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Radio World®

Vol 13, No 10

Radio's Best Read Newspaper

May 24, 1989

Record Crowd Attends NAB

by Charles Taylor

Las Vegas NV Advances in digital audio and transmission were two among many hot spots of the annual NAB convention and engineering conference here, which drew a record-breaking 50,136 attendees.

The show, held 28 April through 2 May, featured more than 675 exhibitors occupying 409,000 square feet of floor space.

The only tangible glitch surrounding the event seemed to be the Las Vegas Convention Bureau's failure to obtain as many rooms from hotels as NAB requested. That, combined with a golf tournament held the same week, resulted in tight rooming and limited choice of accommodations.

Otherwise, all elements of the show—exhibit hall traffic, sales, logistics and new technology—were a smash, judging by a sampling of exhibit hall banter.

"It's been the smoothest year since I've been involved with (the convention),"

said Rick Dobson, NAB exhibits and associate membership director.

The growing practicality of digital workstations was a topic of choice for radio. On the floor, refinements in software and user friendliness were the key advances in digital audio workstations. Many new offerings were aimed specifically at the radio station market.

Much of the equipment introduced at the show combined multitrack recording, editing and digital mixing in real time. New software allowing all editing, recording and playback functions on a single screen also was displayed.

In addition to advances in audio, the future of digital transmission was another leading issue for discussion.

At a radio engineering session on the topic, Harold Walker with Pegasus Data Systems said, "The search for better sound will inevitably require the use of digital transmission methods. To accommodate these requirements, new and better techniques are required."

FCC Chairman Patrick speaks

FCC outgoing Chairman Dennis Patrick capped the convention with an all-industry speech, in which he reviewed his accomplishments and pleaded for continued progress in the future.

He urged broadcasters to continue "to speak loudly" for technical improvement, citing his administration's progress in AM service, which he hoped



A record crowd of over 50,000 saw the sights at NAB's 1989 convention. For highlights, see page 7. Photo by Don Sinez

would give AM "every possible technical opportunity to prosper in the incredibly competitive radio marketplace."

Patrick added his disapproval of translator abuse and abuses of the comparative renewal and petition to deny systems. "We've all put up with abuse of process for too long," he said.

Among those receiving recognition at the show was William Connolly, president and CEO of Sony Advanced Systems, who was honored with the Engineering Achievement award.

Speaking at the luncheon honoring

Connolly was Leonard Feldman, who has been active in the fields of high fidelity and audio engineering for more than 30 years. He advised careful study of possible inherent problems in FMX before a station adopts the system and asked broadcasters to take part in im-

(continued on page 7)

Class A's Discussed In Session

by John Gatski

Las Vegas NV Two FCC commissioners told broadcasters here at the NAB convention they are "inclined" to support a 3 kW power increase for FM Class A's on a case-by-case basis rather than across the board.

Commissioners James Quello and Patricia Dennis also said the FCC will not decide the issue until midsummer.

The commissioners' comments were in response to questions from the audience pertaining to the controversial Class A power hike proposal, including when they will take action.

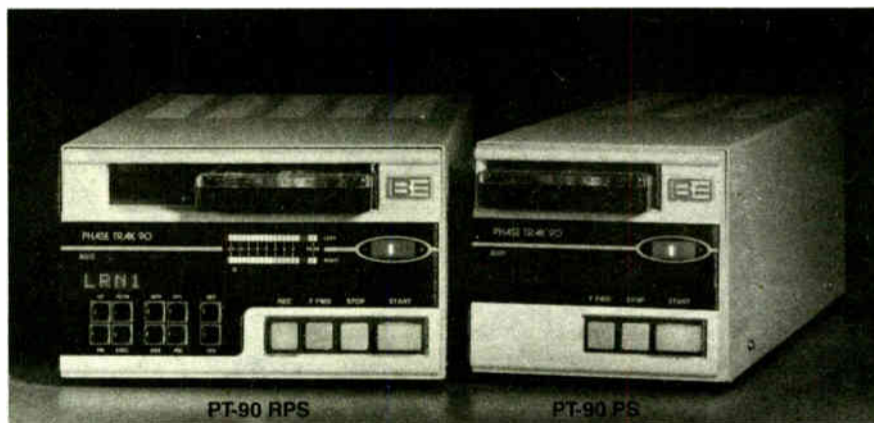
Support the NAB plan

In elaborating on the Class A proposals, Quello and Dennis said they are "inclined" to support the NAB proposal to allow Class A's to increase on a case-by-case basis based on interference concerns, rather than the New Jersey Class A Broadcasters Association proposed blanket power hike.

"I think you should be allowed to go to higher power as long as you don't interfere with other people," Quello said.

Quello said Class A's should not expect automatic power upgrades because they are, after all, licensed for lower power than Class B and Class C stations.

(continued on page 9)



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Ranger Falls From Tower And Survives

by John Gatski

Baton Rouge LA Not many people fall 180' from a radio tower and live to tell about it.

Alvin Glaze, a ranger with the Louisiana Department of Forestry and Agriculture, recently survived such a near tragedy, sustaining only cuts and bruises.

The 46-year old father of three who lives in Leesville, LA was awed by the ordeal that could easily have ended his life.

"I am much thankful," Glaze said from his hospital bed a few days after the 18 April fall. "It's a miracle that I even lived."

His boss, Louisiana's Associate Forester Bill Mercer agreed. "He had all good luck. It wasn't his time to go."

On the day he fell, Glaze, a veteran of radio tower work for the department, and another ranger were climbing the old tower to dismantle the antenna that the agency used for radio communications in Baton Rouge.

A new antenna had been placed on a taller Department of Transportation tower in town and the old one was no longer needed.

(continued on page 10)

NEWS BRIEFS

Stopping Short-Spacing

Washington DC The NAB, in a continuing effort to curtail FCC efforts to allow short-spaced FMs with directional antennas, filed a motion to stay the new policy.

This follows petitions for reconsideration from numerous groups, including NAB. Opposition focuses on issues including potential interference.

The policy is effective once the Office of Management and Budget prepares new forms required for filing, a process expected to be completed by mid-June. NAB also asked OMB to not grant the FCC's request to change the forms.

Minority Preference in Court

Washington DC The battle over FCC policy that gives

preference to minorities seeking new broadcast licenses may be headed toward further court appeal, even to the Supreme Court once again.

The US Circuit Court of Appeals for the District of Columbia in April upheld an FCC policy that gives preference to minorities seeking new broadcast licenses.

But this ruling, on a two-to-one vote, is in striking contrast

to a different panel that in March ruled on a related policy, which had allowed minorities to purchase stations at a reduced price when owners faced losing their licenses. The second ruling also was two-to-one.

Both cases are shadowed by a January Supreme Court decision that struck down a minority set-aside program, known as the Richmond case.

In the latest ruling, which involved three companies seeking a TV license in Florida, the court's majority said the Supreme Court ruling did not affect a 1984 federal appeals court

ruling that noted FCC minority preference policy was constitutional.

Observers on both sides of the issue expect further appeal to settle the differences in the rulings.

Selling the Airwaves

Fort Lauderdale FL Some AMs in South Florida have moved to formats where all 24 hours of daily air time are for sale, according to the *Fort Lauderdale News & Sun-Sentinel*.

For \$75 to \$300 an hour, theoretically anyone can play DJ, or give financial, medical or moral advice to listeners.

Stations cited by the newspaper include WVCG-AM, Coral Gables, and WLQY-AM, Hollywood.

"Where does the little guy get a chance to use the airwaves?" WVCG Sales Manager John Latzko told the paper. "They come to us, give us 300 bucks for an hour, and they go on the air and do whatever they want, within FCC limits."

On "brokered radio," listeners can hear Edward's Caribbean Rhythms show, or Kok la Chante in Creole, courtesy of the Haitian Catholic Center, for some examples. Then, there is advice on dating for singles from Dear Connie.

The stations, however, may be close to violating FCC rules. The paper reported that directors said listeners don't generally know the time is bought, which is an FCC requires the station to make known.

The Numbers

Washington DC The latest statistics from the FCC showed 10,532 AM and FM stations were on the air as of 30 April.

That figure broke down into 4950 AMs, 4192 FMs and 1390 non-commercial FMs. The report also said 1722 FM translators were operating.

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those supplied as optional items on competing products, allowing much greater creative freedom. Input channel auxiliary send sections are designed to be the most versatile in the industry, providing 4 different auxiliary buses to allow digital delay, reverb, talent foldback, and mix-minus feeds. Stereo input channels can provide either mono or stereo effects sends. Even more, the SP-6 has 4 auxiliary effects return inputs that allow effects to be recorded onto the multitrack or sent to the monitor buses.

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NRQZ to Stay Intact, FCC Says

by John Gatski

Greenbank WV The National Radio Quiet Zone in Virginia and West Virginia (NRQZ) will remain as its title suggests—quiet, according to the FCC.

The FCC dismissed a recent petition asking it to move the NRQZ, which con-

Moving the NRQZ would have allowed existing stations to open power and radiating patterns and allow a less restrictive constraint for new stations in the Shenandoah Valley in Virginia and West Virginia.

The Commission decided in March that the NRQZ should stay intact because of the continued use of other telescopes at Green Bank and a possible rebuild of the large dish.

Collapsed dish

The 15 November collapse of the 26-year old radio telescope dish, which had provided data on numerous constellation discover-

populated, elevated area in West Virginia and Virginia. The quiet zone boundaries are located 80° longitude, 30' to the west; 78° longitude, 30' to the east; 39° latitude, 15' to the north, and 37° latitude, 30' to the south.

FCC rules require all broadcasters, including AM and FM, to maintain low field strength parameters in the NRQZ to avoid any undue interference to the telescope reception.

Under the NRQZ, the observatory has the right to reject any new stations or stations that want power upgrades if they exceed the prescribed field strength limits.

Limit on area broadcasters

In arguing that the time was right for moving the NRQZ to a better area, con-

sultant Bob du Treil said the quiet zone is a hindrance to existing broadcasters in Harrisonburg and Staunton, VA and Elkins, WV.

He said existing stations have to pull back their signals in some areas to nearly one thousandth of their normal power to meet the zone's requirements.

"The constraint has become a growing problem as the population in the Shenandoah Valley has increased," du Treil said.

On the basis of a growing population and uncertainty about whether the radio telescope will be rebuilt, du Treil, Lundin and Rackley asked the Commission to move the zone and suggested the remaining smaller telescopes could be moved to a potentially quieter area such as the western US.

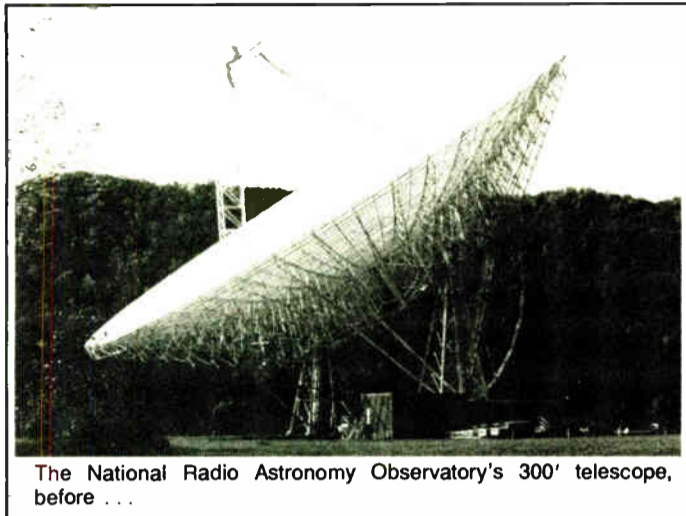
The Commission, however, dismissed the petition as it has similar ones over the last few years, citing continued use of two other radio telescopes at Green Bank and a potential rebuild of the 300' dish.

"The NRQZ is still heavily used and it would not be easy to move those other antennas," said Joe Husnay, FCC staff engineer for the Office of Engineering and Technology.

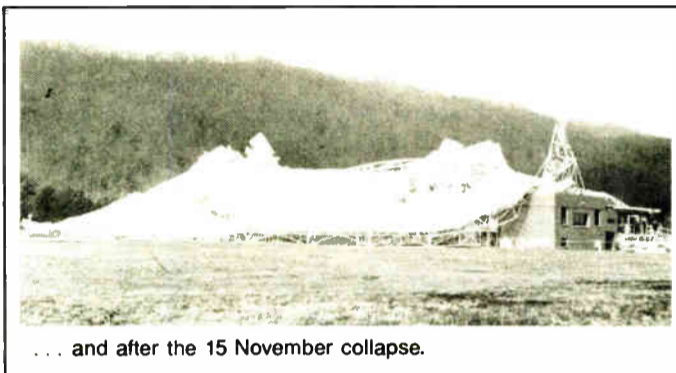
Continued use

The operating radio telescopes include the Navy's interferometer, which consists of three 85' radio telescopes, used to pinpoint exact locations of objects in the atmosphere. The observatory also uses its

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The National Radio Astronomy Observatory's 300' telescope, before . . .



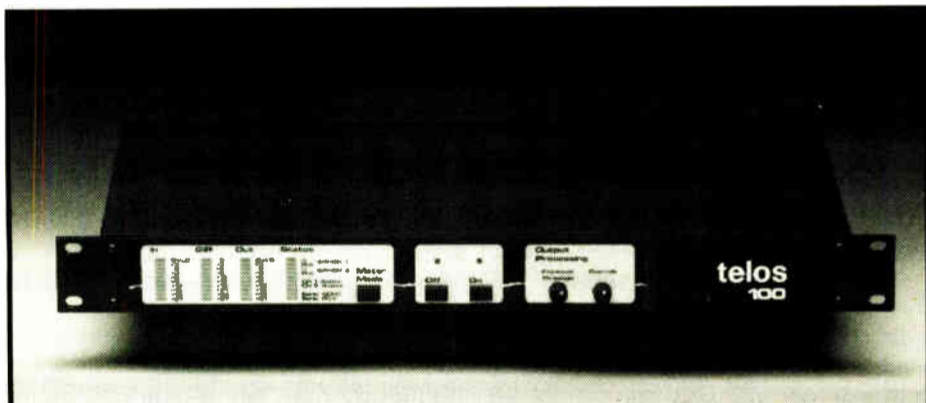
. . . and after the 15 November collapse.

tained the largest moveable radio telescope in the US until the 300' dish collapsed last November.

The radio telescope and the NRQZ is controlled by the National Radio Astronomy Observatory in Charlottesville, VA, which is funded through the National Science Foundation and Associated Universities.

ies, prompted the Washington, DC, broadcast consultant firm of du Treil, Lundin and Rackley to file a petition for modification of FCC Rules 73.1030 in January.

The rule created the NRQZ in an un-



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All This, and Champagne Too

by Judith Gross

Falls Church VA It's not a bad way to kick off five fun-filled days at the NAB show in Vegas.

The NRSC provided a bit o' the bubbly to toast the passage of a mandatory NRSC standard and to challenge receiver manufacturers to start making those radios.

NRSC chairman Charlie Morgan did the honors, popping the cork with



aplomb. By the time the last glass was emptied, everyone was toasting each other. Hey, how about champagne at ev-



ery NRSC meeting? Maybe those important compromises would be reached a lot faster.

Thought that the report submitted to the NRSC technical subgroup on composite clipping and what it does to a station's baseband was very interesting. Chuck Adams from CRL did the work on that one. Don't be surprised if it sparks mucho discussion in the months

to come.

Did I say fun-filled days at the NAB? Well, they were very full. The radio hall was more crowded than ever, and get this. Next year in Atlanta, where there is a little less room for everyone, even more exhibitors have asked for space in the radio hall.

Must be a popular place to be.

It's got a down side, though. Some radio exhibitors, feeling the squeeze, have opted for more space in the TV hall. That makes it a tad more expensive for them next year. I know of at least one company who won't be going to Radio '89 in New Orleans as a result.

By the way, where were all the radio networks at this convention? They didn't have the lavish hospitality suites we've seen over the years. In fact, it was pretty slim pickings. Could they be saving it all for the fall radio show, or maybe even (gasp!) cutting back?

Oh, and not to mention any names, but one company exec figured out that he could have taken the penthouse at Bally's instead of a booth this year.

That's right. At 1000 bucks a night it holds some 350 people, would have held the company's (it's a transmitter maker) entire booth and ended up costing less. Heck, \$1000? I know folks who dropped more than that at the blackjack tables.

One lucky one-armed bandit player did quite a bit better than that however. Betty Palmer, whose husband Mike heads up Ar-rakis, the console

manufacturer, put five nickels into a nickel slot. Daring move, Betty, but it paid off.

The rolls came up with three sevens, and the lucky Mrs. Palmer walked away with a grand total of \$1448. Way to go.

☆☆☆

The convention was also the place where the joint NAB-RAB Futures Com-

mittee unveiled its new campaign: "Radio. What would life be like without it." (No, no question mark. Grammar is not the issue here.)

It's a nifty set of promos starring the god-like voice of James Earl Jones and the music of Richie Havens. (If you have to ask me who Havens is, you're too young for me to tell you.) Now, I don't want to be too critical here. I'm very much in favor of anything that boosts radio's image.

And the idea of the radio being your friend when you're lonely and a tension-breaker at life's awkward little moments is something with which I'm personally familiar.

But the committee wants stations to air these spots to point out how bleak life would be without radio by including a segment with 30 seconds (count 'em), of silence, also known as dead air.

Okay, I get the point. But on the air, 30 seconds feels like a couple of eternities. Do they really expect stations to cut their sound for a full half minute? What if one or two stations in the market don't air them at the same time? It'd be pretty easy to zap to a different station, wouldn't it?

Ten seconds of dead air wasn't enough? Better still, why didn't the committee opt for a real radio genius to get its point across, the way similar campaigns have in the past? How about Stan Freeberg? Betcha he'd a done a dynamite job.

☆☆☆

Last issue we told you about a new combiner going onto the gargantuan Hancock Building in the Windy City for a whole batch of FM stations.

Hate to say it, but we goofed. The company which maintains the Alford System which is currently in place on the building, and has for the past 20 years, is Broadcast Services Incorporated, which was inadvertently omitted from mention in the article.

Broadcast Services worked with Dr. Alford to develop the system, which the company points out is unique and still provides high quality technical performance, even better than many systems that are popping up these days.

Didn't want to leave the impression that just because the Alford system is being replaced, it isn't still a great system.



A big mea culpa. You can call Broadcast Services Inc. at 312-869-8904 if you want to know more.

☆☆☆

Well all right, even if it was TV, I just gotta say what a delight it was that Sid Caesar showed up in person at the TV birthday party luncheon where he was inducted, along with Ernie Kovacs, into the Hall of Fame.

Loved him in the '50s (course, I was just an itty bitty tot then) and his "multilingual" luncheon speech was just what I needed to lighten up a fatiguing day of convention hoopla.

And let's face it, it was pretty gutsy for Engineering Award Luncheon speaker Len Feldman to get up there and tackle some thorny issues in his luncheon address.

There are others who, being invited by the NAB to give the keynote talk, would have taken an easier road and side-stepped controversies brewing over FMX and HDTV. But Len pointed out some tough realities, and agree with him or not, you gotta give him credit for telling it like it is.

Do you realize that next year's NAB convention in Atlanta starts a whole month earlier than this year's did? That means we've got less than 11 months until the next NAB. Don't remind me.

I'm still a little "show-shocked" from this one. But I'll continue to sort out all the rave products and give you a full rundown, including my top picks, next issue, 14 June.

Heard something interesting? Spill your guts to Earwaves. Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted 1989 edition Radio World mug.

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Boo! Hiss!

Dear RW:

In regards to Peter Hunn's proposal for an FM class "A1" (22 March, RW), I can only say "Boo! Hiss!" The real world knows the FCC has already authorized more than enough AMs and FMs in most areas.

Survival is a struggle in every market I'm aware of. This joker wants more FMs! What a hoot! If I ever pick up a sniff the FCC is entertaining such nonsense, I'll be a charter member of that big, huge noise across America who say "no way."

I know AM needs help. All constructive and progressive owners I know are interested in keeping AM viable, but not with hare-brained schemes that let guys like Hunn mess the world up more than it already is. On the other hand, maybe all he really wants to do is operate a 10 watt FM with no simulcasting and an absolutely non-commercial format.

Let me know, Peter, how serious you really are about providing a public service—convince me you're not just another one of those who are always trying to get a cheap, free ride at the expense of others.

Charlie Hargrave, GM
KSPK-FM
Walsenburg, CO

Yay! Hurray!

Dear RW:

I just wanted to let you know that Peter Hunn's proposal for an FCC rule revision would be well-received out here

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in Portland, where our college station is stuck with a carrier current AM only. We would dearly love to have an FM license, but of course, the last one was taken by KBVM, the local religious station.

If only we could get a Class "D" license to operate an FM transmitter—five mile radius is more than enough for us! We would have to fight to get the money for the necessary equipment, but at last we would have something to fight for. As things stand now, we whither on the vine as the student body listens to the clearer-sounding FM stations.

Although the focus of your article was on daytimers, I feel that the problem of small, non-profit stations who want to have a limited broadcast area in FM (i.e., 10 watts) needs to be addressed, and perhaps if your point is made, ours will be more easily made as well.

Thank Peter for his time, and if he ever decides to lobby the FCC or do anything in which we can be of any help, let me know.

John Stewart, Productions Manager
KDUP
Portland, OR

Extending LP usefulness

Dear RW:

The letter from John Sunier in your 12 April 89 edition raised some interesting points. The quality level of vinyl disc reproduction in most radio stations is appalling. This seems to stem from the attitude that the difference between professional and consumer equipment is ruggedness rather than audio quality.

This attitude has limited the ability of professional equipment to evolve toward higher audio quality, especially when teamed with the effects of the loudness wars in masking differences in quality with shrillness and compressed dynamic range.

Mr. Sunier's approach of using only the highest fidelity equipment as a means to dub vinyl discs to tape would work nicely for those stations that have a rather limited play list and/or library. Unfortunately, those are the very stations that can obtain most of their source material on compact discs. Any stations such as ours with more than ten thousand LPs in their libraries would be hard pressed to find the resources for the dubbing process.

Our approach has been to find the highest possible fidelity equipment that can be back-cued and can stand up to the ministrations of the occasional ham-handed jock. Years of experimentation both here and at other stations has led me to install Grace F9E cartridges in Sumiko tone arms, along with the best preamps we can afford. These are not moving coil cartridges, but are enough of an improvement over the usual radio station equipment to elicit unsolicited praise from listeners.

I hasten to add that I have not kept up with the state of the art in cartridges for the last two years and there might now be better equipment for the task.

There is an increase in stylus replacement cost and they are not quite as rug-

A large portion of the industry's resources have rightly been focused on solving AM's numerous difficulties over the past few years.

While this effort continues and begins to reap some results, it's not too premature to look toward the future of the FM band as well.

Preliminary findings by NRSC technical subgroups and action from the FCC, while not immediately alarming in themselves, do provide a kind of "early warning" to prevent FM from following in AM's footsteps.

The ruling allowing directional antennas for short spaced FM stations has existing stations questioning the effect new allocations will have on their signals, while the controversy over a Class A power hike continues.

The Commission also has yet to tackle the potential for problems caused by increasing use of translators.

At the same time, the use of high power boosters, and problems which may arise as they become more widespread, have yet to be fully explored.

Planning For FM's Future

In highly competitive markets, the push for greater loudness brings the threat of modulation wars and further distortion. Stations rightly wonder how much further it can go.

An NRSC technical subgroup is examining a report on composite clipping which shows erosion of a station's baseband, while a second group is struggling to find the resources to look at multipath problems in a world where higher audio quality is increasingly in demand.

In addition, new technologies such as FMX, noise blanking and diversity reception need to be studied more closely to see if the added costs are worth the benefits both to stations and receiver manufacturers.

And there is a need to encourage more research and development of technologies—including new methods of transmission—to meet the demands of a digital future.

All of these efforts will take time and cost money and may result in some hard choices for broadcasters as problems are brought to light.

But FM stations should learn a lesson from the struggles facing AM and generate the resources to solve tomorrow's problems before they become insurmountable.

The costs could be much greater if we wait.

—RW

ged as one would like (they object to being dragged across a disc), but they are the single most cost-effective improvement that you can make in your air sound. What percentage of your air time comes from vinyl discs?

One last thought. An ultrasonic stylus cleaner can extend the life of styli. Styli that sound so bad that they apparently need to be discarded can be rejuvenated by use of ultrasonics long after cleaning with brushes and alcohol or other fluids has lost effectiveness.

So don't give up on your vinyl disc collection yet. It can still yield high quality audio even without having to dub it all to tape.

R.P. Cham, Director of Engineering
Vermont Public Radio
Winooski, VT

Straightening out a mess

Dear RW:

Your story about the FCC placing applications for new broadcast facilities into a lottery could have gone a little further. The reasons exploring why the hearing process is in such a mess would be very enlightening. May I render just a few?

Buyouts! Probably the worst practice permitted by the FCC. What a great chance for speculating applicants and attorneys to make a buck. Why not go to the FCC document room and invest a few dollars at the copying machine? Re-file the original applicant's engineering and you're on your way to a possible grant and most certainly a buyout.

Selling the CP upon grant! You don't even have to build the station to make a very good profit. By abolishing the

three year rule (requiring the winner to build and operate the station for three years before permitting sale), the gamble gets even better.

Third party buyouts! This simply puts broadcasting totally out of reach of the typical broadcast aspirant. It now becomes a game for the very wealthy. Let all the applicants beat each other to death (hearing attorneys do very well in this process) and walk in with a big check as they reach financial exhaustion. Sell the CP to someone who will now have a huge debt-service to manage at the expense of local involvement.

The lottery! Voluminous applications by financially qualified (the only remaining FCC applicant criterion) speculators. Local involvement by a local broadcaster is gone because the applicant is an investor-trader.

To make the hearing process work again: eliminate the buyouts entirely. Do not allow reimbursement for expenses. Require construction of the CP and the operation for three years. Never allow third party involvement.

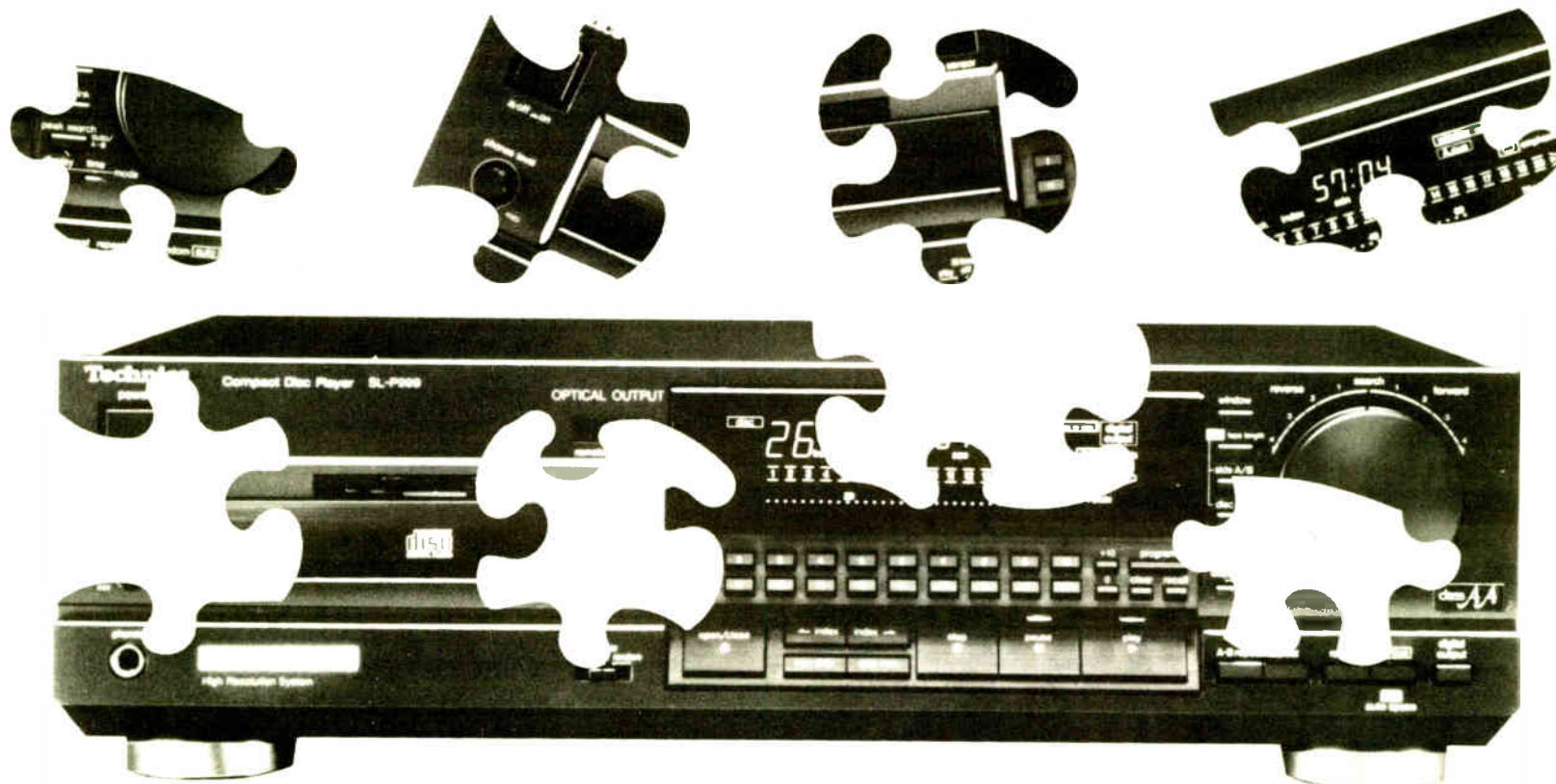
This will return the licensing process to earnest broadcast aspirants. The winners will be the public and the broadcast industry.

Lawrence J. Tighe, Jr., President
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Next Issue
RW
June 14

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NRSC Toasts RF Mask Ruling

by Alan Carter

Las Vegas NV The National Radio Systems Committee (NRSC) broke open champagne and toasted receiver manufacturers to celebrate the FCC's recent adoption of the AM RF mask standard known as NRSC-2.

There also could be more to celebrate: representatives of two receiver manufacturers, Denon and Delco, said they will have NRSC radios on the market, with Denon's possibly as early as next spring.

The NRSC, meeting here 27 April before the opening of the NAB convention, also took its first look at the FCC report and order on the rule making released that day.

While the FCC did not codify the now-voluntary NRSC preemphasis standard known as NRSC-1, members seemed satisfied the Commission accepted their recommendation that stations will be assumed in compliance with NRSC-2 until 30 June 1994 if they use NRSC-1.

The effective date of the rule making is 30 June 1990.

Cheers

"We're celebrating the result of a long, diligent effort," said Charlie Morgan, NRSC chairman and VP/Engineering of Susquehanna Broadcasting toasting his

fellow broadcasters.

"And we'd like also to toast receiver manufacturers, to say that now that we've done our part and obtained a standard, it's up to them to give us better fidelity AM radios," Morgan added.

Commission approval of the standard capped several years of development and many compromises leading to the new standard, which will eliminate second adjacent channel interference among AM stations by requiring them to "pull back" their occupied bandwidth to 10 kHz.

The FCC stopped short, however, of approving a preemphasis curve and ceiling of 75 μ seconds which comprised the NRSC-1 audio portion of the standard.

However, among the "more important" points in the report and order, the FCC recognized NRSC-1 by referring to it by its ANSI/EIA number, 549-1988, according to NRSC Coordinator Stan Salek, NAB staff engineer. This makes the preemphasis a matter of record at the FCC, he said.

Attenuation discrepancy

The report and order also set the attenuation step to begin at 10.2 kHz, rather than at 10 kHz as initially proposed. According to the Commission, there was a discrepancy between the audio attenuation required by NRSC-1 and the RF attenuation required by the early version of NRSC-2 contained in the notice in the region 10 kHz to 10.133 kHz.

The early version of NRSC-2 required an attenuation of 25 dB at 10 kHz, where the current specification makes a minor adjustment in the region 10 kHz to 10.133 kHz to account for the less attenuation required by NRSC-1.

"We believe that the most straightforward approach to eliminate this ambiguity between the two standards is simply to adjust the initial 25 dB RF attenuation step at 10.2 kHz, rather than at 10 kHz, as initially proposed," the Commission stated.

On another issue, the FCC said presumptive compliance status of a station would be void if the Commission receives interference complaints and technical evidence by a spectrum analyzer. The station would then be required to make its own measurements and take corrective action.

NRSC members readily admitted action now must focus on implementation of a deemphasis curve by receiver manufacturers and the design of higher fidelity AM radios.

Electronic Industries Association (EIA)

held discussions in Japan on the issue, thought recommendations could be made by the summer Consumer Electronics Show in 1990.

While Delco officials said the company would have NRSC in top-of-the-line models, they gave no target date. Denon, however, committed to 1990, possibly in the spring for home and automobile models.

FM progress

In other NRSC work, the FM subgroup is proceeding with study in two areas.



The National Radio Systems Committee met just prior to the NAB convention, to review the FCC's recent ruling on the AM RF mask.

NAB Show

(continued from page 1)

proving AM by adhering to the NRSC standard.

Without radio

Also at the show, a new advertising campaign for radio was unveiled with the theme, "Radio. What would life be without it?"

To launch the \$100 million campaign, the NAB and Radio Advertising Bureau (RAB) hope to band together all commercial stations and networks nationwide 26 May at 7:42 AM to air a two-minute spot narrated by James Earl Jones that includes 30 seconds of silence to emphasize radio's prominence in everyone's life.

Goals of the campaign, according to RAB, are to increase awareness and appreciation of radio's role among opinion leaders and the general public, to raise professional commitment within the radio industry and to increase radio's share of overall advertising dollars.

While the floor was still being swept from this year's convention, plans for the 1990 NAB show had already been firmly established. Next April, as the Las Vegas Convention Center undergoes extensive renovation, Atlanta will host the NAB show.

The location will mark only the third time in the past eight years that NAB has strayed from Las Vegas, and its first visit to Atlanta.

The location might bring new challenges to conventioners, because the city's Georgia World Congress Center is in a compact area that does not have the free parking and abundance of hotel space available in Las Vegas.

But Dobson noted that the center will offer 420,000 square feet of exhibit space. That figure surpasses by 8000 square feet the floor space available at this year's conference—so far, NAB's biggest ever.

Engineering Director George Hanover said his organization has alerted members to the FCC action on NRSC.

He also noted EIA is working with NAB to develop a certification mark to signify improved radios; among the specifications of such a mark could be the NRSC.

But Hanover was quick to point out that equipping radios to receive NRSC should not be tied to the certification mark because it could be years before the mark could be approved.

EIA and NAB officials will meet 11 July on certification mark issues. NAB Science and Technology VP Michael Rau, who has worked on the mark and

One group is studying multipath, and is planning to conduct field tests at WAEB-FM in Allentown, PA, in June. WAEB CE Harry Simons, a coordinator of the project, said the working group needs additional help because it does not have a budget to rent or buy equipment.

The second group is to study occupied bandwidth for FM, much the same way NRSC began its work in AM.

A first study by Chuck Adams of CRL looked at the effects of modulation and composite clipping.

The next meeting of the full NRSC is 6 June at the summer CES show in Chicago.

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FMX Unharmmed By Study

by John Gatski

Las Vegas NV Although FMX's developers believe the sting of the Bose Corp.'s critical report on the technology has worn off, potential manufacturers attending NAB said there has been little demand for FMX generators.

"There is zero interest," said Apex Systems President Marvin Caesar, who noted he has decided not to make FMX generators in the foreseeable future.

Apex Systems Sales Man-

ager Arnie Christensen said the market has not yet established itself and there are no indications when that will happen.

"We are not interested in it at this point in time," he said.

Other companies have expressed cautious interest in FMX if stations start demanding it.

Circuit Research Labs (CRL) offers its FMX demodulator but not the compressor, in its SG-800A generator.

"We are pretty interested,"

CRL Engineering Manager Chuck Adams said, "but we have to see some market interest."

Orban Associates President Bob Orban said his company is still interested in producing FMX generators, but he did not give a time frame when manufacture and sale would begin.

One FMX manufacturer

Currently, only Inovonics Inc. makes FMX generators, which are operating in about 100 stations across the country.



Consultant Tom Keller stands at the FMX booth in the Convention Center.

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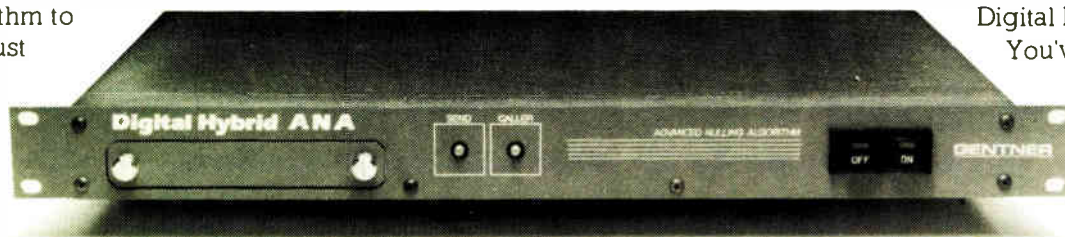
The Digital Hybrid ANA's flawless performance makes the caller sound as if he's right next to you...and your listeners. And, your on-air staff will love the way they sound. The high quality interaction between caller and talent will also strengthen the natural flow of conversation.

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World Radio History

It received its license to produce them from Broadcast Technology Partners Ltd., the developer of the technology.

At a press conference held at NAB, BTP President Emil Torick, co-creator, admitted manufacturers have not flocked to the technology, but said interest is starting to build on a larger level.

He said FMX is just starting to be promoted by broadcasters and manufacturers.

Sprague Semiconductors is ready to introduce an FMX chip for receivers and Denon's home receiver should go on the market soon, he said.

For the manufacturers, "I think it is a question of when to enter the market," Torick said. "There are a lot of overseas manufacturers also interested."

Bose report impact

Some manufacturers at NAB said they were not sure whether the controversial Bose/MIT report, which was released 25 January, had had an impact on station interest in FMX.

Dr. Amar Bose is an engineering professor at MIT and chairman of the board of the Bose Corporation, which makes high end auto stereo systems with Delco, Acura and other companies, as well as high end home audio speakers.

The Bose report claimed FMX aggravates multipath problems on FM, no matter whether the receiver is in stereo or mono, and increases noise and distortion.

Although it has been suggested that MIT did not actually support the research, the lab research was conducted at MIT facilities, using MIT graduate students and an MIT copyright was affixed to the test report, according to Bose.

BTP defended the technology, asserting that the Bose report was not conducted under real world conditions and used defective equipment.

There also was speculation that Bose was working on an alternative system, which he has denied.

Leonard Feldman, a well known, respected reviewer of (continued on next page)

Bose Study Has Little Effect

(continued from previous page)

consumer audio equipment, addressed FMX and the Bose report in an NAB engineering luncheon speech.

Feldman was the keynote speaker at the NAB-sponsored Engineering Achievement luncheon. NAB is a limited partner in BTP and thus maintains an interest in the promotion of the system.

Feldman, however, took the opportunity to say he believes the Bose report appeared correct in its mathematical assertions. But he suggested that station engineers conduct their own tests before making a decision about whether the technology will enhance their transmissions.

Some manufacturers are uncertain about their course of action because of the Bose report controversy.

"We are set ... to do FMX on our Model 400 CAT/LINK, but we don't want to get involved in the middle of something political that we don't understand,"

Quality Engineering Innovation (QEI) Senior VP Bill Hoetzel said.

On the other hand, Inovonics President Jim Wood said the Bose report has not stymied demand for demonstration requests for the product, which is the initial step the company takes before letting a station choose whether to make a purchase.

Defending FMX

"There is almost no effect," Wood said. "We have only a few people asking about the Bose report. I think people realize it was more politically motivated than technology motivated."

He said interest has remained strong enough for the company to introduce a new FM stereo/FMX generator, Model 706 at NAB.

It was added to the Inovonics line as an upscale alternative to the Inovonics Model 705 and some of the new features include internal metering, which allows

for setup and performance evaluation from the units without separate test equipment. It also offers remote input for mono switching and FMX on/off function.

Wood noted that Sweden and other European and Far East broadcasters have expressed interest in FMX and are not worried by the Bose report.

Torick, co-inventor Tom Keller and other FMX proponents remain curious over Bose's motivation for doing the FMX tests.

FMX works

Broadcast consultant Renville McMann, a former Engineering Achievement Award recipient, expressed support for the FMX system. McMann said he has "no reservations" about the stereo and noise improvements FMX can make to FM.

He also said the noise that Bose claimed was multipath was actually

caused by synchronous AM. "Bose missed the point," McMann said.

McMann said he is also baffled by Bose's decision to hold a large press conference in order to denounce the technology without first having tried to work with BTP if he believed there was a problem with FMX.

In March, Bose staffer and researcher William Short said that the noise and distortion encountered during the tests was not synchronous AM and that an attempt was made to contact BTP about the multipath problems encountered in the test.

In other FMX news, Torick said WBBM-FM in Chicago, one of several CBS O&O stations using FMX, is still looking to put its FMX generator back on the air.

The station shut off the generator earlier this year when it was discovered that noise and distortion had increased on cheaper quality radio receivers, according to CBS.

BTP said the trouble stems from a synchronization problem with a 57 kHz data paging subcarrier the station broadcasts and has nothing to do with what Bose said about FMX.

"They have it ironed out, but they have not implemented it," Torick said.

For information contact, Emil Torick at 203-622-2643; Wrenville McMann, 203-966-0157; Jim Wood, 408-458-0552; Chuck Adams, 602-438-0888; Bob Orban 415-957-1067; Bill Hoetzel, 609-728-2020, and Marvin Caesar and Arnie Christensen, both at 818-765-2212.

Session Touches on Class A Fray

(continued from page 1)

"Remember, they didn't buy higher power," Quello said. "When they apply for higher power, no one promises them gold at the end of the rainbow."

Careful consideration

Dennis said both proposals are under careful consideration, but the NAB proposal seems more reasonable.

"Although both sides have made very good arguments, I am more inclined to do it on a case-by-case basis because of the increased concern about interference on the FM side," Dennis said.

FCC Mass Media Bureau Chief Alex Felker pointed out that the Commission is not considering the exact New Jersey plan, but a modified version.

"The so-called

grandfathered short-spaced A stations, especially in the Northeast and also in Southern California, would not be allowed to go up in power" under the proposal, Felker said.

Dennis said the Commission is waiting for the two vacant seats to be filled and a new chairman to be appointed before making a decision.

President Bush is searching for candi-

dates to fill the open slots. Chairman Dennis Patrick on 4 April announced his resignation effective on the confirmation of a replacement. The two other positions have been vacant for nearly two years.



FCC Commissioners Patricia Diaz Dennis (left) and James Quello discuss the arguments presented in the Class A controversy.

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Ranger Survives Fall

(continued from page 1)

Glaze said he climbed to the top of the tower to begin dismantling the antenna. His safety strap, tool belt and a 200' rope with a small pulley to lower the pieces back to two men on the ground were attached to his waist.

According to Mercer, the two crew members on the ground looked up just as Glaze slipped from the top of the tower.

The crew members told him, Mercer said, that Glaze fell backwards 10' onto one of seven sets of guy cables, which he somehow grabbed. With his hands, Glaze rode the cable about 40' before he let go, probably from pain.

Glaze then free-fell several more feet, landing on another set of guy cables. He grabbed at them, managing to get his hands and one leg hooked onto them as he slid toward the ground.

He ended the traumatic descent when he barely nudged the roof of a nearby building, which the cables crossed. He came to a bouncing stop, snagged on the cables and ended hanging upside down just a few feet from the ground.

Glaze suffered numerous abrasions, a lot of cuts to his arms, hands and leg, which required stitches, but no broken bones.

"They said it looked like a swan dive," Glaze said.

He said his memory of the fall is vague, and he is uncertain what led to

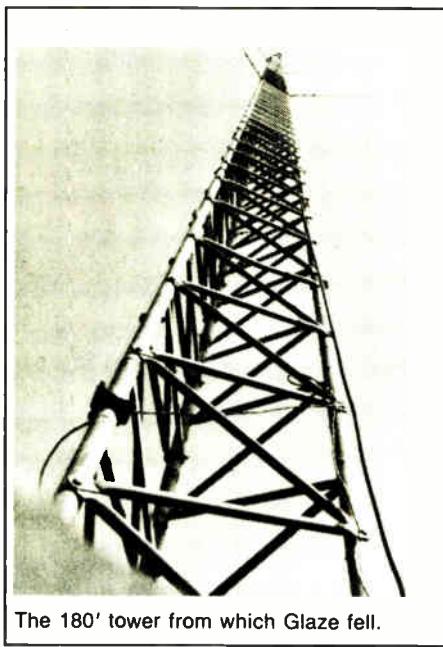
the accident.

Glaze offered a speculative explanation. "Apparently, I wrapped the safety strap around something that was not secure, or I thought I wrapped it around the tower, but missed."

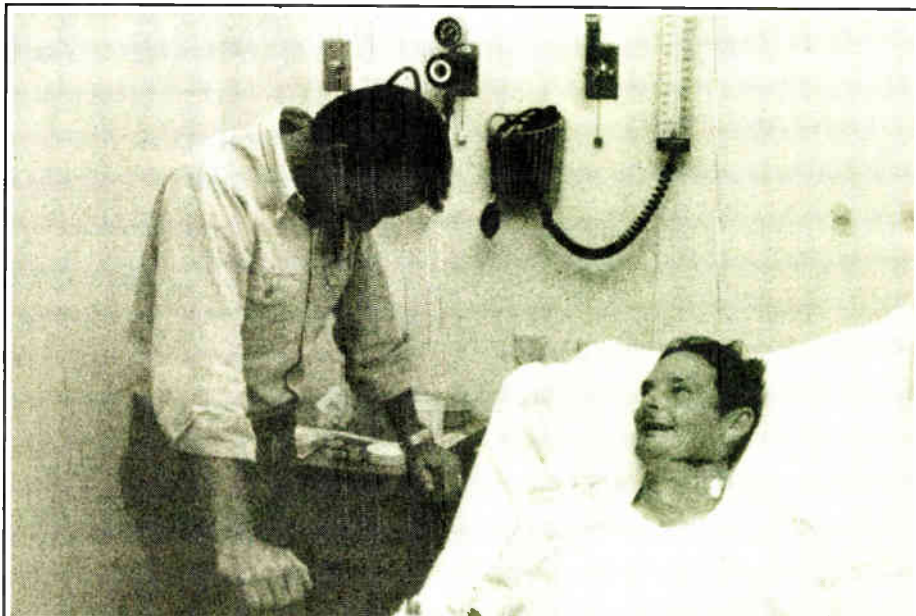
Mercer said a subsequent investigation found no broken structures in the area of the tower from where Glaze fell.

Glaze said his initial fall may have been broken when the tool hook on his belt snagged the guy cables just long enough to get his hands around them.

Glaze said he has had some close calls



The 180' tower from which Glaze fell.



In recovery, Alvin Glaze (right) shares a moment with a friend, Dave Singleton.

during his 23 years with the department. For 19 of those years, he has climbed radio towers to perform periodic maintenance, antenna replacement or repair.

"I guess everyone who works on them has close calls," he said. "This was the worst for me."

During his four-day hospital stay, Glaze said the seriousness of what happened started to dawn on him and he realized that only because of an ex-

remely fortunate series of events had he escaped with his life.

"I still can't believe sometimes I am actually living," he added.

Glaze said he asked his superiors not to tear down the tower until he gets well enough to finish the job. He thinks it will be good therapy, making him less likely to develop a fear of heights.

"I want to go back up and tear it down," he said.

Engineers Surveyed

by John Gatski

Stillwater OK A radio or TV engineer's decision to pursue technical on-the-job training may depend on whether the station has a tuition reimbursement policy, according to a recent survey of 93 engineers in Oklahoma.

In addition to statistical data, the survey also classified the engineers into several groups based on common answers.

The survey was conducted in 1988 by John Griffin, a media consultant and researcher who undertook the project for his master's degree thesis at Oklahoma State University.

Of the 110 radio and TV engineers surveyed, 93 provided enough responses for analysis—about half of them are in radio. Of the radio engineers, 14% worked for FM stations, 5% for AM stations and 27% for combos. In total, 80% of the respondents worked full time, 11% parttime and 6% were contractors.

Although the survey was conducted in Oklahoma, Griffin maintained that some of the trends, especially the group categories, could apply to engineers nationwide.

With regard to education, the survey noted that 35% of those who worked for employers with a tuition policy attended an NAB technical conference in 1988.

Fewer attend conferences

In contrast, only 7% of those who worked for an employer without a tuition policy attended.

According to the survey, the results were similar for attendance at SBE technical conferences.

Overall, 72% of engineers responding said their employers did not have a tuition policy, while 25% said their employers had such a policy.

NAB Science and Technology VP Michael Rau said the survey is interest-

ing, but he warned against making generalizations based on its responses.

"I would be careful applying it nationwide because it came only from Oklahoma," he said.

Rau said its results would hold up better if it had been undertaken in a few other states in different regions of the country.

The survey also addressed other educational issues facing broadcast engineers including a preference for practical experience over college studies.

However, the survey noted that many of those questioned acknowledged a need for some advanced and specialized skills not available through practical experience exclusively.

Writing skills

Most engineers rated written communication skills an important necessity. A smaller number expressed concern that engineers are not learning "people skills," or skills that are needed to get along with others.

From the survey information, Griffin categorized the engineers into several groups.

Among those for radio engineers is the "action-oriented" engineer who is mainly involved in day-to-day operations and maintenance. This engineer believes he or she is underpaid, left out of the overall planning at his or her station and lacks many advanced and specialized skills.

The "action-oriented" engineer values practical experience over college training and is "thrilled" by the rapid pace of broadcasting, according to Griffin.

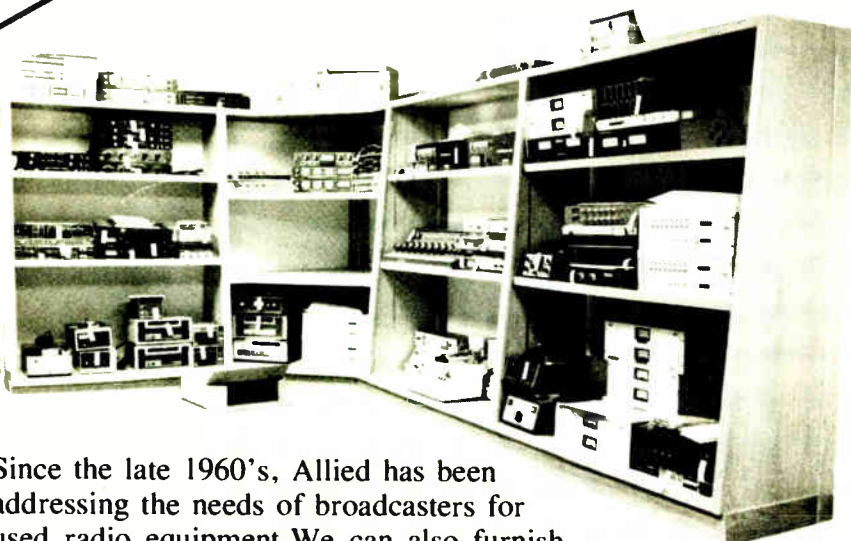
The "rural technician" engineer is primarily a radio engineer who feels geographically isolated and believes he or she needs more technical skills, the survey said.

This engineer, according to the survey, would like more formal education and

(continued on page 13)

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Good Marketing To The Letter

by John M. Cummuta

Downers Grove IL Letters are funny things. Some have clinched million-dollar deals, some have fertilized true love, most have kept garbage men in business for hundreds of years.

In other words, good ones deliver good results. Bad ones waste the trees that made the paper.

If you're trying to build a successful business as an engineering consultant, you need to be an effective letter writer.

It can get you new business and save the clients you've already developed. Being able to write effective sales letters will put dollars in your pocket.

From people to people

When I was managing stations I frequently had the privilege of helping on-air talent develop their skills. One of the most common mistakes made by novices (and some not-so-novices) was that they looked at their audience as a group, rather than as individuals.

So, they tended to do their shows as if they were on a stage, talking to a large crowd. The problem was one of percep-

tion, because the "audience" was really composed mostly of singular people, listening by themselves.

That's the way people read your letters, even if you're sending the same letter to every station manager in America. Write to one person.

ENGINEERING MANAGER

Once you've got your audience in mind—be yourself. Don't try to write in business language or tech-talk. Just be you saying, "Hi . . . I keep stations like yours running at peak efficiency—cheap," or

whatever your message is.

Write pretty much like you talk, correcting for inaccurate grammar. Your reader will feel more comfortable with someone who sounds comfortable being who they are.

Don't just tell—sell

Tell your readers what you can do for them. Don't waste a lot of space reciting your accomplishments or qualifications. That stuff can go at the end where you will simply be backing up the claims you made at the front of the letter.

Sell copy is loaded with benefits for the reader. Remember: everybody's favorite radio station is WIIFM: "What's In

It For Me?"

A good exercise to go through before writing is to become your typical reader, in your mind. In other words, you want to get a first-hand feeling for your target person's needs and problems. That way you will slant your letter to sell benefits that meet their needs rather than yours.

Remember that you tend to think in technical terms about a station's performance, whereas the manager tends to think in financial terms.

To effectively sell your service to that manager, you're going to have to position your benefits in financial terms too. That way your services will seem less like costs and more like investments.

USP stands for Unique Selling Proposition (continued on page 30)

Quiet Zone

(continued from page 3)

other 140' fixed radio telescope, according to the National Science Foundation.

More than 150 researchers from 40 universities were using data collected from the 300' antenna at the time it collapsed.

According to Kurt Riegel, head of the National Science Foundation's National Astronomy Center, the possibility of rebuilding the 300' dish is still in the discussion stage.

He said a new structure with the latest technology would cost about \$75 million. The original dish was built for \$1 million in 1962.

du Treil, however, said he believes rebuilding the antenna at Green Bank would be a mistake. "If they are going to build such a monster, it should be put in a more rural area," he said.

For information, contact Bob du Treil at 202-223-6700; Joe Husnay at 202-653-8114, or Kurt Riegel at 202-357-9696.

Engineers

(continued from page 10)

technical training.

The "rural technician" often has a bleak outlook on the future because smaller, rural stations usually pay the least, Griffin said.

Griffin also identified what he called the "people-oriented" engineer, who usually works for a large- to medium-market station. Like the "action-oriented," this engineer wants more training in advanced and specialized skills but also believes in a balance of formal education and hands-on experience.

Of all groups, this one feels strongest that engineers fail to learn adequate skills to get along with others.

Griffin attributed his high number of survey respondents to personal visits to many stations and placing the survey in the Oklahoma SBE newsletter.

For information about the survey, contact John Griffin at 405-377-3666.

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Reading a Topographic Map

by Thomas L. Vernon

Harrisburg PA It's surprising how some of the things we learn in school pay off in later years in ways we never would have expected. For instance, many of the courses I took in geology as an undergraduate have helped me in my electronics and contract engineering work.

How? For one thing, the knowledge of how to read and interpret topographic maps has proven to be quite valuable.

Topographic maps offer a wealth of information to the engineer who understands them. They're useful in locating monitor points for field strength readings, STL site surveys and determining locations for uplinks and downlinks. Accurate station coverage maps can be a

useful tool for the sales force.

Other lines aren't marked, but you can find the elevation by counting up or down from the index line and multiplying by the contour interval.

On 7½ minute maps this interval is usually 20 feet. You can determine the height of a point between contour lines by interpolation. For instance, if you're at a point halfway between 580' and 600', the point would probably be 590'.

When an STL installation is being planned, and the distance between the transmitter and receiver is more than a few miles, you must plot a topographic profile of the area, which will reveal potential obstructions and indicate the minimum acceptable antenna height.

First, find the exact location of both points on a 7½ minute map. If the points are on adjacent maps, fold back the white margin of one map and join the

STATION SKETCHES

useful tool for the sales force.

This month's column looks at map scales, contour lines, determining elevation, and construction of a topographic profile.

Topographic maps offer a wealth of information to the engineer who understands them.

Map scales

Topographic maps come in several

scales, each offering advantages and disadvantages, depending on the application. Scale is expressed as a ratio, for example 1:24,000. This would indicate that one unit on the map equals 24,000 of such units on the ground. These units can be inches, feet or miles.

The larger the scale, the more detail is shown, but a smaller area is covered on a given sized map. Conversely, smaller scale maps show a larger area, but with less detail.

Large scale maps such as 1:24,000 are useful for locating earth stations, doing STL site surveys, and finding monitor points. These are commonly known as 7½ minute quadrangle maps and are the most frequently used series for broadcast work. Each quadrangle has a name, and the names of adjacent quadrangles are printed on the margins of the map.

Intermediate-scale maps are available in scales of 1:50,000 and 1:100,000. On the latter scale, one inch represents more than 1.5 miles and these maps cover 1145 to 2167 square miles. Such maps enable you to plot the coverage area of higher powered stations without covering a wall with dozens of 7½ minute maps taped together.

Small-scale maps come in three scales: 1:250,000, 1:500,000 and 1:1,000,000. These can cover over 8500 square miles and are generally not used by broadcast engineers.

Reading contours

In addition to showing detail on a horizontal scale, these maps also accurately plot vertical elevations by means of contour lines, which show areas of equal elevation.

Lines spaced far apart indicate land that is relatively flat. Lines spaced close

together indicate steep slopes. On 7½ minute maps, every fifth contour line is printed darker and marked with elevation above sea level.

Other lines aren't marked, but you can find the elevation by counting up or down from the index line and multiplying by the contour interval.

On 7½ minute maps this interval is usually 20 feet. You can determine the height of a point between contour lines by interpolation. For instance, if you're at a point halfway between 580' and 600', the point would probably be 590'.

When an STL installation is being planned, and the distance between the transmitter and receiver is more than a few miles, you must plot a topographic profile of the area, which will reveal potential obstructions and indicate the minimum acceptable antenna height.

First, find the exact location of both points on a 7½ minute map. If the points are on adjacent maps, fold back the white margin of one map and join the

Topographic maps offer a wealth of information to the engineer who understands them.

two together.

Put a strip of paper between the two points and mark on it the elevation at one mile intervals, including the highest and lowest points.

This information can now be transferred to an earth radius paper, as shown in Figure 1.

STL considerations

This is also a good time to note the exact coordinates of your STL transmit and receive sites, as well as the exact distance between them.

With a protractor, you can now also determine the azimuth of your transmitting antenna, as measured clockwise from true north as zero. All of this information is required by the Commission for STL license applications.

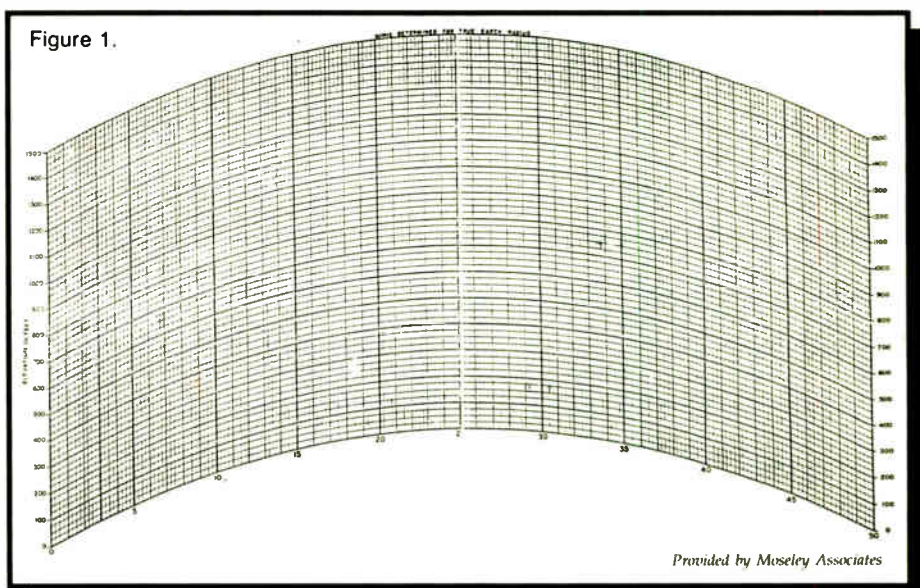
For accurate STL path calculations, the vertical profile is plotted on a special 4/3 earth radius paper. This is necessary because radio waves don't travel in straight lines; rather, they're bent slightly towards the face of the earth by the troposphere.

For this reason, the "radio horizon" is about 30% longer than the visual horizon; thus the need for special paper.

You can obtain this paper from suppliers of STL equipment, such as Moseley or TFT. For short distances, you may want to convert linear graph paper to earth radius paper. Usually you would use paper with 10 squares to the inch.

The curve is determined by the formula $h = 0.5d^2$, where h is the height of the curve and d is half the distance between the two points. For example, a 30 mile path would be: $h = 0.5 \times 15^2 = 112.5$ feet.

After all the points have been plotted and connected with a smooth line, the



Fresnel zone calculations may be performed.

You can obtain topographic maps through the mail, or over the counter at some stores. For more information, you also can write to the Map Information Office, US Geological Survey, Washington, DC 20242.

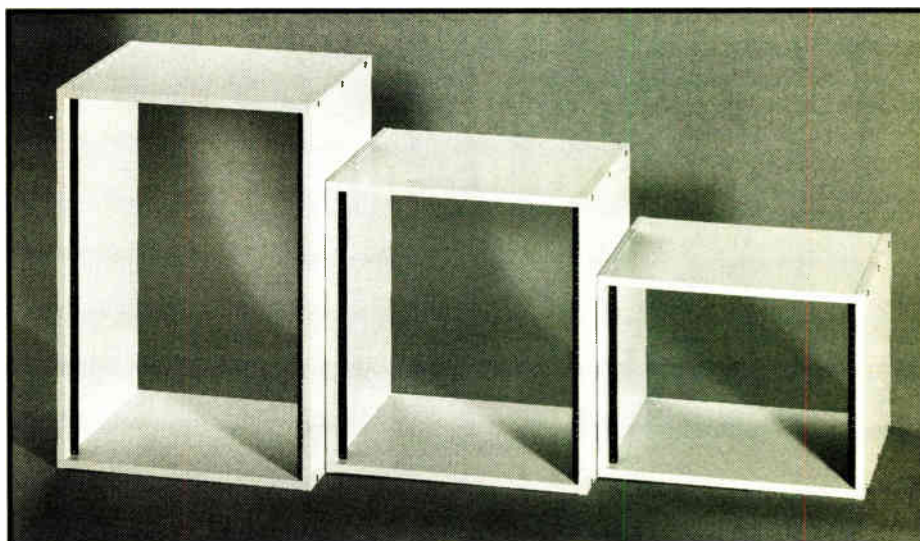
Ask them for an index to the topographic maps for your state, as well as a booklet explaining symbols used on USGS maps. Both are free.

Plotting and retrieving lots of geographic coordinates can be a very tedi-

ous and error-prone activity. There are some computer programs to do much of this work for you. You may want to dial into some of the broadcast bulletin boards for more information.

If you need more information on setting up STL equipment, application notes are available free of charge from Moseley Associates and TFT.

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



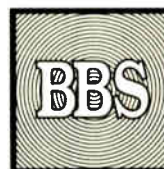
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Where Service and Engineering Make The Difference

Setting Up a Board For Special Effects

by Bill Higgs

Louisville KY Several months ago, I shared from my "collection" of tips and techniques for troubleshooting. Here are a few other ideas that may save you time and money in the production room.

A couple of years ago, my station obtained a special effects unit. This little digital gizmo is amazing: clean audio becomes little ones and zeros and then turns into echo, reverb or what have you.

It is installed in a side chain in a Yamaha production console, which allows for various mixing schemes.

Many smaller stations are still using on-air type consoles in their production rooms—often the former main studio board. More than likely, these units were never intended for side chains, submixing, mix-minus, or any of the niceties that we take for granted today.

It may be easier than you think to add a special effects unit to your existing board. In most cases, only the microphone signal need be altered.

Using the channel key

Most modern effects units have a relatively high impedance input sensitive to

about -10dB level, so their inputs can simply be placed across the output of the board's microphone preamplifier immediately after the fader.

In most consoles, the channel key is the easiest place to get to this point. Since this normally is an unbalanced stage, consult the effect box manual for connection instructions.

Those devices having high impedance balanced inputs can easily be used with external preamplifiers by bridging them across the preamp output.

The problem now becomes how to get the processed signal back into the board. If an unused channel is available, it can be used. The channel fader will now control the effect depth.

If no spare channel can be had, terminate the output of the effects processor at the ends of a 500 ohm audio-taper potentiometer. Ground the counterclockwise end. Couple the wiper to the console mixing bus with a 10 K resistor (use two resistors for stereo) and you're in business.

Because you will be unbalanced (electrically, not mentally!), follow the instructions for your unit for single-ended output.

Incidentally, this trick is a quick and dirty way to add "just one more" input to a console. If you need it, add a single-throw switch between the resistor and the mix bus for a channel key. Dual pots are available if you need stereo.

Equalization and reverb

Need to add a graphic equalizer? Most hi-fi type graphics can be added between the console's mixing amp and the line amp. This way, all of the monitor circuits will follow the EQ. If the stage is direct coupled, add a 100 ufd capacitor at the inputs and outputs.

I have used this trick successfully on several consoles, including Ramko and LPB. Be careful if you try it with a McMartin; some of these boards use over 100 volts on the transistors! Use the capacitors and find one rated at least 250 volts in order to handle spikes.

BOTTOMLINE BROADCASTER

Let's talk about reverb for a moment. As wonderful as the digital boxes are, they may be out of financial reach for many small stations struggling on a very limited budget. There are several ways of skinning this particular cat, and it is worth noting that mechanical plates are still in demand at recording studios.

One inexpensive method of achieving a reverb effect is to place a speaker and microphone in a quiet unused room. Feed the speaker from an amplifier off the mic preamp as noted above and branch the microphone back into an unused mic channel.

In some cases, an existing monitor speaker can be used in a studio with muting disabled. Reverb will depend upon the size of the room and its shape, but a little experimentation can some-

times produce an acceptable effect. Stairwells work well for this, too—experiment!

For those without access to large spaces, I recall an article in an old electronics magazine about a reverb unit made from a garden hose! Honest! A speaker fed a funnel on one end and a small dynamic microphone was mounted at the other. If you are game to try this one, hook it up as above.

Voice and audio effects

If you want a special voice effect on the cheap, try talking through everything from vacuum cleaner hoses to megaphones. I once walked into a production room to find an announcer with a mop bucket over his head. Creativity takes a unique personality . . .

For a "two-way" radio sound, try using an old carbon mic with a nine volt battery in series. These things are already frequency limited and the effect can be quite good, especially with a "courtesy beep" from the station audio oscillator at the end of each "transmission!"

Using a small transistor radio speaker as a mic can also give an interesting sound which might be handy on some spots.

Thoughts on demodulation

A few words in closing about the tunable demodulator project. This project has generated more calls and interest than anything else in the past year (manufacturers, take heed: you have a market here!).

Several callers inquired about the frequency designation of the subcarriers. My demod is designed to be driven from the video or baseband output of a standard satellite video receiver, so the frequencies noted represent the offset from

(continued on page 30)

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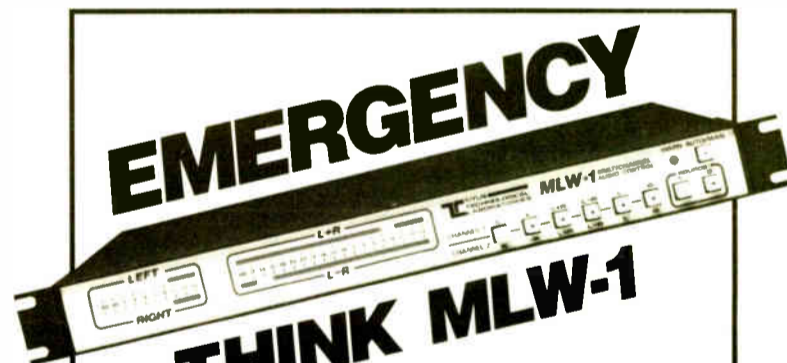
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Last of a Dying Breed?

by Ty Ford

Baltimore MD This month's *Producer's File* takes a close look at why quality production people are getting top dollar in a hungry market.

The fact that finding even "good" production people is more difficult than finding a good morning show demands we ask the question, "How come?"

I've had my suspicions about what I thought might be an overall trend toward a lack of production expertise for some time. My first awareness occurred in 1977 in Baltimore when I became part of the original airstaff which turned WBAL-FM into WIYY-FM.

Hearst had changed its classical music format to the ill-fated NIS (News and Information Service) in hopes of bettering its share. This was not what you'd call a particularly adventurous move since FM penetration in Baltimore was behind that of most of the top 20 markets.

PRODUCER'S FILE

When NIS proved to be a "no-go," Hearst took a look at the AOR success Burkhardt, Abrams, Michaels & Douglas were enjoying down the road at DC-101 and steeled their nerves for the leap into the world of industrial strength rock 'n' roll.

My first clue that production rats like me were an endangered species was seeing the look of astonishment on the PD's face when I said I was actually looking forward to doing production.

Had I known that I would also end up producing work that aired on WIYY's sister station WBAL (then #1 in the market and with a long-legged 50 kW signal), I would have had to have been physically or chemically restrained.

After awhile I realized that my passion for production was not shared by others on the staff. "Their loss, my gain," I thought as I happily churned away in the studio. I later came to the conclusion that each of us is motivated in a unique way. But there was something else.

Basics are no secret

I believe my affinity for production is largely due to the fact that I can visualize various audio paths through a console and its peripheral devices.

This ability, along with a basic understanding of how the various components in a production system interface with each other, affords me a spectrum of possibilities. I am no longer bound by simplistic off/on, louder/softer choices.

Still, this visual ability is not particularly awe inspiring. In fact, it's pretty basic stuff. Why then are more people in radio not aware of it?

My suspicion is that it is not being taught in colleges and universities. The more I speak to students and educators, the more this suspicion is born out.

One professor disclosed to me that the reason these areas of telecommunications are not taught is that the academicians

are afraid of the institution being labeled a "trade school."

"We teach our students to think in order that they may know how to do these things," is a quote which many of the educators agree is a prevalent philosophy.

Some in the teaching ranks are aware that this attitude is causing an increasingly larger gap between Academia and the Real World; however, they are not in positions of power to change the curriculum.

There is something terribly wrong here. Consider a medical student who, while never actually performing any kind of surgery, is unleashed on the unsuspecting public, sheepskin in hand, as a surgeon. That's the guy I want whacking away on my prostate—you bet!!

Don't get me wrong. Having the technical chops is only one-quarter of what makes a good production person. Equally strong writing skills, performance skills, and people skills are mandatory for success.

In fact, schools that don't include basic English, creative writing, psychology or sociol-

ogy and basic business courses are not doing a complete job.

Apathy and ignorance

While I don't have enough data to prioritize all of the contributing factors, apathy and ignorance probably top the list.

Although of primary concern to radio, audio is often considered an afterthought in the video world, especially in light of the industrial/corporate video boom we are now experiencing. Video courses are far more attractive to the TV-suckled segment of the population currently attending institutes of

(continued on page 25)



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Here are a few user comments about the 222A:

Frank Foti, Consultant (formerly WHTZ/Z-100, New York, NY/WMMS, Cleveland, OH): "Sublime on some material, very dramatic on others. Retains natural quality of music. A device to keep the competition guessing at a very affordable price."

Bill Ruck, KFOG-FM, San Francisco, CA: "Wow! On-line, pre-Optimod 8100A, set at maximum enhancement. Sounds very dramatic. Management loves it; I love it!"

Bob Leembruggen, KLOS-FM, Los Angeles, CA: "Sweet separation with center channel power."

John Alan, KLOL-FM, Houston, TX: "Unit works well; no additional multipath, even in Houston!"

Egidio Giani, WLR South East Radio, Waterford, Ireland: "Nice overall stereo sound which does not sound enhanced when in fact it is."

Unnamed Source (at user's request), Columbus, OH: "Good job at a great price. Subtle intensity!"

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*Suggested List

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World Radio History

Rules May Hurt Short Spacing

by Steve Crowley

Washington DC After a proceeding lasting two years, the FCC has announced the adoption of rules in Docket MM 87-121 permitting short-spaced FM transmitter sites based on contour protection standards.

In essence, the rules state that a facility not meeting the separation requirements of Section 73.207 may be approved if no interference is caused or received. Interference protection may be accomplished through a directional antenna, a reduction in facilities, or taking advantage of favorable terrain.

CONSULTANT'S CORNER

For many years, FM short-spacings of up to several kilometers have been granted following a waiver request supported by an adequate showing. This generally had to demonstrate how the public interest would be served—by reducing environmental impact or by providing first service to a community, for example.

Furthermore, it has often been necessary to demonstrate that no fully-spaced sites, or those of lesser short-spacing, were available—perhaps because of FAA or zoning restrictions.

Other reasons—call them economic—have been less successful, such as locating closer to populated areas or co-locating with an AM station.

By adopting the new rules, the Commission hopes to greatly reduce waiver requests. Indeed, the Commission has stated its intention to discontinue the granting of waivers for short-spacing.

But though the intent of the new rules is to give stations increased flexibility in transmitter site selection, unfortunately the effect in many instances is to eliminate any possibility of short-spacing.

Results of the ruling

Concluding that the use of directional antennas should be authorized cautiously, the Commission is generally limiting the maximum amount of short-spacing to the amount of separation specified for the next smaller size station class.

Also, to reduce the burden on limited FM application processing resources, the maximum amount of short-spacing is initially limited to eight kilometers. Applications involving greater amounts of short-spacing will not be considered at this time.

As a result of the "next smaller class" provision, many stations wishing to short-space second and third adjacent channel facilities will find themselves unable to do so.

For example, the separation requirement for third-adjacent Class C stations is 105 kilometers. If a station is to be short-spaced, it cannot violate the separation requirement for the next lower class facility—Class C1 to a Class C. Unfortunately, that separation requirement is also 105 kilometers, and no short-

spacing is possible.

Other problems arise because the second-adjacent channel spacing requirements of 73.207 are based upon third-adjacent channel protection ratios.

The spacing requirement for second-adjacent Class C1 facilities is 82 kilometers. The C2 to C1 requirement (next lower class) is 79 kilometers, so there would appear to be the possibility of short-spacing one of the Class C1 facilities.

However, assuming uniform terrain and maximum facilities, the stations must be 106 kilometers apart in order for there to be no predicted interference. Again, no short-spacing is possible.

Similar problems with "existing inter-

The KDB-FM site is 45 kilometers from KAGR. Unfortunately, in this instance the adopted rules prohibit separations of less than 46 kilometers, so the KDB-FM site could not be used. The Santa Barbara facility would be better served if the new rules were never adopted, as a strong showing could be made in support of a waiver request.

A way around the problem

One way of alleviating this situation would be to eliminate the "next lower class" requirement. The eight kilometer limitation would remain to prevent overburdening FCC resources.

The only other requirement would be that interference to another facility is not

... though the intent of the new rules is to give stations increased flexibility in transmitter site selection, unfortunately the effect in many instances is to eliminate any possibility of short-spacing.

ference" occur in some co-channel and first-adjacent channel short-spacing situations. In fact, the adopted rules will help in only about half of potential short-spacing situations.

Awkward situations

If an applicant cannot employ the new short-spacing rules and is precluded from requesting a waiver of Section 73.207, an awkward situation may result.

A case in point is the channel 299B1 allotment in Santa Barbara, California. The area in which a facility could locate at full spacing is small and FAA and environmental restrictions substantially reduce the number of potential sites in the fully-spaced area.

One existing site, that of KDB-FM, would be ideal for channel 299B1. Here the channel would be short-spaced to KUZZ-FM Bakersfield by 74 kilometers and to KAGR Ventura by three kilometers. Terrain averages would work to prevent predicted interference with KUZZ-FM.

Similarly, terrain and the fact that most prohibited contour overlap would occur over water make it easy to avoid predicted interference on land with KAGR.

created or increased. Moreover, waiver requests could continue to be entertained for cases where no short-spacing is possible under the new rules.

From this same docket, the Commission is adopting standards for antenna performance. One of these, the 2 dB per 10 degree standard, is being changed from a policy to a rule. It was originally created as part of early short spacing rules whereby a station was limited in power and antenna height in the direction of the facility to which it was short-spaced.

To prevent patterns with sharp "notches" that would clip the service area of the other station, the patterns were not to exceed the rate-of-change of 2 dB per 10 degrees.

Since the adopted rules require protecting an entire service area, and not just on-line, the 2 dB per 10 degree standard is no longer applicable.

In no VHF service, mass media or otherwise, is there a 2 dB per 10 degree rate-of-change standard, nor is there any need for one given the performance that can be certified by antenna manufacturers.

A station that might otherwise be able
(continued on page 28)

CRL SPOTLIGHT



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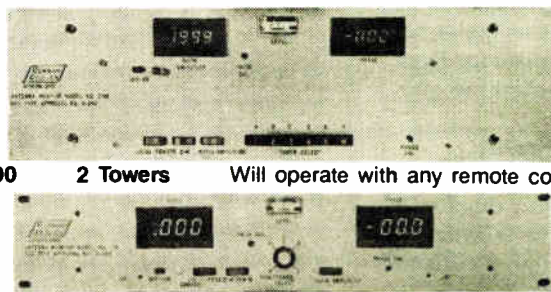
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Understanding the Other Side

by Barry Mishkind

Tucson AZ Broadcasting is a part of the communications business. It's filled with people who devote their professional careers to making a connection with the listening public.

Yet, tell someone that you work in a radio station, and the image they have is of a lonely DJ playing the hits in a mood-lit studio as he waits for listeners to call in their requests.

Television and movies take great liberties with the reality of what we do on a daily basis. Even *WKRP in Cincinnati* rarely showed any interaction between the air staff and the engineering staff.

Of course, there was one episode in which the "engineer" appeared. He was a belligerent fellow who wore crepe-soled shoes, "just in case of a lightning strike!"

ECLECTIC ENGINEER

Not exactly the positive professional image we'd like to have associated with us, is it?

Communicate an image

Truth be told, though, while we deal with the programming staff on a daily basis, we often fail to provide a basis for improving our image among the staff.

We're not talking just about putting on a tie and removing the pocket protector. Rather, we have to focus on how we communicate and interact with the air staff, particularly the PD.

That communication can be hard to come by at times, given the driven egos that often inhabit the control room. Failure to communicate, coupled with seemingly different priorities, can cause our lives to take on a strained quality.

On the other hand, it is possible to help the PD see things from our perspective, if not actually get him or her on the same "side."

For example, take the air signal. Sure, the PD wants the loudest signal in town but hopefully without heavy processing artifacts. You, the engineer, also want the station signal to stand out in the market. Are your goals really that different?

Think about what might happen if you and the PD sat down and talked calmly and intelligently. Try explaining the tricks that can be used to enhance the station's sound if you don't have to dummyproof the audio chain. You'll both find common ground, and likely a compromise that meets both your goals.

Links in the audio chain

It does seem amazing to think that a professional broadcaster may give little thought to how people actually hear. Yet,

time and again, a calm discussion with most PDs ends with them understanding why we do what we do with the audio.

Perhaps the sound won't be quite as clean as you might prefer, but also not as "smashed" as the PD thought he wanted. Your common goal of making the station as appealing as possible to the listener will be more easily attained.

Some suggestions you might try out include the "less is more" concept and how processing relates to time spent listening.

One station went out and purchased new processing equipment, then turned up all the knobs and was shocked it

wasn't the loudest on the dial. Not even close!

After explaining to the PD that over-processing actually caused the audio to fight itself, and by backing the processing off a little, the station jumped right out of the dial.

Discussing listener fatigue and how it affects the ratings also often results in direction to turn down the smash. Less is indeed more!

The basic point again is that instead of building kingdoms individually, we need to work together as a team to make the station a success.

Yes, a lot of you are saying, "I'll just wait until the next book and there will

be a new PD around here." And there is some truth to that. Engineering is usually more stable than programming.

Nevertheless, professional pride should move us to seek the common ground (that does *not* mean burying the PD under the antenna system!) so the station as a whole moves ahead.

Dealing with the air staff

How can we stop the air staff from turning the control room into a lunchroom? Or deal with those DJs who've had jackhammer implants in their fingers to kill remote start buttons? Or the DJ who calls at 5 AM to ask, "How do I turn the transmitter on?" That is where a good relationship with the PD can help.

Relate problems to dead air. No PD
(continued on page 29)



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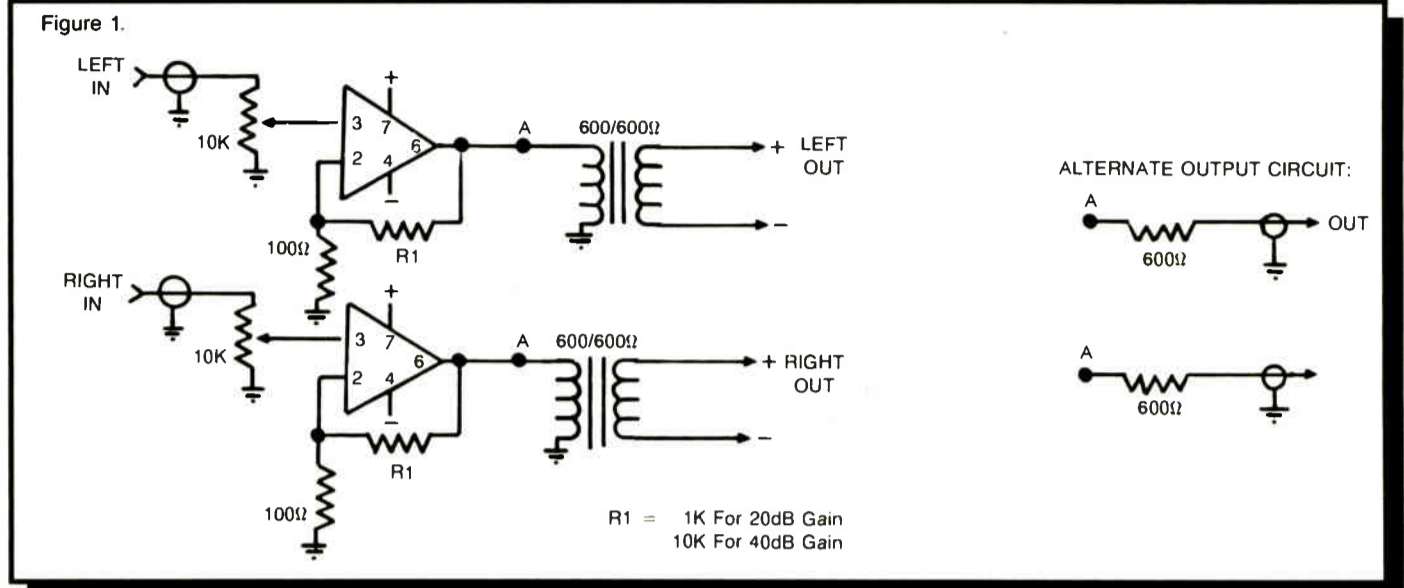
Utility Line Driver Amp Design

by Steve Johnston

Norfolk VA One of the compromises we encounter these days is the installation of "consumer-type" audio gear in broadcast studios.

Tuners, tape decks and related equipment of less than pro quality find their way into even the most sophisticated stations—either to save money, fill a particular need or because they are available quickly.

The use of consumer-spec equipment can be tricky, thanks to the audio interface standards employed in these units. Levels, impedances and balancing are at odds with the standards of broadcasters, and danger lurks at every patch-cord knot!



GREAT IDEA

The following are several circuits that can make life easier for the engineer faced with the "consumer-to-broadcast" connection.

The line driver

Figure 1 illustrates a two-chip utility line driver. This circuit utilizes two 5534 op-amps as an unbalanced input amplifier that is capable of bringing the mid-level (-10 dBm to -20 dBm) signal from the output of a consumer tuner or tape deck up to the +4 or +8 dBm level employed at most stations.

The output of the amplifier can be configured as balanced or unbalanced, depending on your application. The balanced version uses transformers—be sure to use the best you can afford, as this component will be the limiting factor in the performance of the amp!

Lightweight, miniature devices are right out—UTC or Jensen products are in order here. Often, the unbalanced option will be fine, as the inputs of some consoles and machines are entirely com-

fortable with this mode. Others choke on it, so consider your application and choose.

R1 can be selected for 20 dB gain (1 Kilohm) or 40 dB (10 Kilohm). Measure the output of the consumer unit with an audio voltmeter and see how far you need to go to get up to your in-house level standard.

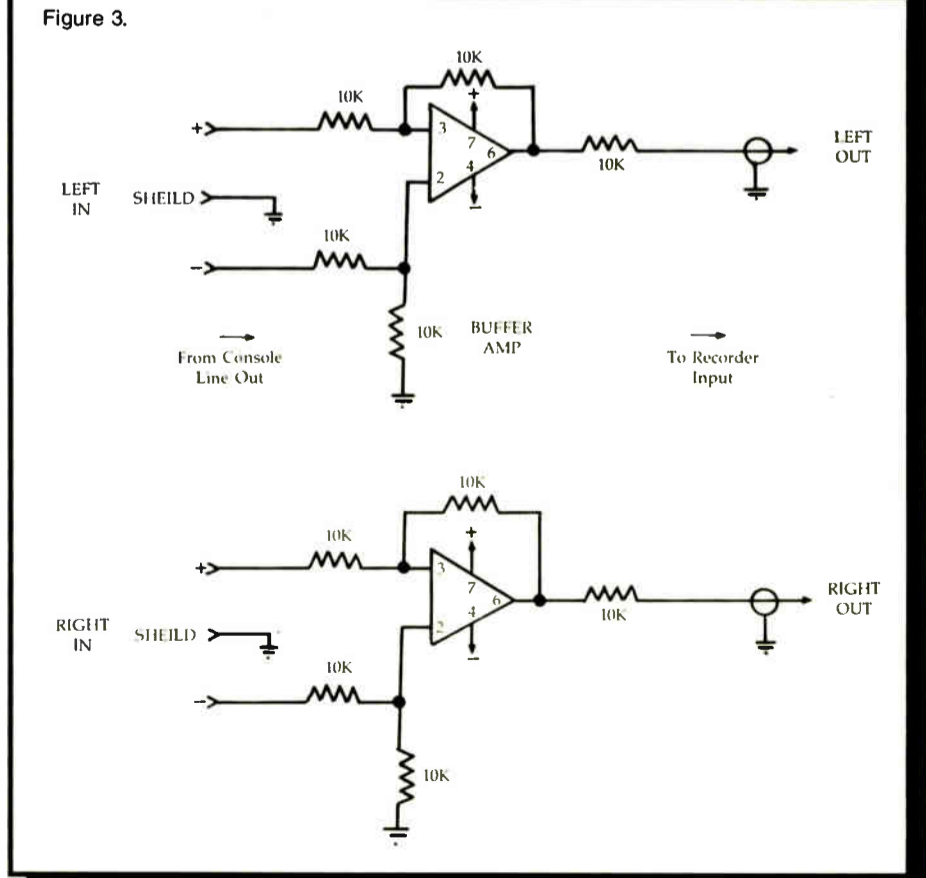
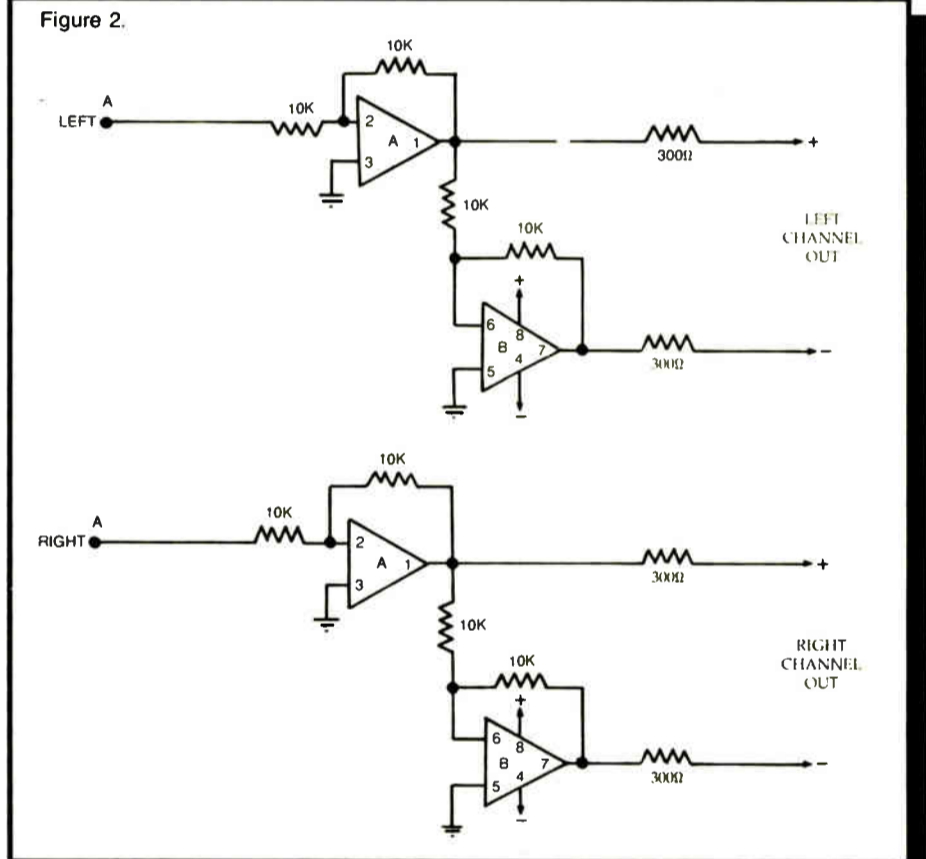
A step further

The circuit shown in Figure 2 goes a step further—it depicts a four-chip active-balanced line driver. The circuit provides balanced output without the big, expensive transformers.

If you need to drive a balanced line and load and don't have the transformers, this design may be the ticket. The 5534s are used again, but this time they each feed a 5532 dual op-amp, configured as an active-balanced line driver.

The 5532s can be thought of as another output configuration option—one that offers equal or better performance than the transformers for some applications and is not difficult to build.

An important consideration in the (continued on page 29)



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Diode Use in Power Supplies

This is the fourth of a 12-part series titled Introduction to Active Devices. Readers who have registered with Northern Virginia Community College can receive continuing education credits from the college upon successful completion of an examination administered at the end of this series. To register contact the Director of Continuing Education, Annandale Campus, 8333 Little River Turnpike, Annandale, VA 22003, or call 703-323-3159. The fee for the course is \$20.

by Ed Montgomery

Part IV of XII

Annandale VA In our last installment, we began an examination of the operation of diodes in solid state. In this column, we continue that examination with a look at the most common use of the diode: power supplies.

The most convenient way of producing and distributing electricity is alternating current (AC) generation. In the Western Hemisphere, the standard for AC is 60 Hz.

Most electronic equipment has always required direct current (DC) for proper operation. Power supplies have always had to change the incoming AC to an appropriate DC voltage to operate specific electronic devices.

As you might remember from our discussion of majority and minority carriers, the diode permits majority carriers to flow only in one direction. Figure 1 illustrates this action in a half-wave rectifier circuit.

In this circuit, AC is applied to the transformer. The voltage is stepped down and then converted to pulsating DC by the diode. Only positive pulsating DC appears across the resistor.

A full-wave rectifier can be produced to deliver twice the power of a half-wave rectifier circuit. Figure 2 illustrates how this circuit operates.

During the positive cycle of an AC wave, diodes D1 and D2 conduct, producing a positive pulse of DC in the resistor. When the negative cycle of the AC wave enters the circuit, diodes D3 and D4 conduct and another pulse of DC is produced.

This is because the circuit is designed to allow current to flow through the resistor in the same direction, regardless of the direction of current flow in the AC wave.

The type of circuit described above is known as a bridge rectifier. The complete set of diodes can be purchased in one

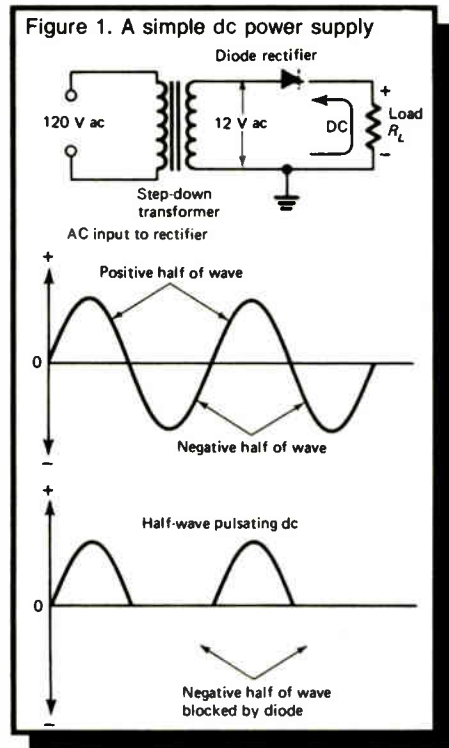


Figure 1. A simple dc power supply

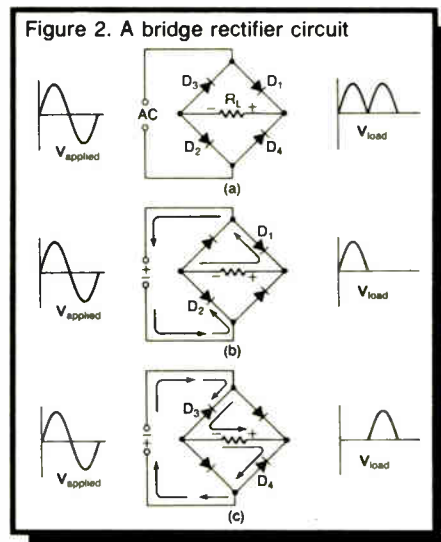


Figure 2. A bridge rectifier circuit

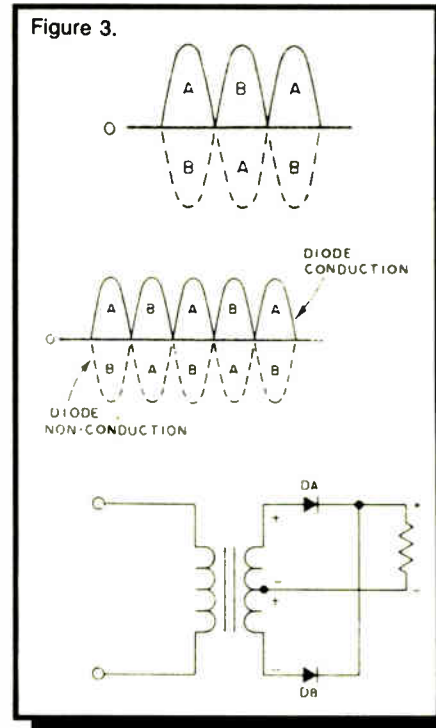


Figure 3.

case with a positive marking on one terminal to assist in wiring the component properly.

It is important to know the proper diode placement when fabricating a bridge rectifier circuit to avoid damage to the diodes and the transformer.

Another type of full-wave rectifier employing only two diodes and a transformer with a center tap is illustrated in Figure 3.

In this illustration, complete develop- (continued on page 28)

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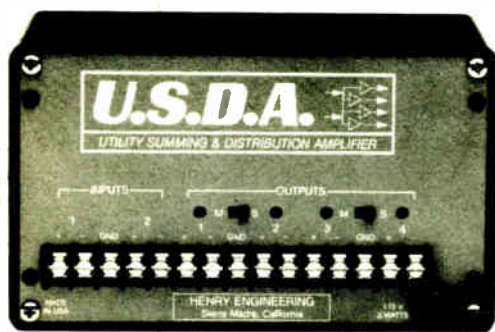
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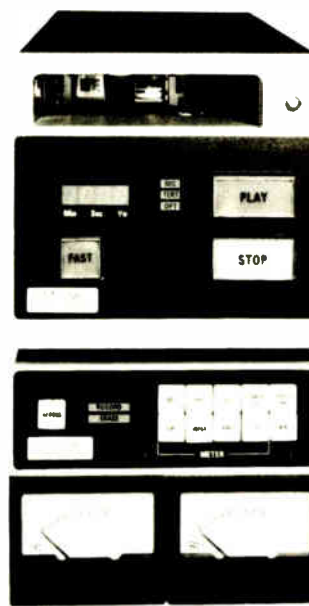


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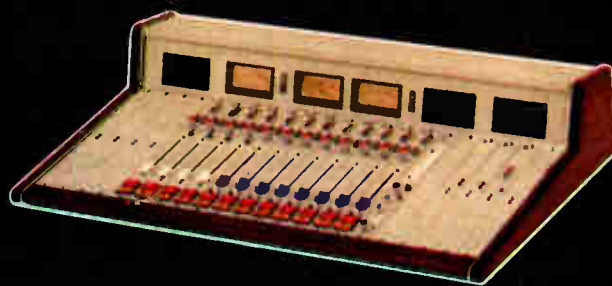
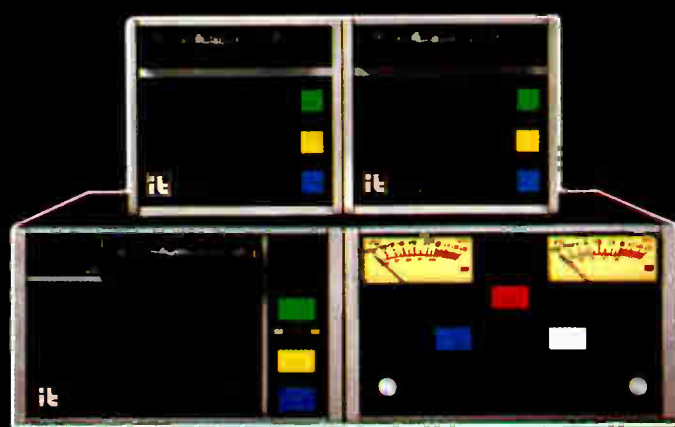
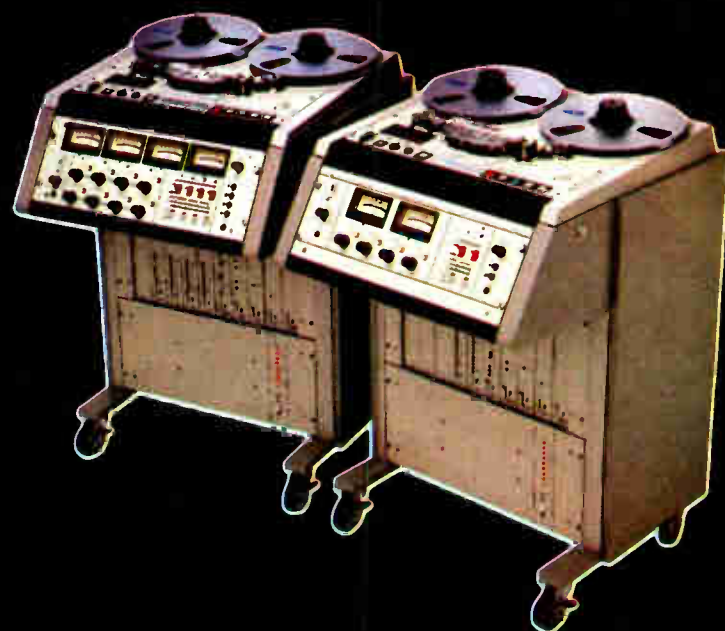


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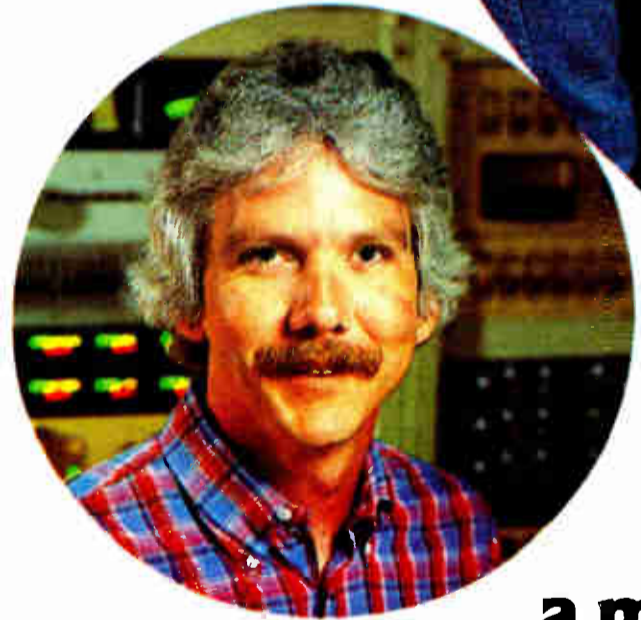
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World Radio History

The Vanishing Production Rat

(continued from page 17)
higher learning.

There are many cases in which the teachers themselves don't know the basics of signal flow and equipment interface.

Some say that because teachers are underpaid, they must work extra jobs to make a decent living. This extra work, it is theorized, cuts into their teaching time and reduces their effectiveness as teachers. Although this may be a factor with entry-level lecturers, I doubt it is true with tenured professors.

While many of the lower-paid lecturers and instructors do work extra jobs, many of them do so because they like the entrepreneurial spirit that not being full-time provides. To many of them, teaching is a source of "pin money," status and recognition.

The first stage of this Catch 22 syndrome becomes complete when the students who graduate from schools with "audio-deficient" curriculums attempt to enter the job market. Because they don't have the skills, jobs are hard to find.

In radio, as this trend continues, more and more broadcasters are considering satellite-fed programming as a cheap and viable cure for lack of talent and ability. For every satellite-fed daypart, there is one less job.

On the road

While at the West Virginia Broadcasters meeting last month, I was asked for the best way to improve station production. First, make it clear to everyone you are considering for a new air position that production is a part of the job.

Second, after listening to their tapes and resumes, have your prospective new-hires go into your production studio, cut a spot and read a short newscast.

People learn to cheat early. That four minute tape you got may be the result of three weeks of work. As a fill-in instructor at a local university, I had a young lady hand in an editing project.

She was supposed to record a flawed read and then edit it to remove the mistake. The "before" and "after" takes were to be dubbed to cassette.

Something bothered me about the edit. After five or six listens with the headphones on, I realized I could hear a telephone ringing several rooms away behind the flawed read just before the edit. There was no telephone under the same portion of the edited version.

The student had tried to fool me by simply recording a flawed read and then recording a corrected one. Although I could have failed her, I chose to give her a D instead of the C+ she should have gotten for the course.

I think it's time a strong message was sent to the academic community from the NAB, RAB and a collection of statewide broadcasters. We have already turned too many air people into air heads by directing them to read poorly written liner cards. Has radio suffered? You bet!!

A complex future

The truth is, audio will remain complicated enough to be a world unto itself. For example, there are effects processors now on the market with 100 page in-

struction manuals. I'm talking about 100 pages of how to work the thing, never mind how to take it apart and fix it.

Equipment manufacturers can hide easily behind the assertions that they are not bilking the market with "planned ob-

... more broadcasters are considering satellite-fed programming as a cheap and viable cure for lack of talent and ability.

Like computers, these devices have a steep learning curve. It takes a lot of time to learn how to use them. Unfortunately, a lot of them also become obsolete too quickly.

solescence" because they are not necessarily the ones creating the new processing chips.

The seductiveness of the new circuits cannot be denied. However, this rapid

acceleration in technology has further widened the gap between our learning institutions and the real world.

I'm sure there must be some great academic and trade institutions which turn out skilled and knowledgeable production people. In fact, if you know of, have gone to or teach at such a place I'd like to hear from you.

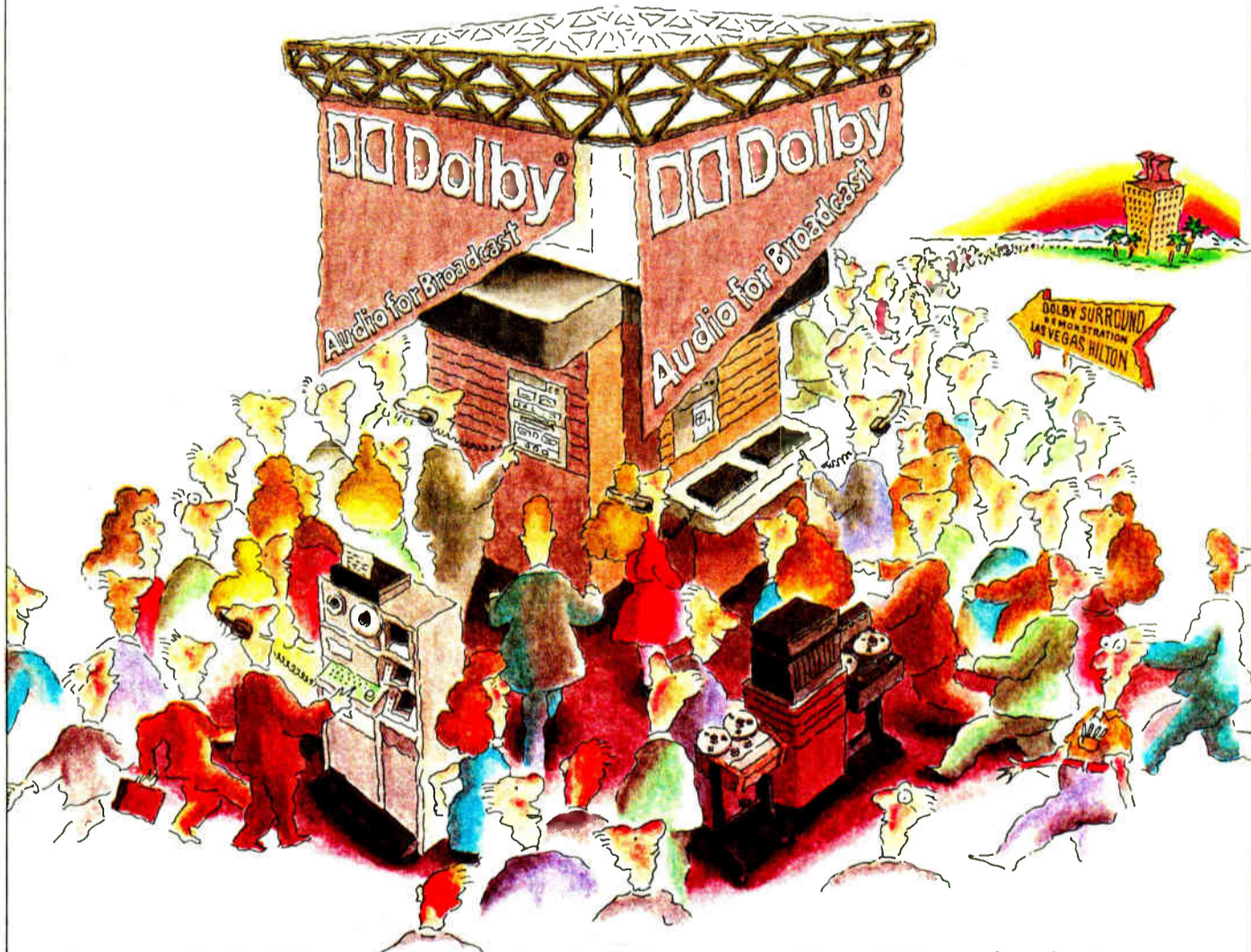
Just off the top of my head, I think audio production scholarships to schools exhibiting dedication should be underwritten by major manufacturers of audio equipment.

If you're an interested institution or manufacturer looking to make that connection, I would be happy to help.

■ ■ ■

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

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KMNY's Studios Spell Money

by Dee McVicker

Tempe AZ There is a lot of talk about money at KMNY-AM. On the air, money is referred to as investments, stocks, bonds and other financial expressions. But at KMNY and its founding network's new facility, money is more loosely defined.

CE Mike Rey doesn't usually think of money in terms of budgets, although he admits to the occasional mega-budget equipment wish list. He doesn't usually think of money as time either, although he has recently spent quite a bit of time consolidating Money Radio Network and its flagship station under one roof.

When Mike Rey does think of money, he is likely to think of it in terms that have little to do with stocks, bonds and investments. Instead, he thinks of where all that talk of money is coming from and where it is all going.

And with the talk of money floating through seven new studios, two network satellite feeds and a transmitter, Rey has his hands full trying to simplify the engineering of this "money" operation.

The equipment stock exchange

The move from two locations to one could hardly be coined Operation Simplicity. The consolidation left Rey with a handful of equipment that didn't fall easily into place. It also left him shy a few pieces and in general put the whole network/station in disarray.

FACILITIES SHOWCASE

Rey took inventory. At the previous KMNY site, he had a full on-air studio that could be moved in its entirety. He also had a stockpile of recorders and miscellaneous equipment that could fit the needs of new studios.

At the Pacific Stock Exchange building, the network's previous facility, he found the production, master control and voicer studios pretty much transportable in whole.

However, the production and master studios had a few extra functions—and equipment—that he quickly branched off into three new studios. That was, after all, the idea behind the consolidation of network and station.

Stockpiling equipment

The new talk show studio, market news studio and world news studio became a compilation of refurbished equipment from the station stockpile and what was left over from the master and production studios.

Rey's equipment shuffle left the facility short one console and a few pieces of furniture. With little hesitation, Rey ordered a new Autogram IC-10 for the master control studio and moved the studio's console, also an Autogram, into the production studio.

He spent more time deciding what to do about furniture. Said Rey, "We originally thought about getting custom furniture. And then we thought that would just lock us in."

The network, already expanding a year ahead of projected growth, needed plenty of room for that growth. Custom furniture would lock it into studios that could be obsolete in one, per-

haps two years.

Rey also reasoned that with rapid expansion springing the move on them unexpectedly, there was no time to have custom furniture made. He settled on butcher block desks with a side return.

According to Rey, the desks not only have aesthetic appeal but easily accommodate the console, recorders and small equipment racks.

From an outsider's point of view, the bucks behind KMNY and Money Radio Network start with a limited partnership

the production studio and the voicer studio.

Meanwhile, as the network is creating its service for the day, network flagship station KMNY is creating its local service from its own reporting sources and interspersing this with network programming.

Rey modestly described all of this as a simple engineering operation that he put together with little more than cables and wires.

The one consolation that Rey has

amidst the buzz of reporting activity is a network of wire strung up in the telco room. With all the activity convening in one small room, Rey can change studio-to-studio configuration as easily as pulling a wire.

Rey couldn't have planned a better network base. The new building, which served as a retail warehouse in a former capacity, had extensive PBX telephone wiring that Rey modified for studio networking.

"Every room has a punch block, and the lines eventually go down to the telco room, which makes things real easy," said Rey. His only task was to equalize the lines, install short runs between studios and install the business phone system.

That seemingly simple task took up quite a bit of Rey's time when he discovered that the previous owners did not have the foresight to install 25 pair trunks into three of the seven studios. More hours of work, and more wires and cables.

With those long hours finally behind him, Rey began work on the other end of his simple network system. Since it was imperative that both services feed their respective outlets simultaneously, Rey based the system on dedicated, identical switching for each service.

The 2x1 switch boxes that Rey designed provide primary studio as well as backup studio source for the radio on-air feed and the network satellite feeds. "They're just manual wafer switches that have six or eight positions on them," said Rey of his switch boxes

Rey designated the talk studio as a
(continued on page 30)



Money Radio Network co-founder Buz Schwartz (right) interviews industrial leaders from the People's Republic of China.

under the auspices of the Investor's Club of the Air.

But from Rey's point of view, the bucks start at the station's and the network's main studios. These studios, the master control and the local affiliate KMNY, are where he creates the central exchange for all other studios.

At any hour during the business day, the whole facility is caught up in a buzz of financial reporting. During New York business hours, stock exchange updates are produced four times in an hour from the market news studio.

From 2 PM on, financial talk shows dominate the format from the talk show studio. In between these format segments, anything can happen that will demand the use of the world news studio,

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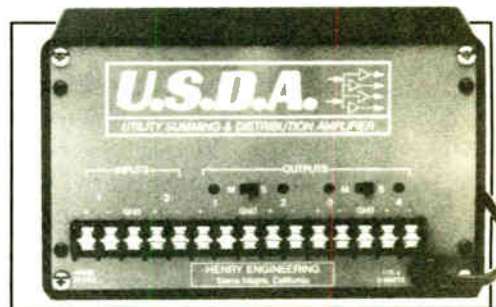
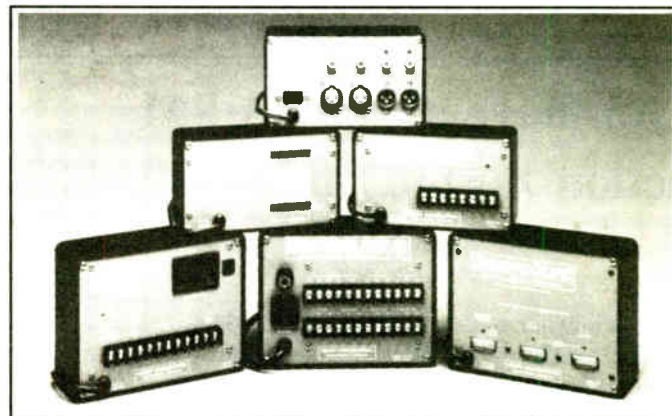


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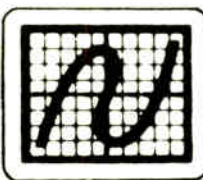
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Power Supplies and Diodes

(continued from page 22)

ment of pulse-free regulated direct current is carried out in circuits following the rectifier.

A diode also may be used as a gate to protect solid state equipment. Figure 4 illustrates a circuit requiring an external DC power supply to operate.

If the direct current is applied with reverse polarity, the diode is reverse biased and no damaging current flows.

Lesson 3 discussed the limitations of diodes and noted that the Peak Inverse Voltage (PIV) should not be exceeded, in order to protect the device from destruction. The zener diode was designed to operate in the reverse bias mode in the PIV range for specific purposes.

Figure 5 illustrates the schematic diagram for a zener diode and its forward and reverse current characteristics.

When the reverse voltage is reached where current flows, the zener region of the diode is reached. This zener region is adjusted to specified voltages during the time of component manufacture.

Zener diodes can be used as a voltage regulator or voltage clamp.

The circuit in Figure 6 illustrates the clamping action. The value of the resistor is chosen to keep the diode operating within the zener region

throughout the variations in power demand. This can be calculated using Equation 1.

Power dissipation of the diode can be determined from Equation 2.

Figure 7 is an illustration of a clipper circuit. The diodes are connected back-to-back. When AC is applied to the input, the output signal will be limited to the zener voltage of the diodes. Thus a signal is limited in its total output regardless of what the input signal is.

Varactor diodes

Varactor diodes are also operated in the reverse biased mode but their function is to act as a capacitor rather than a voltage clamp. As the varactor diode is reverse biased, the junction or depletion region widens.

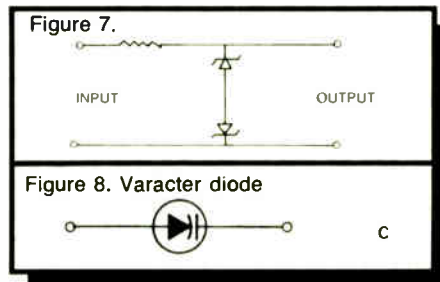
Changing the reverse bias voltage varies the amount of charge the device can hold. Varactors are very effective in radio-frequency circuitry. A schematic

diagram of a varactor diode is illustrated in Figure 8.

Light emitting diodes (LEDs) are diodes that illuminate when the junction is forward biased. They come in red, yellow, green, and infrared. The colored diodes are often used in place of lamps in modern circuitry.

Infrared LEDs are used in remote control systems. LEDs are dependent on current flow. However, they must be protected from excessive current through the use of a series resistor. Equation 3 illustrates how the values of this resistor can be found.

LED voltage and current is listed by the manufacturer. These devices usually have



a forward voltage rating between 1 and 3 volts with a current rating in the range of 50 milliamps.

Ed Montgomery currently is an electronics teacher at Thomas A. Edison High School in Fairfax County, VA. He has taught broadcast engineering at Northern Virginia Community College and worked as a broadcast engineer for several radio stations.

FM Short Spacing Blues

(continued from page 18)

to take advantage of the interaction of the tower with its existing side-mounted non-panel-type antenna to generate a pattern may be forced to use a more expensive panel-type antenna in order to tailor the pattern rate-of-change.

DA limitations

Another adopted rule states that directional antennas may not be mounted on the top of an antenna tower which includes a top-mounted platform larger than the nominal cross-sectional area of the tower in the horizontal plane.

This requirement effectively prevents candelabra or "T-bar" type mounting configurations. Proper antenna measurement and modeling by the manufacturer should make this requirement unnecessary.

Lastly, the Commission has decided not to allow stations to receive interference. Many of those commenting in this proceeding and opposing received interference envision the buying and selling of interference rights—as has been proposed for AM stations.

In some instances, though, interfer-

ence may be received without service loss to existing listeners. This occurs when a station improves its signal—through moving or improving at its existing site—and new interference is received within the new portion of the station's service contour. As no service was provided before, effectively, no "interference" is caused.

The same is true of a new station where interference is created in areas not having prior service. The area receiving interference is generally inconsequential when compared with new service rendered. The public will likely gain improved service by the station moving to an site enabling it to maximize population served.

Because of these and other concerns, six Petitions for Reconsideration have been filed with the FCC. Some deal with technical concerns such as those above, others oppose the overall concept of using contour protection to allow short-spaced transmitter sites.

Therefore, even though rules have been adopted, they may not be final.

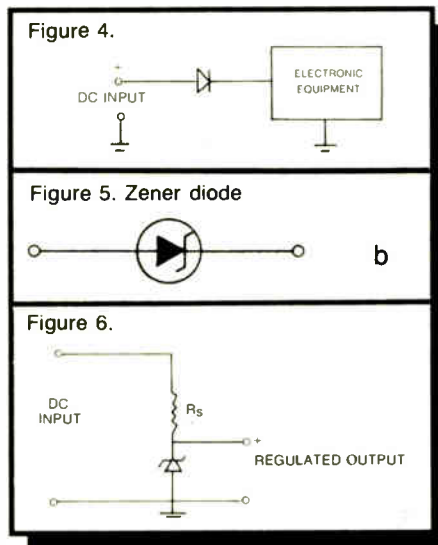
Steve Crowley is a registered professional engineer with the consulting firm of du Treil, Lundin & Rackley, Inc. He can be reached at 202-223-6700.

Equation 1.

$$R_s = (V_{in}(\text{minimum}) - V_z) / 1.1(I_L \text{ maximum})$$
 Where V_{in} = Minimum value of input voltage; V_z = Zener voltage; I_L (maximum) = Maximum value of current delivered to the electronic device or load.

Equation 2.

$$P = V_z((V_{in}(\text{max}) - V_z/R) - I_L(\text{minimum}))$$
 Where $V_{in}(\text{maximum})$ = Maximum input load; $I_L(\text{minimum})$ = Minimum load Current



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Understanding the PD

(continued from page 19)

likes to hear silence. If you can help him see where equipment abuse or lack of knowledge about the transmitter can lead to dead air, most PDs will make some effort to get the air staff to pay attention, or maybe even answer the hot line when you call it!

The bonus comes when the PD sees you care about the product and responds by using part of his jock meetings to stress the need to care for station equipment, to clean heads and pinch rollers each decade or so. You might even get a useable transmitter reading before retirement!

A strong, reasonable PD will do these things for you. A weak one... well, maybe you *should* consider waiting for next ratings book...

Planning together

Number six on my list of unpleasant surprises is "Oh, by the way, we need you to set up for the remote this afternoon." Or the phrase that always seems to occur at 4:57 on Friday afternoon, "Did you know the cart machine isn't working?"

Getting the air staff to communicate needs and problems is not always easy. Not even discrepancy reports left everywhere will get some of them to let you know what's happening. But a good rap-

port with the PD can ease much of this.

Not only can the PD check on the condition of the plant on a regular basis, he or she can help prevent surprises by planning future needs with you. Whether a special remote or format change, the further ahead you both plan, the easier it will be.

In fact, the PD can be a great ally in getting your budget approved by the GM. Think how much easier it would be to get a new test set if the PD tells the GM that you need it to improve the station's sound.

Of course, one pitfall to avoid is using too much technical jargon. A little effort to be direct and clear will be rewarded with cooperation.

On the other hand, what does the PD mean by "the station sounds too hi-fi?" If you can anticipate the PD's way of thinking, true communication becomes possible.

After interviewing a number of PDs and CEs, an interesting pattern develops. The stations with the best sound usually have PDs and CEs that respect one another and communicate closely. May you have that happy situation at your facility!

■ ■ ■

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

Designing Line Drivers

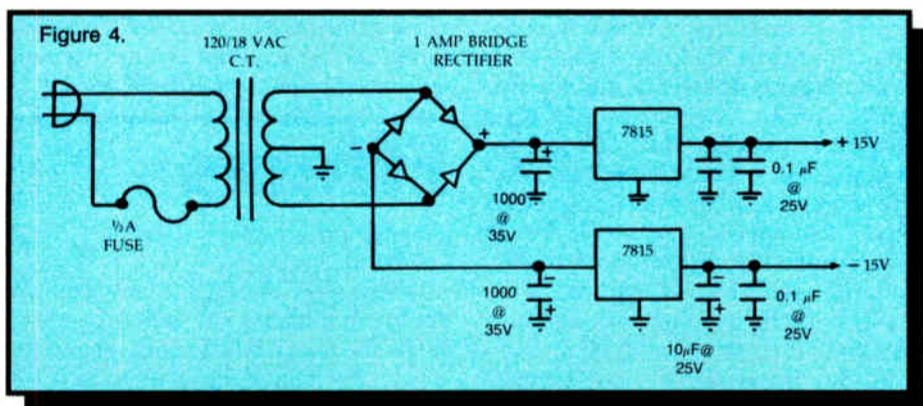
(continued from page 20)

construction of any of these circuits is the type and tolerance of the resistors. Please use metal-film resistors with the lowest tolerance you can find.

The nature of the metal-film resistors will allow the lowest possible noise in the amplifier, while the low tolerance will allow close matching of the balanced line legs for best outside interference rejection.

As for power, the view in Figure 4 shows a simple power supply that can operate either of the line-driver circuits or the buffer amp. The only special consideration is the capacitors around the regulators—these are important to keep the 7815 and 7915 stable and out of oscillation.

Observe proper safety precautions when building the power supply—line voltage is nothing to joke around with.



Try matching the 300 ohm output resistors with a digital ohmmeter and then pick devices with the closest values for use as pairs on each channel.

A simple buffer amp

When installing a consumer tape recorder in a broadcast studio, it is quite important to avoid connecting the unbalanced tape machine input directly across the clean, balanced console output. You can take the great signal out of that \$30,000 console and totally wreck it with the addition of that \$99 cassette deck!

The circuit in Figure 3 will create a bridging load that will connect across the console output without significantly impacting the audio quality on the line, while providing the proper unbalanced output to feed to the recorder inputs.

These circuits will be useful for years to come—consider building a couple in your "spare time" (ha ha) for future use.

If you want to find out more about op-amp circuits, I'd suggest you pick up two books published by Howard W. Sams and Co.—*IC Op-Amp Cookbook* and *Audio IC Op-Amp Applications*—both by Walter G. Jung.

These books are quite useful around the shop and office and can save you money by providing information that can allow do-it-yourself construction of devices that cost hundreds of dollars.

Good luck with you interfacing jobs—and keep a few aspirin on the workbench, just in case!

■ ■ ■

Steve Johnston is CE of WGH-AM/FM in Norfolk, VA. He can be reached at 804-497-1310.

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Letters Are Best Market Tool

(continued from page 13)

sition. If you don't have a unique reason why your prospect should do business with you rather than your competition—neither will he or she. You *must* be able to project a unique benefit to your services or there will be no emotional reason for a prospect choosing you.

And make no mistake about it, people make buying decisions for emotional reasons. Even the most analytical people simply gather data to support the decision to buy something they want.

Figure out where you can out-perform your prospect's other options, which may well include both inside and other outside engineers.

You must be cheaper, faster, higher quality, guaranteed, certified or some other comparative above the other possible choices your prospect can make. If you can't say you're better in some way, save the paper and don't send the letter in the first place.

If you can anticipate common or specific objections, it can be helpful to address them directly in the letter. For example, "I know that an outside, contract engineer appears to cost more per hour than a staff technician, but . . ."

Sales is a process, not an event. If you're sending a letter designed to get a new client, then tailor your approach to simply get you in the door. Don't try to sell the whole banana in the first salvo.

Offer to give them a *free* frequency check, distortion analysis or some other

low-cost, low-time service, just to get you in front of them. Then, once you're face-to-face, you can begin selling your additional services.

You will have demonstrated some of your capabilities and you will be making a more personal impression.

If you make a tantalizing offer, put a deadline on it. Being the procrastinators that we are we tend to put things off as long as we can. A deadline gives you at least some control over that tendency.

Other tips

Be precise about numbers. Don't say, "About \$20." Say, "\$19.99." If you want a number to sound big or small, you control that perception with the units you're counting in, not the digits in the number itself.

For instance, one mile is perceived to be larger than 5,280 feet, because miles are bigger than feet. It's the units, not the numbers. A half million dollars sounds like more than 500,000.

Avoid superlatives and absolutes in your letters, unless you can absolutely back them up. Otherwise you come off sounding like a used car salesman.

Stay away from technical jargon. Some engineers like to season all their communications with technical terminology, because they think it makes them sound knowledgeable. But what it really does is intimidates readers, embarrassing them that they don't understand you.

Do you think someone you've embar-

assed will then want to do business with you, so you can continue to intimidate them with your big words?

Testimonials and endorsements are powerful sales tools. So if you can get permission to quote a satisfied customer, or if some manufacturer or other quality third party will let you print an endorsement, it will carry a lot of weight with your reader. Most of your letter will be you bragging about yourself. A testimonial gives you a real credibility boost.

Make sure that your letter is "you" oriented rather than "me" centered. The word "you" and its offspring grab the reader's attention, because it says that what's being talked about affects the person directly. It also helps you center your letter on their needs rather than your qualities.

Avoid using humor in your letters unless you know the reader well, and are sure that they will perceive the comments the same way you mean them. If you are sending the communication to people you don't know, stay away from humor altogether.

Different people find different things funny—and offensive. Even if they just don't get the punchline, they will feel intimidated that you might consider them

stupid, because they didn't understand your joke. Just don't attempt humor in business letters.

Wrap it up

In a nutshell, writing good sales letters is a simple process of climbing into your prospect's head to see what the individual needs are, then writing with your own personality to explain how you can meet those needs.

Be you, but keep the letter focused on them and what they'll get from doing business with you.

Don't worry about the length of your letter. Contemporary research shows that as long as your letter is interesting to readers, they will stay with you for several pages, if that's what you need to tell your story.

One of the most effective sales letters ever written was twelve pages long. The only rule is that it should be as long as it needs to be to get the job done. Just keep it interesting.

Oops! I'm out of space. Well, next month we'll talk about what to do with your letters and how to get a lot more mileage out of them.

■ ■ ■

John Cummuta is president of Advanced Marketing Concepts, a broadcast management and marketing consulting firm, and a regular RW columnist. He can be reached at 312-969-4400.

KMNY Spells Money

(continued from page 27)

backup to the KMNY air feed and the production studio as the backup to the network satellite feeds. "I can also change the backups without taking either of them off the air," noted Rey, referring to the phone line runs between studios.

The output of the switch boxes are then fed through a two channel Valley People compressor. Since the format dictates monaural feeds, Rey was able to segregate channels for dedicated compression of each service.

Light compression, a necessity for both services, ensures that program material will not overdrive the phone lines feeding into the transmitter site and the two satellite uplinks. "We have two 8K lines going to each satellite and a 15K line going to the station's transmitter," said Rey.

By adding a 2x8 DA to the compressed network channel, Rey was also able to feed compressed material to the talk, production, and KMNY studios.

"I was originally going to design it so that they (the talk, production, and KMNY studios) could pick up the master control room feed, but there are times when the master control could be off line. So, I had to make sure they were getting a network feed, instead of the master control room feed," explained Rey.

While Rey was lining up equipment and routing studio feeds, he was occasionally interrupted by construction work.

The downstairs showroom in the former warehouse, which ran the full length of the building, was being partitioned off for office space and the ceiling was being dropped down.

Upstairs, where the seven studios are, large plate-glass windows were being installed between the master control room and the world news and market news studios.

When Rey finally heard the last of buzz saws and moved the last of the

equipment into place, he took a few minutes to think about money in terms of his budget.

Equipment expense was tallied up to a new console and a new DA, engineering time was tallied up at approximately 150 hours, and cable and wire took the bulk of consolidation expenses at a couple of thousand dollars.

Not bad for an engineer who thinks of "money" as a lot of talk coming out of seven studios.

■ ■ ■

Dee McVicker is a free-lance writer with a long record in equipment sales. Comments on articles and inquiries about her writing service can be taken at 602-899-8916.

Effects

(continued from page 16)

baseband.

Technically, the SCPC services are doubly modulated FM, but appear as a single FM signal following baseband detection. Frequency designations in the 70 MHz range represent offset from the bottom of the satellite.


Another question concerned weak signal strength. Because of the power levels of the SCPC signals, relatively high gain is necessary for proper detection.

The mixer I described provides several dB of conversion gain, but needs to be followed by a good receiver IF section. Commercial units have at least 20 dB of conversion gain, followed by several IF stages.

My thanks to the good folks at Wegener for their timely info.

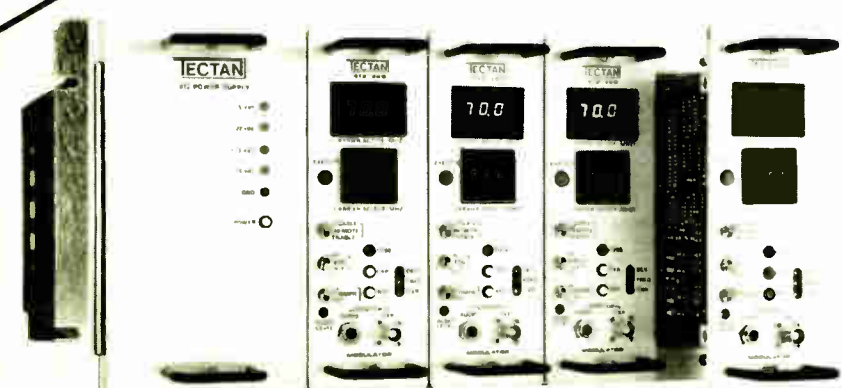
■ ■ ■

Bill Higgs is on the engineering staff of WHAS-TV, served as CE at WXLN/WFIA radio for six years and has also done station consulting work. He has a PhD. in Theology which helps explain his patience with small market radio. He can be reached at 812-945-9414.



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DAT tape

Ampex's Magnetic Tape Division has unveiled the Ampex 467 DAT (digital audio tape).

The Ampex DAT products come in a full range of length configurations—45, 60, 90 and 120 minutes. Each of the products utilizes a small tape-view window to maximize the labeling area.

For information, contact Steve Smith at Ampex: 415-367-3888, or circle Reader Service 91.



Baseband enhancer

New from Somich Engineering is the DBE-1000 dynamic baseband enhancer. The unit is a digital-friendly composite processor that increases apparent loudness, reduces baseband overshoots and enhances the low end of the audio.

The stereo pilot signal is protected even at the most aggressive settings and a switchable phase linear 67 kHz notch filter provides almost 30 dB of SCA protection without compromising separation.

Multiturn dial controls are provided for processing level and carrier modulation, permitting accurate, repeatable settings.

The DBE-1000 retails for \$1895.

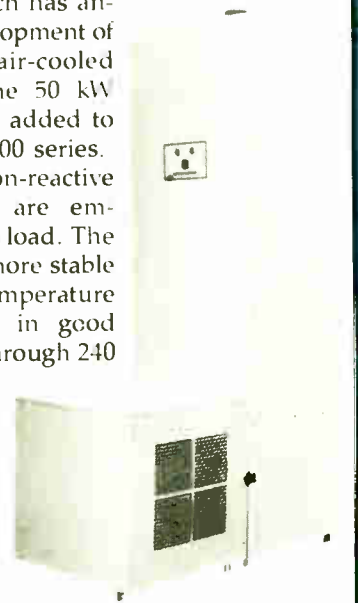
For information, contact Jim Somich at Somich Engineering: 216-526-4561, or circle Reader Service 95.

Dummy load

Altronic Research has announced the development of a high power air-cooled dummy load. The 50 kW product has been added to the Omegaline 6700 series.

High power non-reactive cermet resistors are employed in the new load. The resistors remain more stable throughout the temperature ranges, resulting in good VSWR readings through 240 MHz.

For information, call Doug Starkey at Altronic: 501-449-4093, or circle Reader Service 98.



Studio headphone

The HD 25 studio monitoring headphone from Sennheiser boasts frequency response of from 30 Hz to 16,000 Hz. Sensitivity specs are 105 dB/mW.

For information, contact Anthony Tudisco at Sennheiser: 203-434-9190, or circle Reader Service 93.



Telecart update

Telecart II from Henry Engineering includes a dual-range counter that registers up to 9999 calls answered and an on-line LED that indicates when the Telecart has connected to the phone line. Built-in CPC sensing allows the unit to be used as a listen-line coupler.

For information, contact Hank Landsberg at Henry Engineering: 818-355-3656, or circle Reader Service 97.



Multichannel recorder

A multichannel analog recorder was recently introduced by Studer Revox. The Studer A827 features 14" reel capacity.

For information, contact Charles Conte at Studer Revox: 615-254-5651, or circle Reader Service 92.

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Antennas, Towers & Cables

ERI Earns Praise from KNIX

by Mike Malo, CE
KNIX AM-FM

Tempe AZ The proper antenna is critical to any FM broadcaster. It is the final link in a long chain of equipment that delivers the signal to the listener. It is frequently located on a mountain, hundreds of feet above ground, where it is inaccessible to most Chief Engineers. And it must withstand mechanical and electrical stresses from weather and possible lightning strikes.

There are many factors to consider when choosing and installing an FM antenna system. Careful planning and thorough analysis of the surrounding terrain will ensure good coverage, and

exhibits excellent circularity in the horizontal and vertical planes and demonstrates good axial ratio. The ERI FMH series antennas offer some notable features inherent in its design.

The individual bays are formed using a custom-made tubing bender and silver solder, or by heliarc welding. The driven

the fact that this antenna has very low downward radiation that helps meet RF radiation limits around the base of the tower.

When mounting an antenna on a tower, the resulting radiation pattern will be dramatically affected by the exact orientation of the antenna (e.g., leg

ERI uses brass outer conductors because of their strength and rigidity and because they are less susceptible to weather conditions.

elements are internally fed from within the pressurized feed line to eliminate moisture affecting the connections. The use of melimine insulators and large diameter elements allow up to 1/2" of radial ice to accumulate without severely effecting the VSWR.

High side of resonance

In addition, the antenna is factory-tuned on the high side of resonance; the VSWR actually lower, with up to 1/2" of ice completely covering the bay. Of course, extreme ice conditions dictate the use of de-icers or radomes, which results in additional wind loading or AC power consumption. The FMH series also contains an internal DC short to minimize lightning damage.

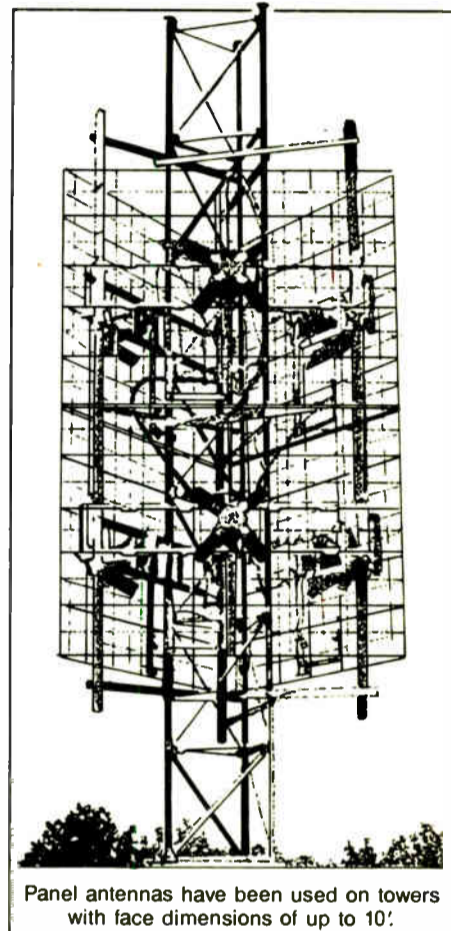
Another feature worth mentioning is

mounting, face mounting and the location of cross members and other antennas mounted on the tower at the same level).

Mounting concerns

If you just mount your antenna and point it at your city of license you may end up with marginal coverage at best and your signal will not be entirely circularly polarized to "find" its way into all of those receivers.

ERI has a 50-acre test range with extremely accurate instruments to measure the radiated pattern. By using parasitic elements positioned in conjunction with an exact replica of a section of your tower, ERI can optimize the pattern to achieve a circularity of +2 dB in the horizontal and vertical plane and an



Panel antennas have been used on towers with face dimensions of up to 10'.

axial ratio of 3 dB.

Of course, mounting the antenna on a pole is most desirable, but these specs are also possible with proper pattern op-

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USER REPORT

a consulting engineer should be retained to assist with the planning and necessary FCC paperwork.

ERI has addressed all of the potential problems that could compromise an antenna systems' performance and reliability. Their designs are flexible and they have antennas for any type of facility, from low power educational to wide-band multistation arrays.

Conductor design

ERI uses brass outer conductors because of their strength and rigidity and because they are less susceptible to weather conditions. The inner conductors are all copper or silver-plated copper and the mounting brackets are stainless steel to resist corrosion.

It is widely accepted that the circularly polarized four-arm short helix (Figure 1)

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Manufacturers Assess DA Rule

by Richard Farrell

Falls Church VA In December of 1988 the FCC passed a ruling that allows FM stations to broadcast in short spaced situations using directional antennas. Proponents feel the ruling will give existing licensees more flexibility in their choice of broadcast sites, while opponents argue that the rule will only serve to create more interference in what is an already cluttered spectrum.

"I think the ruling could be a good thing for the industry in that it allows more stations to become available to people," offers Jampro Antennas Vice President Alex Perchevitch. "As long as the systems are accurately and properly engineered, designed and installed—that is essential," he cautions.

"The ruling has actually minimized the

By crazies, Surette refers to patterns that are sought by broadcasters—and assessed as attainable by some manufacturers—that are to his mind unachievable. Surette says he has encountered such situations recently.

"I have received a dozen or so inquiries into directional antenna patterns that were theoretically calculated to allow a station to use a new direction," reports Surette. "Some of the patterns were so

ridiculous that there was no way a standard antenna system could achieve the kinds of patterns that these consultants had calculated; they were just done on theoretical plots.

"... the ruling is good because it has gotten rid of a lot of the 'crazies,' but it is bad because it has not allowed any flexibility (to the broadcaster)"

ridiculous that there was no way a standard antenna system could achieve the kinds of patterns that these consultants had calculated; they were just done on theoretical plots.

"One pattern that came in here had a level of RF that had to be zero. There is not an antenna system in the world that has zero energy in one direction," Surette says.

"And I saw an FM antenna manufacturer quoting its standard product to achieve one of these unachievable patterns. I know that they are just looking for business," he says.

Surette finds the ruling regrettable in the sense that he sees patterns that are achievable that, under the new system,

may not be allowed. To these, the Commission may say "no, it cannot be done," Surette fears.

Specific rules

Electronics Research Incorporated (ERI) President Tom Silliman says that "even though the rules allow more use of directional antennas, primarily for new CPs or additional short spacing, they are in fact more restrictive. The rules are very

specific now: the FCC will not allow you to submit a calculated pattern for a license, whereas the old rules would."

"I do feel that short spacing is needed," says Dielectric RF Engineer Jay Martin, "and the FCC has designed certain specifications that make the protection adequate. The only problem that could arise would be when the actual pattern is not obtained that the directional antenna was designed for.

"I have a feeling that this is going to become the major problem in the future. Predicted and actual patterns may not match due to terrain, other antennas in the area and things of that nature," Martin says.

"We are just going to have to wait and find out if the rules are going to have to get tighter and reduce the short space potential in the future," says Martin, who believes also that "field measurements are going to have to be taken more extensively in the future than they are today, and by a more controlled means."

Concerns about interference

Indeed, the question of exacerbating interference on the FM band is at the center of opposition to the FCC's ruling, but Tom Silliman holds a more optimistic view. "I feel that if the directional designs are done properly, then this new ruling will not clutter up the spectrum.

I think it is going to cause a lot of people to consider minor shifts to their stations, but I do not think that is disruptive," Silliman says.

And, naturally, thoughts of interference raise questions about how, if at all, the new directional antennas would be policed. There seems to be general doubt about any real way that the FCC could regulate the antennas that is both technologically accurate and logistically feasible.

"I have heard people say that there should be a DA monitor. But I think people making that kind of comment do not completely understand the design of FM DAs," says Tom Silliman.

Policing themselves

Silliman is more likely to lay the responsibility at the doorstep of the manufacturers and consultants closely involved with the design and implementation of the directionals. "I think it all really goes back to the manufacturers. They should be checked occasionally. You are going to have to rely on the manufacturer's integrity. I do not think you can police it in the field

"If you, as a manufacturer, are willing to lie about the engineering," Silliman points out, "then, yes, you can do anything you want. But to me that is unthinkable."

"What the FCC has to do," says Bob Surette, "and they do not have the money to do it, is they have to not wait until somebody files a complaint about a station. They have to be able to just drive around and look at an antenna system."

But Surette does not blame broadcasters. "I think that broadcasters in general try to do well, and they do not try to intentionally cheat, if you will, and go against the Commission. I think what they do—because the law has not been clearly defined—is stretch it as far as it will go.

"And how far can you stretch an undefined law? So the new ruling is at least an attempt to define what is legal and what is illegal. And from what I see, they got rid of some of the 'crazy' patterns out there," stresses Surette.

Ruling a boon?

And what does the ruling mean business-wise for makers of FM directional antennas?

(continued on next page)

INDUSTRY ROUNDUP

number of new directionals that will be allowed," says Bob Surette, manager of RF engineering at Shively Labs, speaking of the restrictive quality to the ruling that he and others believe exists.

The good and bad

"In one respect," says Surette, "the ruling is good because it has gotten rid of a lot of the 'crazies,' but it is bad because it has not allowed any flexibility (to the broadcaster)," he says.



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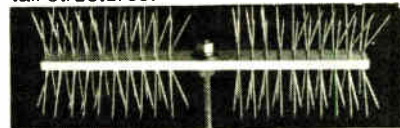
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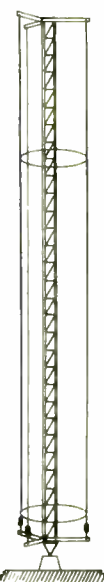
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Shively Track Record Sells KMLE

by Eric B. Schechter, CE
KMLE-FM

Phoenix AZ Shamrock Broadcasting, Inc. acquired the assets of KMLE in 1988 and decided to build an entirely new facility that would include, of course, new antennas.

USER REPORT

Based on a long history of supplying a quality product with excellent technical support, we decided to use the Shively Labs Model 6810 eight-bay center-fed antenna and three-stage bandpass filter for

... a factory modeling of the antenna... was performed to ensure optimal performance.

the new transmitter site.

Shively has been in the business of building antennas and RF-related products since 1960. The company's present day antennas have the same unique design concepts as they did back then.

The major changes to today's Shively antennas have been increased mechanical strength and power testing up to the actual point of failure. I feel it is safe to

DA Rule

(continued from previous page)

"I do not see any special influx of directional antennas," says Surette. "Last year, the big thing in the industry was the booster antenna. It really did not come to fruition... the booster is not the savior of the weak signal. And this year it is going to be directional antennas," Surette predicts.

Tom Silliman sees things differently. "Obviously, the ruling is going to open up the market for directional antennas quite a bit," he says. "It is going to be more work for the manufacturer, but there are going to be more sales."

The real workload in implementing this rule, believes Silliman, is going to be on the back of the consulting engineering community, not the manufacturers.

"They are the ones who are really going to be busy. The manufacturers gained and so did the consultants. The consultants will probably gain much more than manufacturers on this one."

say that when properly specified by the customer, the antenna will perform as expected.

The Shively antenna we use now is leg mounted on a self-supporting tower atop South Mountain in Phoenix, AZ, an "antenna farm" that is home to all of our market's TV and Class C FMs.

One advantage of having the 6810 antenna on a shared tower structure is that it is a physically

lighter antenna than most. Thus, in climates not requiring radome protection from icing, the reduction in weight and windloading become an important factor when several antennas are placed together.

If there is a particular caution I would offer regarding a Shively or any other antenna, however, it is that scrupulous attention must be paid to its installation. In our case, a factory modeling

of the antenna on the proposed structure was performed to ensure optimal performance.

But, as in any great plan, Murphy's Law took effect. We discovered that, due to geological considerations, the orientation of the tower had been changed. We therefore needed to reduce the possibility of pattern distortion, and we opted to mount the antenna on a leg that faced free space and did not "look" in-

to other towers on the mountain.

From there, the race to the finish line was on, and we received construction permits and site licenses. Five days before our target on-air date, the antenna was hung on a brand new tower belonging to KTSP-TV. And as the next few months progressed, we were busy finishing studio work and paid little attention to coverage; it seemed to be excellent.

We noticed later, however, that there were pockets of marginal reception and aggravated

(continued on page 39)

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Mark Tames Deer Point Terrain

by Tim McCartney, Dir Eng
KBSU-FM

Boise ID Use the eight-foot antennas and noise will not be a problem! Good advice for a new STL installation for which a smaller size might have been adequate. KBSU chose eight-foot, P-9A96G-1 Mark antennas to connect its 10.7 mile STL hop at 946.5 MHz in April, 1988. And noise has not been a problem.

This design of grid parabolic antennas covers 940-960 MHz and is constructed of a hefty welded aluminum pipe. Its radiator's active element is protected by a teflon feed housing. VSWR is 1:3:1 or

better on this model, although Mark provides a lower reflected rating as an option.

KBSU's Marks are non-pressurized and not equipped with de-icing elements, although such options exist. The receive antenna, located at an altitude of 7200', has yet to cause any signal degradation, despite many occasions this past winter when several inches of snow and ice had accumulated.

Reliable signal

The system's STL path analysis, from the RF Specialties STL computer program, calculated 38.5 dB of fade margin,

which is sufficient to guarantee a reliable signal. My experience over the past year has proven the prediction true.

For its part, antenna gain for the eight-foot Mark is +25 dBi. Since the six-foot antenna would not have provided as much fade margin, the next largest size was selected for maximum performance.

In fact, sufficient receive signal was not the concern. Rather, receiver attenuation may have been necessary to avoid front end overload. Certainly a receiver preamp was not needed! And, as it turned out, neither was an attenuator.

The two Mark antennas arrived packaged together in a wooden crate about two feet by eight feet. And, since both transmit and receive antennas are identical, there really was no selection process.

Installation on a mountain

The receive antenna, to be placed atop Deer Point Mountain, was prepared for the journey to the top. It was fastened down to an eight-foot wooden spool containing three-inch transmission line.

On the mountain, the antenna was installed to a 4.5" outer diameter (od) mast, which contains plenty of wind loading capacity. For example, a 3.5" od pipe is rated at about 125 mph. The antenna itself is rated for 125 mph winds, with one inch of ice.

Besides, there must be at least 15 different eight-foot grid parabolic antennas on the mountain. So there was little concern about wind loading.

The receive dish was aimed down to Boise State University, and the transmit unit was installed on top of the four-story campus library building, with assistance from a crane hauling it to the rooftop. Mounting was to a two-inch mast fabricated by university personnel.

USER REPORT

The FCC license called for 56.5° azimuth. The main lobe was easily located by aiming the transmit antenna for maximum received signal strength on the mountain.

The licensing for horizontal polarization determined the orientations of both transmit and receive antennas.

No reflected power test

Since the system worked perfectly, we elected not to conduct one test that is normally advisable: that of reflected power at the receive antenna. This requires use of the STL transmitter feeding the receive antenna to check for VSWR. Such tests must be careful and brief in order to avoid interference, since the FCC only licenses one transmission location.

Other miscellaneous specs on the Mark product include: half power B/W of 8.7 degrees; F/B Ratio, 29; cross polarization discrimination response 40 dB; and impedance of 50 ohms.

The Des Plaines, Illinois company is no stranger to trade shows, so it is easy to learn more about their products. Mark Antenna's complete line is summarized in a bound booklet for RF users.

All in all, no problems and excellent performance have been the results on both transmit and receive sides. And KBSU is most pleased about a low noise floor, especially during classical music programming.

The crowded 950 MHz aural STL band in Boise is often a source of trouble, but not for KBSU. A good system and some planned "overkill" from the eight-foot Mark antennas make the difference.

■ ■ ■

Tim McCartney holds a Master's degree in Human Resources Management, is a former radio GM and is certified by the SBE as a Senior AM/FM engineer.

For more information, contact Mark Antennas at: 312-298-9420, or circle Reader Service 88.



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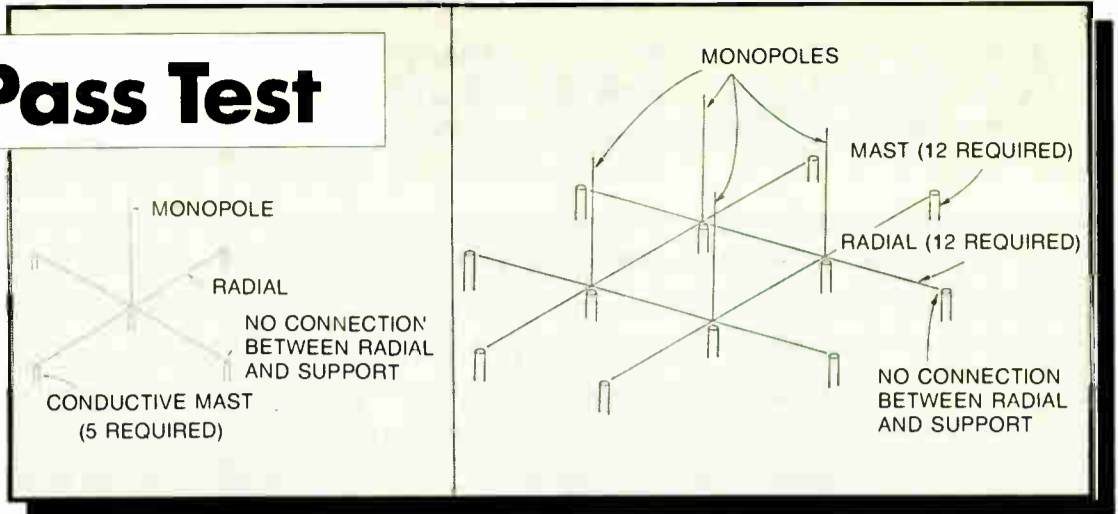
Elevated Radials Pass Test

by Clarence M. Beverage
President
Communications
Technologies, Inc

Marlton NJ In late November of 1988, a new full scale AM antenna system was installed and tested in Newburgh, NY under my direction. The facility consisted of a 120' guyed tower, a base insulator at the 15' level

above ground and an elevated ground system consisting of six quarter wave radials.

The system ran on a frequency of 1580 kHz with a power of 750 W under a Special Field Test Authorization provided by the FCC. Field measurement data compiled on the system revealed that the radiated field was equal to that which would be obtained from



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a 105' tower and a traditional AM ground system consisting of 120 quarter wave, buried copper radials.

The genesis of this system was a paper presented at the IEEE Broadcast Symposium in September of 1987 entitled "AM Broadcast Antennas with Elevated Radial Ground Systems." This paper was later published in the March 1988 issue of the IEEE Transactions on Broadcasting under the authorship of Dick Adler (Naval Postgraduate School), Jim Breakhall (Lawrence Livermore Laboratory), Al Christman (Grove City College) and Al Resnick (Cap Cities/ABC).

Good news

Results of the Newburgh, NY field test are important to the engineering community and broadcasters in general. The measured data confirms theoretical operation of the antenna system as computed through the use of a mathematical modeling technique called the Method of Moments.

SPECIAL REPORT

Mathematical models require real world measurement data to validate their accuracy. Antennas with elevated ground systems have been constructed in the shortwave bands and the operation has confirmed the theory. However, this is the first full size system constructed in the AM band.

The favorable results on 1580 kHz warrant further full scale construction at lower frequencies. Practical benefits to the broadcaster are numerous when this type of antenna system is implemented.

Preserves environment

The earliest implementations are likely to come in environmentally sensitive areas. As large tracts of land for AM antenna systems become more expensive and unavailable—due to land use regulations—forested land and wetlands become candidates for AM antenna system construction.

The elevated ground system minimizes impact on the en-

(continued on page 45)

ERI a Sound Choice at KNIX

(continued from page 33)

timization when leg mounting an FMH antenna or mounting it onto a 24" face. The additional expense of optimization is greatly offset by the benefits received.

Optimization of an antenna may also involve beam tilt to focus the center of radiation at the horizon. Null fill is then used to provide even coverage between the antenna and the horizon.

There are physical limits to the optimization process, however. Towers with a face dimension of 30" or more will severely degrade the radiated pattern, which cannot be fully optimized. Panel antennas (Figure 2) have been used on towers with face dimensions of up to ten feet, with excellent results. They are wide band, allow multistation

use and work well in severe weather conditions.

ERI uses reflecting screens to eliminate distortions in the pattern caused by the tower and the company's panel antennas exhibit excellent circularity.

The cogwheel

ERI has another option for serious broadcasters: the cogwheel. It is truly remarkable and the circularity of the pattern it produces is exceptional. It's manufactured with its own four-sided spine as a support structure and needs no reflecting screen. Broadband and excellent for multistation use, the cogwheel also works well in severe weather.

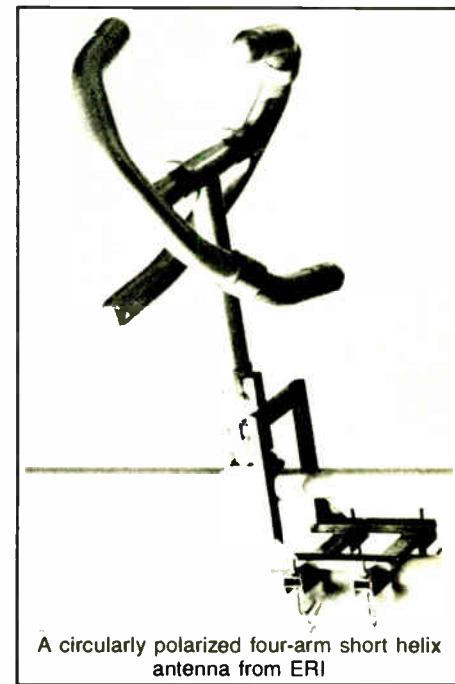
The cogwheel may also be stacked for additional gain, and it is available in four polarization types: horizontal, vertical,

circular and slant linear.

If circularity is not what you need, however, ERI also builds a dual polarized directional FM antenna. It can be useful along coastlines, up against mountains or to help with short-spaced conditions. Like other ERI designs, it is broadband, rugged and can operate with $\frac{3}{4}$ " of radial ice with little change in VSWR.

We use a twelve-bay FMH at KNIX, and after ten years there have been no leaks and no failures. We also have a "product eater" at our South Mountain antenna farm. I have seen their work up close, and I can tell you that the engineers at ERI are great to work with.

FM signal radiation and propagation is a complex subject. Each of the con-



A circularly polarized four-arm short helix antenna from ERI

Outfitting KMLE with Shively Gear

(continued from page 35)

multipath. Further investigation indicated that some important copper grounding strap components were missing from the antenna system.

We knew from the Shively manual that for a leg-mounted antenna spaced closer than 24" to the tower, two copper grounding straps per interbay section are mandatory for proper performance.

Shively's reasoning behind the suggestion is that circulating currents induced in the structure will distort the pattern. Also, the top bay was tilted back toward the leg due to a change in tower member diameter.

A quick call to Shively brought all of the necessary hardware for installation of the ground straps. The tower crew manufactured a shim for the top bay and then all was right with the antenna and the problems disappeared.

As the months have progressed, I have kept track of reflected power from the antenna. It has never risen above 50 W, and only seems to show an increase due

to air temperature. Typically, it is less than 30 W. Credit for this performance should be given to Shively's simple yet effective adjustable fine matching transformer.

Field tuning is easily accomplished with the system pressurized and under high power conditions. This method of tuning allows the user to compensate for a variety of factors related to the mounting structure.

The bandpass filter has proven effective at eliminating intermod products, and, with as many stations as there are on South Mountain, we decided that it was better to put the filter in before any problems were encountered. The filter, with its forced air cooling, is never even warm to the touch.

In conclusion, our decision to use Shively products was based on the company's ability to deliver a quality product on time, its long history in the FM broadcast antenna industry, its excellent customer service and an antenna that has proven itself over many years in the

field. After correcting the deficient installation, the 6810 antenna has met our expectations and will do so for a long time to come.

Eric Schecter is an SBE-certified AM/FM broadcast engineer and a 1979 graduate of the University of Arizona. He holds an advanced class amateur radio license—call sign KD7XR—and enjoys exploring the back country of Arizona and the Southwest.

For more information on Shively antenna products, contact John Clark at: 207-647-3327, or circle Reader Service 83.

cepts described in this article could be isolated and studied individually. There are many factors involved—designing a system involves physics, science, mathematics, electronics, environmental conditions, structural forces, terrain, experience and a little luck.

Electronics Research Incorporated has a bank of knowledge and experience in the field of FM antennas. I recommend you make a "withdrawal!"

Mike Malo has worked as a radio CE for over ten years and welcomes your questions or comments. He may be reached at: 602-966-6236.

For more information on ERI antennas, contact Bill Elmer at: 812-853-3318, or circle Reader Service 85.

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WKDQ Opts for Central Tower

by **Shelby Wilkinson, CE**
WKDQ-FM

Henderson KY Bristol Broadcasting was granted a CP for a 944' tower in early 1988. We had to find a tower and a crew for the job. Most importantly, we had to figure out ahead of time what problems we might encounter with a tall tower. Our land's terrain was rough and wooded.

Central Tower, located in Newburgh, IN, was fairly new to the tower building business, but looked like the perfect choice. We turned over a major part of the job to them and they went with it!

The actual tower base was to be constructed approximately 1000' back from a main road, so clearing the land and building an access road were top priorities.

We also visited local TV stations with 1000' towers to find out about ice and wind, etc., and got a good look at their installations. That is when we discovered that this was not going to be easy.

Fortunately, Central Tower kept us up to date on all progress, supplied all the information we needed and answered any questions we had.

The building begins

Once the road was built, the tower sections started to arrive. Rigging rolled into position, the base was begun, and we

were on our way, the actual construction beginning in early July.

The base was set and cured, and the first section went into place. It was only a 4' section, but the engineering was excellent, and the section was mounted on a special rocker plate to provide a pure pivot connection to the base.

On the taper, Central Tower used heavy channel to provide sheer plate resistance. The bracing was so close together that it provided a virtually solid taper section.

USER REPORT

The anchor points were a problem since most of them were on the sides of small hills. And since all vegetation had been cleared, erosion was also a big concern. Central Tower used flexible rods, which were designed well in excess of load requirements.

These flexible rods also dampen cable vibrations. They are hot dipped, galvanized and coated with Bitumen for corrosion protection. We had to bury and mound the points until we could grow grass and protect them from erosion. We used strategically placed hay and straw bales to stop seed and earth from washing away.

As the tower went up, I noticed another curious point on some sections. Central Tower had designed into their sections extra bracing at the guy pull-offs. Upon investigation, I found what they call "double angle constructed K bracing" at all guy pull-offs.

This type of bracing strengthens the sections and also distributes dynamic loading at the cable connections. I believe this is an exclusive of Central Tower's weld-together construction, and, in my opinion, adds extra strength to the sections where it is really going to count: at the guy pull-offs. It results in a stronger overall tower.

At this point, we had to look at grounding for the tower. I decided I

would go with what I call a "star ground system." It consists of eight 8' ground rods placed in a star shape, all tied together with 4" copper strap and buried one foot deep.

This 4" strap was welded to the tower taper section and further on into the building for transmitter grounding. The guy wires at the anchor points were also grounded by copper wire to an 8' ground rod ahead of the guy dampeners.

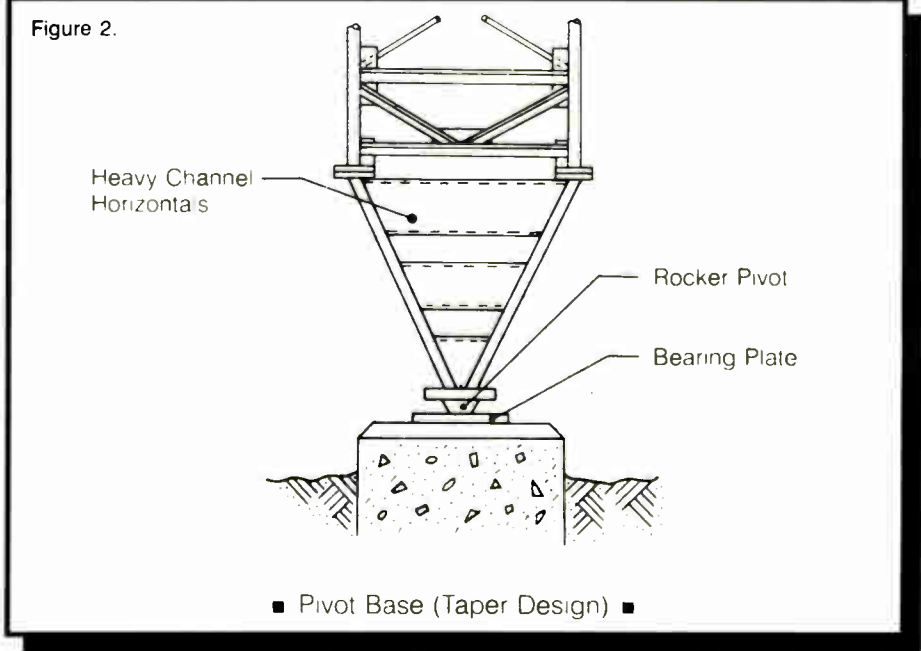
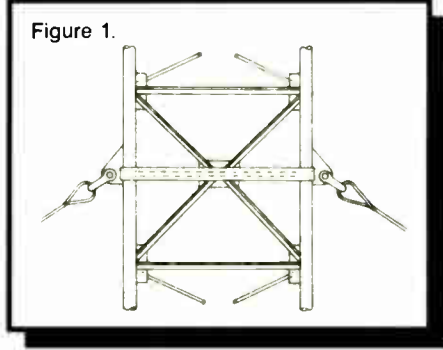
Alternate lighting devised

The tower began to reach high above the trees and temporary lighting became a concern. Having no AC on-site yet, I came up with a 12 V strobe with one-million candle power and a deep-cycle marine battery to raise up on the headache ball at the end of the day.

Later, after lighting was installed, we had to rent a 6 kW generator to run the lights until AC became available. We used a farmer's fuel tank to run the generator and only had to fill it up once. We got our 3-phase power five days later and the lighting was temporarily wired to the controller and tower lights.

Now we ran into our first big problem. The lighting system was drawing too

(continued on page 46)





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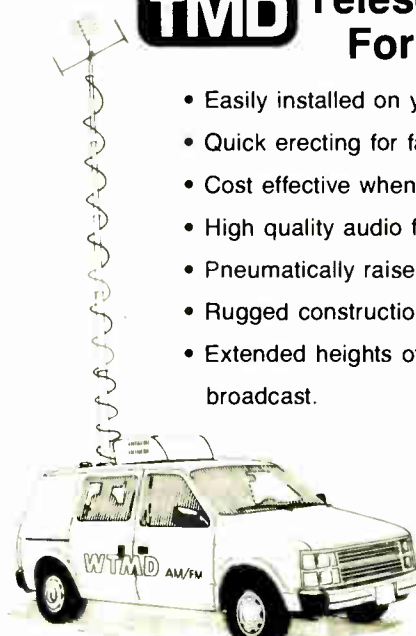
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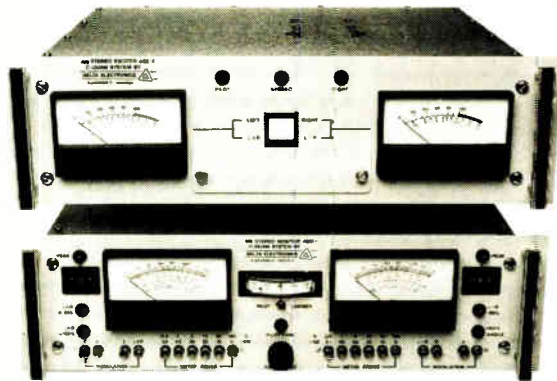
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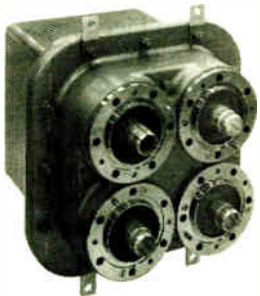
AM Splatter Monitor— Spectrum analyzer performance at a significantly reduced price! An inexpensive means of verifying FCC and NRSC spectral compliance. This frequency agile instrument tunes from 1700 kHz down to 450 kHz, with 9 or 10 kHz channel spacing. The monitor also measures incidental phase modulation (IPM). Designed to be rack-mounted or operated from a vehicle's 12 volt supply using an optional antenna.



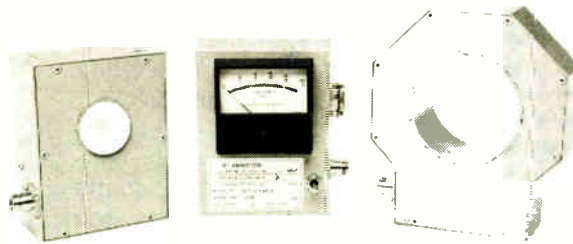
C-QUAM® AM Stereo— The Above Standard Industry Standard is easy to install and maintain with its modular design and construction. Offers standard features other manufacturers charge as options. A sound value, built to last.



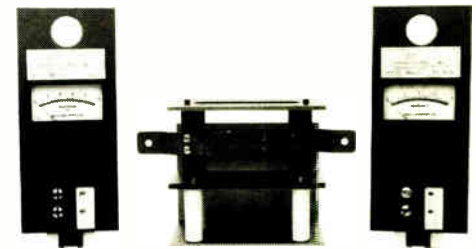
High Power Pulse Reflectometer— Strong interfering fields that would destroy time domain reflectometers are virtually ignored by the PRH-1. This instrument can handle up to 1,000 watts of induced power on an intermittent basis as it locates faults on transmission lines. Provides a visual representation of the transmission or sample line, STL coax, or antenna, using your oscilloscope.



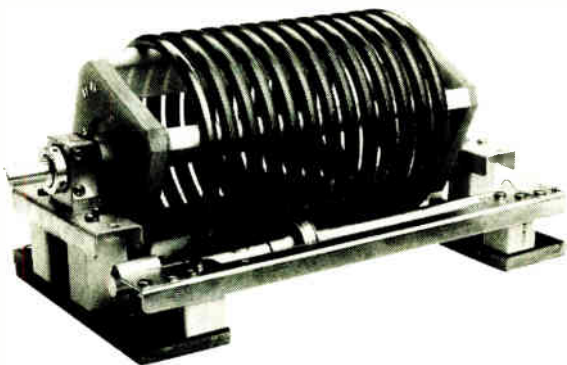
Coaxial Transfer Switches— These 1 1/8" and 3 1/8" motorized four port switches are designed to switch between antennas, transmitters, or dummy loads both quickly and efficiently. The switches can also be operated manually and are fully interlocked.



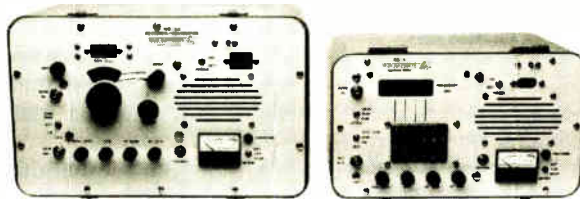
RF Ammeters and Sampling Toroids— Precision toroidal current transformers (TCTs) provide stable antenna monitor sampling while eliminating the problems associated with loops. TCTs also work well in supplying additional modulation monitor or test sample RF outputs. The transformer coupled ammeter (TCA) offers stable base or common point current readings, independent of modulation. The dual and single scale meters also provide remote DC outputs.



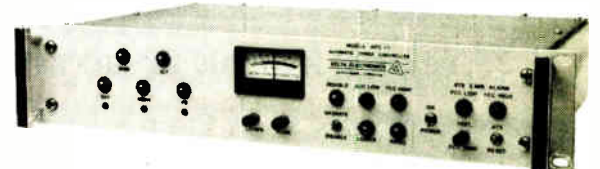
Low Power RF Ammeters— When every milliamp of current counts, depend on the accuracy of the TCA-Jr. This portable RF ammeter is designed to plug into either a Delta MJ-50 Meter Jack (pictured above), or a standard J-plug jack. Two current ranges are available: 0.2 to 1.0 Ampere, or 0.4 to 2.0 Amperes.



Rotary Variable Inductor— Where long life and high reliability are required, specify the RVI. Designed to provide long life, even under continuous rotation, the RVI is available in either 12 μ H or 10 μ H versions (maximum inductance). Other values by special order.



RF Receiver/Generator— A rugged, high output (2 watts) generator and correlation detector receiver virtually eliminate false nulls caused by interfering signals. The RG-3A operates from 0.5 to 1.65 MHz, and the expanded range of the RG-4 generates signals from 100 kHz to 30 MHz.



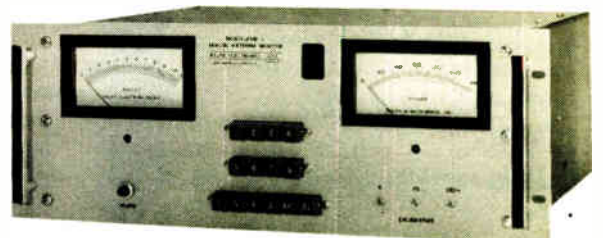
Transmitter Power Controller— Your insurance against over- and under-power citations. Continuously monitors transmitter power levels, compensating for AC power line sag by adjusting the transmitter to 100% power.



Digital Controlled Processor— This inexpensive, stereo tri-band processor boasts user-friendly controls and an aggressive sound. Mono stations can take a step toward AM Stereo, at a price that won't break the budget.



Impedance Bridges— At last, a means of measuring your impedance under full power. Both portable and in-line bridges are available, with a variety of features, for both AM broadcast and HF applications. The in-line Common Point Bridge can be supplied with a TCA RF Ammeter to permit precise current and impedance measurements.



AM Antenna Monitors— These are true ratio monitors which deliver a ratio reading without the need to continually reset the reference tower to 1.000. This simple operation reduces errors by non-technical personnel and makes tuning an array easier.

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Tips on Using Transfer Switches

by John Bissett
Bdcast Product Sales Mgr
Delta Electronics

Alexandria VA As engineering staffs continue to shrink in size at most stations, the need for redundant systems becomes more important. At the transmitter plant, motorized coaxial transfer switches provide the engineer with a reliable, quick means of getting back on

SPECIAL REPORT

the air using either an auxiliary transmitter or the exciter.

Motorized switches are also gaining popularity in AM applications, where the isolation provided by the switches reduces the crosstalk of AM Stereo signals.

Available in a variety of configurations for varying line sizes and power requirements, these motorized/manual switches have been designed to make the engineer's life easier. Unfortunately, it is not always that simple.

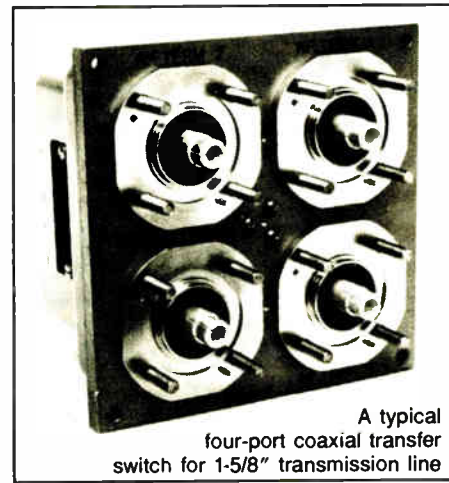
Things to consider

Improper installation can easily cause the engineer additional headaches, but these headaches can be avoided through some simple planning, and making sure the switch fits your requirements. A

number of design and installation factors need to be considered.

Perhaps the most important consideration is location. Though good engineering practice dictates that you keep the number of elbows to a minimum, a compromise between a location with ease of maintenance characteristics and the fewest elbows may be best. The switch should not be located directly over the transmitter, in such a way that the PA exhaust air blows on the switch.

And although locations 15 feet in the air may be aesthetically pleasing, such locations can make maintenance and re-



A typical four-port coaxial transfer switch for 1-5/8" transmission line

pair nearly impossible. At the same time, do not mount the switch too low where it can pose a safety threat to those bumping their heads on it—especially in a dar-

... motorized/manual switches have been designed to make the engineer's life easier.

kened transmitter room suffering from a power failure.

As you search for the ideal location, also consider the weight of the switch. Though the smaller 1 5/8" switches pose no great problem, the larger 3 1/8" switches typically weigh over 50 pounds.

Proper support

Such weight requires adequate structural support. Kindorf™ (a structural steel beam used by electricians) and threaded steel rods make an inexpensive support system. Since the switch is suspended on the threaded rods, mounting height and leveling of the switch is easily accomplished.

Leveling the switch to prevent binding of the feedline is another important consideration, another reason for not mounting the switch high in the air.

Orient the switch so that the RF ports will meet the required transmission line layout. As you determine the RF plumbing route, consider a means of patching around the switch, should it fail. The ability to remove the switch from service and easily plumb the transmitter output to the antenna will alleviate headaches later on.

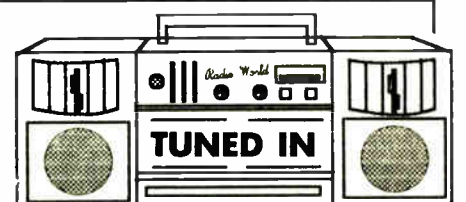
As you decide on the mounting location, also keep in mind that you may need to operate the switch manually. Most motorized switches have a means of manually controlling their operation, but such features are worthless if they are inaccessible. If you mount your switch near a ceiling, provide at least a foot of clearance to permit removal of the motor housing for maintenance purposes.

Although most manufacturers impose no mounting criteria as to how the

switch sits—that is, contact bullets pointing "up," "down" or "to the side," some engineers prefer mounting the switch with the bullets facing upward. Their rationale is that any contamination or dust would in that position fall away from the contact bullets.

While the installation is planned, a decision on interconnecting the control and interlock circuitry must also be made. AC

(continued on page 45)



People . . . Richard Wagner has been named Director of Engineering at CCA Electronics, Inc. Mr. Wagner was formerly a research scientist at Harvard University.

CCA Electronics also announced that long-time Jacksonville/Macon area contract engineer Don Jones has joined its Field Service and Testing Department.

Recent news from Sennheiser finds Al Zang stepping in to become that company's manager for Professional Products. Mr. Zang has 15 years in the audio industry and has held positions at retail, representative, distribution and manufacturing companies.

He will be responsible, among other things, for dealer and end-user support, and he will aid Sennheiser in developing the overall direction of its professional products, which include microphones, headphones, boom sets, RF wireless and infrared technology. Mr. Zang will be based in Sennheiser's Old Lyme, CT headquarters.

Reports earnings . . . Gentner Electronics Corp. has reported third quarter net income of \$179,622—up 214% from the \$57,162 reported for the comparable period one year ago. Revenues were also up 90% from the previous year, according to Gentner.

CEO William V. Trowbridge attributes the revenue increase in particular to his company's remote control and telephone product lines, which "continue to experience growing market acceptance."

The figures for the quarter, which ended 31 March, mark Gentner's ninth consecutive quarter of profitability.

CCA ELECTRONICS, INC.

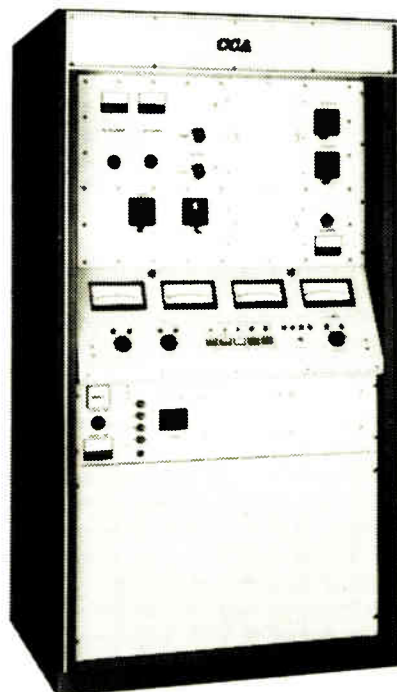
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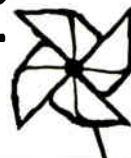
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Verda Zaps Lightning Strikes

by Rob Meuser, Pres
Int'l Bdcst Support Services

Hamilton Ontario CANADA It is difficult to attribute a lack of lightning hits to technology when it may well be simple good luck. Only time reveals the real truth in such matters. But if stations with a history of lightning damage install lightning deterrent systems and the damage is suddenly reduced, then the system apparently must work.

USER REPORT

Lightning protection systems, like the one manufactured by Verda, all work on a similar principle: namely that a continuous "draining" of static electricity must take place before the charge is big enough to become a lightning bolt.

Compared to some other systems, Verda can provide the same protection with much less mechanical loading.

Such systems depend upon a large number of small points, which, being both quite sharp and at the top of the tower, cause static discharges to begin at voltages much lower than the normal amount required of a lightning bolt.

Tower charge equal to cloud

It is not too unlike having thousands of little lightning rods at the tower top. This draining process eventually causes the tower to assume a charge that is the same as a threatening cloud, thus repelling further discharges.

Any serious company marketing lightning protection has a file of case histories where there have been great im-

provements at a certain client's installation. The difference between them, in my opinion, comes with the physical form the various systems employ to perform their functions. On this criteria Verda ranks highly.

The Verda lightning protection system takes the form of a ring of spikes of approximately the same diameter as the tower's cross section. The primary virtue of such a system is that it greatly reduces tower loading and installation costs. Compared to some other systems, Verda can provide the same protection with much less mechanical loading.

Some pointers for dealing with such

lightning protection systems: remember that static electricity is being drawn to the tower when the system is working, so a good static drain is essential; guy wires should be treated separately for static draining and arc gaps should be properly set.

(An interesting aside about arc gaps: there are vacuum devices available that more sharply define arc over voltage than an ordinary air gap does, and they are worth adding to any system.)

The real question

But the real question is: does the Verda, or similar systems, work? Having

dealt with such systems in new installations, I can only say at this point that several 50,000 W installations with up to 9450' towers have operated for over five years without any hits.

These stations are in exposed locations where one would expect some lightning strikes. But, as I indicated at the beginning, only those stations that have a history of lightning damage and then go on to install such systems can claim with any certainty that system's effectiveness.

In the case of Verda, the overall economy of installing their system makes it a must on any tower installation.

■ ■ ■

Rob Meuser may be reached at: 416-526-8200.

For more information on the Verda lightning deterrent, contact Richard Tarney at: 414-961-2185, or circle Reader Service 87.

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face tolerance unequalled by mesh or other home-type antennas. The result is higher efficiency, optimum side-lobe performance and increased gain. This is the extra margin of performance that only a Comtech Antenna can provide. That's why literally hundreds of Comtech 3.8 Meter Antennas are operating today at radio stations throughout the U.S.

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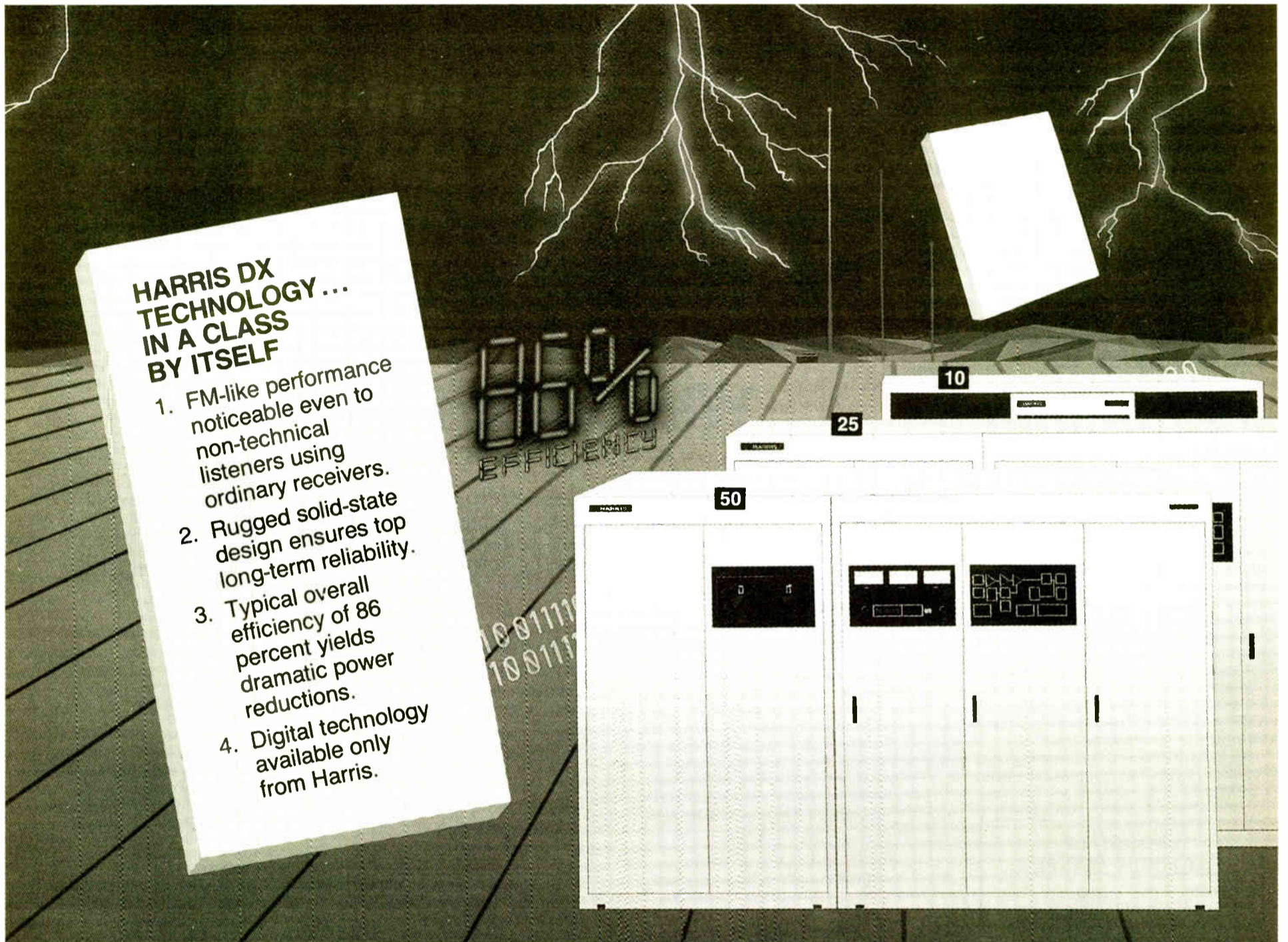
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We invite you to learn what users worldwide have discovered about Harris DX Series transmitters. For more informa-

*The Harris DX-25U is upgradable to a DX-50.

tion about the DX-10, 25U or 50, or to discuss even higher power requirements, please write: Harris Broadcast Division, Marketing Department, P.O. Box 4290, Quincy, IL U.S.A. 62305-4290, or contact us at:

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How to Use Transfer Switches

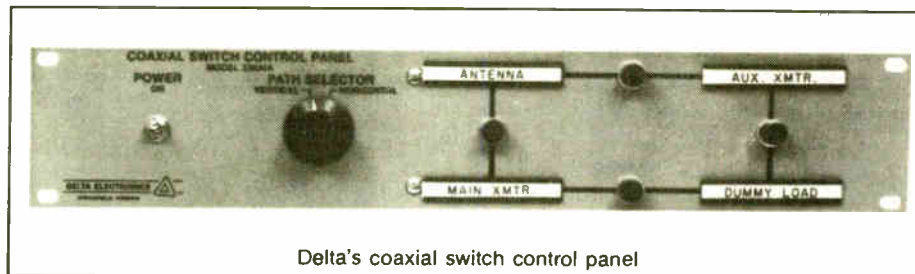
(continued from page 42)

power must be planned and routed to the switch location. Remember that your switch may use either 120 or 220 VAC; size your wiring accordingly.

Switch control functions are usually straightforward. And with the increased number of automatic transmitter changeover panels on the market, control interconnection should not be a problem.

The remote control of a transfer switch is usually dependent on the CE's level of trust in his air staff. In an off-air emergency, air talent can hurriedly rush through remote control functions and may cause more damage.

A middle ground can be reached by connecting the switch to a higher remote control channel and labelling it "Dummy Load." In this manner, the engineer has



Delta's coaxial switch control panel

full remote control function, yet the labeling discourages tampering.

The dreaded interlocks

Coupled to the remote control question is that ugly word interlocks. Talk about a love/hate relationship! Properly interlocking the transmitters and the coax switch is a must—ask anyone who has paid for the repair of a smoked switch!

But good intentions—using proper

switching procedures to avoid switching a transfer switch hot—have a habit of disappearing in the wee hours of the morning or in the middle of the morning drive.

Connecting the transfer switch interlocks is akin to going to the dentist; we know we are supposed to do it, but somehow never find the time. Save yourself the agony of a major toothache, connect the interlocks.

Elevated Ground System Has Merit

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environment. Since a minimum number of radials are employed, the radials do not require burial and forested sites require the removal of fewer trees.

Currently, two applications for construction permits are pending before the FCC for directional antennas using elevated radial ground systems to mitigate impact on the environment. A third pending application will utilize a traditional site.

In terms of cost, the elevated ground system is generally less costly to construct than a traditional ground system consisting of 120 buried copper radials. In this light, a broadcaster with a deteriorated ground system might wish to install an elevated ground system rather than go to the expense of installing a traditional buried system.

And, importantly, the elevated system, if installed sufficiently high above the ground, offers the advantage of allowing the land to be used for agricultural crops,

including fruit trees of nominal height.

As the state of this technology progresses, it is also conceivable that designs will evolve wherein an elevated ground system is installed above the roofs of single story structures.

Electrically superior

Electrically, the elevated radial system is believed to provide superior performance to the buried ground system because it allows the collection of electromagnetic energy in the form of displacement currents, rather than induction currents the earth.

It is anticipated that antenna system stability will be superior with the elevated ground system also, since changes in ground conditions caused by moisture content will have a lesser effect on such a system.

The Newburgh, NY tests were performed on behalf of WGNV Radio and are associated with an application for a new transmitter site, power increase and

change in frequency. For the temporary 1580 kHz operation, the radials were elevated 15' above ground.

A frequency of 1200 kHz would require a 20' elevation, while a 35' elevation would be required at 680 kHz. Additional height may be required if foliage growth is desired below the elevated radials.

Broadcasters interested in this new technology should explore its potential to fit their needs with their consulting engineers. Specific authorization may be required from the FCC to utilize the elevated ground system, pending establishment of specific standards to confirm antenna system efficiency versus frequency of operation. The lower the frequency, the greater the elevation required.

Communications Technologies, Inc. is a broadcast engineering consulting firm. Clarence Beverage may be reached at: 609-985-0077.

And while you are connecting the interlocks, check to see how they operate. Do they open before the RF path opens, or at the same time? How many interlock contacts are there? Not all switches are the same, and what works for one manufacturer may not for another. Check the instruction manual.

Coaxial transfer switches can greatly simplify the engineer's transmitter plant and proper installation and selection will assure years of reliable service.

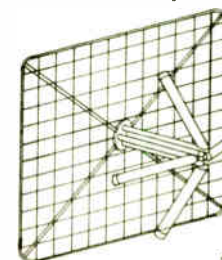
Editor's Note: To assist engineers in planning the addition of transfer switches to their facility, Delta offers a free planning and installation guide. For a copy, contact Delta at: 703-354-3350

John Bissett is a former CE and contract engineer. He can be reached at: 703-354-3350.



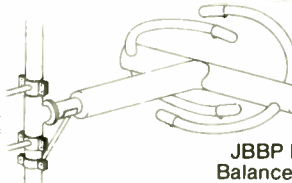
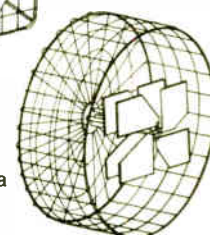
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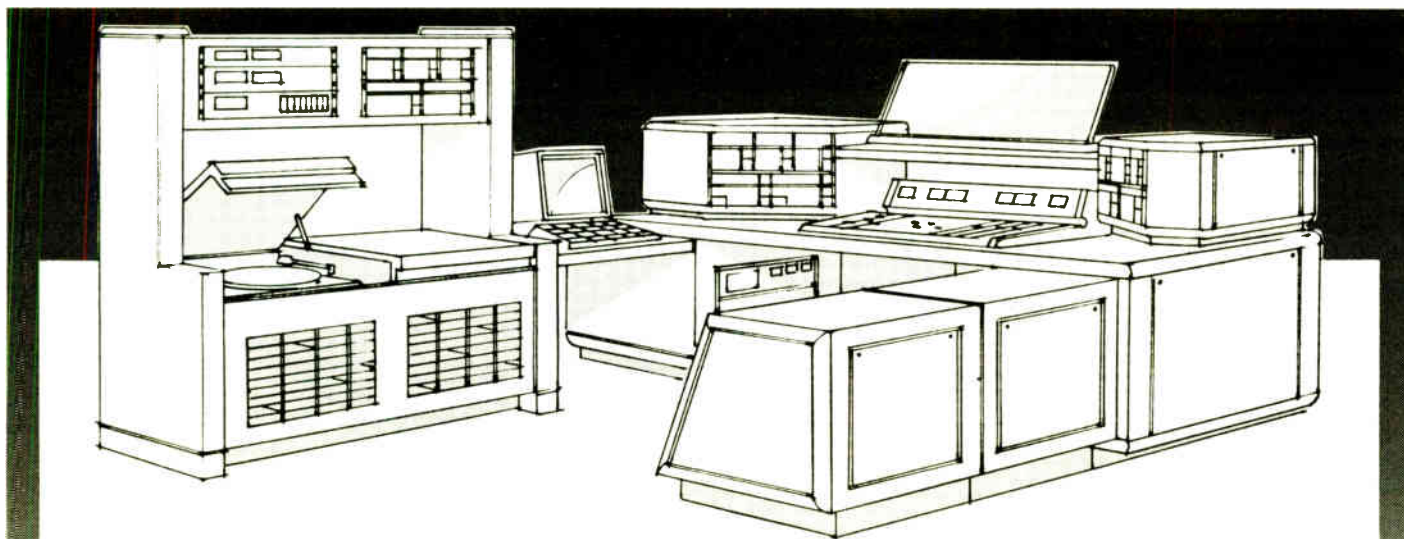
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Circle 41 On Reader Service Card World Radio History

Central Tackles WKDQ Tower

(continued from page 40)

much current, causing the controller relay contacts to burn and when it came time for the relay to drop out, it was stuck on. We also found that when it rained, the fuse for the top set of side markers would blow when the lights came on.

If I replaced the fuse while the lights were on, they would work until the next time the controller kicked on. Resistance measurements showed that all of the side marker sets looked the same. We knew then that it had to be moisture.

Solving a moisture problem

No water was found inside the conduit or light sockets, so we rewired the top side markers and that took care of our problem. I did find some water at the lowest junction box, but some extra waterproofing fixed that also.

Next came the antennas. We pur-

chased an ERI 6-bay antenna for the main and a super power single-bay for back-up. Due to the height of the tower, we had $-.5^\circ$ of beam tilt built into the main antenna. Four-inch Andrew heliax was run to the main antenna, and 3 1/8" line to the back-up antenna. Due to wind loading, we did not use radomes.

The top set of guy wires has fiberglass rods, so the antenna pattern was not affected. The upper 80' of tower tapers down to a 24" face. The antenna was mounted on the 24" face sections, and the back-up antenna was mounted, on the same face, at 400'.

We also put up a Mark 4' open grid STL dish, mounting it at 200' with 7/8" line running to it. We also mounted two Marti antennas for a repeater system. So we now have six antennas at various levels on the tower.

The dreaded ice bridges were the next concern. I had no idea of the damage ice

falling from 1000' can cause. I found out when I looked at ice bridges on some local TV towers and saw the damage that falling ice had caused.

Building bridges

We installed an ice bridge over the STL dish, as well as over the lines from the tower to the building. We had to install free-standing ice bridges over two air conditioner compressors located behind the building. The roof consists of poured concrete, reinforced with steel to protect our large investment inside. Ice bullets were also installed on the guy wires.

The importance of all of this became apparent when one of the largest ice storms we have seen in years hit about two months after completion of the tower. The force of ice when it hits things is almost beyond description.

I could not come within 300' of the building when the ice started falling. Standing about 400' away, I watched in total amazement for almost an hour. I saw large chunks of ice take down entire medium-sized trees in the woods!

The ice knocked huge craters in the ground all around the tower site. (The ice bridge we installed to protect the lines now bears serious battle scars!) We lost a beacon and a side marker to falling ice and the fence surrounding the building was also damaged. The tower, however, stood tall under this incredible load.

So, to recap: this tower is model #6024, manufactured in April, 1988 and is Central Tower project GT-59. Total height is 944' above ground, with a 60' face, tapering down to 24" at 864'. The top guys have fiberglass rods down past the antenna, so radiation is not affected. It is rated at 70 mph windload without ice and is 60% guyed with deadman anchors.

Amazingly, the tower took only 21 days to erect and that included a few days of bad weather. Once their work was done, Central Tower took me up via the tower rigging to let me inspect anything I wanted.

I went up three times and this is the sturdiest tower I have ever climbed. The people at Central Tower always take great care of us and if I have a problem, I just call, and they are on-site within 40 minutes.

Bristol Broadcasting has plans in the works for another 1000' tower in Paducah, Kentucky. Central Tower will erect that one, too. If you are planning any kind of tower work, I highly recommend them.

■ ■ ■

Shelby Wilkinson has 17 years in broadcast engineering. He may be contacted at 502-827-8995.

For more information on Central Tower installations, contact David Davies at: 812-853-0595, or circle Reader Service 82.

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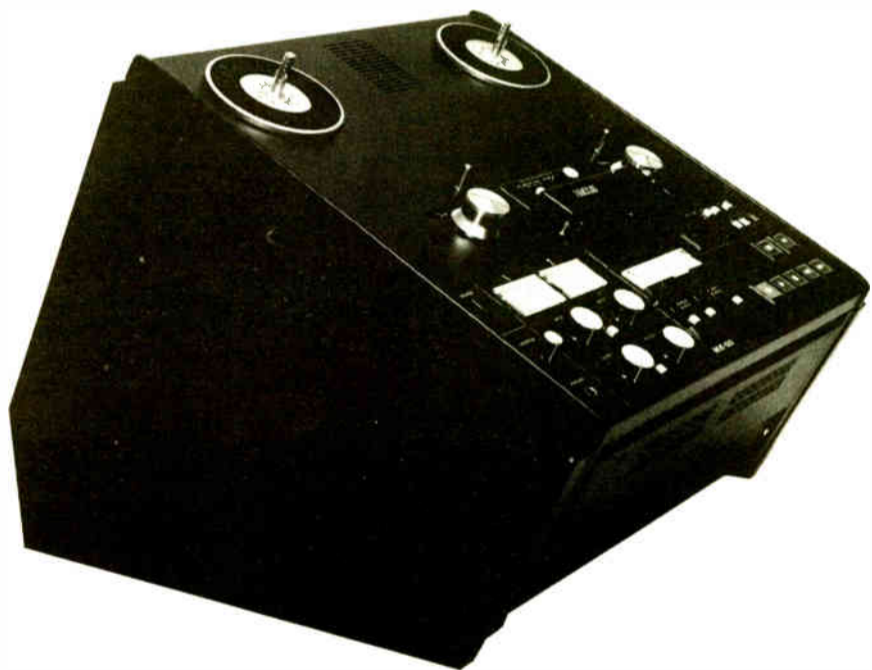
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