another modification available from a monitor manufacturer can actually cause potential overmodulation, since it can ignore real modulation. It keeps the peak lights off by requiring overmodulation to occur for a certain length of time before the peak light goes on. This covers the problem rather than addresses it.

More help coming

Some of the problems found in the modulation monitor can also occur elsewhere within the composite signal path, including composite STLs and exciters. We understand that a device from the Modulation Index folks will be available soon to perform special tests to aid in finding these problems.

This device will generate special band-limited test signals to determine peak control accuracy, and will also deliver a precise 13,587 Hz sine wave for Bessel calibration of FM modulation monitors.

The cost of the modification was thousands of dollars less than that of purchasing a new three-tone monitor, and was well worth it. I highly recommend the modification for those of you who need an accurate way to measure modulation to stay competitive and legal.

Editor's note: For more information, contact Greg Oganowski at Modulation Index: 714-974-4770. The author may be reached at 213-467-1224.

Holaday Measures RFR

(continued from page 32)

tant of which is the inability to change input range and have that change reflected in the log. This would be desirable when going through areas of widely changing fields, but then a notebook should be used to record other data, and the range change versus time can also be noted.

Together the HI-3002 meter and HI-3320 Datalogger make a nice package, but as yet, there is not any convenient way to carry the package when climbing towers. What is needed is a chest pack with the Datalogger slightly moveable and close at hand for programming. A Velcro-type fastener should be used to hold the probe overhead, yet allow it to be easily detachable for hand-held measurements.

Exposure surveys

The Holaday instrument package allows for the relatively simple measurement and recording of RF fields. Meaningful measurements, however, depend on thorough knowledge of the operation of the equipment (any equipment), the nature of the parameter being measured, and a well-defined understanding of the reason and use for which the measurements are made.

For example, exposure surveys will normally be used to document areas of potential worker exposure. From the survey, policy and rules will probably be developed by an employer to avoid excessive exposure.

For public exposure, once an area is determined to pose a potential exposure problem, public access is controlled by barriers and signs. If these barriers are ignored and exposure occurs, it is the result of a willful act of an individual.

If, on the other hand, an employee enters an area and suffers exposure because of the lack of or incorrect survey data, the exposure is caused at least in part by what might be considered as the negligence of the employer. The liability in these two cases is substantially different.

Editor's note: For more information, contact Burton Gran, VP of Holaday Industries: 612-934-4920. The author may be reached at 202-296-2722.

CE Impressed with Sound Tech

(continued from page 31)

octave resolution.

In the speed/drift mode, digital readouts show instantaneous and 10-second averaged error in percent, while the error is being graphed over a 610 second period.

The Sound Technology 1500A is also capable of measuring noise, azimuth and flutter. The two-channel voltmeter function displays alternate left and right channel noise readings in digital and bar graph form, automatically referenced to the set level; it is not necessary to algebraically add in the dB, the noise level and the output signal level to determine SNR.

Detection and display dynamics conform with selectable NAB, ANSI or CCIR/ARM standards, with or without weighting. Response of the noise measuring circuitry is −3 dB at band limits of 20 Hz and 20 kHz.

To prevent errors that can occur when performing azimuth alignment using a single tone, Sound Technology developed a unique four-tone test signal: 2.8, 5.7, 11.8, and 15.8 kHz are measured within a 0.1 second cycle time.

When aligning a new head, azimuth can often be more than 180° out at 15 kHz. The long wavelength of the 2.8 kHz signal is thus perfect for beginning coarse adjustment.

By observing the reaction of the phase error at 2.8 kHz, the correct direction of adjustment is quickly determined. As the adjustment is continued, the phase error for each frequency decreases until a zero average point is reached.

The display shows each frequency individually on the horizontal axis, while the vertical axis is a measure of phase error in degrees, 60° per division, ±180° maximum.

If either a single tone, frequency sweeps or pink noise is used with an AC voltmeter or oscilloscope, you can never be certain that the head is accurately aligned for a true zero *average* phase error—the deck's instantaneous phase error, although minimum at times, could be all positive or all negative. The Sound Technology 1500A, however, displays both positive and negative error excursions, thus allowing a zero average setting to be determined. Having such measurement power, precise adjustment becomes a simple and repeatable task.

Although most users seem to reserve the azimuth test exclusively for magnetic tape equipment, we have found this feature to be extremely handy as a four-frequency phase meter.

By connecting, say, the parallel combination of the left channel input *and* output of the 1500A to the input of the DUT, and the right channel input of the 1500A to the output of the DUT, input/output phase shift versus frequency can be easily measured. The four test frequencies cannot be changed, but it is much faster than using an oscillator and a dual-trace oscilloscope.

The flutter test function, like noise, is displayed in a vertical bar graph format. The digital readout displays the 2-sigma signal, which is a smoothed, 95% of peak value. Measurements can be made to the detection and display dynamics specified by NAB, JIS and DIN/ANSI, weighted or unweighted.

One very valuable option that can be added to the 1500A is a ⅓ octave spectrum analyzer.

And, finally, an IEEE-488 General Purpose Interface Bus adapter—also sold as an option—allows the 1500A to be completely controlled and interrogated by an external computer.

Documenting test results is a simple matter; a scope camera can be used to photograph the monitor's display or a video printer can be connected to the video output jack of the 1500A.

The Sound Technology unit flourishes as a self-operating test instrument. But it can also be used in the manual—or engineering mode as it has been dubbed—at the push of a button. Now the unit becomes a 123 discrete frequency generator with tracking two-channel analyzer or a real-time reading wave analyzer for bias adjustments.

To aid in the test of phono cartridges, a special test record that offers 1500A test signals is available from Sound Technology. In addition, a wide selection of test tapes designed to be used in conjunction with the 1500A are available from Standard Tape Laboratory.

Sound Technology also manufactures the 1510A—billed as a Tape Recorder/Audio Test System. It offers all the features of the 1500A and adds a spot frequency response test, maximum operating level and dropout tests, and balanced inputs and outputs. Performance is also somewhat refined over the 1500A.

Editor's note: For more information, call Cindy Alderson of Sound Technology at 408-378-6540 or Robert K. Morrison of Standard Tape Laboratory at 415-786-3546. The author may be reached at 714-684-9992.

Buyers Guide

AS-10 a Sure Bet for C-QUAM

by James S. Stanley
Stanley Broadcast Engineering

Tempe AZ ... Broadcast Electronics designed its new AS-10 Stereo Modulation Monitor for AM broadcast facilities using the C-QUAM™ system. Requiring only 5¼" of space in a standard 19" rack, it lends itself to almost any operation.

The AS-10 allows the station engineer to monitor all parameters pertaining to the monaural and stereo signal. Front panel indicators include selectable metering of L or L+R channel program information and R or L−R information.

Functions and features

The unit has fixed peak modulation indicators for −100% L+R and +125% L+R as well as 100% L−R peak modulation. There are also adjustable peak modulation indicators for the L or L+R channels and R or L−R modulation. Minus/plus polarity switching is provided, and the adjustable peak indicators and modulation metering track with the minus and plus polarity selector.

Other front panel indicators include RF input, stereo pilot level and pilot presence, which illuminates whenever the 25 Hz stereo pilot is detected.

The autorange function allows the user to operate the front panel switchable metering from −50 dB to 0 dB automatically in 10 dB steps. The same function can also be accomplished manually.

One unique feature of the AS-10 monitor is the wide-range RF input AGC. The AGC will track a power change as great as 4:1 without requiring station personnel to recalibrate the RF modulation sample level presented to the monitor from the transmitter.

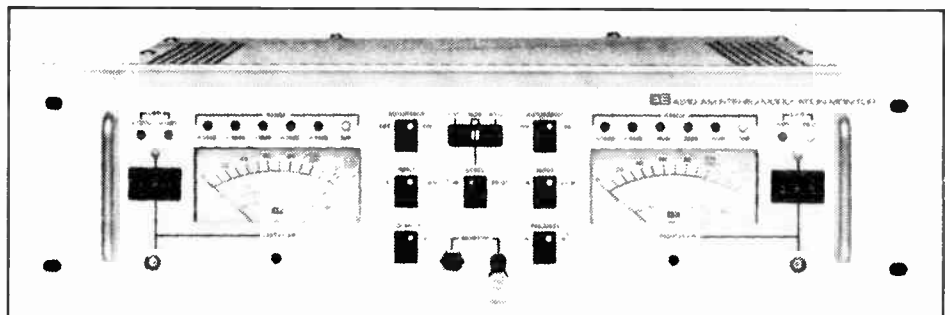
Decoded audio samples are given for L or R channels and L+R and L−R. Conveniently located on the front panel as well as the back, these outputs permit the connection of test equipment used during proof of performance measurements. A front panel headphone output with volume control lets the engineer hear the demodulated signal even in the noisiest of environments.

Because it is frequency agile, the AS-10 can easily be reprogrammed in the field to any frequency between 530 kHz and 1630 kHz in 10 kHz steps.

We recently tested the AS-10 monitor in the field and were quite pleased with the results. The monitor was installed at a station that operates at a power level of 50 kW day and night. Closed-loop stereo separation measurements were made while one of the 50 kW transmitters operated into the antenna system with normal programming.

> *One unique feature of the AS-10 monitor is the wide-range RF input AGC.*

Even in the high RF environment, the AS-10 resolved stereo separation of nearly 50 dB L into R channel and R into L channel.



BE's AS-10 Stereo Modulation Monitor

The actual measurements were −46 dB at 1 kHz modulating the left channel at 50% and measuring the resultant crosstalk in the right channel in decibels below the reference. The separation when measured from the R channel into L was −47 dB at 1 kHz 50% modulation.

Testing

Later during the test we operated one of the 50 kW transmitters into the dummy antenna. The other transmitter remained on the station antenna system with normal programming.

Again the AS-10 performed quite well. During normal programming, the AS-10 monitor was relatively free of overshoot in the peak indicators and metering, even while monitoring complex, heavily processed waveforms.

I believe the AS-10 would be a fine choice for use in any AM broadcast facility, even if the present requirements were only for a monaural modulation monitor, with stereophonic operation contemplated for the future.

Editor's note: For further information, contact Steve Ford at Broadcast Electronics: 217-224-9600. The author may be reached at 602-264-8752. C-QUAM® is a registered trademark of Motorola Inc.

System One Answers Test Needs

by Robert Metzler, Pres
Audio Precision

Beaverton OR . . . Audio proof-of-performance tests of the complete broadcast station are not something that most engineers relish. Test equipment and engineers are required at both studio and transmitter if the station is split-site.

The communications and adjustments required to run the proofs at constant modulation levels are laborious ("Up a little . . . up a little more . . . down a little. Okay, hold it there. Write down the generator level, and give me a minute to null out the distortion analyzer.").

Some of us are a bit error-prone at 3 AM, so it's not unusual to find when plotting graphs the next day that we misread the meter on the "3" full scale instead of the "1." In addition, the pressure from management at 24-hour-a-day operations often shortens the "window" of time available to barely enough in which to make the measurements, with no time to make adjustments or troubleshoot problems and bring the station's audio quality up to what it could be.

Performance proofs in minutes

Modern audio test equipment and techniques now make it possible to run a complete monaural audio proof in approximately one minute, and a full stereo proof in about three minutes. This includes graphing the data on the screen of a personal computer, which runs the actual mechanics of the proof, and saving all data to diskette for later graphic and tabular printout.

The computer doesn't make "3 AM mistakes." The rapid testing speed frees the engineer's time—and creativity—to track down and correct performance-limiting problems.

The entire operation can be automated, in fact, to the point of running monthly or weekly if desired—while the chief is home in bed! He can then look at a printed or screen-displayed summary the next morning to see if work is required.

The System One audio test system from Audio Precision can run split-site proofs by two techniques; a limited-compliance method and a full-compliance method. The architecture of the limited-compliance method is diagrammed in Figure 1.

Limited compliance

The method is basically identical to what can be done with several other recent automatic audio test systems from US and European manufacturers. The oscillator at the studio proceeds through a sequence of test signals. The analyzer at the transmitter, driven from the modulation monitor, automatically measures the results.

Measured data is stored to diskette at the transmitter location. No communication between the two sites is required other than the studio-to-transmitter link. This very lack of communication, however, is what makes this a "limited-compliance" method.

The studio computer has no means of knowing the modulation/deviation level of the transmitter. It therefore cannot adjust the oscillator level at each frequency to produce measurements at constant modulation.

The frequency response values measured and recorded are modulation monitor output voltages, rather than the long-time, FCC-required technique of recording and plotting generator output level or gain set reading needed to achieve the target modulation value.

This limitation is particularly serious when making distortion measurements of an AM station on the 100% modulation sweep. The oscillator level which produces 100% modulation at 1 kHz may produce only 80% modulation at 50 Hz, and the transmitter linearity above 80% modulation at low frequencies (where it is likely to be at its worst) will thus go completely unmeasured.

Full compliance

The full-compliance method of split-site proof automation (unique to System One) is diagrammed in Figure 2. A data communications link, such as a dial-up phone line or an existing command or communications line, is connected between the studio and transmitter personal computers via modems.

Now, operation is automated exactly as "FCC-style" proofs have always been run. Measurements of the mod monitor output are sent over the data communications link to the computer at the studio, where they are compared to the value corresponding to the target modulation/deviation.

The oscillator level is automatically adjusted as necessary to arrive at the exact target of modulation. The oscillator output level is then stored and plotted. Distortion is automatically measured at the exact specified modulation levels, with the distortion values also sent over the data communications link to the studio.

(continued on page 38)

Figure 1. Limited Compliance Method

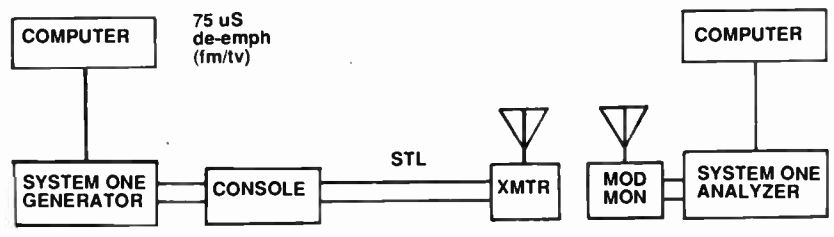


Figure 2. Full Compliance Method

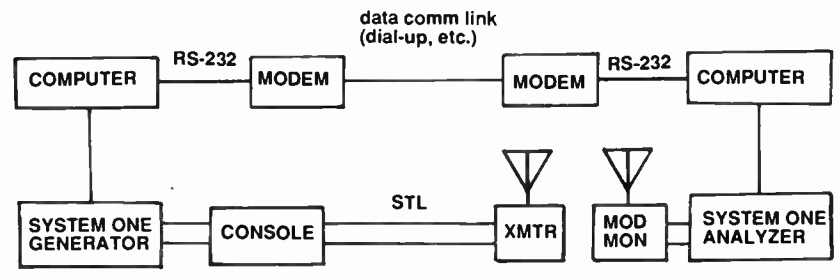
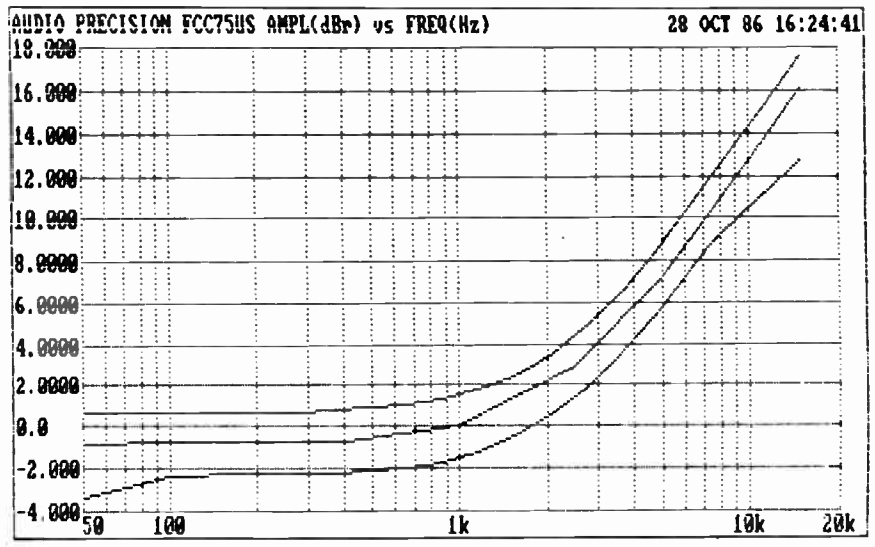


Figure 3. FCC Upper and lower limits and frequency response measurement, 75 us pre-emphasis.



Circle Reader Service 11 on Page 39

Buyers Guide

Cart System Still Not Perfected

by Carl Martin, Pres
Audi-Cord Corp

Part 2

Normal IL ... The pressure pad has traditionally been used in the cartridge to keep the tape in contact with the head gaps due to dissimilar wrap between the two sides of each head, as well as to the often irregular motion of the tape as it left the supply hub.

These pads have taken on different design and shape—or have been omitted altogether by the various manufacturers—as needs have been interpreted.

Braking loss

When a pressure pad is used, it introduces a "braking" loss which adds to the tension of the tape at succeeding members.

These extra tensions vary widely by the type of materials used and the size of the pad itself. Tests indicate the change of load at the capstan for two heads and pads ranges from 0.5 oz to 3.2 oz, depending upon the manufacturer.

With the losses from each pad indicating up to 1.6 ounces, it would seem logical to remove these losses caused by the dummy head. Indeed, many users do this by pulling this head out or retracting it until it just touches. Tests tend to indicate that the dummy head does not significantly improve tape guidance to the replay head, but does have some value to act as a "scrape flutter" filter in some cases.

Machine design changes

The cartridge transports in common use today also vary in design. In spite of the similarity of the cartridge transports, they often are misunderstood and compared to the reel-to-reel transports in general use.

This is very erroneous. In the three-motor reel-to-reel, the control of drive tensions is entirely related to the balance of torques of the playoff and takeup motors, and the changing diameter of the tape on the reels.

The cartridge drive system has only one driving force—the capstan/roller mechanism. All other tensions and forces are deadweight losses.

Tape formula changes

By the early 1980s, the trend of the broadcast industry was toward the use of cartridges for recording music, often in stereophonic format. Of major importance in this trend was the inherent longer lengths of tape load to satisfy the length of music.

However, some very important considerations may have been overlooked that influence the cost of operations and maintenance of these cartridge systems in such applications.

The traditional cartridge tapes were soft-matte oxides on a medium-to-thick base film, lubricated by solidified graphite applied to the back side.

The effect of the matte oxide was to capture air between turns of the tape on the supply hub and prevent the turns from sticking together. This tape had a serious limitation.

The oxide did not intimately contact the head gaps due to its roughness, and the oxide was magnetically inferior, resulting in output losses at the extreme audio frequencies and higher SNR.

By 1980, new tapes began to appear for use in cartridge loading that were formulated for extended range and lower noise.

These have largely been smooth oxides. These tapes certainly perform electrically superior to the traditional tapes, but a whole new world of problems has been created with their use.

These problems are from pull tension and the wear factors that result from extra friction. These higher tensions are caused by intimate mating of the two polished surfaces of the tapes when they are wound on the supply hub.

Another factor is sensitivity to storage time and temperatures which will cause the turns to stick together.

Obviously, there is a proportionate increase of wear with increase in tension, but other factors can add severely to this wear.

One of these is the use of the harder oxides alloyed from cobalt or chrome particles. These oxides are considerably more abrasive and, when combined with the use of pressure pads, are responsible for increased head and capstan wear.

Editor's note: This is the second of a three-part series. Part 3 will appear in next month's Buyers Guide. For more information, contact the author at 309-452-9461.

Category of the Month

Each month the Buyers Guide highlights one area of broadcast equipment.

JAN	FEB	MARCH	APRIL
Test & Monitoring Equipment	Satellite & Automation Equipment	Microphones, Turntables & CD Players	AM Transmitters & Exciters
MAY	**JUNE**	**JULY**	**AUG**
Antennas, Towers & Cables	Program Audio Processing	Studio Audio Equipment	Consoles
SEPT	**OCT**	**NOV**	**DEC**
Reel-to-Reel & Pro Tape Recorders	STL, Remote, & Telco Equipment	FM Transmitters, Exciters & SCAs	Cart Machines

For more information, or to participate in the Buyers Guide, write: Radio World Buyers Guide, PO Box 1214, Falls Church VA 22041. 703-998-7600.

TEF System 12 Generates Excitement

(continued from page 33)

cation for this measurement. It applies to the design of speaker systems, in either multiple-enclosure sound reinforcement situations or the design of a single-speaker enclosure.

A sweep of the full audio spectrum will show the direct signal from the acoustical center of each driver in a cluster or individual enclosure as they relate in time (these are the other spikes I mentioned earlier).

By physically moving the speakers forward or backward until all the spikes are aligned, you can properly correlate all the drivers in time. But wait—there's more.

By identifying the spike that is the direct signal from the speaker, you can tell the System 12 to ignore all the reflections and, as far as the TEF is concerned, any room you're in becomes an anechoic chamber. Now you can set your speaker enclosure on a turntable and do an accurate polar pattern.

Talking during the test

Another feature that makes this a more attractive acoustic test system than any I've seen is its use of time delay spectrometry. It's a technique that, with very few extreme exceptions, ignores ambient noise.

You can actually stand close to the microphone and carry on a conversation without affecting the test. It's the truth. I saw it happen.

Of course, since the TEF is actually a CPM-based computer, it's also capable of normal computing functions, such as word processing. You can generate text to go with your graphics.

There's more that the System 12 is capable of doing, including FFT, phase versus frequency measurements, and Nyquist Curve generation that required more time than I had available to learn, and more space than I have available to explain.

Although it's a little pricey to have sitting around on the shelf of the average medium-market radio station, a serious acoustical engineer would find it well worth the outlay of cash and the time required to learn to operate it.

I extend my thanks to Allan Seipman for all the help. My only complaint is that the demonstration was so fascinating that I stayed too long and found myself in the Galleria area of Houston during rush hour in the Christmas shopping season.

But, armed with the Traffic Master on the radio, I set out to do battle with the traffic while I tried to figure out where I was going to come up with an extra $10,000. I'm still figuring.

Editor's note: For more information, contact Techron at 219-294-5571. The author may be reached at 713-558-5121.

System 1 Proves Unique

(continued from page 37)

All results are thus automatically graphed on the screen of the studio PC as the proof progresses, and stored on diskette or hard disk at the studio rather than at the remote transmitter location.

Graphs are drawn in the traditional form shown in Figure 3 (for the example of an FM frequency response). FCC upper and lower limits are also shown and all measurements are automatically compared to the limits for a final report.

Diverse applications

The hardware and split-site communications and control capabilities described are standard features of System One and personal computers. The specific software routines for FCC-style proofs, and the filters required for automated main-to-sub and sub-to-main crosstalk tests at stereo stations, are moderate-cost options.

The standard System One hardware and software also perform all other audio testing required in even the most elaborate broadcast plant—tape machine setup and performance verification, measurements of consoles, distribution amps, audio power amps, processors, and even measurements of 16-bit digital audio devices such as CD players and the forthcoming digital audio tape machines.

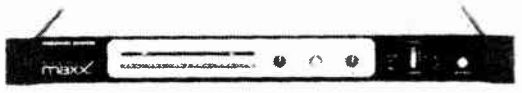
All tests can be saved to diskette to document the performance of each item of equipment in inventory. Old and new measurements can be graphically overlaid to highlight deterioration or trends.

One audio test set thus serves all the station's needs, rather than separate, specialized equipment for tape, electronics equipment and split-site transmission line testing.

Editor's note: For more information, contact the author at Audio Precision: 503-297-4837.

Radio World Marketplace

Selected from the many new product releases which cross our desk each month



Spatial image enlarger

Modulation Sciences' Stereomaxx™ operates in the spatial domain to enhance and enlarge the stereo image. It is mono-compatible and includes sophisticated circuitry which avoids the undesirable side effects of other image enhancement techniques, according to the company.

The unit is fully compatible with all audio processing gear that a station may be currently using. Modulation Sciences recommends that Stereomaxx be installed as the next-to-last device in the audio chain, before the limiter and after most other audio processors.

Stereomaxx is currently in production and will be available from distributors serving the broadcast market. Cost of the unit will be $3195.

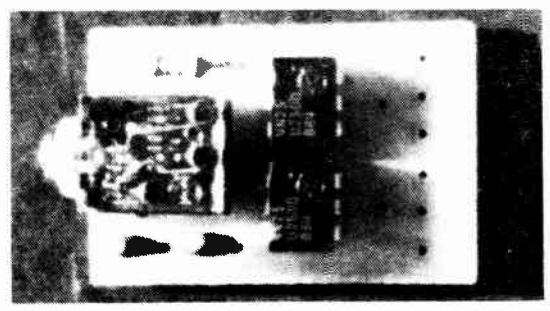
For more information, call **Dick Schumeyer** at **718-625-7333** or circle **Reader Service 54.**

Stereo cartridge recorder

Pacific Recorders & Engineering's Micromax Stereo Recorder comes equipped with the MAX-TRAX half-track format tape heads. Optional NAB format quarter-track heads are also available.

The tape drive system employs DC servo-controlled motors for both the capstan and pinchroller. Combined with a constant pressure polyurethane pinchroller with self-aligning precision bearings, the drive system permits split-second, 60 msec tape starts while consuming only 15 W total while recording.

For more information, call **Mike Uhl** at **619-438-3911** or circle **Reader Service 69.**

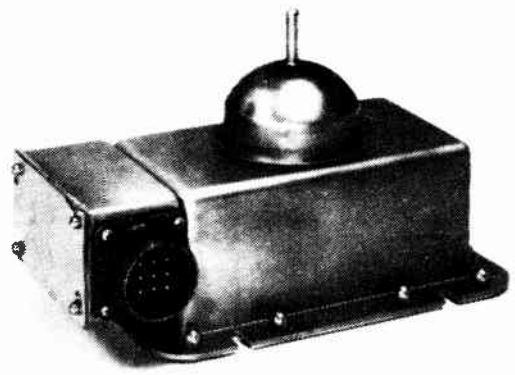


Remote opto-interface unit

Henry Engineering's P5A Remote Opto-Interface is a small, inexpensive circuitboard that can be added to nearly any CD player, cassette deck or other unit to provide or extend a device's remote control capability.

Measuring 1"×1½" in size, it contains two opto-isolator ICs, and solves the problem of connecting remote control wiring to a CD player that has no remote socket. It does not disrupt the operation of the microprocessor and related circuitry.

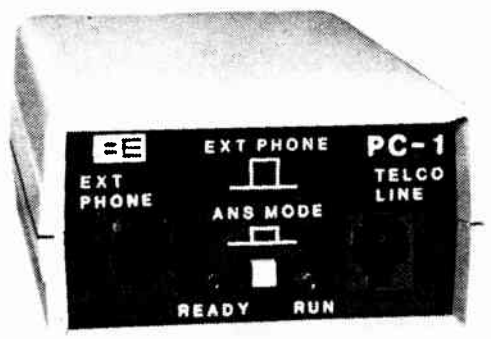
For more information, call **Hank Landsberg** at **818-355-3656** or circle **Reader Service 61.**



Ice warning system

Rosemount's 872B/524B Ice Warning System, consisting of a controller and an ice detector, is specifically designed to reduce antenna deicing costs and to fully automate antenna deicing systems. The system will detect ice and energize antenna heaters only when ice is physically present but before ice accumulation can reduce antenna performance.

For more information, call **Mike Johnston** at **612-435-4359** or circle **Reader Service 58.**

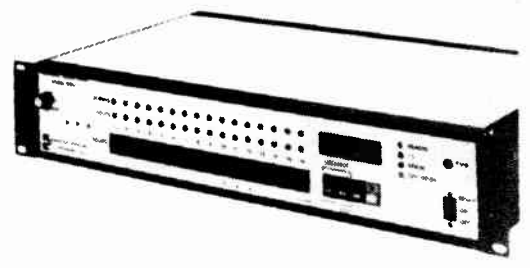


Telephone/cart machine interface

Broadcast Electronics' new PC-1 telephone/cart machine interface is designed to operate in conjunction with virtually any NAB tape cartridge playback unit, or with any remote-start, remote-run playback system.

It works by detecting an incoming call and relaying a "start" signal to the cart machine's remote start input. The PC-1 will answer a call only if the cart machine is ready.

For more information, call **Tim Bealor** at **217-224-9600** or circle **Reader Service 72.**



"Talking" DTMF remote control

Monroe Electronics Inc. has introduced the Model 5001 DTMF Remote Control, which answers DTMF-coded inquiries and generates alarm reports in English using synthesized speech.

The device monitors 16 on-off type logic inputs and controls 16 outputs through built-in Form C relays. It controls its output relays as instructed, and reports the state of its logic inputs when queried by the user. It will generate an alarm report spontaneously when designated inputs change state.

For more information, call **Monroe Electronics** at **716-765-2254** or circle **Reader Service 71.**

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007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
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Circle Reader Service 30 on Page 39

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CTR100 Series

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

CTR10 Series

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

CTR30 Series

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

ESD10 Eraser/Splice Detector

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

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Circle Reader Service 34 on Page 39