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Slow Start for NTIA Study

by Alex Zavistovich

Boulder CO ... Research into the "technical viability" of multimode chips for AM stereo system reception, conducted by the National Telecommunications and Information Administration (NTIA), is off to a slow start, with the NTIA unable to pinpoint a completion date.

To compound matters, Motorola, which in addition to Kahn Communications represents one of the two active competitors remaining in the AM stereo arena, has opted against providing NTIA with C-QUAM equipment, awaiting further information of the nature of the testing.

The NTIA's Institute for Telecommunications Sciences has begun "some preliminary analyses, firing up equipment and so forth," according to the institute's executive officer, Val O'Day. He stressed, however, that not all the equipment has been received.

O'Day also declined to provide details to **RW** of the testing done so far.

No more than 90 days

In February, the NTIA released its "AM Stereo and the Future of AM Radio" report which recommended the institute study the "technical viability" of integrated circuits that could automatically detect either Motorola's C-QUAM or Kahn's ISB system.

NTIA Assistant Secretary for Communications and Information Alfred Sikes said at the time that he expected chip testing to take no more than 90 days.

However, with almost 90 days having passed since the NTIA report was issued, O'Day would not speculate on when the institute's test results would be completed.

O'Day told **RW** in April that the date the results are expected "is contingent on the completion of the analyses we were originally hoping to have finished in the May time frame," he said. "But there are certain variables still to be resolved which might impact that (date)."

"It's kind of a fluid time line we're working on," O'Day said, but he stressed that work is "in progress" on the tests.

An NTIA source noted that the 90-day statement made at the time of the study was based on the assumption that the institute would get the equipment it needed immediately.

Motorola refuses

The delay in the institute's research is at least partly attributable to Motorola's reluctance to participate in the project.

Motorola's AM Stereo Manager Frank Hilbert told **RW** in April that Motorola had still not presented the NTIA with C-QUAM equipment.

Pointing out that multisystem technology "has been tried in the marketplace in the past, and failed," Hilbert stated that, "we (Motorola) feel there is no need for testing, and that it will confuse the market."

Hilbert maintained that Motorola made "major presentations" to the NTIA on multisystem integrated circuits (IC), along with engineering analyses of why past ICs have failed. At press time, Hilbert said the NTIA had not responded to the presentations.

Because of the lack of necessary equipment, the completion date for the institute's testing may be "staggered" from the release date of the original study, the NTIA source admitted. "The Assistant Secretary (Sikes) will probably start counting days from the time all of the equipment is in," the source said.

The Institute's current plan is to proceed without equipment supplied by Motorola, the source continued, adding "we can get the equipment from other sources."

Statistical model

The NTIA has maintained that the further investigation of multisystem technology was based on a survey of receiver manufacturers.

However, agency officials acknowledge that a statistical survey of market conditions, rather than direct questioning of the manufacturers, led to that decision.

"We did not actually ask the manufacturers if they were interested in making multisystem radios," an NTIA spokesperson told **RW**.

In preparing the survey, the NTIA developed a series of questions reflecting "hypothetical" market situations. The agency has declined to provide **RW** with the exact questions.

But the situations presented various combinations of percentages of stereo receivers in general with percentages of stereo stations adopting Kahn's ISB system and those adopting Motorola's C-QUAM.

Questions were also posed, the NTIA said, to determine whether a receiver manufacturer's willingness to adopt AM stereo would be affected by compatibility between the systems/the availabili-

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Main Studio Rule Eliminated

Washington DC ... Main broadcast studios no longer need to be located within a community of license, due to a recent FCC ruling which also eliminated the main studio origination rule for local program production.

The Commission decided in a 16 April meeting to permit radio and television broadcast stations to locate their main studios within their "principal community contours"—the contour a station is required to place over its community of license.

Another action by the FCC did away with the requirement that broadcast stations originate at least 51% of their non-network programming from their main studios or other points in their community.

Stations must, however, keep a public inspection file in their community of license and must have a local or toll-free telephone number.

The FCC's decision revises a long-standing policy that required broadcast stations' main studios to be maintained in the community of license.

Unless they obtained a so-called "Arizona waiver," stations in violation of the main studio rule had been subject to fines or other FCC action.

To support its elimination of the community of license aspect of the main studio rules, the FCC determined that a studio in the community of license is not required to ensure that the licensee is physically accessible to local citizens.

According to FCC Mass Media Bureau attorney Eileen Huggard, the Commission has reconsidered the need for *physical* accessibility.

Comments from broadcasters, she said, showed that a station's audience generally phones or writes the station, rather than visiting.

Other comments noted that during the 1950's, when the studio rule was framed, transportation was not as developed as it is today. A studio had to be within the community of license to remain accessible to the public, Huggard said.

Now, Huggard maintained, a local or toll-free number in conjunction with a public inspection file in the community of license may serve the public as well as the presence of a main studio would.

However, the studio must still be within its principal community contour, she said. The contour is defined in the FCC's rules as 5 mV/m for AM stations and 0.16 mV/m for FMs.

The FCC also noted that, in the case of local origination, the main studio may no longer play a "central role" in a station's program production.

The Commission also held that new developments in broadcast technology and production, as well as "competitive marketplace forces," have changed the role of the main studio in program origination.

Coverage of local issues does not necessarily have to come from locally pro-

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Regulatory News

Support for FM Booster Plan

by David Hughes

Washington DC ... Broadcasters say they support an FCC plan to allow FM stations to increase the power of the booster facilities and feed them via microwave or satellite.

The NAB, in comments filed in April, said it backed the FCC's plan to permit FM boosters to be licensed to output powers of greater than the existing 10 W limit, as well as eliminating the restriction that they be fed only over-the-air from the original, full-power facility.

> *The FCC should make certain that the new higher powered boosters ... do not extend the boosted service beyond the primary station's proposed contour.*

In February, the FCC, responding to a request from Evansville, IN-based Brill Media Company, proposed the power hike for boosters, which are employed on the same frequency as the original station to eliminate areas of poor coverage.

Boosters, which now operate from 1 to 10 W, differ from translators which operate on a different frequency from the main station.

The Commission stressed in its proposal that the new higher powered boosters would still be prohibited from causing interference to other stations. Despite the higher power, a booster still could not expand the original station's coverage area beyond its predicted 1 mW/m contour.

In its filing with the FCC, the NAB said that "due to compelling technical considerations and the placement of conditions on booster station license eligibility and geographic location, the Commission should extend such program relay options to booster facilities."

Conditional support

However, the association maintained that its support for the plan is conditioned on the Commission's adoption of a "package which would include effective safeguards against interference to existing broadcast service."

The NAB stressed that the FCC should make certain that the new higher powered boosters, which should be station owned and operated, do not extend the boosted service beyond the primary station's proposed contour.

While it supported the concept of higher powers for boosters, the NAB warned the Commission that it has "great concern" that satellite-fed boosters could lead to satellite-fed translators and thereby be "completely at odds with sound communications policy."

The NAB said it feared the creation of "a new low-power FM service which not only would be an inefficient use of the spectrum, but would be highly detrimental to the furtherance of locally responsible broadcast service."

The FCC, in a separate docket, has proposed satellite and microwave feeds for non-commercial translators in response to a request from the Chicago-based Moody Bible Institute.

Apart from the NAB's fears of a new low-power FM service, other broadcasters generally supported the booster hike plan.

Other comments

CBS echoed several radio stations in saying that as long as the FCC's co- and adjacent-channel rules remain intact there should be no increase in interference.

The Association of Maximum Service Telecasters (MST), an organization which represents TV interests, advised the FCC not to allow FM booster increases that could interfere with TV channel 6, which operates just below the FM broadcast band.

The NAB, MST and others also stated their approval for implementation of a proposed booster service for TV, similar to the existing FM booster service.

The docket number is MM 87-13. Final FCC action is expected in late spring or early summer. The FCC contact is Marcia Glauberman at 202-632-6302.

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FCC Clips

Comment Period Extended

The FCC said 10 April that it had granted an extension of time for comments on Docket MM 87-7, which would relax the broadcast multiple ownership rules.

The rules would allow, for example, one party to own a UHF TV station and radio properties in a single market.

The proposed changes would also permit the ownership of more than one AM station in a market.

Responding to an NAB request to allow time for more data to be compiled, the FCC has extended the comment deadline, which had been in April, to 15 June, and the reply comment deadline to 15 July.

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

EBS and Earthquakes

The FCC has changed the Emergency Broadcast System (EBS) script giving stations the option of mentioning earthquakes and other situations in which the EBS will be used.

In response to requests from California broadcasters about using the system for earthquakes, the Commission said it has revised the third sentence of the standard EBS announcement to allow the listing of possible emergencies.

Following, "If this had been an actual emergency ...," stations may now mention the types of emergencies likely to occur in their area.

For more information, contact the FCC Management Planning and Program Evaluation Office at 202-632-3906.

Ex Parte Rules Revised

The FCC said it has "clarified and revised" its ex parte rules, which require that even informal contacts regarding a rulemaking procedure be part of the public record. They also ensure that a reviewing court can examine a complete record of the Commission's proceedings.

In 1986, the FCC began an overview of its ex parte rules. The Commission maintained that the existing rules have been criticized because "they were not readily understandable, did not reflect current agency practice and were silent in areas in which explicit ex parte guidance could or should have been provided."

The revised rules, which were announced in March, "remedy many of these shortcomings," the FCC said. For example, it added, they categorize the many types of Commission proceedings that the previous rules did not address.

The new rules are restructured into three broad categories of proceedings —exempt, non-restricted and restricted. They also "delineate more clearly the types of communications exempt from ex parte restraints," the FCC added.

For more information, contact Steve Bailey at 202-254-6530.

Dial-Up Gear Walks Fine Line

In this issue, **RW** *begins a four-part examination of a topic that is causing some confusion throughout the radio engineering community—so-called "dial up" transmitter remote control.*

It appears that in spite of FCC rules, some engineers are using the nearest telephone to bypass the required remote "control point" and duty operator to make changes in transmitter operation.

In this first installment, we take an introductory look at the problem. In upcoming issues, we will examine how the FCC, equipment manufacturers, broadcasters and consultants deal with the growing problems posed by dial-up remote technology.

by David Hughes

Washington DC ... There are indications that an increasing number of broadcast engineers are running to the telephone, just about any phone, to make transmitter adjustments.

With the growing use of dial-up transmitter remote control equipment, engineers can check transmitter param eters and change transmitter operations anytime, from the nearest phone, virtually without anyone else, including the FCC, knowing.

While the Commission maintains that its rules prohibit an engineer from bypassing required, specific transmitter

Special Report

"control points"—complete with a duty engineer, transmitter shut down facilities and EBS capabilities—it appears that the advancement of technology is increasingly rendering the rules unenforceable.

The day of the "floating control point" has dawned.

The FCC specifies that transmitter remote control is legal via a telephone hook-up if it is from a specified, stationary "control point," or if it is done with the full knowledge of the on-duty operator manning the control point.

But sources indicate that engineers may be using the dial-up technology to bypass the control point and take control of the transmitters via the pay phone on the corner or even the cellular phone in their cars.

"Is that any different from an engineer at the transmitter making a few minor adjustments without telling the on-duty operator?" one industry source questions. "The only difference is that, now, the engineer does not have to be at the transmitter."

And, what about the possibility for abuse. Even though many dial-up systems have security codes, could someone gain access to the system and wreak havoc?

Lack of information

Engineers do appear to have questions about just what kind of impact the FCC's deregulation efforts have had on remote control regulations.

"Some of our customers," a representative of a firm that manufactures dial-up remote control gear admits, "think that it's all been deregulated. We have to tell them that it's not." He adds, "There is a lack of information out there."

Equipment manufacturers of dial up gear—including Gentner, Moseley Associates, Hallikainen and Friends, Delta Electronics and Advanced Micro-Dynamics—stress that their gear is meant to be used within the bounds of FCC regulations.

"We make a strong point of that in our instruction manual," says Delta's Bob Bausman.

Hallikainen and Friends even issues a 60-plus page document, entitled *Legal Considerations In Broadcast Transmitter Remote Control* to purchasers of its DRC190 remote control system. Yet, buyers are advised that while the document contains "well researched opinion ... no guarantees are made as to its accuracy."

However, just as the output of a home VCR can be fed into an antenna, or a car can be driven at 100 mph, dial-up remote equipment can be used improperly, manufacturers admit.

As one representative put it, his company's gear does go "above and beyond" FCC rules. However, most firms stress

> *'Once you start taking readings from the pay phone at the 7-Eleven, it's pretty tempting to make transmitter controls, too.'*

that they advise the purchasers of the dial-up equipment to check with their attorney or the FCC before using it.

According to Peter Burk of Advanced Micro-Dymanics, "It is our intent to create as much flexibility as possible—while meeting (FCC) regulations."

Yet, the possibility for abuse is there. "We've heard of some very interesting schemes proposed at stations," notes another manufacturer's representative.

One common complaint from both broadcasters and manufacturers is that the FCC's rules on dial-up transmitter remotes are not as clear as they could be.

With deregulation, the FCC is now permitting a lot more latitude in how engineers can remotely operate their transmitters.

Clarification sought

One consultant who has asked the FCC for a clarification of its dial-up remote policies is Don Markley, head of Peoria, IL-based D.L. Markley and Associates.

"There is a lot of misinformation out there," Markley says. "While the FCC has loosened up a lot in its remote control rules, it has never said that you no longer have to have a designated control operator."

"There has still got to be a control point that is equipped with the ability to initiate and receive EBS," Markley maintains. "And, the remote operator has to be able to control the transmitter."

Despite the dial-up control gear, Markley says the Commission still requires that it be informed about the location of remote control points, which should have EBS and monitoring equipment as well as a telephone—with a duty operator.

He maintains that the FCC has said

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Proximity Furor Sparks Action

by Alex Zavistovich

Washington DC ... An ad hoc committee of the Association of Federal Communications Consulting Engineers (AFCCE) investigating the use of proximity coefficents for AM array field strengths is expected to reach a conclusion on the matter by late spring.

Although he would not provide details of the committee's activities, at press time AFCCE spokesperson John Lundin said he expected that some presentation should be made at the AFCCE annual meeting, to be held 14-17 May, in Honolulu.

The ad hoc committee was formed in February, Lundin said, following the association's joint meeting with Canadian government engineers.

Concern over use of the proximity adjustment method outlined by a Washington DC-based telecommunications consultant Frank Colligan in the 15 January issue of **RW** was in part responsible for the committee's formation, he added.

Proximity correction

In his **RW** contribution, Colligan proposed a proximity correction method to counter the near field parallax effects close in to an array during field strength measurements.

He suggested running a proximity analysis of a directional antenna pattern. The FCC does not require its use in filing CPs, he said, but will accept it under certain conditions.

Field strength readings could be corrected, Colligan suggested, by "multiplying each observed field by the ratio of the point source field divided by the near field."

He cautioned, however, that theoretical design parameters of the array must be used irrespective of monitor readings for FCC Form 302. Use of a reference tower was also stressed.

Proximity analysis was recommended by Colligan for use on "short radials that head into rough ocean, swamps and the like, within the first few miles."

Method questioned

Colligan's method, however, was questioned in **RW's** 15 March issue by Jeffrey Bixby, an engineer with the Washington DC firm Moffett, Larson & Johnson.

It was also criticized in a letter in the same issue from Karl Lahm, PE and VP with A.D. Ring & Associates, another D.C. based consulting firm.

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

"Radios located at any measuring point will respond to the same field as the field meter does," Bixby indicated. "Sadly, radios simply cannot be trained to ignore interfering signals by multiplying them by some correction factor."

Bixby acknowledged the desirability of having a factor which, "when multiplied by the measured data yields the desired result."

Still, he noted, "if we can use it, so can the station down the road. The result will, of necessity, be more interference."

A better method?

According to Lundin, some AFCCE members expressed the belief that there may be a better method than the one proposed by Colligan in cases of a near unity field ratio.

In the case of a deep null, he suggested, the method may not "give a good correlation to what is actually happening." However, "that's not to say the system is not workable in other situations," Lundin stressed.

The FCC does not have a true standard or guideline pertaining to proximity adjustment, he said, noting that the Commission "normally accepts any filing ... presented with an understandable, valid justification," provided no objections are raised.

The AFCCE's establishment of an ad hoc group was well received by Colligan, who told **RW** he "welcomes the committee to come to a decision on a standard" for proximity effect adjustment.

The FCC's position on the issue is "subject to somewhat broad interpretation," Colligan said. "Various people use various (proximity adjustment) methods, and the FCC consistently accepts them," he indicated.

Colligan acknowledged that "often, proximity correction coefficients are rather small, to the point of being insignificant." Still, he held, use of the system refines data close in to the array better than using other means.

For additional information, contact John Lundin at 202-223-6700 or Frank Colligan at 301-229-5577. Contact Jeffrey Bixby at 202-841-0500.

NTIA Chip Study Off to Slow Start

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ty of multisystem chips.

The NTIA then sent the theoretical situations to 88 receiver manufacturers for their responses.

Comparisons were made between manufacturers' responses with and without the added condition of multisystem availability.

According to the NTIA's conclusions, "differences in the estimated constants for the two receiver models suggest that the availability of a multisystem receiver will more than double the likelihood that a manufacturer will decide to manufacture an AM stereo receiver."

Exaggerated percentages

Telecommunications Policy Analyst Tim Sloane acknowledged that none of the questions directly asked the receiver manufacturers whether they would adopt AM stereo and, if so, under what conditions.

"We thought the questions in the survey were somewhat easier to ask, and would get more reliable responses" than asking directly, Sloane said.

In particular, he said, the NTIA was looking for a "critical point"—whether there might be a combination of market conditions which would persuade a manufacturer to adopt AM stereo.

Sloane noted that some of the percentages were exaggerated beyond actual market conditions.

However, he also noted that when working with the "small universe of respondents" of receiver manufacturers, the survey situations had to be limited.

If the NTIA chose to present situations which reflected large jumps in market conditions, Sloane said, they might not have accurately determined whether a critical point for AM stereo adoption existed.

The agency decided, therefore, to start with inflated market conditions, he said. The point at which manufacturers would add AM stereo is "presumably beyond real market situations," he noted.

Fewer than one in three

Only 26 of the 88 manufacturers contacted—fewer than one in three—responded to the NTIA's survey. However, an industry expert with a background in statistics commented that, although the response rate was low, it was not too low to draw conclusions.

Still, the source questioned if the number of responses merited the strength of the conclusion drawn by the NTIA.

Sloane admitted that he was "not comfortable with the response rate." He maintained, however, that his confidence in the responses should be looked at separately from the decision to investigate multisystem receivers.

"We (NTIA) are confident that a technically viable, minimal cost multisystem will help nudge the market forward," he said.

The other NTIA source added that contact with the receiver manufacturers before the survey suggested that the response would not be high.

"In general, receiver manufacturers are not as interested in AM stereo as other technology," the source commented. 'If this were FMX, it would have been another matter."

For additional information, contact Val O'Day at 303-497-3484 or Tim Sloane at 202-377-1880.

Main Studio Rule Ended

(continued from page 1)

duced programming, the FCC noted.

Huggard added that the Commission's ruling on local issues was based on its deregulation of the radio and television industries.

"The issue of local coverage is left to the discretion of the licensee," she said. "It may be the case that a program produced someplace else would be pertinent to a local problem."

FCC docket number is MM 86-406. For additional information, contact Eileen Huggard at 202-632-7792.

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).

Praise for nostalgia

Dear **RW:**

As usual, I found Floyd Hall's article in the 15 March issue of **RW** interesting. It is always interesting to discover some of the history of broadcasting.

He mentioned that there were "shared time" stations listed on the Federal Radio Commission list of broadcast assignments in 1928.

Although (flipping through the Broadcasting Yearbook), I can't find any "shared time" stations in the US, there does exist at least one pair of stations with "specified hours." This little bit of history is in the Los Angeles, California area.

KPPC Pasadena went on the air in 1924. They are currently licensed to run 100 W on 1240 kHz with "specified hours."

KGFJ Los Angeles went on the air in 1926. They are currently licensed to run 1 kW on 1230 kHz, but run 100 W on Wednesday evenings and Sundays.

As I mentioned, I find the history of this industry quite interesting.

I'd be interested in seeing articles describing the first AM directional antenna systems, the early years of FM (including the original FM band prior to the move to the current band), the early years of FM stereo, the early years of AM stereo (I seem to recall that Leonard Kahn had the ISB AM stereo system operating in the 1950s on XETRA, 50 kW on 690 kHz in Tijuana), etc. There's a lot of ground to cover!

Finally, regarding AM preemphasis, while I agree that "predistorting" the broadcast signal to compensate for the receiver is a good idea, I think it was illegal until 1986.

Prior to that, 73.40 required the audio frequency response of the station from the "common program input amplifier" (used to say "main microphone input") to the antenna output to be ±2 dB from 100 Hz to 5 kHz, reference to 1 kHz. How many stations were cited for violating this rule?

I shall look forward to receiving the next issue of your excellent publication.

Harold Hallikainen
Hallikainen & Friends
San Luis Obispo, CA

More on Neumanns

Dear **RW:**

After reading Tyree S. Ford's "Comparing Mics for Production" in the 15 February edition of **RW**, I feel some additional comments concerning the Neumann U-87 mic are in order.

I have used a U-87 here at the Zoo for the past five years, and in that time, have had no problem with fragility. In fact, our U-87's have taken just as much hard use as the RE-20's we use in FM control, with no adverse effects.

As for cleaning the capsule, two cleanings in the past five years is all we have needed.

One problem Mr. Ford did not point out about the U-87 is its distortion when worked at close range.

Our air personalities, most of whom are used to "eating" a mic have to be reminded to stay an average of five to eight inches away from the U-87. At this range the windscreen, which cuts a great deal of high end off the mic, can be removed safely.

Handled with a little care and knowledge, I feel the U-87 is very close to being the perfect voice mic for radio station use. Training your personnel in the proper use of this sort of mic may take a little extra time, but the results are well worth the effort.

Greg Fadick, Creative Director
KZOU-FM
Little Rock, AR

Technics CD player

Dear **RW:**

I really enjoy your publication! There is nothing else like it and I read every word in every issue! Keep up the good work!

I enjoyed the writings in the previous issue about CD players.

We have the Technics SL-P1200 which we purchased from Control Technology (as advertised in **RW**) and we love it.

They supply this unit with built-in +4 dB balanced line amplified and XLR connectors, so all you have to do is plug it in. It also has a hard wired remote control jack and interfacing it to our Pacific Recorders console was a snap.

The Autocue function works flawlessly and the unit cues exactly to the music everytime for perfect instant starts. The digital display shows a countdown of time remaining on the cut you are playing.

I haven't had any experience with the "professional" units on the market, but if they don't have Autocue and "time remaining" like this fine Technics, then they need to go back to the drawing board.

On the subject of AM stereo, we still haven't made the switch because we still don't feel there is a clear winner.

I understand that the Japanese Government is evaluating all of the original AM stereo systems and will name a national standard.

Since they make most of the receivers, perhaps we should adopt whatever system they decide on as our de facto standard. It will be interesting to see what system they select.

Harley Drew, Program Director
WBBQ AM/FM
Augusta, GA

Gone fishing

Dear **RW:**

Outside of looking at my beautiful wife each day, about the only enjoyment I get out of life is reading **RW**. It has been about a year since I last wrote to tell the world that I was selling out and goin' fishin'.

I didn't sell out; seems no one wants a AMer in LA . . . "lower Alabama" . . . So I bought a sailboat and went fishin' anyway. Didn't catch any fish, but I got to catch up on readin' **RW**.

I got into this here business about 19 and 57, my first transmitter was the Knight 100 mW featured in the 1 April issue.

Thanks for bringing back memories of my first non-commerical basement radio station in Chunute, KS.

About quad AM—thats a great idea. KahnQUAM, is that what you call it? Soon as you big boys at Kahn and QUAM decide what's what . . . maybe we poor ole' boys can pay six prices for what's what.

In the meantime, I think I'll put this ole' AMer that no one wants on automatic and go fishin', and read **RW**.

William Keith Hoisington, President,
Chief Engineer, Morning Announcer,
and Sometimes Salesmen
WTCG
Andalusia, AL

Accuracy error

Dear **RW**:

We appreciate the recommendation in Gary Wachter's article in the 1 April issue of our little LM34 temperature sensors.

However, the one typo error that did creep into the report happened in the worst possible place—the statement of accuracy!

Of course the LM34's typical accuracy is *not* +−10.5°F, it is actually +−1.5°F.

Various parts in the family are guaranteed as accurate as +−2°F maximum, over a range as wide as −50° to +300°F.

Robert Pease
National Semiconductor
Santa Clara,CA

Editor's note: We regret the error. For more information or a data sheet on the product call National Semiconductor at 408-721-5613.

A New Era Begins

As new chairman Dennis Patrick takes over the reins of the FCC, radio broadcasters eagerly wait to see what kind of commission will emerge.

Even given the speculation about Patrick being a "rubber stamp" from the Fowler administration, there is evidence that some new ways of looking at things may be forthcoming.

No one expects a dramatic departure from the previous commission's stands, but there are early indications that some ongoing policies may be more carefully scrutinized, or more stringently enforced.

Patrick is expected to operate within the deregulatory framework set by the Reagan administration. But hopefully, he will set his own agenda, and in so doing, offer an individual perspective on issues that will provide the industry with a fresh view.

One issue sure to surface early is AM stereo. The legacy of the "marketplace" is still with us though there is recent evidence of support for a Commission comment on the question of whether a de facto standard now exists.

Patrick should make it a point to look carefully at issues of concern to daytimers, especially pre-sunrise authority powers in light of the daylight savings time change.

In addition, minority and multiple ownership, FM translators and the Moody Bible Institute case, FM2 proposals and the plans for an expanded AM band are items that the Commission will be dealing with in the near future.

The new chairman's opinions on each of these have yet to be heard.

Patrick should also keep in mind, as he sets the pace for his chairmanship, that technical deregulation raises different issues for radio than for TV.

Radio station owners have generally welcomed the bulk of deregulation which did away with masssive paperwork and freed their operations from bureacratic burdens. But in certain cases, radio engineers have been less than happy with what they perceive to be the resultant lapse in technical quality at some stations.

Everyone hopes that the FCC and its new chairman will continue to do what is necessary to maintain, and if possible improve, radio's technical performance. That would be beneficial to FM, and it's even more critical for AM.

—RW

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Fowler Exits With Crackdown

by David Hughes

Washington DC ... In one of his last official acts, outgoing FCC chairman Mark Fowler launched a campaign against explicit language on radio and TV.

In a move seen as running contrary to the "hands off" deregulatory stance of his chairmanship, Fowler spearheaded a change in the FCC's rules affecting offensive material, particularly what has been termed "shock radio."

The action came during a Commission meeting 16 April, a day before Fowler's official retirement,

The FCC said it would issue warnings, and possibly even fine or revoke the licenses of stations airing material that refers to sexual and other "indecent" topics during times when children could be listening.

Until now, the Commission said it would stay out of governing the content on radio and TV stations, and had only occasionally responded when any of the so-called "seven dirty words" had been broadcast.

The new policy was characterized as being too broad and vague by critics, which include some of the radio personalities whose on-air conduct was being examined by the FCC and the American Civil Liberties Union (ACLU).

Taking a centrist course, NAB Joint Board Chairman Ted Snider said: "We are concerned as an industry about indecency on our airwaves. We recognize our reponsibility to our listeners and viewers, but we also have First Amendment concerns."

During the April meeting, the Commission examined programs at three stations—WYSP, a Philadelphia station simulcasting the controversial Howard Stern show from New York City Infinity-owned WXRK; KCSB, a non-commercial Santa Barbara station that broadcast an allegedly indecent song; and Pacifica-owned non-commercial KPFK, Los Angeles, which aired a play about homosexual encounters.

While all stations received FCC warnings, only the KPFK case was referred to the Justice Department for further investigation.

At the close of the meeting, Fowler, who has served as chairman for six years, handed the gavel to his successor, Commissioner Dennis Patrick, who officially took over the next day. Fowler had announced in January that he would be resigning.

He attended a "good-bye party" in his honor at a Washington DC restaurant following his last Commission meeting.

A day earlier, at an NAB breakfast, NAB President Eddie Fritts presented Fowler with a plaque.

Fowler told the NAB audience that his toughest task was the development of subscriber line charges during the break-up of AT&T. He also said that TV cable must carry and financial interest issues were also challenging.

Los Angeles-native and attorney Patrick, 35, served on the White House staff from 1981 until he became an FCC commissioner in 1983. A Republican like Fowler, he is expected to continue many of Fowler's initiatives.

Former FCC Chairman Mark Fowler

Remote Gear Raises Legal Questions

(continued from page 3)

that stations cannot dial up from just any phone and bypass the duty operator at the control point.

When dial-up transmitter remote control operation is taking place, if it is not being performed by a designated control operator at a designated control point, the operator must still "be kept in the loop," Markley said.

Burk adds, "Our equipment allows a chief engineer to call from any pay phone and (make transmitter adjustments) over the shoulder of the announcer, who often is the duty operator. The announcer can still pull the plug."

FCC not clear

John Reiser, of the Commission's Engineering Policy Branch, said the FCC does not plan to release a public notice on the subject to clear up some of the confusion. However, the FCC does respond to individual inquiries.

He maintains engineers simply cannot use any phone booth for dial-up control—they must rely on "fixed control points" with a "designated duty operator."

In a 1984 remote control Report and Order, the FCC indicated that "the use of remote control at sites other than the main studio or transmitter address must be identified to the Commission if the station cannot be contacted during operation at either the studio or transmitter locations."

It added that licensees may operate their stations by remote control using any method that assures that an operator is on duty, that the transmitter operates properly and that the FCC can contact station personnel during hours of operation.

According to John Leonard Jr., president of RF products for Gentner, the Commission has removed its "how to" methodology provisions from the rules. "But still, there has to be an identified remote control point," he adds.

However, one source who did not want to be identified sums the problem up: "Once you start taking readings from the pay phone at the 7-Eleven, it's pretty tempting to make transmitter controls, too."

In our second installment, we will take an in-depth look at the FCC's rules on dial up remotes, and whether the Commission agrees that its rules are often unenforceable.

Minority Survey Stirs Protest

by David Hughes

Washington DC ... The FCC indicated in mid-April that broadcasters are required to complete a controversial "Minority Ownership Report" and return it to the Commission by mid-May.

Completing the questionnaire was originally supposed to be voluntary, but the FCC apparently changed its mind and made it mandatory.

The NAB is upset at the Commission's change of heart, and had previously complained strongly to the Office of Management and Budget (OMB) that the FCC did not fully disclose the content of the minority report when it was made available for public comment earlier this year.

In two letters—dated 23 March and 3 April—to OMB Administrator for Information and Regulatory Affairs Wendy Gramm, the NAB said the OMB's approval of the FCC reporting form was "without proper public notice and without full disclosure of the form's purpose, regulatory relevance and overall burden to broadcasters."

On 6 April, after receiving the letters, the OMB changed its mind and sided with the NAB in recommending that response to the report be voluntary.

But then, on 17 April the FCC indicated that it had "overridden" the OMB decision—thereby making response to the form mandatory.

History

The NAB became involved in the issue in February when a notice was published in the *Federal Register* saying that the form "would be used to collect information on female and minority ownership of broadcast stations and the degree of owner participation in stations' management."

The association said the FCC originally proposed a two-page form with a 31 May "voluntary return date."

"(The) NAB obtained a copy of this request and, noting that the two-page proposed FCC reporting form specifically included the phrase '(y)our response to this form is voluntary,' chose not to oppose, nor comment on, the FCC request," the NAB said a letter to Gramm.

However, according to the NAB, stations soon reported receiving a "radically different" four-page "Minority Ownership Report" form due 30 April, in addition to a "two-page solicitation of ownership information."

The NAB added that the forms ask stations to list the amount of programming a station runs each week in "specific programming categories" that it said were "in terms of racial, gender, foreign language and age."

Also, the NAB said the forms indicated that the FCC inquiry "is now chacteriz-ed as 'required to retain a benefit.'" The NAB indicated that the language is interpreted by the FCC to mean that a response "is now mandatory and not voluntary, as originally represented."

"This is a particularly burdensome request since the FCC several years ago adopted decisions which eliminated the need for stations to retain the kind of records necessary to make such data calculations," the NAB maintained.

Had it been informed of the different form, the NAB said, "we surely would have opposed it as unduly burdensome and without relevance to any current or lawful regulatory purpose."

The Commission said it decided to change the report forms after they were published in the *Federal Register* at "the urging of the House Telecommunications Subcommittee staff."

Questions added

The FCC said it added questions dealing with "formats and target audiences," and changed the form's status from "voluntary" to "required to retain a benefit."

In its latest action the FCC, in its 17 April public notice, said it had instituted a new deadline for the return of the required report—15 May.

It also modified some questions in the report. The Commission indicated that responses to particular questions concerning "programming for children and senior citizens is not relevant" to the minority aspect of the study and are now "voluntary."

It also said that it would keep the identities of stations responding to the report "confidential to the extent permitted by law."

The FCC said it has directed its staff to "remove station identification from forms already received. Broadcasters that have not already submitted the report may, if they choose, omit their call let-

(continued on page 12)

Station Learns From PCB Fine

by Alex Zavistovich

Portland OR ... The Environmental Protection Agency (EPA) has fined Scripps-Howard, owner of Portland, OR's KUPL AM and FM, for the station's accidental dumping last year of toxic polychlorinated biphenyls (PCBs) in a solid-waste transfer facility.

An "enforcement action" with a $2,325 penalty was assessed 20 February 1987 against Scripps-Howard, the station's Cleveland-based owner.

According to Bill Hedgebeth, an enforcement officer with the EPA's Seattle branch, the fine was levied for violation of PCB control regulations.

Studies conducted in the 1970's showed PCBs to cause serious health effects in humans and laboratory animals. The chemicals were used from 1940 to the mid-1970's in liquid coolants for large capacitors and transformers, especially in electric utilities and broadcast equipment applications.

Burned to the ground

CE Larry Reid said KUPL's PCB problems began on 23 March 1986, when the station's transmitter building on Mount Scott in Portland "burned to the ground." Contractors hired to clear debris from the site hauled away three transformers with the rest of the refuse.

The transformers and other refuse were taken to the Clackamas Transfer and Recycling Center, a solid waste transfer station outside of Portland. At the center, the insulator of one of the transformers broke open, Reid said.

Although "no more than two gallons" of the PCB material was spilled, he said, it leaked into several tons of solid waste already at the transfer station.

The contamination was discovered during a routine check of the waste pit for recyclable materials, said Jo Brooks, a spokesperson for Oregon's Department of Environmmental Quality.

KUPL was immediately notified, and Reid traced the transformers to a 1947 Western Electric FM transmitter which had been in storage when the fire occurred.

According to Brooks, PCB material containing more than 500 parts per million of the chemical must be disposed of at a hazardous waste disposal facility, rather than a sanitary landfill.

The PCB level of the material which contaminated the transfer station, Reid noted, was approximately 850,000 parts per million.

Cleanup efforts

Reid and KUPL GM Ed Hardy both visited the transfer station, and coordinated with the Portland EPA office on cleanup of the facility.

By that time, Brooks said, the contamination had spread to include not only the refuse, but a portion of the transfer point's floor, as well.

A hazardous waste disposal contractor was hired to haul away the impregnated debris, which was to have been sent to a chemical waste landfill in the town of Arlington, in eastern Oregon.

The Arlington facility, however, refused the material because of potential methane production, Hedgebeth said. The refuse was then taken, at KUPL's expense, to a chemical landfill in Utah, operated by US Pollution Control, Inc.

Hedgebeth said the station and Scripps-Howard were "very helpful" in the handling of the PCB cleanup and became "immediately involved with the Portland office" when notified the leak had occurred.

Scripps-Howard also voluntarily initiated some "outreach" programs to educate and advise broadcasters of the problems of PCB's in the broadcast environment, Hedgebeth added.

According to Reid, the Cleveland corporate headquarters sent warnings to various radio stations, providing inventoried listings of liquid-filled electrical equipment which might potentially cause PCB contamination problems.

The educational actions undertaken by Scripps-Howard were lauded by Hedgebeth as being "extremely helpful" to the EPA.

"Radio and TV stations are probably not aware, for the most part, that they may have equipment which might contain PCBs," he said.

Reid stressed that a station which is involved in such a situation should do two things simultaneously—hire a licensed hazardous waste disposal team to clean the area and get legal help to intervene with the various agencies which will become involved.

In KUPL's case, the station was also faced with having to pay for the cleanup by itself, he added. Because the spillage was not a direct result of the transmitter building fire, the station's insurance company did not cover the costs.

Health risk

In addition to the expense involved in handling the disposal of the chemical, concerns about PCB exposure center on its being a recognized health risk in the environment, according to Dr. Bill Morton, professor of environmental medicine at the Oregon Health Sciences University.

"Evidence from experimental animal

(continued on page 18)

Afterthoughts on NAB Show

by Tyree S. Ford

Baltimore MD ... I came away from this year's NAB convention with two distinctly different feelings about what I had seen and heard.

My first feeling, a good one, came as the result of witnessing the advancement in practical applications of digital audio.

Although arguments by some that digital audio is harsh and abrasive in comparison to analog are sometimes justified, the software and hardware developments have come a long way in only one year.

After these systems have been "locked down," refinements of harmonic content, EQ, slew rate, and A/D and D/A conversion will fall into place.

The differences in opinion concerning analog or digital audio we are now hearing are comparable to those we heard when the transistor began to replace the tube.

As long as there are humans there will be preferences, opinions, discussions and arguments. Without concerned and dedicated human input, progress itself would either stop completely, or exist in a state of technical anarchy.

There are those who believe the FCC's deregulatory moves over the past five years have led the way to this anarchy.

Proponents view deregulation as a move towards free enterprise, and view it as a vital ingredient to progress.

Moderates believe that either road is acceptable as long as the overall intent is to improve upon the present.

My second and less positive feeling as a result of attending this year's NAB convention was the lack of attention given to the creative performance and more human side of broadcasting.

At this point in time, our "High Tech=High Touch" equation is heavily imbalanced in favor of the High Tech side.

While the two forces seldom track exactly in sync, the disparity is greater now than it has been for some time.

As we attempt to increase efficiency by taking time to learn and use new systems, we get further and further away from the human elements.

Nowhere is this more evident than in the on-air presentations of our announcers and their pre-recorded promos and commercials ... the air product.

The responsibility for these areas is usually that of the PD, many of whom are not prepared to deal with the necessary human complexities.

The PD's role

To begin with, the PD must be able to determine if a talent's performance needs improvement.

Producer's File

If improvement is needed, what area(s) needs to be worked on? Are there inherent problems such as regionalisms, accents, or specific individual speech patterns which negatively effect a person's delivery?

Careful judgement must be made here. Some unique qualities of a person's voice may work in their favor. The PD who becomes fixated on the wrong issues does an injustice to the talent and the station.

This is not to say that many PDs don't have a handle on these things—many do. The problem that exists is that systems are becoming markedly more important than the people who use them.

This diminished attention to verbal communication strikes at the very heart of radio.

Of increasing importance is the ability to communicate verbally in a convincing manner. This requires the talent to transform the written word or ad-libbed thought into believable speech.

Written vs. spoken word

Problems occur at this point for several reasons. The words, even if they are grammatically correct, may be poorly written. Most journalists who write for the written word sound stiff when reading their own scripts.

This is partly due to the fact that they may not be good speakers. More importantly, it's usually because they write for the written word.

If a PD is writing liners or promo copy without hearing what the words will sound like when spoken, the chances are good that the delivery will be less than convincing.

This is especially important when, for a number of reasons, the copy must be delivered exactly as it is written.

When verbatim delivery is not necessary, talent may make the communication even more effective by putting the written thoughts into their own words.

Less experienced members of the airstaff should be urged to write down their ad-libs and to rehearse them several times before opening the mic. This is a great way to keep from talking yourself into a corner.

(continued on page 12)

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

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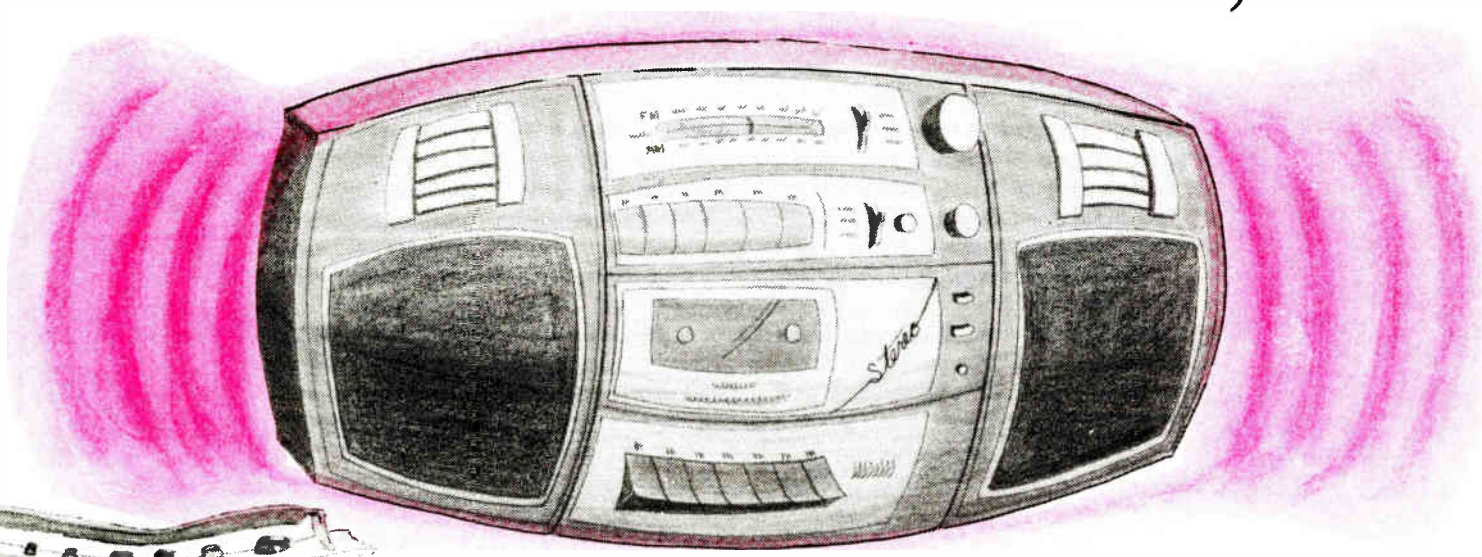

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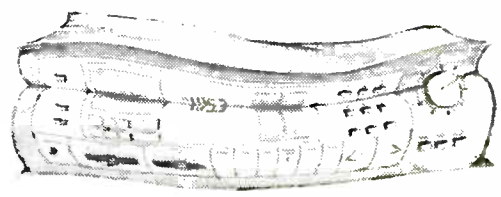

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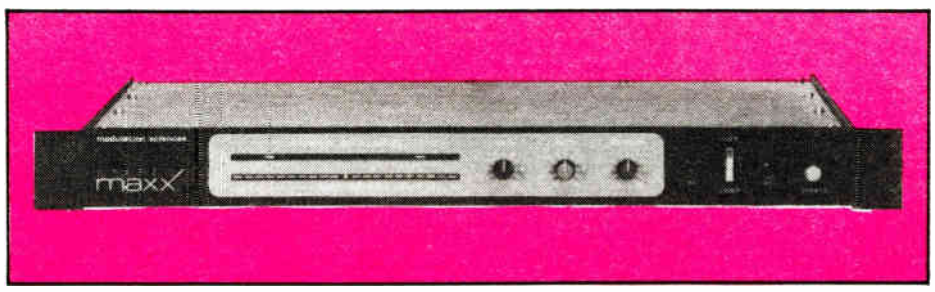

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Circle Reader Service 18 on Page 39

Firing is CE's Toughest Task

by William Ellis

Springfield MO ... Max looked into the general manager's eyes for what seemed to be an eternity. They both knew what had to be done: a long-time employee in Max's department had to be discharged. As Max stood up and walked slowly towards the door, the GM asked, "Max, do you want me to do it?"

"No," Max answered, "he's in my department, I'll do it."

Max returned to his office thinking how easy it would be to let the GM do the "dirty work." Maybe he made a mistake. What do you think?

Whether you call it outplacement, termination, discharge, layoff or firing, the most distasteful part of being a CE or manager is telling a person he or she is no longer wanted or needed.

Many times, I have seen people who were discharged move on to better positions, higher income and more responsibility and authority than they would ever have attained in our organization.

Indeed, you might be doing a person a favor by discharging him or her. That knowledge, however, never makes the job any easier.

Following good hiring practices can reduce the number of people it is necessary to discharge but, inevitably, you *will* find it necessary to let a person go. Experience is the best teacher, but most people do not have much experience in this area.

Lack of knowledge and experience breeds fear and, yes, Max fears confrontation when he must discharge this long-time employee.

However, hiring *and firing* are part of the job, and Max is determined to do it. Let's help him do it right for both the employee and himself.

Is there a right way and a wrong way to discharge an employee? Having been on both sides of the desk, I believe the answer is definitely yes.

First of all, never discharge an employee in anger, or on the spur of the moment. Harmful repercussions for the station can occur if proper thought and planning are not done prior to the action.

Most stations have some sort of policy that must be followed leading up to the discharge of an employee.

Each station is different but most follow, to some extent, the "three strikes and you're out" philosophy. On the third warning of unexceptable behavior, you are discharged.

On all three occasions, it is very important to document in the personal file, in detail, the offense and the results of your interview with the employee. I have found it helpful to provide the employee with a copy of the documentation going into his or her file.

There are many reasons for discharging an employee. A layoff due to a business slump is comparatively easy to handle, but discharge for "cause" is naturally emotional and takes much more skill on the part of the CE. Some say "anyone can hire, but it takes skill to fire."

To be fair to the employee, specific reasons must be given for discharge. The reasons must make sense and not be a smoke screen hiding the real facts, i.e., a person works for 10 years as a technician and then is discharged for incompetency. What was he doing for the last 10 years?

Another favorite is "incompatible management philosophy." What does that mean? Some people never find out the real reason for their discharge.

Before meeting with the employee to be discharged, much preparation is required. Yes, timing is important. The meeting should be held in private and as near to the employee's end of shift as possible. It should also be as short as possible, and all business.

I suggest you follow these steps when discharging an employee:

1. Write a discharge notice specifying previous meetings with the employee, written notices and dates. Make three copies, one for the employee, one for the personal file and one for your personnel file. Some employees hear nothing

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William Ellis is director of engineering of KOZK TV in Springfield, MO. Call him at 417-865-2100.

Thoughts About Dallas Show

(continued from page 9)

If the same attention to detail given by Sales Managers who have their A/Es practice opens, closes and turn-arounds was applied to the unique aspects of on-air presentation, radio would sound much better.

The bottom line is, both A/Es and airstaff are selling. Both require exceptional communications skills. The ability to monitor the development of these skills is equally important.

Spontaneous air-checks

I know of no better way to monitor the development of on-air talent than by using a cassette skimmer. It should be installed so that it records every time the mic is on.

A major mistake some PDs make is to intimidate the airstaff by holding air-check sessions like "pop quizzes." A much better use of a skimmer is to let the airstaff use it as often as they like.

Urge them to use it often to check themselves. Schedule your air-check sessions after they have become comfortable with this method. Let *them* choose which tapes they want you to hear.

Those tapes will probably have some great bits on them, which will give you a chance to give some good positive strokes.

There will also be enough places where you can suggest improvement. If they manipulate the air-checks to hide serious flaws, make your own skimmer and include it in a future session.

The GM's role

If, as a GM, you sense that your PD is doing a good job, but feel there are areas that need improvement, the best course is to get these topics on the table in a non-threatening way.

More than one PD I've spoken to has revealed that directing airstaffs is one of the most difficult aspects of the job, and something they don't do well.

GMs should not expect PDs to admit these kinds of difficulties unless they feel very secure in their jobs. Any suggestion to a PD that outside help may be a possibility may be read as a move toward dismissal.

The fact remains that, as in the operation of any complex system, "proof reading" is essential to confirm that we are on track.

From the engineering perspective, we use proofs of performance. From the sales perspective we use weekly sales reports. From the business perspective we use CPAs. From the program perspective, if we wait for "the Book" it's too late.

This single fact has established the entry point for almost every consultant in the industry.

In my next column we'll take a closer look at the advantages and disadvantages of consultants. Your opinions and ideas are always welcome.

FCC Report Stirs Furor

(continued from page 7)

ters and community of license from the form," instead substituting the county and state in which the station is located.

NAB Counsel Barry Umansky said that while the FCC's latest action was a step in the right direction, the association would have been more satisfied if the FCC had agreed with the OMB's eventual decision to make responses voluntary.

"We are still troubled that the FCC went to the OMB with amendments to the report" after the NAB examined the original form, Umansky added.

Other issues

In related news, the Commission, during its 16 April meeting, voted to adopt new Equal Employment Opportunity (EEO) rules and reporting requirements.

The new rules, the FCC said, "emphasize a licensee's overall EEO efforts rather than simply the numerical composition of its workforce."

While stations are still required to file an annual EEO report, each station's EEO program will now be subject to review at renewal, regardless of its employment profile. Each station will be reviewed carefully, even if its employment profile is within FCC guidelines, the Commission said.

The FCC added that the new method will "allow the Commission to monitor EEO efforts more closely and flag potential problems before they arise."

The Commisson said it has also adopted revised EEO report forms and increased its staff to monitor reports from stations.

The docket number of the EEO ruling is MM 85-350. For more information contact Marcia Glauberman at 202-632-6302.

The docket number of the minority report issue is MM 86-484. Contact Barry Umansky at the NAB's legal department, 202-429-5456, or Florence Setzer at the FCC, 202-653-5940.

Clarification

In the 15 April issue of RW, the telephone number for the newly-formed Buygroup Limited was incorrectly printed. The correct number is 212-541-6611. We regret any inconvenience caused by the error.

Predicting Impedances Risky

by Tom Osenkowsky

Brookfield CT ... When we design matching and phasing networks, we most often use formulae to consider the carrier frequency only. This may not always be advantageous.

I have often referred to the preference of using 90° networks and low L/C ratios, and have given some supporting examples.

Off-base predictions

In the "early days" some assumptions were made as to antenna current distribution and other external factors when predicting base impedances.

These assumptions were based on the consultant's experience.

Let us look at a simple two-tower array in Table 1a.

The impedances predicted in this 1964 design were simply the loop impedances since it was assumed the base and current loop were synonymous.

Table 1b shows a complex dog-leg array designed in 1969.

These predictions were based on the induced EMF loop impedances divided by $\sin^2 G$.

Table 2a and Table 2b show the predicted base impedances for the two arrays using the MASTER® computer program.

Table 2c and Table 2d show the actual measured operating impedances. Note the similarity between MASTER® and the actual case.

The validity of $\sin^2 G$ now becomes questionable. There is a point to be made here.

Phasors and ATUs of early design, and even some of recent design, may have been premised on inaccurate base impedance predictions. Thus, their bandwidth characteristics may be impaired.

Recognizing the inability to accurately predict base impedances, networks were often designed to have a wide adjustability range.

Most often, networks were adjusted solely to produce the correct ratios and

(continued on page 17)

Table 1A

G = 88.3	S = 90	T1 = 1 / 0	T2 = .9/ 115
T1	38.0 + j 33.5	P = 799	I = 4.58
T2	11.8 − j .3	P = 201	I = 4.13

Table 1B

	G	S	Phase	Field	Az	Zop
T1	126.2	72.2	167.2	.584	340	13.5 + j 242.6
T2	115	17.5	−8	1.0	250	12.1 + j 182.3
T3	126.2	72.2	−167.2	.684	160	5.1 + j 303

Table 2A

	Zop
T1	50 + j 75.3
T2	15.5 + j 32.3

Table 2B

	Zop
T1	34.6 + j 488
T2	29.8 + j 349
T3	18 + J 699

Table 2C

	Zop
T1	46 + j 64
T2	12.8 + j 48

Table 2D

	Zop
T1	36.5 + j 401
T2	25.2 + j 320
T3	17.5 + j 550

Weather Beeper a Station Plus

by Fred Baumgartner

Englewood CO ... This is one of those projects that is half program and half engineering, and each can feel as if it gets the better part of this toy.

Boon to programming

If you are a full service station, your PD lives for the days when large portions of the population tune in.

School closings or other unique information gives the station a chance to sell the audience on the idea of staying with it full time.

The idea is to put a small distinct beep on the air every time dangerous weather approaches.

It has to be hidden enough in regular programming that no one gets irritated. And it has to be promoted so that whenever a dark cloud goes overhead, folks tune in to check if the warning beep is on.

For the PD, it allows the station to be virtually the instant source of weather warnings.

It gives the weather or news department something to talk about in promos and it reminds the announcer that folks out there want to know about the weather more than the next record.

This unique device allows continuous programs such as sports to run without long interuptions. The corresponding announcement can replace a promo or be part of an extended break rather than a series of bulletins.

And equally as important, it saves the EBS tones for the "real" stuff. Plus it has the potential to save lives.

Most PDs worry about losing spots or driving the audience away with loud noises. Much experience says that no sponsor has asked for a make-good because the beep landed in his spot.

In fact the weather warning could give a salesperson the opportunity to point out to a potential advertiser the advantages of having all that "tune-in."

> *"It allows the station to be virtually the instant source of weather warnings."*

We've never gotten a call from anyone who asked anything other than "what is it?" or called just to say "thanks."

Figure 1 shows a 556 (which is two 555s) set up as an oscillator. The left side generates a 400 Hz square wave that is coupled through low-grade 600/600 ohm transformers.

The right side produces a 50 ms pulse every 20 seconds or so, which pulls in the four-pole relay briefly and allows the tone to go down the lines.

The output lines are connected across the line just before the limiter. The pulse is short and the limiter clips the square wave.

The idea is that it cuts out a small hole in the program and replaces it with a short, loud 100% modulation tone that is easy to recognize without wrecking the program.

Likewise the device appears as a nothing to the audio chain until it pulses (no loading, nothing but an extra invisible piece of short wire).

One caveat is that it must not go ahead of the processors as the pulse will of course result in aftereffects such as pumping. This means it is ideally located at the transmitter site.

Feeding it 24 volts can be done by remote control. The 150 ohm 5 W resistor can be removed if 15 volts or less is desired.

Finishing touches

In some cases a level control needs to be added between the relay contacts and the transformer outputs. The auxiliary rig needs a feed as it is most likely to be on in bad weather.

WIBA is stereo and the processing is matrix so adding it to L+R entering the limiter works fine.

If the processing is discrete, use the aux feed to feed the right channel and the main to feed the left. Another beeper in parallel can be used to feed the aux.

If you simulcast, build a box for the FM as well, because two feeds are about the limit for this device.

After you build the box, make a tape of the output. You can shorten the space between the beeps for making the (fast paced) promos and proving to the PD that it isn't distracting.

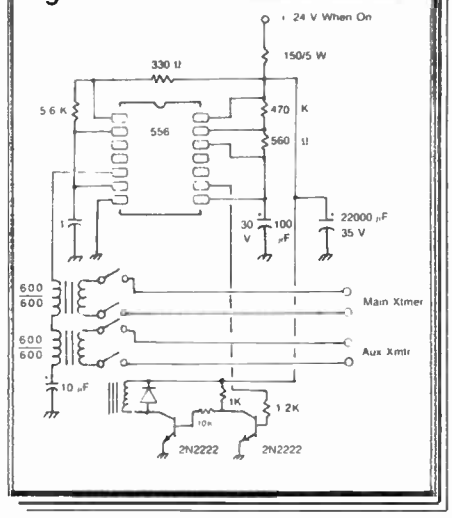
You will want a continious cart of the tone just in case, but it doesn't work nearly as well.

Construction was breadboard and plastic box. Total cost is less than $20 and it can be built in an hour. Of course it takes a week to play with getting it in and selling the idea.

I did get a call from a guy who heard it during a Brewers game and came in from fishing on a clear day before a monster storm hit.

I doubt I will ever know, but I will bet that if it hasn't already saved lives, it will.

Figure 1. WIBA Weather Guide



Fred Baumgartner, assistant CE at KWGN-TV and former CE of WIBA, Madison WI, is a frequent contributor to **RW**. *He can be reached at 303-740-2883.*

Circle Reader Service 34 on Page 39

Missing Inductance a Solvable Mystery

by Floyd Hall

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

One man, an American, more than any other, contributed the most to electrical, and even electronic development around the turn of the century?

No, no, not Thomas Edison! A man many of you may never have heard of, but as far back as I can remember, he was my hero! The wizard of General Electric Company—Charles Proteus Steinmetz!

There was a time, when any young man who majored in electrical engineering was required to study *Alternating Current Theory*, by Charles Steinmetz.

He was born in Germany in 1865, and became a college professor there, but when he was 23 years old they kicked him out of the country because of his radical political activities—to our eventual gain!

He was a small, crippled man, but within practically months after his arrival in America, he became a citizen and head of the research department of General Electric Co., in Schenectady, NY.

His brilliance was so obvious, that GE gave him anything he asked for, including a large and elaborate laboratory.

Many modern developments in electrical and electronic equipment are based on inventions that Steinmetz made or supervised.

Sadly, to me, Steinmetz has gone practically unheralded, but ask any old time GE engineer and he'll tell you.

In the field of motors, generators, dynamotors, transformers, alternators, AC control and power transmission—he wrote the book.

Old Timer

Like many such geniuses, he was eccentric. That is to say, he was as nutty as a fruit cake!

He smoked cigars constantly, and was allowed by GE to smoke in any prohibited area.

He was almost constantly in pain from his crippled legs and back, but in the course of some research, he often did not leave his laboratory for days on end.

If you can get hold of a copy of his biography, you will find some fascinating reading. I used to have one, but during WWII it got lost in the shuffle. I don't remember who wrote it, but it was written not long after his demise in 1923.

Case of missing inductance

Several of you have written and called, relative to the AM modulation transformers that I have described which lost all, or most, inductance.

I said many months ago I would talk to some of my steel friends—electrical sheet steel that is—and see if someone could tell me why the laminations in those transformers had just lost all permeability.

Well, I have. And they did. Two engineers when I queried them separately, gave me substantially the same answers.

They told me—as I knew—that every steel company manufactures several different types of laminations in various thicknesses and grades, for particular applications.

Just to name a few, there are Electrical; Dynamo; Super Dynamo; Dynamo Special; Transform A, B and C; and audio transformer A and C. In addition there are several high permeability, low density steels with patented names.

The audio transformer A and C steels are described as "Highest Permeability at Low Flux Densities," etc. Most of these steels are rolled in the following thicknesses: U.S.S. gauge 29, 28, 27, 26, 25, 24 and 22; ranging from 0.014" to 0.031".

Flux density

Now, in a modulation transformer, the primary not only responds to the audio voltage generated by the modulation tubes, but also carries a sizable amount of DC current, which adds to the flux density.

Several of the silicon steel laminations manufactured in the last few years have given as "Special Properties," "Highest

(continued on page 17)

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

56 Years Ago in RW

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

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

Largest Receiver Shown in Booth

Modern devices of international broadcasting were illustrated by picture and display in the National Broadcasting Company booth at the eighth annual Radio-Electrical World's Fair.

The world's largest radio receiver was one of the attractions. This receiver is a duplicate of one of the short wave diversity receivers used at the experimental station of RCA Communications, Inc., at Riverhead, Long Island, where trans-oceanic programs are picked up and conveyed to NBC studios for distribution to the networks. The enormous receiver is a development of the RCA-Victor company engineers.

Throughout the show engineers picked up foreign programs at Riverhead and transmitted them by land wires to the booth at the Garden. English, French, German, Italian and other programs were presented at the booth.

The idea of the exhibit was to give visitors an idea of the wide scope of international broadcasting.

Reprinted from Radio World, October 1931.

Good Engineering Standards

by Ronald F. Balonis

Wilkes-Barre PA ... The need for standards of good engineering practice began, I suppose, in the beginning when there were no rules, or standards, when trial and error were the tools of the trade for radio broadcasting.

For me it was a time of someone else's memory—mine begins with the Standards of Good Engineering Practice as they exist.

Whatever ... "Standards of Good Engineering Practice" has been the nebulous label for a section of the rules over the years. In the 1950s, it was as Section 3.4; in the 1960-70s, Section 73.46; and today, but a brief remnant covering AM: Section 73.49.

Basically, the section prescribes guidelines for the construction of broadcast transmitters and their installation with the stated intent and purpose of operator safety.

Today, there is little need for inclusion of such practices in any form in the rules.

Today the practices in and the technology of radio, electronic, and electrical engineering are well-defined, with numerous standards, codes, rules, laws, and regulations that have evolved to guide the technical practice of them, as well as their application to the design, manufacture and installation of broadcast equipment.

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To name just a few standards, we have: EPA, EIA, NEC, IEEE, NAB, Local Building and Zoning Codes, and, still especially for us, those of the FCC.

Reasons for good practices

But, whether it's prescribed in the rules or not, the practice of some standards of good engineering is in the self-interest of all engineers and stations.

There are many selfish reasons to do so: the prevention of Class C (Electrical) fires is one. More efficient installation and operation of equipment and its maintenance afterward is another.

And, since engineers are known more for what they do, less so for what they say, professionally the kind of engineering you practice reflects and follows you.

Just about all standards of good engineering practice affecting radio are based upon the NEC—the National Electrical Code.

Electrical wiring and installation is guided everywhere by the NEC, which is published by the National Fire Protection Association.

The Code prescribes, to a seemingly microscopic degree, the details of connecting, wiring and installing just about everything electrical.

Though a copy of the code is a useful reference, for the type of electrical tasks normally encountered in radio engineering, I prefer a copy of one of the more understandable layman-ized versions, available at most electrical stores.

Major rewiring or installation of AC circuits is not the general everyday task for a station's engineer. But, electrical practice relating to circuit loading and load distribution is.

Some practices to follow

Overload of AC circuits can easily creep up on you. With time the outlets always disappear. Then, with one breaker controlling it all, one fault puts everything out.

Making sure the equipment is distributed over a sufficient number of outlets controlled by a sufficient number of "fused" circuits is a good, self-interest, engineering practice for the station and you.

Even if AC circuit loading is not a problem, it is easy to get an overload condition in the equipment plugged into it, if its fuses are the wrong amperage.

When a fuse pops in a piece of equipment, the only practice to follow is to always replace it with the proper size and type, never larger. Much of today's equipment draws 100 W or less; a fuse higher than necessary can increase the chance of a Class C fire.

Although much of the specifics of the NEC do not apply to the installation, wiring, connection and maintenance of a radio station's equipment, the intent, the purpose and the methods do.

The intent is to make for safe installation practices: minimize electrical and fire hazards. The purpose is to define consistent standards: wire sizes, wiring connections and labeling and the methods to insure that the ways of connection and installation are consistent.

Sources for practices

A one-place source for standards of good engineering practice for radio is hard to come by. Some of our engineering practice comes from the NEC, as above, some from the telephone companies, some from the recording industry, and some results from the specific needs of radio broadcasting.

But most of it, I suspect, comes to you from the other radio engineers you've known, or from following their work—passed down from generation to generation.

As I recall, my sources for standards of good engineering practice, as applied to radio, came from all of the above. However, in addition to the NEC publication there are some other published sources which I recommend.

For audio and studio installation practice, I use a copy of the **Audio Cyclopedia**, Second Edition, by Howard M. Tremaine, Howard W. Sams & Co., Inc. Indianapolis, IN 46206 (I believe it is still in print and available).

Besides containing all you might need to or want to know about audio, it details standard wiring and installation practice for audio facilities. There are many things to consider in the making of a broadcast studio. It is more than just the physical installation of equipment.

There are factors to consider such as power requirements, separation of the cables, grounding, isolation of magnetic fields, ventilation and noise—equipment

(continued on page 18)

A Case of Missing Inductance

(continued from page 15)
Permeability at Very Low Flux densities."

These latter steels can easily be destroyed in a short time if subjected to high magnetization levels, high flux densities and/or severe mechanical vibration.

This is quite easily accomplished in a transmitter by a continuous flow of DC or by vibration.

> *A couple of whacks on it with a hammer, and you now had stove pipe iron!*

I can assure you that this is an over simplification, but nevertheless it can be deduced that those transformers that gave up the ghost must have been originally constructed of high quality laminations.

Conversely, you might conclude that a transformer built with cheap low grade laminations might last forever!

This reminds me of an experience I had many years ago. I was working for ERPI, and installing sound movie equipment.

It was about 1927 or '28 I believe, and one theater installation I had made suddenly developed a severe hum in the sound system. Several local people had tried to fix it without success, and I was sent down and told to correct it.

Now, they had recently installed some new heads on the projectors and had found a slight difficulty.

The shield can on the preamp tube was in the way so they just hit the thing a few whacks with a hammer and bent it out of the way.

I didn't know it at the time, but those "tin cans" were made out of Western Electric's latest invention known as "Permalloy."

This stuff was an extremely high permeability silicon steel. However, a couple of whacks on it with a hammer, and you now had stove pipe iron!

Old Man Cole

About that time, I started up a small transformer business, and my nearest competitition for custom transformers was "Old Man Cole" in Los Angeles.

He called me up one day and asked if I was coming up, and would I stop in his shop. I said I would, and did a day or two later.

He showed me a transformer he had wound—on steel somebody had furnished him—which measured nearly zero inductance.

This was the second one he had made which wouldn't work, and the old boy was completely flabbergasted.

I questioned him at length; measured the transformer myself; and stood and scratched my head. About that time I suddenly remembered: Permalloy!

I must tell you, that anyone who has ever stacked a transformer, when he gets the coil pretty tight, he then pounds the laminations in with a hammer, and tightens them up by pounding them on both sides.

Like I said, pound on Permalloy; or Allegheny Mumetal; and you wind up with some stove pipe iron!

In all seriousness, I believe these transformers I have found which had lost all or most of their permeability must have been built on thin, high permeability, low density audio steel.

In the beginning their performance must have been good, with low loss and low distortion, but this high grade steel just couldn't take the DC.

OK, now you have my learned opinion, but nevertheless, in each case when the transformer was replaced, the set worked fine thereafter. Q.E.D.!

Impedance Values Not Always Based on Facts

(continued from page 13)
phases, disregarding matching.

My rationale behind using 90° networks is the fact that their branch currents and voltages tend to be reasonable and have better bandwidth characteristics as a final result.

Less sensitivity

I say better bandwidth because the sensitivity to component and impedance variations is less at 90° than at values greatly departed from that.

It must be kept in mind that if your system is severely mismatched, you may experience an overall RMS increase due to better radiation efficiency (less loss!), given the same operating parameters.

In this case, it will be necessary to retune the pattern, and of course, perform the matching process again. Next time, we'll discuss array tune-up.

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

The Need for Good Standards

(continued from page 16)

or external.

There is the placement of the cables for power, high and low level audio and control lines to plan for. And, there is the documentation, labeling and wiring methods. All require the application of some sort of standards of good engineering practice.

For the RF and electronic technologies, there are also many published sources of practice and procedure to borrow from. The technical trades are a good source for current technology and practice.

> *Broadcasting's unique in that new technologies don't immediately replace the old.*

However, if you've just gotten into radio, there is a lot of old and new technology that you have need of. Broadcasting's unique in that new technologies don't immediately replace the old. They just add another level for you that's seldom needed or used perhaps, but still has to be in your tool box.

There are two ways of keeping them all in your tool box ... the hard way: trying to know and remember everything all the time; and the easy way: just knowing where to find what you need to know. I prefer the easy way, to know it when I need it. And, to that end, that's what books are for.

Two useful books

You could have books for each technical speciality on your shelf. But for most day-to-day RF and electronic needs I find, like the one for audio, the encyclopedic technical handbook kind most useful.

There are two I refer most to: the **NAB Engineering Handbook** and the **ARRL Radio Amateur Handbook**. They both have about the same utility to me for radio engineering but they approach the technology from different directions.

However, since the **NAB Handbook**'s price approaches a week's take-home pay ($199.50), the **ARRL Radio Amateur Handbook**'s price ($18.00) makes it a more cost effective source of detailed technical information for any radio engineer, amateur, or novice or general. And, even at that, you do not always have to buy the latest copy, most public libraries keep the latest ARRL Handbook on their shelf.

You can get the **NAB Engineering Handbook** (7th edition, $199.50 nonmember/$139.50 member plus $10.00 shipping) from NAB Services, 1771 N Street NW, Washington, DC 20036, and the **ARRL Handbook** (1987, $18.00 plus $2.50 shipping), from ARRL, 225 Main Street, Newington CT 06111.

By now, it should be obvious that I advocate the maintenance of an engineering bookshelf, a personal one and/or a station's. In most areas of radio engineering and its practice, if you don't know, there's a lot you can say, but very little you can actually do.

The application of some standards of good engineering practice relate for the most part to the practice of knowledge, to knowing the reason why and the method for how. It's a way also to keep your feet clean: you won't step in it if you know what it is.

Coming Up Next, a topic related to this one, Engineering Ethics. The why of the how you do what you do.

Station Deals Well With PCB Dumping Problem

(continued from page 8)

studies show that PCBs have toxicities," he said. In particular, studies indicate that the body absorbs the material but does not excrete it readily.

Thus, Morton noted, small doses which in themselves may not be harmful could have a "dangerous cumulative effect."

The latency period for development of symptoms of PCB poisoning is "most likely dose related," he said, with signs appearing more quickly the larger the dose.

Among the most common conditions caused by exposure to the chemical is chloracne, a dermatological condition resembling blackheads, appearing on the face, neck and shoulders.

Morton pointed out that, although chloracne is not disabling, it usually implies liver involvement.

Other symptoms of the toxic effects of PCB were chronicled approximately two decades ago, he said, in the Japanese town of Yusho, where the chemical found its way into the food chain and was ingested by a large number of the town's inhabitants.

Complaints included nausea, vomiting, pigmentation changes in the skin, peripheral nerve damage and blindness, Morton noted. Birth defects occurred in children born to parents exposed to the material.

Morton pointed out, however, that the Japanese incident was a case of chemical ingestion. The most common means of PCB contamination, he said, are absorption through the skin or inhalation of vapor.

For additional information, contact Larry Reid at 503-297-3311, Bill Hedgebeth at 206-442-7369, Jo Brooks at 503-229-6044, or Dr. Bill Morton at 503-225-8311.

Firing Tough for CE

(continued from page 11)

after you tell them they are being discharged, so a copy of the discharge notice should be given to them for later reference.

2. Have the employee's final pay check ready and present it at this meeting. It should include vacation and severance pay.

3. Collect keys, credit cards, etc. The employee should be sent to his or her work area to remove personal articles, and asked to leave the building immediately.

Personally, I see no need to give an employee notice. I would rather see the employee receive severance pay, based on the combination of service to the station and, of course, why he/she is being discharged.

Should a person be given the option to resign rather than be discharged? It depends on the individual case.

Some situations call for the immediate removal of an employee for the good of the station, other situations might tolerate a condition for another two weeks.

In some states, persons who resign are not eligible for unemployment compensation unless they can prove they were forced to resign.

Are there dangers in keeping an employee on even when you know he or she should be discharged? Yes, of course.

In such cases, to do nothing is much worse than discharging the employee. If one employee remains on the job though his or her performance is substandard, all employees are affected. One rotten apple can contaminate the entire barrel.

As a surgeon uses a scalpel to remove a cancerous growth, so must a CE or manager eliminate the poor performing employee to preserve the integrity of the whole.

Once the discharge is completed, you may think you can forget about it, and go on to more important things. Not so.

You can be certain that one day the telephone will ring, and on the other end will be a prospective employer asking about your former employee.

I have found that it benefits no one—the former employee, the prospective employer or yourself—to deviate from the truth when answering specific questions asked by a prospective employer.

I also believe the former employer should not volunteer either positive or negative personal opinions as to the performance of a former employee.

Max was fortunate in his situation, he and the GM agreed on the dismissal of one of Max's people. What if they disagreed?

I have been in the position of being ordered to discharge a person whom I knew was not guilty of any wrong doing. In this situation, you really have only three choices: (1) discharge the employee as ordered to preserve your own employment; (2) resign; or (3) tell your superior that if he wants the person discharged, do it himself.

At one time or another in my career, I have exercised all three options. In looking back, I would say number three was the best decision. However, this could result in you being discharged for insubordination.

What if you wanted to discharge an employee but were forbidden to do so by your superior? You have only two options: (1) resign your position; or (2) live with the situation.

Option one would solve your personal problem, but not that of the station. Option two gives you the opportunity to prove over a period of time that you are right. Eventually, you may be able to convince your superior that your recommended action is correct.

You will note that in both situations where disagreement occurs between you and your supervisor, and even in Max's situation when there is agreement, two people are involved in making the decision.

Even when there is disagreement, I have found that it is absolutely necessary for two people, no more and no less, to be involved in the decision. Acting on your own can be disastrous, as can be a "group decision."

You will recall that Max had the opportunity to "pass the buck" to the GM who offered to confront and discharge the employee. Max proved to himself that he is a good manager by accepting the responsibility to discharge the employee.

If you have the authority to hire, you must assume the responsibility of discharging an employee when the occasion calls for it.

1008

Auditronics announces linear fader console performance at rotary knob prices.

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Unapproved Book Tells RCA Tale

RCA
by Robert Sobel
Stein and Day, New York, 1986.

Reviewed by Ronald H. Black

New York NY ... *RCA* is described by its author, Robert Sobel, as an unauthorized, unsubsidized history of the company.

The author is a professor of business history at Hofstra University, and in addition to being published in the *New York Times, The Wall Street Journal* and *Barron's*, is the author of some 25 other books dealing with the history of US business and corporations.

This book traces the origins of the technology of "wireless," a technology

Book Review

developed, as its name implies, to perform the function of a telegraph without the inconvenience of a copper conduit for signals.

American Marconi

Around the turn of the century, early in the development of wireless technology, its primary use was to communicate with ships. Although there were several players, US wireless business was dominated by American Marconi, a company that, while being controlled by Americans, was substantially owned by British Marconi.

The American Navy did not wish to rely on a company with foreign ownership for its communications, and by 1919, British ownership in American Marconi was bought out and the company became the Radio Corporation of America.

Because the company was fashioned to be in the wireless business, broadcasting was not covered in the basic accords. Thus, it became a wide-open field in which bitter contention developed.

Although the concept of broadcasting seemed to have occurred to almost every wireless pioneer, Frank Conrad of Westinghouse set up the early Westinghouse broadcasting stations without any apparent inkling of their commercial possibilities.

Then, in 1916, the commercial manager of American Marconi, David Sarnoff, wrote a highly perceptive and highly publicized memorandum describing his plan to make radio a "household utility" by bringing "... music into the house by wireless."

At this point, the author digresses into several pages concerning Sarnoff, who from 1920 until his death in 1971, dominated RCA.

Sobel, while obviously respecting the foresight and business creativity of Sarnoff, also points out that he was not without flaws as a business manager, and that several of RCA's failures throughout the years could be attributed to him.

Broadcast interests

Meanwhile, by 1922, RCA had become far more interested in broadcasting than in becoming the American flag carrier in the wireless field.

This led to the formation of the National Broadcasting Company in 1926 out of an amalgam of RCA's and AT&T's fledgling broadcasting operations.

The succeeding years brought RCA's very successful purchase of the Victor Talking Machine Company, and its less than fabulously successful entry into motion pictures via the Radio-Keith-Orpheum Company (RKO).

The historical saga wends through RCA's second decade.

In the years from 1929 to 1935, the company won its independence from General Electric and Westinghouse, NBC emerged as RCA's major source of profit, the company moved its headquarters to Rockefeller Center, and Sarnoff's dream to unite broadcasting, recording and motion pictures dissolved. RCA also began to experiment with television.

The company spent the last half of the '30s warring with the Federal Communications Commission, and developing television. The war with the FCC resulted in the divestiture of the NBC Blue Network, which formed the foundation for ABC.

World War II caused a temporary halt in television activity while RCA produced for the war effort.

The postwar years brought the rise of television, RCA's abortive effort to become the number two company in computers, the initial corporate forays into becoming a conglomerate, the passing of the torch of leadership from David Sarnoff to his son Bobby (who continued the acquisition trend his father had

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Write Ronald Black c/o **RW.**

RCA Book Interesting Reading

(continued from page 21)
begun), and RCA's painful and costly withdrawal from the data processing business.

The '70s was a period of high turmoil at RCA, punctuated by the deposition of Robert Sarnoff, and the assumption of leadership by Anthony Conrad, whose regime lasted less than a year.

Conrad's ouster produced the chief executiveship of Edgar Griffiths, a stormy period in the company's history marked by the market introduction of the RCA videodisc.

Other happenings included further expansion of the company via acquisitions, the decline of NBC, and utter turmoil both at RCA under Griffiths and at NBC under its hoped-for saviour Fred Silverman.

Period of turmoil

The years from 1981 to 1986 brought stability and recovery to both RCA, under its new chief executive, Thornton Bradshaw, and to NBC under its new leader, Grant Tinker.

RCA's corporate restructuring and return to core entertainment and electronics businesses resulted in its restoration to financial health, fueled to no small degree by the resurgence and success of NBC.

The last chapter in the RCA story is an event that was deemed incomprehensible and totally remarkable by the author. RCA was purchased by the company that David Sarnoff had spent so much effort trying to break free from decades earlier, General Electric.

RCA is a highly interesting history of the origins of the radio industry in the US and the historical development of the company most closely associated with the history of television, radio and broadcasting. It highlights RCA's glorious successes and equally pyrotechnical failures.

The book collaterally traces the career of the man most closely associated with RCA, David Sarnoff, his remarkable intellect and prescience in some respects, and his shortcomings. The decline, decay and turmoil brought about by Sarnoff's failure to adequately groom a successor, and the ultimate restoration and sale of the company are covered.

No cooperation

It must be pointed out that in the absence of any real cooperation from RCA, Sobel's information was obtained from published records and books (an impressively complete bibliography accompanies the text), and verbal accounts from present and former employees of RCA who were willing to talk, often anonymously.

As a responsible journalist, Sobel gives as good an accounting of his sources as possible. He remarked that the biggest gap in the RCA story is a worthwhile biography of David Sarnoff, stating that most of the Sarnoff biographical materials are hagiography. He cites the work of Elmer Bucher, who between 1941 and 1962, produced a 56-volume monument of more than 13,000 pages, bearing such titles as *Radio and David Sarnoff, Color Television and David Sarnoff,* and *A Tribute to David Sarnoff.*

Anyone interested in the history of radio and broadcasting should find *RCA* by Robert Sobel absorbing, whether or not the opinions and conclusions Sobel liberally offers are accepted.

Good Field Intensity Readings

by Lawrence Behr

Greenville, NC ... Once solely the province of a cadre of field engineers heavy with years of experience, the responslbllity for the taking of AM field intensity measurements has today often been put upon the station or contract engineer.

There are many traps lurking in this seemingly straightforward arcane art, ready to frustrate the most enthusiastic newcomer.

Fortunately, the measuring equipment, which once filled a small van, now can be held in your hand; and there are few back-country bootleggers to worry about today. Nevertheless, a successful measurement project will call on talents in navigation, radio science and meterology.

The following guidelines assume the services of a qualified consulting engineer in initial measurement point specification and later data analysls.

Adhering to these suggestions while making the measurements will assist in the preparation of required FCC technical exhibits with a minimum of subsequent time and expense, and with supportable accuracy for the Commission.

Why take measurements?

Field intensity measurements in the AM band are normally made for one of several reasons:

1) determining interference contours of a proposed transmitter,

2) proof-of-performance of a directional antenna,

3) location of actual coverage contours, or

4) a site survey for determining adequacy of a proposed new transmitter site.

Each of these may be accomplished by the application of the same basic techniques, although the particulars may vary with the requirements of each case. Your consultant normally determines the exact requirements beforehand.

Successful field measurements are over 50% preparation. Careful attention to this phase will make your task enjoyable, while embarking with only a meter in hand is guaranteed to lead to chaos and confusion.

To paraphrase a popular commercial: don't leave home without it!

For starters, before beginning your field intensity measurement program, you should have on hand the following equipment:

1) maps properly marked with measurement radials, on the largest scale appropriate,

2) a field intensity meter,

3) a good compass,

4) field intensity log sheets,

5) a pair of dividers and ruler,

6) a supply of pencils, and

7) a 100' tape or surveyor's wheel.

Maps for the survey will normally be US Geodetic Survey Quadrangle Maps for areas close to the transmitter, and county road maps, or 1:250,000 scale topographic maps, for areas distant from the transmitter site.

Occasionally, aerial photographs may be required for an area where measurement locations are particularly difficult to identify. The creation of these measurement maps is basic to the success of your survey.

Getting started

Each survey will have highly specific requirements for the content of measurements and for the geographical scope of the effort.

The science of designing a measurement program requires careful engineering attention, as does the analysis of the data you will obtain.

Unless you are highly experienced, this is an area best left to your consulting engineer.

The field intensity meter that you use can be one of many available. Some choices include Potomac Instruments FIM-21 or FIM-41, Nems-Clark 120 series or RCA WX-2 series units.

Although a bit dated, the latter two are still excellent instruments and widely found. Before using any other type of field intensity meter, be sure to clear it with your consultant. Not all meters have the required accuracy.

Be sure that the field meter has been calibrated by the factory within three years of the measurement date. If it has not, then it must either be returned to the factory for calibration, or compared with another acceptable meter of recent calibration and found to be within proper accuracy limits.

The remaining items are for convenience in taking and recording required measurements. The surveyor's wheel, measuring tape and compass will be very helpful in establishing measurement locations away from discernable

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Lawrence Behr is president of Lawrence Behr Associates and the head of LBA Technology. He has been involved in broadcast communications for more than 25 years. He can be reached at 919-758-4509.

Measuring AM Field Intensity

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map features.

A bit of advice—make all notes on both maps and log sheets in pencil. Inevitably, survey materials get rained on or otherwise wet, and many inks have the nasty habit of running and rendering data taken illegible.

Before beginning measurements, consider the terrain over which the survey will be taken and arrange for an appropriate vehicle. Field intensity surveys are most conveniently taken with two people.

One person, qualified to take field measurements, navigates and gets out of the vehicle to make the readings. The other person acts as driver and keeps the measurements log, describing each point and making appropriate notations. Such a procedure can considerably expedite the survey.

Plotting the route

Where measurements are to be made over a considerable distance on a number of radials, it may be found helpful and expeditious to arrange these radials on a highway map and predetermine a course of attack.

This is particularly useful in remote or inaccessible territory, or in the urban "jungle."

In this manner, portions of radials lying close to one another may be taken sequentially and the balance of the radial can be taken at another time more convenient in the survey.

Measurement radials may be taken in a rotating sequence by going out one radial, and then driving across to and down the next. This in and out pattern is particularly helpful when running antenna system proofs where evenly disposed radials are normally encountered.

Your planning should also take into consideration the fact that skywave signals will affect readings, and this problem should be figured into the schedule and travel plan, as the FCC may question readings taken prior to two hours after sunrise or within two hours before sunset.

However, measurements of low intensity points may be affected even beyond these limits.

Consequently, where fields will be below 1 mV/m, such distant low intensity points should be taken in the middle of the day and the closer points with higher field intensity at early or late hours of the day.

Before proceeding to the field, the maps for the survey should have been marked with the radials and a number of suggested measuring locations along each radial. Not all of these points need be taken.

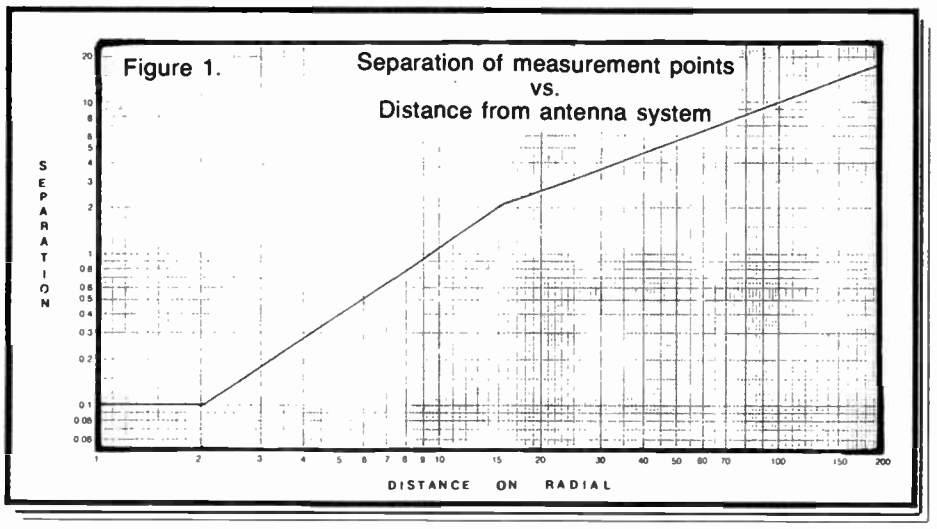
Figure 1 will help determine the required separation of measurement locations at various distances from the transmitter. Consider these spacings to be a minimun.

How far to measure

You should plan to get as many measurements as possible, within reason. Where it is not possible to get a continuous spectrum of measurements because of intervening terrain or other obstacles, additional measurements should be taken at other accesslble points of the radial to compensate for the lost data.

Section 73.186 of the FCC Rules also contains guidelines for taking data. This is well worth studying, but it must be applied with common sense to actual measurement situations.

Figure 1. Separation of measurement points vs. Distance from antenna system



Depending on the objectives of the field intensity survey, the distance to which measurements should be taken on a given radial will be determined either by a predetermined cut-off distance, received interference, or the encountering of a specific field intensity.

Measurements are not normally taken closer to an antenna system than five times a nondirectional tower height, or ten times the maximum spacing in a directional array.

Where the survey is being made for the purpose of determining the ground conductivity between the transmitter site and another station's contours, measurements are normally made until the field meter indicates interference with the desired signal.

This interference will be noted as a "beat" of the undesired signal with the desired signal, causing it to vary significantly in amplitude.

Any time that the needle variation is sufficient to mask a reading, interference should be assumed, the effect noted in the log, and measurements on that radial direction terminated.

The audio should also be monitored on the field intensity meter to make certain that the station being measured is actually the one desired.

More than one survey has gotten off the track when a bumped field meter ended up on the wrong station. It's a good idea to monitor comtinuously on the car radio, too, so you know what's happening with the signal at all times.

Measurements may be taken to establish the location of a specific signal strength contour over an arc.

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Problems Come Three at a Time

by Mark Persons

Brainerd MN ... I was called out early one morning to KNSP Radio in Staples, MN. Station manager Dave Bormann was waiting for me at the transmitter site.

The station's McMartin BA-1K 1 kW AM transmitter was refusing to run. It would shut down from overload just a fraction of a second after the high or low power plate-on buttons were pressed.

Closer examination showed that there was no PA voltage. Instead, PA current and modulator current were present as an overload relay shut down the transmitter.

This indicated the high voltage rectifiers were okay because current can only flow when voltage is present.

We checked capacitors in the PA and modulator sections with an ohmmeter. None were shorted.

There was, however, a 200 ohm reading to ground around the secondary winding of the modulation transformer.

Removing wires from both ends of the winding revealed that the modulation transformer had a short or partial short to its case which was bolted to the transmitter's floor which in turn was connected to ground.

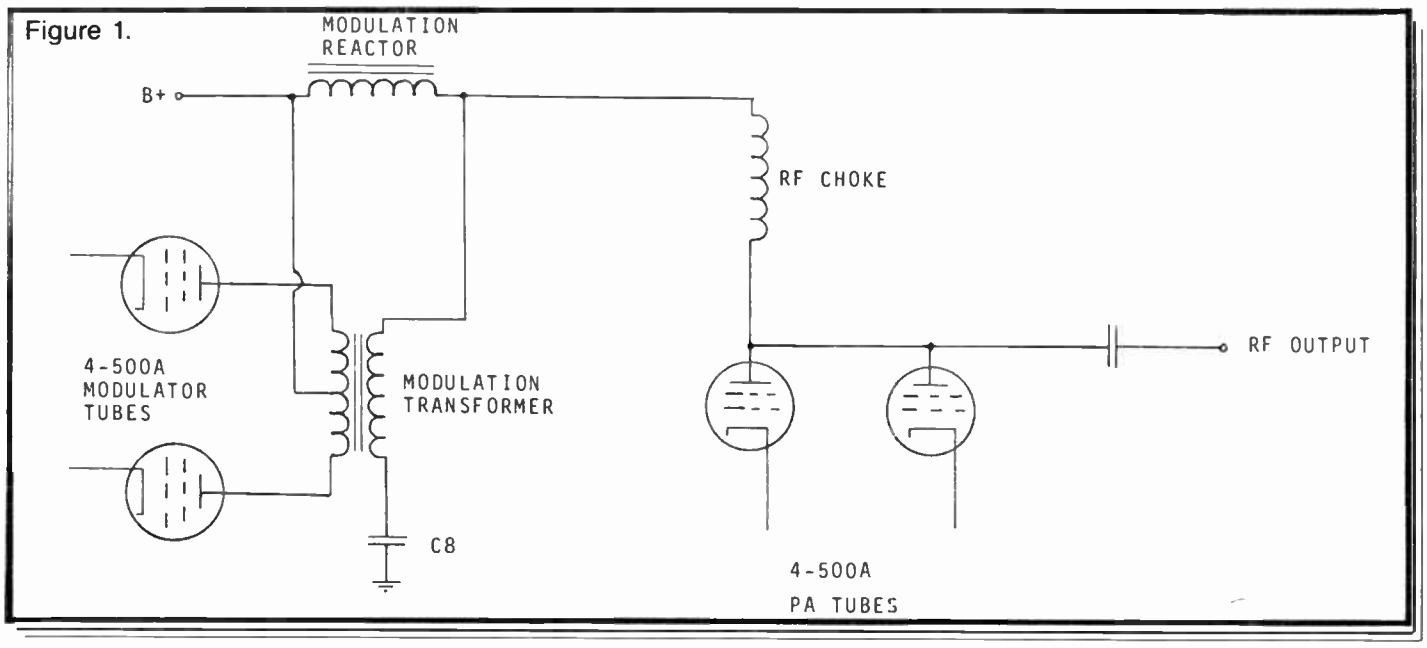
Well, that effectively shorted the high voltage to ground causing the overload.

Problem after problem

Dave went to a nearby woodworking shop and talked them out of several 3000 V pieces of wood. We put the wood under the modulation transformer to insulate it from the rest of the transmitter.

Mark Persons is president of M.W. Persons and Associates engineering consultants. He can be reached at 218-829-1326.

Figure 1.



When we turned the transmitter on, there was another problem ... no RF drive to the PA tubes. Swapping tubes revealed that one was shorted apparently from cathode to grid.

After replacing the defective 4-500A PA tube, the transmitter would produce RF at low power (500 W) but the wood insulator would arc over at high power.

The PA voltage at low power is about 2000 V, while at high power it is 3000 V.

Well, the station was back on the air, but there was almost no modulation.

Sure enough, a tone fed into the transmitter would modulate the RF to only about 5% before severe distortion erupted.

It wasn't immediately clear what other damage had been done to the modulation transformer so I connected the PA high voltage lead to one primary terminal of the modulation transformer.

The transmitter would then modulate cleanly to about 75%. They were back on the air at half power with nearly normal modulation. The troubleshooting and temporary repairs had taken just over an hour.

A new transformer

As a next step, I called the original manufacturer and inquired about a new replacement modulation transformer. Their price was on the high side. However, a call to another manufacturer revealed that an equivalent transformer was available for $695.

The replacement transformer is not in a case and oil-filled as the original transformer, but it performed just fine according to my tests after installing it several days later.

But our problems weren't over. The transmitter produced just 5% modulation again after replacing the transformer.

I traced the problem to an open C8 capacitor in the AC ground side of the modulation transformer circuit. Replacing it took care of the problem.

We are mystified about how three major components would fail at the same time in the transmitter. Perhaps someone out there has an idea and can help us out.

The Fine Art of AM Field Measurement

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In this case, one or more radials will usually be measured out from the transmitter site towards the required field intensity contour value.

The measurements are continued for five or ten miles after encountering the contour in order to definitely pin down its location.

To either side of the complete measurement radials, stub radials are frequently utilized.

These radials are short and only extend for a distance of a few miles to either side of the desired contour location on that partlcular azimuth.

The efficient taking of contour measurements is one of the more difficult tasks as the measurement runs cannot be pre-planned back at the office. They depend on real-time analysis of what is actually being measured in the field.

Keep in mind that the objectives of the field measurement survey are to obtain data that is accurate and may be referenced exactly to geographical coordinates.

No matter what configuration of points you plan for, you should record sufficient data to allow another engineer to go back to the same exact measuring spot at any time in the future and replicate the measurement.

Needless to say, data must be sufficient to allow a reasonable analysis to be made back in the office. This obviously calls for a great deal of care on the part of the engineer making the survey.

Using the meter carefully

If you are not already very familiar with the field intensity meter that you are using, be sure to closely follow the manufacturer's instruction book.

A word of caution. Most broadcast engineers are familiar with the tradition of "zeroing" panel meters. In the case of the field intensity meters, *don't*.

The meter scale is a special one, and it is not normally at rest on "0."

Tampering with the meter zero set adjustment would be a serious mistake which will ruin the meter calibration. Such calibration adjustments can only be made at specially equipped labs.

With regard to the operating calibration adjustment, you should check your front panel calibration at every measurement location.

Some meters are more stable than others and can hold calibration through a good deal of roughness and many

Figure 2.

FIELD INTENSITY MEASUREMENT LOG

NON-DA ☐ DA-D ☐ DA-N ☐ DA- ☐ P- ___

STATION _____ FIM TYPE _____ RADIAL _____

FREQUENCY _____ SERIAL # _____ AZIMUTH _____

POWER _____ CALIBRATION _____ OPERATOR _____

COMMENTS/WEAX:.

POINT NUMBER	DATE / TIME	FIELD MV/M	DISTANCE MILES	DESCRIPTION

measurements. However, unless you are extremely confident in your knowledge of that particular meter, be sure to check the calibration each time!

It should go without saying that you should check your battery supply prior to embarking on measurements. But, you'd be surprised how many people have ended up 50 miles fron nowhere with dead batteries, requiring a long trek back to town.

If your measurements go into remote areas, carry a spare set. Aside from battery problems, occasionally measurement interruptions occur because of erratic meter operation.

Commonly, this is due to dirty or wet loop antenna contacts, which can be lightly burnished with a pencil eraser to polish them up for good contact.

Although there is nothing wrong with making measurements in a little light rain, wetness can short out the loop antenna contacts, so a speclal effort must be made to keep this portion of the meter dry.

Taking to the field

Having gathered up your gear, and planned the route of march, it's time to take to the field and get some data. As mentioned previously, your maps will normally have been marked with suggested locations for measurements on each radial.

Where reliable physical landmarks are not available for establishing these locations, yet data is needed, you must walk to each point. Consultants call these "walk-in" points.

This situation is generally encountered in making measurements closer than two miles to the transmitter. These measurements will normally be made each tenth of a mile and require your most precise navigation skills.

Establish the radial on which you will

(continued on next page)

Taking Field Intensity Readings

(continued from previous page)
travel with the use of a good surveyor's compass or transit. When using a compass, don't forget to correct for magnetic declination and local magnetic errors.

Distances should be taken using a measuring wheel or a 100' tape measure. In critical situations, a survey may be needed. Whatever method you use, it is essential that it be reliable, accurate and repeatable.

Fortunately, most field measurement points don't require walk-ins. Wherever possible, measurements will be specified to coincide with highways, lanes, or other features readily accessible by car.

In taking these points, the important thing to remember is to take the measurement exactly on the radial unless otherwise approved by your consultant.

If overhead wires or other obstructions make it inadvisable to take a measurement at the specified location, a new location should be chosen at a distance of approximately five to ten times the height of the obstruction, either towards or away from the station on that radial.

The distance from the specified location should be noted in the measurement log and the point actually measured should be accurately marked on the map.

Where the measurements are specified to be very close together and near the transmitter, as in the first several miles of the measurement run, it is advisable to take the measurement at the specified location and accept whatever distortion is introduced by the obstruction.

However, you should carefully add to your field notes a full description of the obstruction so that this can be taken into account in analysis of the measurement data.

A word of caution here: sometimes engineers making field measurements generate a concept of how the measured data ought to look as they go along.

They reject data which seems not to fit this perception which can be a dangerous practice as it biases an otherwise objective process.

It is far better that you give your consultant the data exactly as you take it, with notes of any irregularities, and let him decide later how the data should be analyzed.

It often happens that the one little point which seems so far out of line will be just the one needed to confirm some critical aspect of the analysis.

Nevertheless, should you see that a significant amount of data is obviously far at variance with reality, you should bring the discrepancy to the attention of your consultant immediately. This may keep you fron wasting a great deal of time on measurements which will have to be repeated.

Taking the readings

When measuring AM signals in congested areas, directional antenna nulls, or in low signal areas, it is important to make certain that the field intensity meter is aimed towards the station.

Reflections and re-radiations from adjacent objects can cause erroneous signals to be indicated at angles differing from the transmitter direction. A good military-style compass is excellent for this purpose.

In general, if a good maximum is obtained in the direction of the station and a good signal null is observed perpendicular to the station direction (a value of one tenth or less of the observed maximum field intensity), the measuring point can be considered good.

Where unusual conditions are observed, these should be noted in the measurement log.

Shown in Figure 2 is a copy of a typical field intensity measurement log. While you may wish to create another format, it is important that the measurement log be kept accurately, completely and intelligibly.

The first part of the log is intended to establish the conditions under which the measurements were taken.

The data on the upper left hand section of the form should be filled in to indicate the actual station operating parameters at the time of measurement.

The mode of operation is indicated under the title. In the center is space for information on the field intensity meter, and on the right hand side of the heading area is a space for the azimuth of the measurement radial and a radial number.

You should fill in the azimuth data from the appropriate maps, as well as the name of the operator in charge of those particular measurements.

Under the comments line, the weather should be briefly described in the form of a notation as to general sky conditions, average temperature and precipitation.

It is also critical to note here the normal antenna or common point impedance and the antenna current reading at the start of measurements, and any other data which will establish operating conditions at the station being measured.

Recording specific data

Since each point on each radial of your map will be assigned a unique number as it is taken, this number will be recorded under *Point Number* on the form.

Under *Date and Time* it is only necessary to record the date once at the begin-

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Field Intensity Measurements

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ning of the day's log. The time should be the local time expressed on a 24 hour clock.

Except for walk-in points, *Distance* will normally be left blank, as your consultant will evaluate this function back at the office, using detailed field maps,

The *Field Intensity* column should contain the actual measured field in millivolts per meter recorded to three significant digits.

Under *Description*, there should be entered notes relative to the particular measurement point.

A complete description of the point adequate to pick it out again in the future is required, should one need to return for re-measurement.

Where a point is located exactly on the radial, and established by measurement using the wheel or tape, that fact should be noted under description and the actual number of feet from the antenna recorded.

Otherwise, your description should reference some physical object not expected to change within the foreseeable future. For example, "100' north of intersection of Lane and Spruce Streets," or "front of white brick house at Route 3, #259."

The importance of this seemingly obvious detail was pointed up several years ago when a client of ours bought a directional station.

When it came time to do a partial proof, we found that the previous "consultant" had noted such permanent point descriptions as "half-buried beer can on left" and "25' north of red Ford." Boy, was the chief engineer hot when he tried to find those points!

One final point while making and recording your measurements is to be sure to check often for accuracy.

Errors may render whole radials useless and necessitate a rerun, wasting your time and effort in the field, and running up your consulting bill.

Other than that, remember to be sure to stick to the radial, use care in taking and recording measurements, and call your consulting engineer if any unusual conditions arise, or you are uncertain about any aspect of your measurement program.

These steps should ensure a successful measurement expedition. Happy hunting!

All US topographic maps, field intensity papers and log sheets are available through Carolina Maps, PO Box 8026, Greenville NC 27834, 919-758-9505. Field intensity logs suitable for reproduction may be obtained from Lawrence Behr Associates, Inc.

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Buyers Guide

Antennas, Towers & Cables

Metroplex Masters Multiplex

by **Dennis Sloatman, Corp Tech Dir**
Metroplex Communications

Orlando FL ... When I was asked to write a report on the Alan Dick (LDL Communications) antenna, I felt the same excitement that I felt the very first time I opened a microphone at a Class A in Rockford, IL. Boy was that some time ago!

In any case, I was eager to relate our experiences with the installation, operation and evaluation of our Alan Dick panel antenna.

The antenna was installed during the spring of 1986 in Orange City, FL. It was designed to allow WJYO, a Class C, WOCL, also a Class C, and WORZ, a

User Report

Class C1 to serve the Orlando-Daytona market with an effective, competitive signal.

Our antenna is a seven bay, circularly polarized antenna consisting of crossed dipole panels, each of which are basically a pair of half-wave dipole arms mounted at 90° to one another.

The dipole arms are angled back by 40° towards the screening frame on which they are mounted.

Circular polarization

Circular polarization is achieved by feeding each dipole in phase quadrature.

The wide bandwidth capability of the antenna is accomplished by employing a short circuit compensating stub connected across each dipole feed point.

The previously mentioned "angled back" dipole arms give the assembly the appearance of a "spearhead," hence their name: spearhead panels.

> *"I felt the same excitement that I felt the very first time I opened a microphone at a Class A in Rockford, IL."*

Initially I had two areas of concern prior to installation of the antenna. One was my lack of previous experience with panel antennas.

The other involved manufacturer support. I mean, how quickly would I be able to obtain needed parts and service from a company based in the "Mother Country?"

It didn't take a great deal of time, however, before I realized that my worries were totally unfounded. The antenna "talks" very well and factory service is absolutely first class.

The only problem we had with the antenna itself was an incorrectly installed power divider which was quickly discovered and corrected. The antenna has since been in continuous operation for more than a year with no further incident.

Other ADC installations

As Director of Engineering for Metroplex Communications, I oversee two other ADC antenna installations in our chain.

At one of our sites a tower rigger ran into a power divider with a wrench and changed its characteristics somewhat.

The factory service rep was there within hours with parts in hand. I cannot stress enough how much I've been impressed with the factory service and support.

If you're considering the purchase of an FM antenna, whether it be for your station only, or for a group of stations wishing to share a common antenna, I suggest you look into the Alan Dick & Co. panel antenna.

Editor's note: Alan Dick & Co. is synonymous with LDL Communications (formerly LeBlanc & Dick, which recently formally merged with Larcan).

For more information, call Lew Page at LDL Communications: 301-498-2200. The author may be reached at 216-566-8080.

FCC Docket Spurs Panel Interest

by **Marlene Petska Lane**

Falls Church VA ... Panel antennas have been around for quite awhile, but it wasn't until just recently that broadcasters began to "discover" their superior radiation characteristics for omni- and highly directional patterns.

In the past, the exhorbitant price the panel antenna commanded in comparison to the bent ring and sidemount antennas usually caused it to be ignored as an option.

Docket 80-90 provided the impetus to change all that. Multiplexing with panel antennas suddenly became a practical way for major market stations to keep their Class C status—in some cases, the only way.

Ecological considerations

Docket 80-90 was not the only reason for the panel antenna's growing popularity. The growing concern of municipalities, especially metropolitan areas, about radiation exposure prompted strict city ordinances forbidding or limiting the number of towers that can be erected.

"Environmentalists, especially on the West Coast, are concerned. They figure the less sites around the less places they have to worry about the (radiation) problem," says Stan Thomas, VP, broadcast sales for Dielectric.

George Harris, senior engineer for Shively Labs, describes the limited choices for several new FM stations wishing to move into a city that absolutely forbids construction of any new towers.

Overview

"There's only one tower, so they (the stations) can either put a bunch of single antennas on it, which the tower may not be able to hold, or buy one premium quality panel antenna where they can all share equally nice omnidirectional patterns," says Harris.

Long-lived trend

Most manufacturers agree that the increased use of panel antennas is a trend that will continue.

"The side effect, as it were, of multiplexing brought about by Docket 80-90

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AutoCAD Helps KNXR Pres Draw the Line

by Tom H. Jones, Pres and GM
KNXR

Rochester MN ... The FCC's Docket 80-90 forced many FM broadcasters to make a tough decision—whether to make the costly investment in upgrading existing transmitting facilities or be reclassified to a lower grade station.

For those with moderate Class C facilities, it meant almost becoming a TV broadcaster with 1000' towers, high power transmitters and large, lengthy transmission lines. Our station chose to bite the bullet and proceed.

Broadcaster's best friend

Our best friend during the entire project was a computer program called AutoCAD. AutoCAD (computer-aided drafting) software turns a personal computer into an electronic drafting board.

User Report

It allows anyone who draws to create and revise drawings on-screen, to store the work for later use, and eventually plot the drawing on paper. Versions of AutoCAD are available for almost all MS-DOS and PC-DOS computers.

AutoCAD is much like a word processor in that revisions and changes are simply accomplished. A great deal of time is saved, too.

Drawings are done on-screen utilizing a mouse or digitizing tablet to move the drawing cursor around the screen. The power of AutoCAD lies in its extensive editing abilities—the power to undo or modify any part of your drawing as easily as you drew it.

Our first task was to lay out the tower site with AutoCAD. The land configuration and the required setbacks were starting points.

Drag the tower anywhere

The tower and guy anchors were then drawn along with a rough footprint of the transmitter building. It isn't too critical where you place these items on the drawing. With AutoCAD you can move, copy, mirror, rotate, erase, stretch or trim any part of the drawing you like.

In fact, you can literally drag the entire tower with its guys or the entire transmitter building to anyplace on the drawing! You are thus able to try many possible layouts and then select the best one.

Next came design of the 22'×50' concrete block transmitter building with a pre-stressed concrete roof.

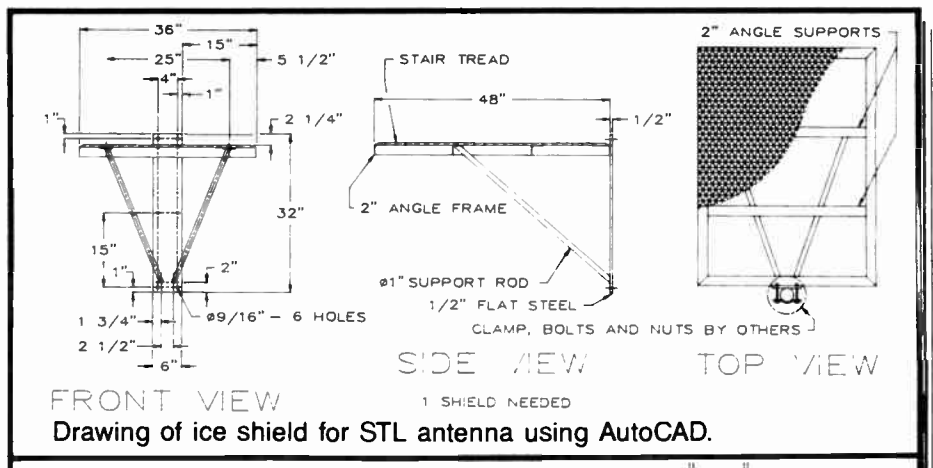
First, we prepared drawings of the footings and the floor plan. Next, cross-section drawings of the walls, partitions and roof detail were completed. Floor trench locations and electrical wiring plans came next.

The program provides an unlimited number of "layers" on which to draw. This feature was very useful in designing the building.

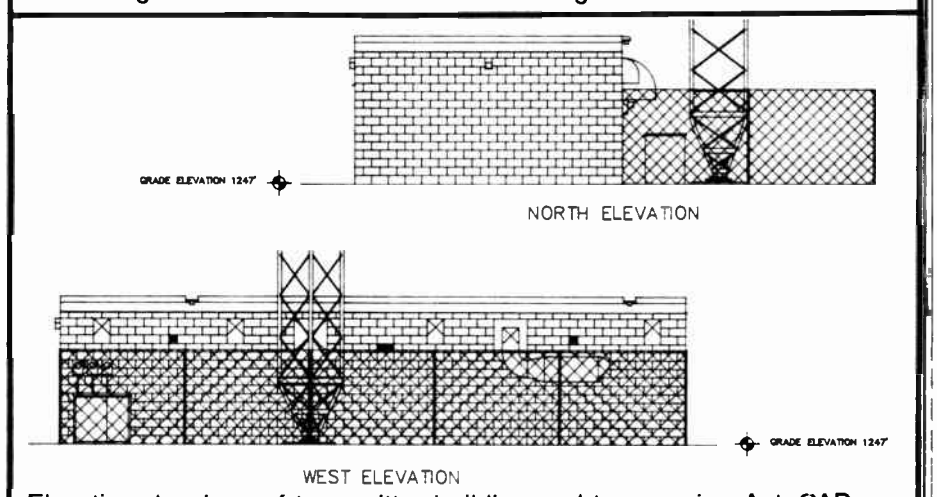
The layered look

The basic floor plan can be drawn on one layer, electrical wiring on another, equipment placement on a third, etc. Layers can be viewed on screen or plotted on paper individually or in any combinations and in different colors.

Building elevation drawings of great detail are possible because arrays of bricks or concrete blocks are easily generated with AutoCAD in a matter of seconds. Your drawings end up having



Drawing of ice shield for STL antenna using AutoCAD.



Elevation drawings of transmitter building and tower using AutoCAD.

detail you normally wouldn't spend the time doing by hand.

Repetitive drawing is completely eliminated. It is possible to draw an object once and store it for future use. When you require the object to be drawn again, you simply recall it from storage, scale it to the required size, then drag it into the desired position on your drawing.

In addition to the basic structural drawings, our transmitter building required many detailed drawings. They included transmitter air intake and outlet ductwork, wiring trench construction, coax entrances and special electrical requirements.

With AutoCAD, we were able to proide the various trade contractors with drawings of excellent detail and accuracy. There was no guessing on how we wanted things done.

AutoCAD's ZOOM command is probably its most used. You can zoom in for a close-up view of the tiniest details and draw without having to squint! The ZOOM capability provides a ratio of more than one-trillion to one between the smallest and largest objects.

Drawings for special needs

During the construction of our tower, numerous situations arose where special fabrication was required.

These special items included out-of-the-ordinary coax and antenna mounting brackets, ice shields to protect horizontal runs of coax to the building, and a custom ice shield to protect our STL antenna.

AutoCAD was used to produce shop drawings for these special requirements. We found that supplying our steel fabricator with exact, detailed shop drawings resulted in items that fit into place perfectly and were made exactly as we wanted them.

A word about placing drawings on paper. A complex drawing requires 10 to 15 minutes plotting time. The same drawing would require a day or more to do by hand. AutoCAD supports a variety of plotters.

We use the Hewlett-Packard 7475A six-pen plotter. The 7475A is able to plot drawings up to B size (11"×17"). We found this size to be very adequate and easy to handle.

(continued on next page)

Stainless Towers Over Rock Mine

by **Ben Weiss, DE**
KLSI

Kansas City MO ... The final choice was made over a year ago during the NAB convention to go with Stainless, Inc. as the turnkey contractor for the new 1100' KLSI-FM tower.

Planning had started months before when we located a 47 acre tract of land on Kansas City's east side that station management felt would meet the requirements for such an extensive project.

At the time we negotiated the purchase option on the land, we were unaware of the problems and delays that were to plague our project before and during construction.

User Report

Tall order to fill

Building a tower of the magnitude we needed is difficult no matter where you want to put it, but building one in the Kansas City metropolitan area posed some unusual requirements that we had to deal with from the very beginning.

One of several strict Kansas City building code requirements was that the tower had to be designed to meet structural requirements as specified by the Uniform Building Code and the American National Standard Institute—not the usual Electronic Industries Association/ RS-222C specification normally used for tower designs.

Since we had been talking to several different tower manufacturers about our project, we asked them for bids on a tower of 1100' designed to EIA RS-222C.

We felt that since RS-222C was the normal criteria for tower design, we could get competitive bids and probably eliminate all but two finalists. After the bids were received and evaluated, it became apparent that Stainless was in the front running along with one other company.

With two companies so close together, we decided to make one final bid request and we asked them to design the tower to meet Kansas City building codes.

So that each of the tower companies could bid on exactly the same design criteria, we invited the chief design engineers of each tower company to come to Kansas City and had them meet with the city code administrator and city engineering personnel.

In this conference at City Hall, these engineers came to an understanding of how the UBC and ANSI specifications would be applied to the design of our tower. Then it was back to the drawing board once more.

It was at NAB '86 that we announced to Stainless, Inc., that we had selected them to build the KLSI tower. Our decision proved to be a wise one as the project unfolded.

Through the ensuing weeks to follow, other circumstances with our land be-

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KNXR Aided By AutoCAD

(continued from previous page)

The H-P plotter uses either felt-tip pens for paper or transparency plotting or refillable drafting pens for final plots on vellum or polyester film.

Custom-designed circuit boards

When it came time to design several printed circuit boards for tower light and power line monitoring, AutoCAD came to the front again. It is easy to lay out custom-printed circuit boards with this software—even double-faced ones.

AutoCAD's GRID command allows you to set up an overlay on your drawing at exactly 0.1" intervals for PC board layout. Then, by activating its SNAP command, any trace or soldering pad you draw is snapped into position to the desired 0.1" interval.

Any engineering department already equipped with a personal computer will find AutoCAD a valuable addition to its software library. Once you start using it, you'll wonder how you got along without it.

Editor's note: For more information, contact your local software dealer, or call Auto-Desk, Inc. at 415-331-0356. The author may be reached at 507-288-7700.

Buyers Guide

Stainless Towers Over a Mine

(continued from page 31)
came factors of concern. We learned that the tower would sit on top of land that had been undermined!

Limestone rock had been removed some years before in a room in pillar fashion not unlike many other mines in the Kansas City area.

Therefore, we had to employ geologists to survey the mine to determine the safety and stability relating to anything built above it on the top surface; particularly the integrity of the tower pier and its guy wire anchors.

While the geologists were completing their survey work in the mine, we contracted a survey crew to locate the tower, guy anchors and building—*both* on the surface and in the mine.

The geologists wanted to know the exact locations of the proposed top surface items as projected downward into the mine so they could pay particular attention to these areas in their evaluation.

No encouraging words

The geologists' report was delayed for more than a month even though we were doing our best to move the project forward. We finally received the geologists' report on 16 July; the evaluation was less than encouraging.

Conditions in the mine around areas of four of the six proposed guy wire anchor locations were not stable enough to be safe over the long term.

The geologists' report suggested relocating the guy anchor positions somewhat so they could be placed in areas on the top surface that were co-located with stable areas in the mine.

> *We learned that the tower would sit on top of land that had been undermined!*

To relocate the anchors, the survey crew had to do part of their work over again and reposition the four guy wire anchor points both above and below the surface.

This information was relayed to Stainless engineers along with the geologists' data and recommendations as to design criteria for the tower pier and guy foundations.

Now the final tower design could be computed that would have guy anchors spaced in a nonuniform manner, not the usual 120° spacing and various distances from the tower base.

With all these changes, the aim of the project design was still to meet Kansas City building codes and incorporate all of the geologists' recommendations.

It was becoming apparent that our choice of Stainless was a good one. So complete was their design work that Kansas City gave us the necessary building permits on 26 September, less than a week after submission of the engineering drawings!

Coinciding with our submission of drawings to the city, foundation drawings were provided to several contractors for bidding purposes on the tower pier and guy wire anchor installation.

Within two weeks we selected a local contractor and foundation drilling at the tower base locations started 14 October.

Obviously with all the delays we were getting a very late start on construction. What had been planned to be a summer construction project was looking more like a winter one.

Rains forced several delays in the tower pier and guy anchor drilling and the site became very difficult to get to, but by 26 November, all foundation work was complete.

Now came the decision on whether or not to proceed with the erection of the tower. Winter construction can be costly if very many days are lost to bad weather.

Because we wanted to get the project completed, management again determined that tower erection should move ahead.

On 1 December, a day of rain and fog, the tower crew and seven flat bed trucks loaded with steel arrived on site. Assembling of tower sections took over two weeks and the crew departed for the Christmas holidays on 18 December.

After the New Year, the crew reassembled on site 6 January. The base stub for the tower was set the following Saturday during a snow storm.

The work was completed in exactly one month and final acceptance signed off on 27 February. Only five working days were lost to bad weather!

KLSI began operation from the new site 5 March. Final work on the transmitter building and grounds are continuing to date.

Throughout construction, Stainless was on top of every detail, helping us to solve every problem that arose, many of which were unusual.

They were always responsive to questions and are helping us solve the few minor problems that have occurred beyond completion of construction.

In retrospect, we made the right decision when we accepted the Stainless bid. It has been reassuring to know we selected a company that has built more tall towers than anyone else.

Editor's note: For more information, contact Peter Starke at Stainless: 215-699-4871. The author may be reached at 816-474-6400.

Buyers Guide

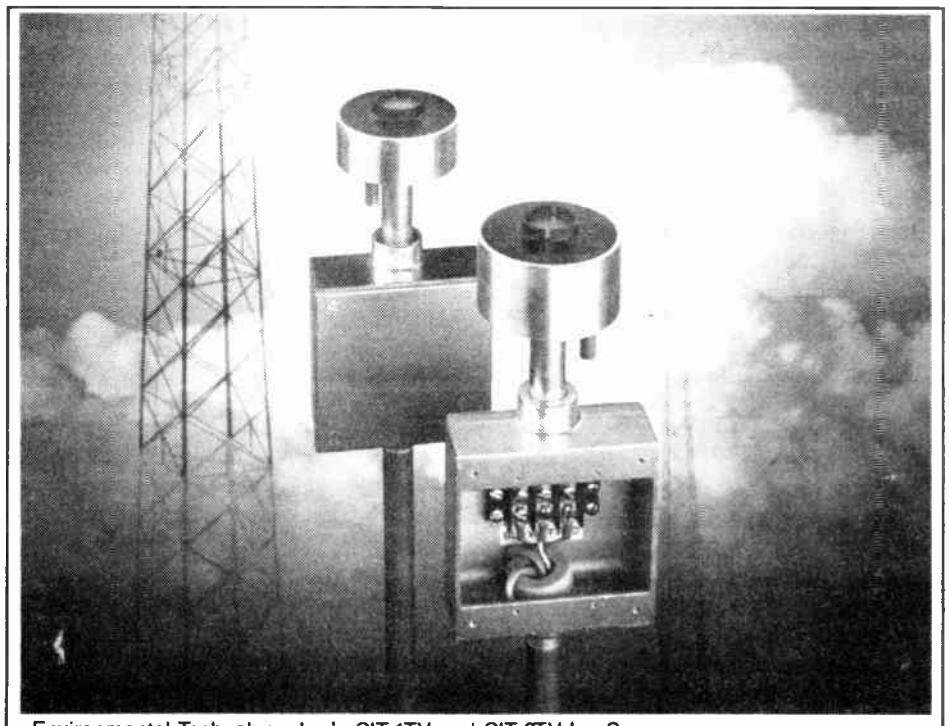
Beating the High Cost of Ice

by Thad M. Jones, PE
Environmental Technology, Inc.

South Bend IN ... Antenna icing results from a variety of meteorological conditions. It could involve clear or rime ice or a mixture of both. Clear ice is translucent and smooth, while rime ice has a rough milky white appearance.

Factors influencing icing include terrain features, antenna height and design, and wind conditions. The cooling of moist air flowing rapidly up the side of a mountain can cause icing over a wide temperature range.

Rime ice accumulates more rapidly under windy conditions. Also, wind speed and the likelihood of the antenna being in the clouds increase with antenna height. Ice susceptibility also varies with antenna electrical and mechanical design.



Environmental Technology, Inc.'s CIT-1TV and CIT-2TV Ice Sensors

Unsatisfactory solutions

Continuous operation of antenna heaters provides reliable de-icing, but at an unacceptably high cost.

For example, assuming 8¢/kWh, an 8 kW FM antenna heater costs $5,610 annually to operate. Reducing energy costs to an acceptable level requires heater control.

Manual heater operation ensures neither continued transmitter operation during icing conditions nor minimum energy cost. To maintain a consistently operating heater in advance of icing conditions is virtually impossible.

Waiting for a VSWR increase may cause a transmitter outage since it takes time for the heaters to become effective. After the icing problem, heaters are all too often forgotten and left on.

Control by thermostat results in high energy costs. For example, in South Bend a setting of 38° F causes approximately four months of heater operation, resulting in an annual power cost of around $1,870.

Using heaters only when needed

Operating heaters only during icing conditions results in the lowest operating cost. This requires detection of icing conditions as close as possible to the transmitting antenna.

Since snow seldom occurs more than 20 days during a typical winter in South Bend, de-icing costs are about $320 annually.

This figure does not include operation to remove rime ice caused by clouds but does assume 24 continuous hours of snow during each snow day.

Minimizing operating costs while ensuring transmitter operation during icing conditions imposes a number of performance requirements on the ice detector.

The tower environment requires ice detector immunity to the electromagnetic pulse from close lightning strikes and the near field of the transmitting antenna.

The high cost of tower climbing means that reliability and freedom from preventative maintenance are essential. Since tower climbers generally lack electronic training, simplicity of installation is a necessity.

The potential for icing exists at temperatures between 20 and 32° F during precipitation or in the presence of supercooled water droplets in clouds.

Reliable transmitter operation requires heater operation during and for several hours after icing conditions.

The ice detector is attached to the tower below and within approximately 75' of the center of the transmitting antenna.

There are often differences between the meteorological conditions at the antenna and at the ice detector which likely result from temperature gradients and variations in cloud coverage with altitude.

Setting temperature limits

To account for these, temperature limits for icing should extend from 0 to 40° F for most climates. The icing temperature range for climates such as coastal and southern locations extends from 20 to 38° F.

These limits take into account temperature measurement errors, including the ice detector temperature tolerance, and errors caused by thermal radiation sources such as the antenna heaters and tower lighting.

Because of meteorological differences between the antenna and ice detector, the heater should continue to be operated for several hours after icing conditions cease. This also melts any accumulated ice.

Precipitation sensitivity

The ice detector requires a precipitation sensor sensitive to all forms of precipitation including microscopic supercooled water droplets. The operating temperature range of the precipitation sensor should be 0 to 40° F.

The ice detector must activate the heaters immediately after icing conditions begin. Allowing ice to build up before starting the heaters may cause a transmitter outage due to heater warm-up time.

Remote control and monitoring of ice detector functions is often necessary, since many transmitter sites are unattended.

The CIT-1TV and CIT-2TV Ice Sensors and APS-3 Control Panel offered by Environmental Technology, Inc. serve as examples of modern engineering practice. Sensor designs inherently reject

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Panel Antennas Rediscovered

(continued from page 29)
is that people realize that panel antennas do in fact work better, and larger companies that can afford them will probably use them even if they don't multiplex," says Ray Tattershall, vice president of LDL Communications.

"I don't think that multi-station owners who've bought one panel antenna will go with any other type of antenna again," he adds.

Manufacturers say that they have received more inquiries about panel antennas at the past three NAB shows than ever before.

"The interest has become greater and we're probably participating in more panel antenna and multiplexed panel antenna opportunities," says Joe DeAngelo, product marketing manager for Harris Corporation.

Attractive characteristics

What accounts for the panel antenna trend continuing, despite the high cost and long after the effect of Docket 80-90?

Besides its superior radiation characteristics, panel antennas benefit those stations that have been plagued with interference problems.

"We're told by broadcasters using panel antennas that they (the antennas) tend to eliminate multipath, picket fencing and various other nasty things that FM broadcasters dislike," says Tattershall.

Ice tolerance is another plus for the panel antenna. "Because the broadband panel antenna is by nature a lower Q network, the ice effects are kept to a minimum," explains Shively's Harris.

Ease of servicing of the panel antenna is also very good.

"One argument against them in the past has been that there are too many connections," says Tattershall. "Of course, if you adopted that idea, you'd never fly on a 747," he adds.

If a panel antenna is struck by lightning or has other problems, Tattershall explains, repair is simply a matter of removing and replacing a component. There is no need to go off the air, or take the antenna off the tower.

And, because of its screens, the panel antenna cuts down radiation by as much as 20-25 dB. Theoretically, a person could climb a tower while the antenna is radiating (although no manufacturer I spoke with said they would try it).

Overcoming reluctance

Although the idea of combining is now readily accepted by most engineers who can easily see the advantages panel antennas have to offer, managers, say the manufacturers, are still hesitant.

> *Manufacturers say that they have received more inquiries about panel antennas than ever before.*

"They realize they have to work with their competitors and there's some front office resistance towards that," says Dick Fry, application analyst for FM for Harris.

By and large, antenna manufacturers agree that panel antennas and multiplexing are the best choices for omni- or highly directional signals.

"Technically, economically and ecologically they are a very good solution," says Tattershall. "And this is from a tower company which has mixed feelings about whether it should be promoting it or not!"

Buyers Guide

Vector Optimizes Bandwidth

by Kurt R. Gorman, CE
Vector Technology, Inc.

Doylestown PA ... With the increased use of AM stereo and the demand for higher quality audio reception, the topic of improved directional array bandwidth has become very important.

Both existing stations wanting to upgrade their facilities and brand new installations want the best possible performance that can be achieved.

This leads to the question, "What can be done with the phasing and branching equipment to optimize bandwidth?"

Let's look at an example of the typical situation faced by many broadcasters when buying a new phasor.

Buying a phasor

A station receives a construction permit to build a directional array. The pattern has been designed by the station's consulting engineer. The geometry of the array and the field ratios and phases for each antenna are known.

The next step is to supply the pattern data, interconnecting transmission line lengths and any physical size limitations to the phasor manufacturer for design and construction of the phasing equipment.

In some cases the station's consulting engineer will provide the phasor design, however, let's look at the original case where the phasor manufacturer provides the design.

Since measured tower impedance data is usually not available until the actual towers are erected, calculated theoretical values must be used in designing the phasor.

To calculate the operating parameters (relative to the base or feed point of the antenna) certain approximations must be made.

One approximation made by many engineers is that of a "transmission line" sinusoidal current distribution along the tower.

This approach may give values close enough to the "real world" numbers at the carrier frequency so that matching networks will provide proper matching, but may not give accurate frequency response values for the array.

> *The topic of improved directional array bandwidth has become very important.*

Proper modeling of the array and the associated equipment must be done to give accurate frequency response data.

Variables affect modeling

However, this technique is very difficult because there are many variables that will change, depending on the actual adjustment of the circuitry.

A few examples of these are:

- The transmission lines may not be perfectly matched. Depending upon the length of line, the electrical phase shift will vary as the loading at the terminating ends change, thus the VSWR changes.
- Coupling between coil sections in various networks will affect the impedance and the current phase shift.
- Ground losses, the physical tower and its mounting will affect tower impedance.

Low "Q" network configurations have many benefits for use in matching in terms of frequency response.

The phasor's power divider can be used to configure the system networks for optimum bandwidth, but as long as matching is maintained, many different power dividers can offer good bandwidth characteristics.

The major importance of the power divider design is such that adjustable power division is given to the array, and that low impedance, high phase networks are avoided.

Common point matching should use a full "T" network as opposed to an "L" network, since the latter has no independent adjustment of phase and impedance.

This leads to an important result: the bandwidth of the phasor system can be calculated theoretically, however after tuning these numbers may not give the optimum response.

An alternate method

There is, however, an alternative available to the broadcaster which permits adjustment of the bandwidth for optimum response.

The phasor is designed and constructed to meet theoretical values at the carrier frequency. Sideband tower impedances are computed using calculated current data, and networks are chosen for optimum bandwidth.

After the phasor is adjusted for the proper pattern impedance sweeps are made of the common point and the input to the power divider.

With this data at ±10 kHz, the common point network can be rotated to provide equal sideband resistances and equal and opposite sign sideband reactances.

This is the method used at Vector Technology, where the station or the station's consulting engineer may send the impedance data after the phasor is tuned.

Vector Technology will (at no cost) then review the common point network and propose any changes to improve the bandwidth. Vector will also work with the station or the consulting engineer to replace or "swap" components that may need to be changed.

This approach of working on the bandwidth has been very successful for various types of arrays.

Editor's note: For more information, contact the author or Melvyn Lieberman at Vector: 215-348-4100.

Buyers Guide

Dynatel Finds Cable, Saves a Job

by Paul Stewart, CE
WOR

New York NY ... When the time comes to repair those groundwires or replace a buried transmission line without going off the air, how do you locate these underground cables and wires? Perhaps, with some very careful spade work!

Replace lines without losing your job

Recently, WOR found it necessary to replace almost 2,000' of 75 ohm buried transmission line with today's standard 50 ohm direct burial transmission line.

User Report

In New York City, if you take your station off the air you must make sure that your resume is up to date.

Replacing 2,000' of 3" transmission line without interrupting the air signal means that you better know where the old transmission lines, sampling lines and any AC and control wiring are buried.

Ed Edison of Hammitt & Edison Consulting Engineers suggested the Dynatel/3M 500A Cable Locator. This system not only locates every inch of lines and cables, but can even tell you how deep they are buried.

The cable locator consists of a transmitter, a receiver and associated cables and couplers. The portable battery-powered tone set locates and traces by using either a radio frequency signal (300 kHz) or an audio frequency signal (577.5 Hz). Any cable carrying 60 Hz can be detected by using the receiver alone.

Although we purchased the 500A to precisely locate 2,000' of buried transmission lines, sampling lines and AC and control wires, it has numerous applications both in the studio and the transmission plant.

Many uses

Three methods are used in locating wires, cables or even pipes.

The power cables can be located simply by using the receiver component, which can detect the flow of the 60 Hz current. (Note: The circuit must be active with current flowing.)

The RF mode is used by coupling a 300 kHz signal to the line using the transmitter set and detecting the frequency with the portable battery-operated receiver.

In the RF High setting this mode can be used for distances up to one mile. The audio mode is used for tracing cables or wires over greater distances.

Using the lightweight portable receiver you can locate any AC wiring in the ground, in the walls, floors or ceilings by simply sweeping this hand-held unit over the area being probed.

It can be used to locate a buried AC circuit or cables and pipes carrying induced 60 Hz. And it can locate the AC wire running through the walls of your offices or studios. Both audio and visual detection are provided.

The use of a transmitter and receiver provides the capability of locating cables and wires without interrupting the ongoing service.

Telephone line tracing

A telephone line can be traced using the RF mode without "noisying up" the circuit for distances up to a mile provided no coils are involved.

The audio mode will provide tracing over greater distances and pass through coils; however, the 577.5 Hz signal is audible.

Not only will the instrument locate underground cables, wires and pipes, but it will also measure the depth below ground.

We used the cable locator to find the direct burial 3" RF transmission lines, sampling lines, AC lines and control lines. We also used it to trace out all the wiring between the transmitter building and the towers.

Our next application will be to identify each wire in a fifty wire bundle of control wires that are not color coded.

Non-invasive testing possible

The Dynatel/3M 500A Cable Locator is also very handy for checking for broken wires in your ground system. The receiver unit is equipped with a 3001 Dyna-Coupler essential for "non-invasive" testing of a circuit. It is similar to an amprobe clamp and permits induction of the audio or radio frequency test signals without breaking into the wire or cable.

You can fish around with a makeshift handle on your upside-down field meter or you can use the cable locator.

You simply unearth the edge of the ground screen around the tower, attach the 3001 Dyna-Coupler clamp around each ground wire, set the units up for RF operation (300 kHz) and trace each ground wire out with the receiver unit. Broken ground wires should be silver soldered to restore the ground system.

The Dynatel/3M 500A Cable Locator is packaged in a high-density polyethylene bright yellow case for durability and visability. The battery powered receiver unit weighs 3 lbs. and is independent of the transmitter section. The total package costs $1,420.

It will be one of the most useful pieces of test equipment in your maintenance shop.

Editor's note: For more information, call Bill Lake at Test & Measurements Systems/ 3M: 800-426-8688. The author may be reached at 212-642-4462.

Ice Sensors Cut the High Cost of Antenna De-icing

(continued from page 33)

EMI from the transmitting antenna and close proximity lightning strikes.

External lateral RF chokes and metal oxide varistors improve lightning survivability, and mean time between failure exceeds 100,000 hours.

Installation requires the connection of three wires to a terminal block and a conduit box to a ½" rigid conduit is attached. The low sensor cost allows for spare parts.

The sensors have an integral precipitation sensor and electronic thermostats with fixed settings optimized for several climates. The precipitation sensor will be sensitive to all forms of precipitation.

The operation of the antenna heater starts within 45 seconds after detection of icing conditions, and an adjustable hold-on timer keeps heaters operating for between one and five hours after icing conditions pass.

Editor's note: The Environmental Technology line is available through Allied Broadcast Equipment and Harris Corporation. The author may be reached at 219-233-1202.

WKSZ Opts for Dielectric Antenna

by Douglas W. Fearn, CE
WKSZ

Media PA ... Back in January of 1984, WKSZ installed a new Dielectric Communications DCR three-bay directionalized FM antenna, with radomes, pole-mounted on top of our 500' tower.

We are required to protect a co-channel station in Washington, DC, and we worked closely with Dielectric in developing the pattern.

We did this not only to meet the requirements of our CP but also because we did not want to compromise our coverage of metropolitan Philadelphia, 15 miles to the east of our transmitter site.

User Report

The final design uses a single horizontal parasitic element on each of the three bays.

Assembly and installation

The antenna arrived, by truck, on the scheduled day and we performed the required assembly on the ground the night before installation.

Assembly of the mounting brackets and feedline sections was required; the radomes were already installed and sealed.

Instructions were clear and the assembly was simple.

The parasitic elements had their own brackets designed to fit the mounting pole.

Installation went smoothly except for one minor bracket problem involving the matching transformer.

The tower drawings were inaccurate—Dielectric had fabricated the brackets correctly.

Fortunately, the rigging crew was able to improvise a solution, and we were soon ready to pressurize the new antenna.

The antenna is fed with 3 1/8" Cablewave Wellflex semi-flexible coaxial line. The line and antenna are pressurized with dry nitrogen.

There is a manually operated purge valve at the top of the antenna and we purged the system for about one half hour before closing the valve.

Not a leaky antenna

In the forty months the antenna has been up, the valve on the nitrogen tank has not been opened. There has been no loss in pressure.

We have two pressure gauges on the line which reassure us that the main gauge is not stuck at 3.5 psi. (Actually, the pressure does vary somewhat with temperature.)

After dealing with two previous leaky antennas, and hearing of chronic leakage problems that many stations experience, we have been delighted with the tightness of the Dielectric antenna.

Of course, some of the credit goes to Edmiston Tower Erectors for the care they put into the installation.

Initial application of power went without incident, with an acceptable VSWR of about 1.2:1. After adjustment of the matching transformer (mounted between the bottom of the antenna and the feedline), the VSWR was under 1.1:1.

Final adjustment

This adjustment required two-way communications with the rigger up at the transformer, which can be difficult because of his close proximity to the antenna.

We reduced power to about 30% (about 5 kW TPO in our case) for the adjustment period. This was for the safety of the person at the antenna.

With new rules now in effect, adjustments probably have to be done at even lower power or with a signal generator. The tuning did not take long to accomplish—just a few minutes.

Our area occasionally experiences icing conditions, so we specified the DCR with radomes.

Through several ice storms (with a half inch or more of ice reported on antennas nearby), we have had no significant increase in VSWR.

A recent inspection of the tower and antenna system found everything tight and in good shape. No rust, corrosion, or radome deterioration was reported.

Performance of this antenna has been fine. It replaced an antenna of similar design but the DCR outperforms the old antenna in every respect.

Editor's note: For more information, call Stan Thomas, VP, Broadcast Sales at Dielectric: 207-655-4555. The author may be reached at 215-565-8900.

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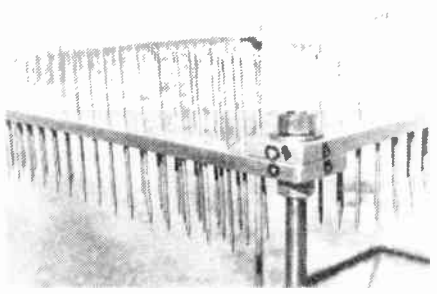
Buyers Briefs



Cortana Corp. has developed a simple, inexpensive device to eliminate the flashover from guy wire to tower that often plagues AM broadcasters.

The SC-3 discharger is easily installed by clamping it on the upper end of the guy wire. It functions by bleeding off the charge slowly by low voltage air ionization which prevents flashover.

Construction is of copper, stainless steel and aluminum. Its light weight allows installation by one person in just a few minutes each.

Cortana has also developed a tower top dissipator for lightning protection: the Crow's Nest.

Four heavy stainless steel rods flare out around the tower beacon to support the T-6 aluminum bars in which the stainless steel machine ground pointed rods are mounted.

This completely shields the beacon from lightning and discharges the upper portion of the tower and any antennas mounted thereon. With a weight of only 45 lbs. and 3 sq. ft. of windloading, the Crow's Nest can be installed on most existing towers without overload.

For more information, contact Ron Nott at Cortana: 505-325-5336, or circle Reader Service 73.

Flash Technology's ElectroFlash Beacon FTB 301 produces highly conspicuous onmidirectional flashes of white light.

Because the beacon location may involve difficult or limited access, it consists of two enclosures: a Flashhead containing the flashtube light source, and a Power Converter containing the electronic circuits which may be mounted in a more accessible location.

The Flashhead provides 20,000 ±25% effective candelas per flash during daytime and twilight, and 2,000 ±25% effective candelas per flash during nighttime, extended duration.

For more information, contact Lewis Wetzel at Flash Technology: 603-883-6500, or circle Reader Service 71.

MCG Electronics, Inc.'s Surge-Master Heavy Duty protectors shield broadcast equipment systems from lightning and transient overvoltages that can result in damage serious enough to require hours or even days of expensive downtime.

The UL listed Surge-Master acts as a buffer between the problem transients and sensitive equipment.

The first stage of protection employs high speed silicon suppression technology totally absorbing the lesser transients and the leading edge of larger transients. The second stage consists of "brute force" MOV technology which reacts rapidly to absorb the brunt of the strike.

There are three heavy duty suppression modules on each line. Front panel status monitoring indicates the exact status of the unit at all times. A resettable "Event Counter" logs the number of transients that have been suppressed.

For more information, contact Mike Coyle at MCG Electronics: 516-586-5125, or circle Reader Service 77.

Kintronic Builds KUPL Phasor

by **Larry Reid, CE**
KUPL

Portland OR ... When the KUPL transmitter site burned to the ground, all of our major transmitting equipment went with it, including the phasing equipment which melted down—cabinet and all.

This caused us to be on the air at low power and non-directional from one of our three towers.

The whole situation did little for our coverage, the morale of our AM air crew, or the insurance company which was paying business interruption coverage on a daily basis.

Quick delivery

New phasing equipment was designed by our consultants in Washington, DC, and the contract was awarded to Kintronic Laboratories, Inc.

Delivery dates on phasing equipment are necessarily long, as each directional antenna system has its own parameters and peculiarities, which require many of the components to be custom manufactured.

Kintronic managed to deliver the unit within eight weeks. In fact, the phasing equipment arrived before the building was ready for it.

User Report

If there is such a thing as a directional antenna that's enjoyable to work on, the Kintronic unit at least approaches that state.

The main controls are all front mounted and have numerical indicators. Anyone who takes the time to jot down the settings at the outset of tuning can do no worse than to be able to get back to the starting point.

There is also a built-in common point impedance bridge and current meter, which provides constant monitoring of those two parameters.

Mistaken logic

As is to be expected in any crisis condition, some problems did arise. The main unit was modified just prior to shipment, and the modification could not be applied to the ATU's which had already been delivered.

The end result was logic that didn't think straight. This was corrected by making up a right/wrong truth table for each of the contactors in each operational mode.

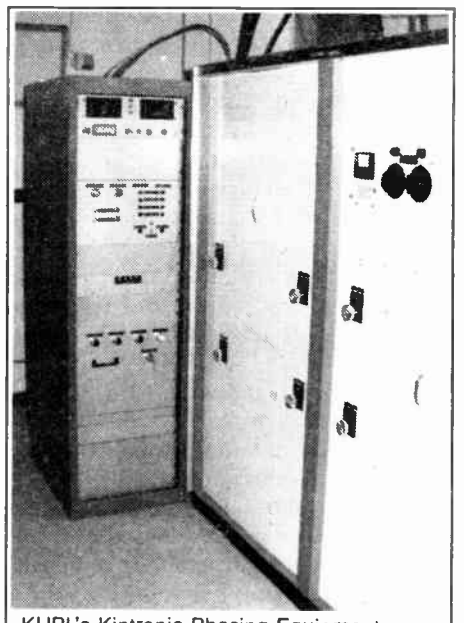
Once this was done it took one phone call to Tom King at Kintronic to solve all the logic problems. The phasing equipment was designed (and thus built) to theoretical perfection.

We were then advised to set it up to some 1979 standards which proved to be at variance with theory, so some field modification was necessary.

The proof is in the proof, but the proof has yet to be done, pending replacement and detuning of a small utility tower which lost a battle with a backhoe. Kintronic is also building the detuning network.

All in all, the only part of the previous phasing equipment that is missed is a sign that said, "Shall we call the consultant or screw it up ourselves?" One day we shall add this option.

Editor's note: For more information, contact Tom King at Kintronic Laboratories: 615-878-3141. The author may be reached at 503-297-3311.



KUPL's Kintronic Phasing Equipment

Consultants

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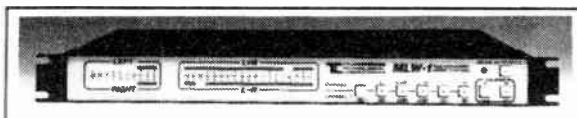
Radio World Marketplace

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



Audio router

Titus Technological Laboratories' MLW-1 automatically corrects audio problems and and automatically can bring up an alternate audio source when an error occurs.

Its microprocessor based controls make decisions before inaudibly "cross fading" the appropriate MLW-1 functions in or out of the audio chain.

In the automatic mode it will sense the loss of a channel and switch both outputs to the channel with audio, or switch in a second or third audio source. It will also bring up a second or third audio source upon loss of signal.

In the manual mode it provides the user with six modes of operation on either of the two stereo audio inputs.

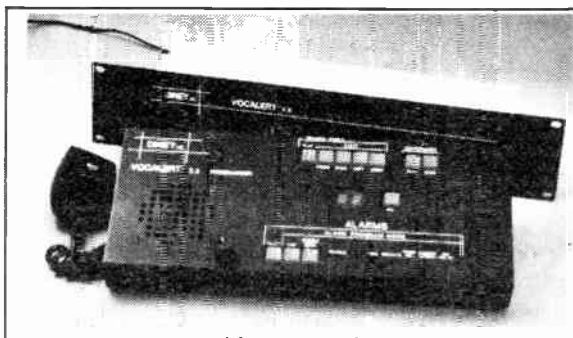
The audio inputs for each channel are balanced bridging and can be dip switch set.

For more information, call **Larry Titus at 203-633-5472,** or circle **Reader Service 65.**

Tape cartridge

Fidelipac's Dynamax Cobalt™ offers greater high frequency headroom, 50% better stereo phase uniformity, inaudible wow and flutter and long service life without user adjustments.

For more information, call **Art Constantine at 609-235-3900,** or circle **Reader Service 55.**

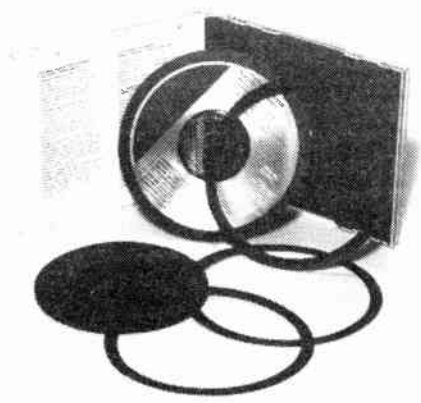


Alarm monitor

Dinet's Vocalert 2.2 is a solid state alarm annunciator which gives a clear voice report of an alarm condition. A switch connected to any of the 14 input channels will trigger a user programmed description of "what happened."

Vocalert is used in remote transmitter monitoring to give a verbal description of abnormal conditions such as low battery voltage, shelf alarm, or even a door opening. Alarm messages are stored in the permanent memory of the Vocalert.

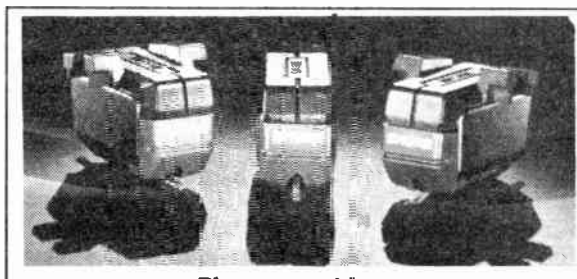
For more information, call **Paul Scott at 619-433-6406,** or circle **Reader Service 51.**



Compact disc rings

Sims Vibration Dynamics' compact disc rings use centrifugal force instead of mass loading to flatten the rotating disc and allow the laser lens to maintain accurate focus. The ring is applied permanently to the back of the compact disc.

For more information, call **Sims Vibration Dynamics at 206-867-1520,** or circle **Reader Service 60.**



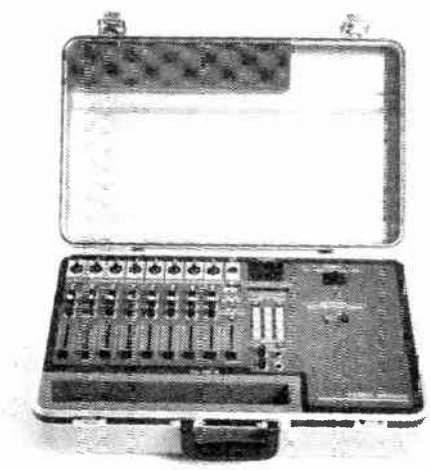
Phono cartridges

Shure Brothers' BC70, BC80 and BC90 phonograph cartridges feature a cue guard design to stablize the stylus shank and prevent it from bending or snapping when backcueing.

A high-stiffness stylus shank is used to ensure stability and longevity in heavy-duty use, and lateral stylus movement is limited by a wraparound stylus grip, which prevents accidental damage to the stylus if the tone arm is dropped on or slid across a record.

The series represents the first line of phonograph cartridges designed specifically for professional broadcast use, according to Shure.

For more information, call **Al DeGenova at 312-866-2573,** or circle **Reader Service 63.**



On-location mixer

Precision Design's remote on-location audio mixer operates on AC or DC voltages. Input consists of 8 mic or line channels with full low, mid and high EQ. Two independent headphone jacks with level adjust are provided.

For more information, call **Brian Hayashi at 206-852-5070,** or circle **Reader Service 59.**

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013	033	053	073	093
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CTR124, CTR34 and CTR14 shown

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