

FCC Upholds NRSC Standard

by Alan Carter

Washington DC The FCC has upheld the NRSC standard for emission bandwidth, due to take effect in just over a month, after an appeal was filed questioning aspects of research and receiver compatibility.

The rule, NRSC-2, defines a stations' transmission parameters and reduces occupied bandwidth from 15 kHz to 10 kHz. The FCC ruled if a station uses the NRSC-1 preemphasis audio standard—that reduces occupied bandwidth to 10 kHz—by installing processing filters no later than 30 June, the Commission will

assume compliance until 30 June 1994, the final effective date.

Petitioners Daytona Group Inc., Magrill Engineering and Gillen Broadcasting Inc. mainly argued there was no statistical study to establish the existence of second adjacent channel interference.

parties commenting on the NRSC standard when it was first proposed confirmed "widespread, significant" second adjacent interference harms AM.

The FCC continued that a formal study is not necessary to establish new rules because it was never anticipated that "interference free" reception would be attained, only some relief.

Daytona Engineering VP Kyle Magrill, however, told Radio World that non-statistical surveys for this far reaching

(continued on page 7)

FAA Revisions May Benefit FM Stations

by Alan Carter

Washington DC Stations denied tower site approval because of potential interference based on FAA calculations may be able to get clearance now that some program changes have been implemented.

The Federal Aviation Administration (FAA) has made two changes in a computer program which the FCC believes will give a "more reasonable" assessment of FM interference for broadcast tower construction.

The changes were scheduled to be in

place at FAA regional offices during the first week of May.

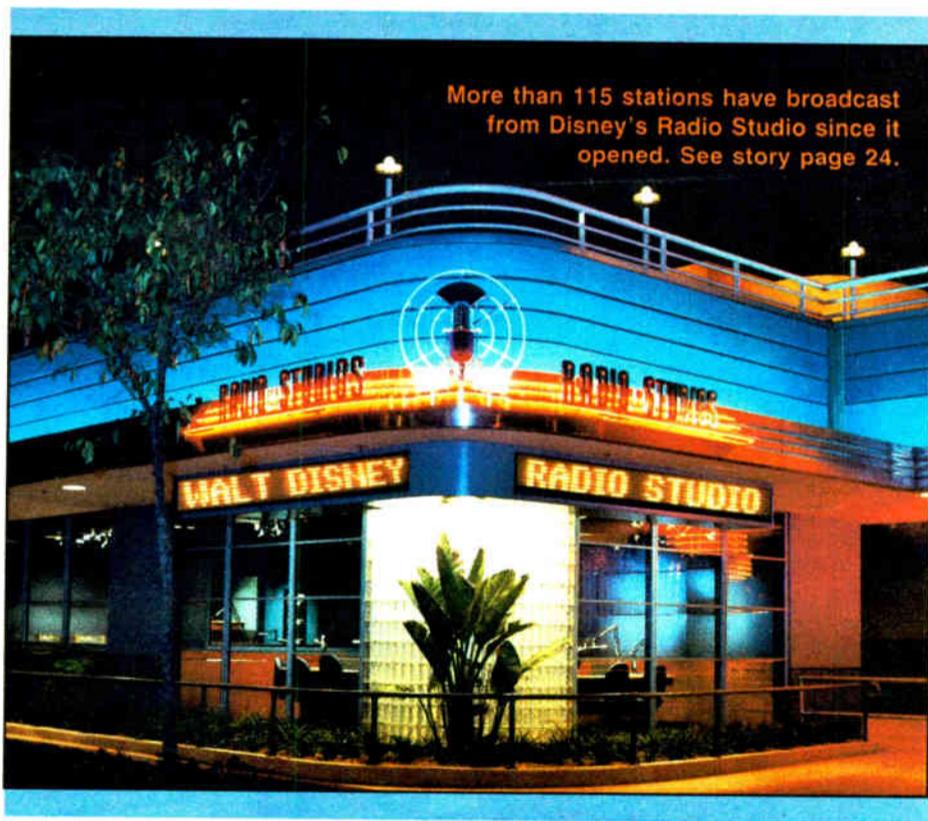
Negotiations between the FCC and FAA started late last year after the two agencies decided to end a long-standing feud that resulted in some broadcasters not receiving approval to build towers near airports.

FAA Systems Maintenance Service Director Peter Kochis said one change adds signal trigger levels that account for an FM signal in air space volume. If the signal is below a certain level, the computer would disregard it. The original

(continued on page 7)

Confirmed by comments

The FCC admitted there was no quantitative data to indicate the exact number of second adjacent problems, but the Commission maintained that numerous



21st Century Radio

by Benn Kobb

Washington DC The future of radio broadcasting may be fade-free, digital and speak with a European accent, but US policy-makers have to do more than they're doing now to keep this country from being left behind.

That was the message during a recent seminar on "Radio in the 21st Century" during which US broadcasters also were encouraged to keep in step with the aggressive push for Digital Audio Broadcasting (DAB) overseas.

A digital band

It is inevitable that radio will be broadcast digitally by the end of this century, according to Robert Mazer, an attorney

with seminar sponsors Nixon, Hargrave, Devans & Doyle.

"We will get into our cars and turn on a radio that has AM and FM bands, and also a digital band. Ten years after that, AM and FM will disappear entirely," he said.

Implementing DAB in the US likely will involve sensitive issues of technical standards, spectrum allocation and license assignments, both for satellite and terrestrial systems, he stressed.

Mazer said the "not-invented-here syndrome" of HDTV should not be allowed to obstruct US analysis of standards.

He urged formation of a US DAB standards committee not unlike the Ad-

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Circle 79 On Reader Service Card

DAT SCMS Bill Reaches Senate

by John Gatski

Washington DC A Senate bill mandating the Serial Copy Management System (SCMS) for consumer DAT recorders is scheduled for a subcommittee hearing, 13 June.

Senate Communications Subcommittee members will hear testimony regarding S-2358, a bill that would require all consumer DAT recorders brought into the US to have the copy-limiting SCMS technology. The bill was introduced

earlier this year by Sen. Dennis DeConcini (D-AZ).

The House version, HR-4096, had not been scheduled for a hearing, according to the House Telecommunication and Finance Subcommittee.

SCMS was agreed to last summer by a group of manufacturers and recording artist organizations as a way to allow the DAT industry to grow without giving would-be pirates a mechanism to make "perfect" bootleg copies of an original CD.

With SCMS, a consumer DAT

for the first time will be able to digitally record a CD, but would not allow the copy to be duplicated. DAT tapes of analog sources can be copied once.

Home Recording Rights Coalition Chairman Thomas Friel said the Senate subcommittee's scheduling of the bill is a sign the bills have a chance to pass in 1990.

Friel, who is also Consumer Electronics Groups VP for the Electronic Industries Association, said passage of the DAT bill would resolve the divisive

issue that has dampened DAT sales.

Although there is obvious support for the bill in the

... passage of the DAT bill would resolve the divisive issue that has dampened DAT sales.

House and Senate because of the number of co-sponsors, a subcommittee staff member

said many members have not yet indicated whether they will support a bill that mandates a consumer technology.

Because of litigation threats by recording artist organizations over the past few years, DAT manufacturers have not pushed their products in the US and

sales have been lackluster.

Until recently, most consumer DAT players were available through scattered distribution. Many did not have warranties.

Although professional DAT recorders were not included in any litigation threats to the DAT industry, those decks have not fared much better in sales, which has kept unit and tapes prices high. Low consumer demand has also meant few pre-recorded tapes.

All non-SCMS consumer and most professional DAT recorders are unable to digitally tape CDs via the digital inputs because most CDs have digital prohibit copy subcodes. Some professionals, however, have claimed that internal circuitry that recognizes the subcode can be defeated.

Some recording artist organizations have said they oppose the DAT bills because they still do not adequately address royalty questions surrounding digital home taping.

Some DAT manufacturers, such as Sony and JVC, announced at the Winter Consumer Electronics Show that SCMS-equipped decks would hit the market before the middle of the year—even without legislation.

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Preparing for Radio's Future

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vanced Television Systems Committee now advising the FCC. Canada, where extensive DAB tests are planned this summer, already has an advanced broadcast systems committee responsible for advanced TV and DAB development.

Gannett Radio Engineering VP Paul Donahue also called for action.

"FM broadcasters today need a technical vehicle that allows them to compete with digital audio in the '90s and FMX is not the answer," he said. FMX does not extend frequency response, does not deliver digital audio and does not improve multipath, he observed.

Cooperation throughout

Donahue said that government, broadcasters and receiver manufacturers will have to cooperate to meet competitive threats from other media such as CDs, digital audio tape and even foreign broadcasts.

"You don't have to be a brain surgeon to figure out that if Canada puts up a satellite, receivers here will be able to pick it up—and Canada will compete with the US."

The 1992 World Administrative Radio Conference (WARC) in Spain is expected to consider spectrum allocations for satellite DAB service. Terrestrial DAB is not on the agenda, but European engineers noted that satellite and ground-based

DAB can operate in the same spectrum if a proposed modulation technique is used.

Mazer said that American broadcasters must get involved if they want to be able to deploy DAB in this country: "I would urge anyone interested in this service to support a frequency allocation at the 1992 WARC."

He said broadcasters should encourage the FCC to move on DAB. "The Europeans are for it, the Russians are actively pushing it, but the US seems to be lagging behind," he said. "I'm not sure when that will change."

Although not yet in full commercial deployment, DAB is well under development within a cooperative program of the European Broadcasting Union (EBU) and EUREKA 147, a consortium that will invest approximately \$47 million in the system.

The consortium's membership includes broadcasters, manufacturers, research institutes, universities and government agencies in West Germany, France, Britain and Holland.

DAB exploits audio compression schemes and an exotic modulation method, Coded Orthogonal Frequency Division Multiplexing (COFDM), to provide as many as 16 CD-quality stereo stations—plus auxiliary data services—within a 4 MHz slice of spectrum. Four channels of 4 MHz each would be enough to cover each European country with its

own set of 16 programs.

Through judicious frequency planning, local city radio services can be accommodated within areas also served by national and satellite services.

Several approaches

EUREKA 147 is experimenting with several approaches to DAB. The single frequency network (SFN) would use fixed satellite service to feed a number of co-channel VHF transmitters on the ground.

Although COFDM appears to require at least 4 MHz in order to work, SFN may work in bandwidths as small as 1 MHz, according to Christoph Dosch of the EBU subgroup on satellite sound broadcasting. This could be accomplished by giving up a single existing VHF-FM channel to produce up to four digital channels.

Other approaches would combine satellite-based and terrestrial systems. Holes in coverage areas could be filled by "gap-filler" repeaters that receive the satellite signal and rebroadcast it locally on the same frequency.

The modulation technique also could enable drastic reductions in transmitter power.

Initial tests in Germany appear to indi-

cate that main terrestrial transmitters could use 5 kW or less to provide equivalent coverage to current 100 kW FM stations, according to Egon Meier-Engelen, EUREKA 147 managing director. Gap-fillers can use as little as 0.25 W.

Canada will have an ambitious DAB schedule this summer, according to Canadian Broadcasting Corp. Engineer Francois Conway.

Canadian demos

Public demonstrations of the system are slated for Ottawa, Toronto (from the famous 1200' CN tower), Montreal and Vancouver.

Conway said that the demonstrations are intended to raise public awareness of DAB, to analyze spectrum requirements and performance of COFDM and audio coding techniques in real-world urban environments, and to help the CBC determine how best to implement the service in Canada.

His organization is looking at satellite-only, terrestrial-only, and hybrid satellite and ground-based systems augmented by gap-fillers.

For information, contact Robert Mazer at Nixon, Hargrave, Devans & Doyle in Washington, DC, 202-223-7200.

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Circle 15 On Reader Service Card

It's Get Tough Time For AM

by Judith Gross

Falls Church VA All right. Show time has come and gone. The Deadheads are back in Nirvana or wherever they hang out when they aren't exposing the world to tie dye.

And Atlanta is just a memory. That doesn't mean that things have slowed down—at least as far as the industry buzz goes.

Right now we're all on the edge of our chairs waiting on the FCC's big plans to save AM. Heard about it at the last meeting, but the specifics are still under wraps at this moment.



Big question: did they do anything about AM stereo? Well, like I told you, yes, it's in there. What they told me is that it's going to be in the form of a **what-do-you-want-us-to-do** question. They suggest an incentive for stations going to the expanded band to be stereo, maybe some other incentives. They'll ask if stereo should be **mandatory**, no system specified. Maybe along with license renewal.

OK, now I know some of you AMs out there are **strapped for funds** and all and that being forced to go stereo would be a hardship. But hey, we have to start **some-where**, don't we? AM isn't going to get any healthier if we all let the next guy do it. So maybe it's time to **bite the bullet**.

Maybe somebody can persuade the NAB to come up with a "**hardship fund**" for struggling stations that make the commitment to improve technically—you know, stereo, NRSC.

As for **simulcasting**, well, fair is fair. The Commission did it for FM when it was in its infancy. Lots of AM stations that owned FMs used to simulcast until the FCC said "no go." That's what

helped FM grow to become a funky new service for eclectic music lovers.

So now, I can't fathom big objections when the **tables are turned** and it's AM we're trying to help.

In this, as in all the Commission's proposals, it may seem as if the **Big Five** on M Street are getting mighty tough. They seem to be saying that if an Amer



Jason Robards Jr. and James Earl Jones helped NPR celebrate its 25th birthday ...

can't cut it in this competitive world then maybe it would be better to **get out** and let those who can take over.

Sure, it might mean **fewer stations**, but fewer stations would mean less interference, a cleaner band, a reason for receiver manufacturers to make better AM radios and a chance for AM to **thrive again**.

Anxious to hear what you all think about this.

As far as NRSC: The deadline is a little more than a month away. We hear the Commission is not going to **look kindly** on stations found to be in violation of the standard. Remember that the occupied bandwidth rules have been changed. Also remember that if you put in an **NRSC-1 processing card** you are presumed to be in compliance.

☆☆☆

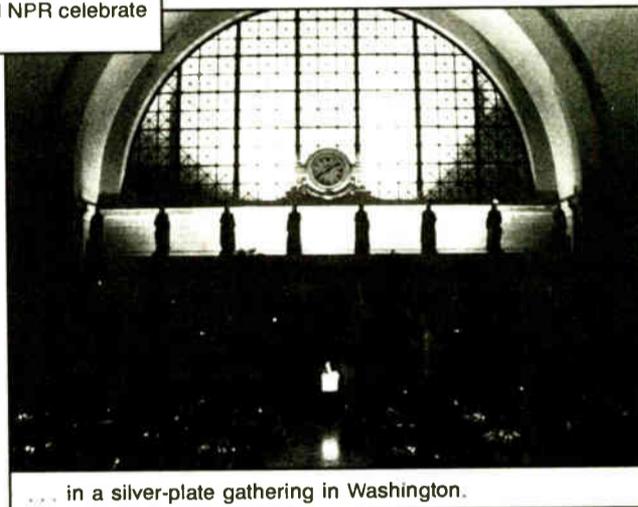
Couple of tidbits have come my way, a few left over from the NAB convention. First, I had to comment on those nifty covers on the catalogs distributed by **Bradley and Harris-Allied** and **BSW**.

Allied's was a you-are-there mobile set-up that made you want to take to the highways at once. BSW's had a decidedly international flavor.

Bradley's, meanwhile, was a subtle scene that blended the old and new of radio in a smoky, sultry, **Maltese Falcon-type** of set-up. There was the hat and trenchcoat, an old radio, rotary phone, old mic. But what's this on the desk? A Sony pro-DAT player and a Dyaxis workstation? Hmmmm.

I also liked the use of the old RWs (real old—from the '20s). Didn't know who you'd expect to walk into that room. **Bogie, or Scott Shannon**.

By the by, that nice furniture set-up from the **Express Group**, the 5000 series that was in the



... in a silver-plate gathering in Washington.

Broadcast Automation booth was won by lucky **Bill Clark**, PD at Clark Atlanta University in Atlanta. Congrats, Bill.

And right after the NAB show was the **Public Radio Conference (PRC)** and a host of celebrations for public radio. First there was **NPR's 25th birthday party**, attended by such luminaries as **Jason Robards Jr., James Earl Jones** (and his beautiful baritone) with entertainment

by **Judy Collins**, all in a posh dinner in DC's renovated Union Station.

The PRC brought in, among others, engineers of public stations for a series of sessions put together by **Don Lockett**, NPR's director of engineering.

Then DC's local public station, **WETA-FM** celebrated its 20th birthday with a party that featured the wit and wisdom of **Stan Freeberg**—Mr. Radio himself.

It was a busy April.

☆☆☆

Lots of talk lately about the **future of radio**. There was a session on that at the PRC featuring some predictions from the FCC's **Bruce Franca** and NAB's **Michael Rau**.

Then a few weeks ago a law firm here, **Nixon, Hargrave, Devons & Doyle** held a seminar on the same subject. Robert Mazer from the firm predicted that by the year 2000 (less than 10 years away) we will have a digital band along with AM and FM.

Mazer went on to say that ten years after that, AM and FM **will disappear** entirely, and the only radio we'll have will be digitally transmitted.

It's no secret that **DAB** is a hot topic. The Europeans are going to spend \$47 million researching it. And Canada is all set to begin testing it fairly soon. Yes, receivers are in development.

With all this pressure not to be **left behind**, makes you wonder about some of today's

station owners. Like the one at the NAB show who told one NAB senior official, "**Your job is to stop it.**"

I suppose he still gets everywhere by horse and buggy.

Heard a juicy tidbit? *Spill your guts to Earwaves by faxing JG at 703-998-2966, writing to PO Box 1214, Falls Church VA 22041, or calling 703-998-7600. Who knows, you could win a coveted RW mug.*



Mr. Jim Stagnitto
Director of Engineering
WNSR-FM
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Peter Burk
President



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Tidbits to consider

Dear RW:

In the discussions in these pages concerning synchronous transmitter operations, I've not seen anything on the longtime operation of two Westinghouse stations: WBX in Boston and WBZA in Springfield.

WBZA had to stay in sync to serve that area. Same frequency. Perhaps one of the old Westinghouse engineers could explain how they operated.

In another recent article some mention was made of publisher E.W. Scripps ownership of a radio station and the author was unable to find any further involvement he had in broadcasting.

Apparently overlooked was the first TV station in Ohio—WEWS TV 5 in Cleveland—still going strong today.

I'd like some help finding some old friends I used to work with in this business since 1950. I'd like to hear from Wm. Arthur (Bill) McLellan the former CE of WJER in Dover, Ohio; Rudi Cehak who held the same position; Bill Green (Wesley Greenfield), announcer; Joel Edwards (Grimm), announcer; Frank Shaffer, station manager and model train buff; Tom McLowery, program director;

sportscaster Lou Boda, who was NBC Football play-by-play man in the '70s and others I may have worked with. Object: possible reunion party.

Ken Courtright, Manager
WBTC
Uhrichsville, OH

Editor's note: Are you guys reading? Contact Ken and if you get a reunion together, let us know about it.

Another way to comply

Dear RW:

Micro Controls, Inc. has been a manufacturer of broadcast equipment for the past 17 years. We at the company have enjoyed receiving and reading *Radio World* for quite some time now. As did our competitors, we also would like the opportunity to comment about our company's position regarding the FCC Rule 74.550 on STL specifications.

It might interest your readers to know that all our STL systems manufactured since late 1973 meet and exceed every requirement of FCC Rule 74.550 with absolutely no modifications to the equipment required.

In early December, 1989, we spoke to FCC engineers in Washington, DC and Columbia, MD, who specifically advised us as manufacturers, that STL transmitters should be tested and verified at the factory for FCC specification compliance as well as manufacturer specifications.

The reason for this safety measure, as explained by these officials, is many units have changed hands and possibly have been modified; thus, units may or may not meet original specs.

As of 1 May through 1 August 1990, for a fee of \$150, all STL transmitters meeting original specifications may be returned to the factory for certification testing and issuance of FCC ID label.

We try to give our utmost service to our customers and give them peace-of-mind that our equipment meets all standards.

Jeff E. Freeman, President
Micro Controls Inc.
Burlington, TX

How about 9 kHz?

Dear RW:

As an AM broadcaster, I would like to congratulate Chairman Sikes and the Federal Communications Commission for taking a stand to improve AM radio. It takes courage to face receiver manufacturers as well as firms that market dimmers, CRTs and other devices that interfere with AM radio signals. This stand is very much appreciated!

While the Commission is exploring ways to improve AM radio, they should consider changing the US from its present 10 kHz system to a 9 kHz system. First, North America is the only holdout for 10 kHz. Let's look at reasons to switch to 9 kHz.

First of all, there would be more channels in the present AM band. There are

The FCC's rewrite of AM technical rules is a clear sign that the Commission is ready to take far-reaching and strong action to alleviate the erosion of the band.

While the specifics have yet to be revealed, the impending NPRM is evidence that the Sikes Commission is taking a markedly different approach to regulations—especially in the technical arena—than the previous two Commissions.

The proposal to populate the expanded AM band (1605-1705 kHz) with stations causing the most interference on the current band instead of the usual special interest preferences is a welcome sign that the Commission is willing to place technical concerns above political ones.

Time To Speak Up For AM

And the FCC's willingness to tackle such diverse issues as AM stereo and simulcasting of programs should give AM stations a reason to believe that some meaningful changes will take place to help AM better compete in a changing technological world.

But the potential to effect change does not lie solely in the hands of the Commission. In the next few weeks, the actual proposals contained in the NPRM will be up for discussion in the industry.

The burden to inform the Commission about what and how to change current policies falls to the entire broadcast community and rests most critically with AM stations themselves.

The Commission needs to hear from all factions of the industry if it is to approve rules that will benefit the AM band as a whole. And all AM broadcasters—engineers and managers—alike should take this perhaps once-in-a-lifetime opportunity to let the Commission know how to proceed.

More importantly, like the example set by the FCC in its proposal for the expanded AM band, those commenting would do well to weigh the technical considerations of the NPRM and judge it on the help it will afford to the band.

This is not the time to let political concerns eclipse the need to help AM. Some drastic measures may be needed to stem the decline which has taken place over the past decade. But AM's survival is a goal worthy of the effort.

—RW

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Next Issue
Radio World
June 13, 1990

106 channels with the 10 kHz system. If a change to 9 kHz were made, there would be 117 channels. We would then be in step with the rest of the world, but more importantly—there would be 11 more channels to spread the current AM broadcast stations.

We all know that one of the main problems with AM is interference. That is the culprit that prompted receiver manufacturers to reduce and reduce bandwidth.

If this were done, the Commission would be able to spread AM stations now on the air across the 117 channels. This would break up the heavy interference of Class IV stations. It would also allow AM daytimers to become full-time.

The FCC also should not put high-power stations on at night. Obviously, it would be rough to take away the 50,000 watt level of the early stations. But they could keep interference down by capping nighttime power to 1000 or 5000 watts. Let's see if the Commission's computers could spread stations so that all, or most, could be non-directional. Some broadcasters will laugh and say, it can't be done—but investigate it before you condemn it.

Keep the NRSC requirement in force and require AM stereo, whatever system individual stations wish. That way the Commission can stick with its "marketplace" stand.

In an article, Mass Bureau Chief Roy Stewart said it took a decade to get the AM band in the shape it now finds itself. He noted it may take that long to get some similarity in audience size of AM and FM.

In the meantime, to enable "standalone" AM broadcasters to survive the Commission should consider allowing "standalone" AMs to be licensed with

power up to 1000 watts ERP on the FM band, the same as with the new FM translator laws. This would place standalone AMs in a better position to survive the next decade of rebuilding. If more FM space is required, do as the Europeans and Asia now do—place FM stations on both odd and even channels.

For skeptics who say it can't be done... look at the new FM radios now being marketed. For the past few years, digital radios have displayed such frequencies as 100.1, 100.2, 100.3, etc. It works in other countries without fidelity loss and stereo is created in the same manner since in those countries, as in the US, stations simply modulate a total of 75 kHz. It works!

I am not suggesting that we do what some countries have done, and move AM stations to the FM band, abandoning AM altogether. Instead allow "standalone AMs" the opportunity to have an FM outlet during the AM rebuilding period. During that time, the AM would simulcast. Once AM and FM are on par, as far as audience size goes, the AMs must be required to program the FM's separately—or turn in the license.

As for the expanded portion of the AM band (1605-1705): do not use that portion until conclusions are made on the new types of antennae being tested. When there were very few radio stations, "skywave" was a friend of listeners. It enabled distant communities to have radio service.

Today, most communities have local radio service and "skywave" is their "enemy." "Skywave" is just another source of interference during dusk, evening and sunrise hours on the AM band.

(continued on page 10)

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NRSC NRSC NRSC

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World Radio History

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Philly FMs Get FCC Warnings

by John Gatski

Washington DC Six stations found to be overmodulating in Philadelphia last March have received only warning letters from the FCC, according to the

Commission's Field Operations Bureau. Stations WEGX, WIOQ, WHY, WXTU, WSNI and WMGK received mild warnings for overmodulation which, according to letters sent by the Commission, ranged from 3%-15% over

the legal limits. Four of the stations were sent Notice of Radio Conditions, which are used to alert stations about "unsatisfactory or marginal" conditions that could lead to a violation. Two other overmodulation warnings came as items in Notices of Apparent Liability for a Monetary Forfeiture, as a result of non-technical violations discovered during visits to those stations.

were measured on 13 March. WHY and WSNI exceeded their 104% limits by 6% and 3% respectively. WMGK and WXTU both exceeded their 100% limits by 5%.

Fines possible

Although none of the stations will be fined for overmodulation (provided it is corrected), the two stations receiving the Notices of Apparent Liability for a Monetary Forfeiture could be fined for the other, non-technical violations.

Violations that could draw a fine include failure to log receipt of EBS test tones and failure to keep up-to-date logs of community programming.

The Notice of Apparent Liability for a Monetary Forfeiture is the first step in the fining process, but does not automatically mean there will be a fine, according to FCC attorney Larry Clance.

FCC Upholds NRSC

(continued from page 1)

action are invalid for determining the severity of a problem.

"Such a survey would have no credibility in most other circles," Magrill said. "The fact that the FCC did not make its decision based upon any quantitative data concerns us.

"Are the majority of stations actually having interference problems?" he said. "Unfortunately, that question has not been answered."

Magrill said Daytona's four AMs do not have second adjacent problems. He added, however, that Daytona stations will comply with the NRSC ruling and noted that equipment is on line at two facilities.

Daytona's stations have more problems with first adjacent interference and co-channel at nighttime, Magrill said.

Magrill acknowledged that the petitioners did not file comments during the rulemaking procedures. "We just really weren't aware of it," he said.

"When we put it in, and it didn't sound as good, we became concerned."

If data supported a widespread existence of second adjacent interference as claimed, Magrill said, the petitioners could accept the requirement.

No research?

The petitioners also said there was no research to indicate how much, if any, second adjacent channel interference is acceptable to listeners. A final point the group questioned was the expectations for receiver manufacturers to build bet-

ter quality radios without an FCC mandate.

The petitioners were incorrect in stating that research did not show how much interference is acceptable to listeners, the Commission stated. It referred to the Harrison Klein and B. Angell reports done in developing the NRSC standard that documented such levels.

In dismissing the petition, the Commission also noted that receiver standards were not within the scope of the proceeding.

"We believe that our adoption of the new emission standard will significantly reduce interference in the AM service," the FCC stated.

Anonymous photographs

The FCC made its visits on 13 and 15 March. They were apparently based on a complaint by modulation manufacturer Belar, which sent anonymous spectrum photographs to the FCC, without identifying the stations, to point out that inconsistencies in the FCC rules have led to overmodulation by stations.

Based on the FCC notices, WEGX and WIOQ were monitored 15 March. WEGX exceeded its allowed 104.5% modulation by 15.5% (120%). WIOQ's modulation was measured at 110%, 10% more than its non-subcarrier 100% limit. WHY, WXTU, WSNI and WMGK

FAA Adopts Revisions

(continued from page 1)

program accounted for all signals.

The second change adds a three-signal intermodulation detection, Kochis explained, which would activate further analysis if all three signals registered. If only two registered, the program would ignore the signal. The original program accounted for any signal detection.

"We are not trading off on safety," said Bill Hassinger, FCC's Mass Media assistant chief for engineering. "We felt the margins (for judging interference) were much too extreme."

Kochis said these changes were under consideration before the FAA and FCC started negotiations over interference considerations.

Kochis and Hassinger said discussions will continue on other possible changes.

"We're making progress. I'm satisfied. We're getting down to some tough negotiations, which I expected," Hassinger said. "It's good—good and healthy. Both agencies have agreed that developing the model is the thing."

Hassinger said there is no way to know the effects until broadcasters put the program to the test. He suggested that those previously turned down for tower sites based on the FAA's calculation might reapply.

Mike Marcus of FCC Plans and Policy said the changes in the computer program would be available to consultants for analysis.

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Cuba Blanks Out Radio Marti

by Charles Taylor

Washington DC As US broadcasters feared, the Cuban government is blanking out portions of Voice of America's (VOA) Radio Marti in apparent retaliation against experimental broadcasts of its controversial TV Marti counterpart.

Cuba began counter-broadcasting music and political programming from its Radio Taino over Radio Marti's fre-

quency, 1180, in mid-April from 1:45 AM to 6:45 AM, according to Joe O'Connell, director of VOA's office of public affairs.

"Since Radio Marti went on the air in 1985, there has been more-or-less continuous low-level interference. You could hear the sounds, but the usual strength was .5 mV. During this new interference, the level jumped to 11 mV, about a 20-fold increase," O'Connell said.

Thus far, VOA's reaction has been guarded. "We are saying that this is in violation of international law and an affront to Cuban people's basic right of free access to information," O'Connell said, "but as far as what we might do to get around the jamming, we're not really talking about it yet."

TV Marti testing began 27 March between the hours of 3:45 AM to 6:45 AM with broadcasts of western news and en-

tertainment from a directional antenna perched inside an Air Force blimp housed 10,000' above Cudjoe Key, FL.

The new service also has been jammed since its testing began with a counter-signal of 50-100 vertical lines. Reports from Cuba indicate that the signal was effectively blocked in downtown Havana, but it was received in outlying areas of the city.

Testing is slated to endure through the end of June.

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NAB Cans Stations

by Charles Taylor

Washington DC In an effort to tighten its budget, the NAB has dropped about 200 radio stations that were more than a year delinquent in dues.

Most of the deleted stations, which normally are given 90 days to make good on overdue membership fees, are located in small to medium markets, according to NAB spokesperson Sue Kraus.

Fees are based on station revenue and normally paid monthly, she said. The lowest bill is \$40 a month, the highest \$700, though group owners are given discounts. Kraus could not estimate how much money NAB lost as a result of the owed fees.

"We went through our files and discovered there were all these stations that hadn't paid in a year. These drops were part of a process of tightening up," she said. "It's a normal way of doing business."

About 150 other stations that are six months overdue in fees were contacted by letter, Kraus added, and given 90 days to pay up.

"The ones that haven't paid in a year, it's pretty obvious that they're not going to, but others we want to contact and try to work something out," she said.

NAB's radio membership totals about 5000.

For information, call the NAB at 202-429-5350.

Root Pleads Not Guilty

Washington DC Communications attorney Thomas Root has pleaded not guilty to federal grand jury charges that he defrauded the government and five clients who were seeking broadcast licenses from the FCC.

Specifically, Root was charged with 20 counts of wire and mail fraud, seven counts of filing documents with the FCC, four counts of using counterfeit and altered federal documents and one count of forgery and obstruction of justice.

According to US Attorney Jay Stephens, Root was under investigation last summer when he survived the mysterious crash of his Cessna 210 in the Atlantic near the Bahamas and suffered a gunshot wound.

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Circle 52 On Reader Service Card

Butler to Run for SBE President

Baltimore MD WBAL/WIYY CE Andy Butler has announced he will run for president of the Society of Broadcast Engineers (SBE).

The election by mail ballot will be due 1 October to national headquarters. Ballots will be mailed approximately 30 days prior to the election.

Butler said one of his main concerns was chapter support. "We are at a critical point in our 25-year history. The Board of Directors, along with the president, must deal with some tough questions, including maximizing the support SBE provides to its members and chapters without imposing impossible

high dues."

Butler said his intentions are to communicate his goals and long term plans through a five-year strategic plan, which is currently being devised.

Butler said his outlined strategy will act as the vehicle through which members and chapters can communicate. "We can't solve the problems we face alone, we need the input, feedback, ideas and support of every member and chapter."

Butler is a certified senior broadcast engineer for AM and FM, and currently serves as vice-chairman of Chapter 46 in Baltimore.

He is past chairman of the St. Louis

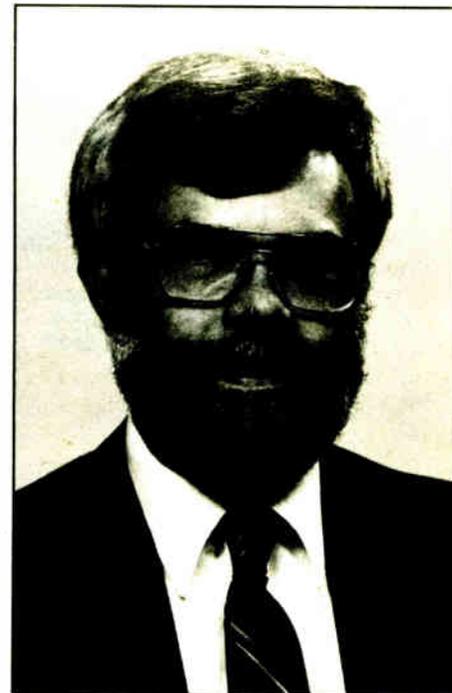
chapter, founded the Central States SBE Convention, chaired the first SBE National Convention committee and served on the committee for five years.

Prior to his current position, Butler was VP/director of engineering for Doubleday Broadcasting and CE for WFAN, New York, and KWK, St. Louis.

He earned a master's degree in engineering management from the University of Missouri.

Butler will run against SBE incumbent president Brad Dick who was elected by mail ballot last October.

For information, contact Andy Butler at WBAL/WIYY, 301-338-6567.



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Circle 16 On Reader Service Card

World Radio History

Readers Forum

(continued from page 5)

If a new antenna design significantly reduces "skywave" it would be a plus for "local" service.

None of us know if AM as we know it will survive. It may end up with true "digital" broadcasts on the current AM frequencies. This would take 100% new receivers, but would create a service superior to the present FM. The answer may lie in narrowband FM, which is now undergoing experimentation.

At this time, there are no accurate crystal balls to say this or that is the solution. Perhaps the 9 kHz change and spreading of the current stations would reduce interference, and the low-power FM repeaters for "standalone AMs" would be the tool that would enable AM broadcasters to survive this period of experimenting and change.

Many small communities, even those in the shadows of large metropolitan cities with several 100,000 watt FMs, need local radio to report on City Council meetings, school closings during bad weather, high school ballgames, etc. I say "AM radio" is an endangered species, and needs as much protection and nurturing as the snail darter, bald eagle or other vanishing breeds. Hopefully others will feel the same.

Bart Walker, President
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FROM THE TRENCHES

by Alan Peterson

The Spoils of Radio

Dear JG,

Pretty much settled in now at the new gig in Danbury CT. The real tough part was in packing up again for another move, except this one's a bit more permanent.

Let's see . . . I've been in radio since 1977, I've gotten fired and now I'm getting divorced. Yep, at last I can finally say, "Yes, I am in radio."

I was amazed to see just how much "yunk" (Swedish for junk) I'd amassed over the years, but even more when I thought about where it all came from. Much of it was perfectly good gear flung by various stations too disinterested to look for whatever was wrong with it.

First in the "take-with" box was a mint Marantz PMD 200 ENG-type cassette machine, ash-canned back in '85. The drive motor must have been shot, hence its extended nap in the dumpster.

Well hey, can I take it home? "Be my guest."

Are you sure? "Just get it out of my sight."

I have come to love that phrase over the years. Home it went, right on the bench.

The motor was fine, a microswitch was shot. Marantz put one in the cassette bay to activate a motor-ready state when loaded. A quick call to the company, a three day wait for the UPS man, fifteen minutes with a Weller 30-watt and there

was my own ENG deck. Total cost: under ten bucks.

I was honest enough to tell my boss the above scenario, and to offer him the machine back—minus the cost of my work. He refused, because the three machines he got for the price of a new Marantz were now in place and he was happy with them. At least 'til they fried and wound up in the can.

Next to go in the box for the move were three great headphones . . . all flung by other stations. "Get 'em out of my sight," I was told. Fine. One new driver, some cable and (believe it) a simple TRS plug and I've got a nice pair of Sennies, an AKG and a Pioneer.

Oh, let's see . . . the carts I rewound, the tuner I saved (needed a sheet of mica under a driver transistor!); the list became embarrassing. "Get it out of my sight" had become the modern day "I will grant you untold riches, Master."

And, despite how packed the box was getting, I couldn't help but think of some goodies that got away for one reason or another.

Like the Ampex "battleship" 2-track deck that wouldn't fit into my Omni. The expensive CD player that couldn't stop mistracking (I blew this one myself by blurting out, "Have you tried swabbing the ciggy smoke off the lens?"). The magnificent—tho' funky—analog synth

that had a very unstable sample-and-hold circuit, but actually had a dirty keyboard rail. More nicotine casualties.

Then there was the stunning Pultec equalizer snoozing away peacefully in WHEN's garage. I saw that baby and they just about had to pick me up off the floor. Unfortunately, nothing would get my boss to part with it. Now, then or ever.

And it's still too bad Mark McKay got hold of a fully-functional traveling disco rig before I did. Tables, mixer, columns and all—free! Apparently, the rig was simply in the way at the station and the GM just said (*eww*'rybody sing!), "Get it out of my sight!" Mark got the rig, I got spit.

May I add none of this good stuff was stolen, Jude. I always make it a point to ask about something than to grab it over a weekend and blame the kid that jocks the syndicated countdown show. I've even inquired about stuff that has the potential to run again. If there's any hope the 20-year old Spotcaster can be resurrected for use in the station (Lord knows

"Get it out of my sight" had become the modern day "I will grant you untold riches, Master."

where, though), I'll take it home, poke around with it and bring it on back.

Nothing like a "Gee Whiz" phase that hangs on all your life, eh? Some stations with acres of scrap gear may consider a donation of a couple of odd pieces to a local high school to help them get a media program off the ground. Let's face it, the stuff can only depreciate so far. And think of the return-on-investment: practiced kids sharp enough to hit the air as weekenders.

I know somewhere out there is a CE-wannabe, eyeballing a dusty, idle Gates Yard board, armed with his *RW Revitalize a Console* clippings. Hey, why not? Since recycling is going to be the big buzzword of the '90s, it only makes

good sense.

When you're in the trench, owning the odd piece or two is fun. When you're managing a station, it could pay to think twice about opening a window and aiming for the dumpster. There's still some mileage left in some gear and with landfill space getting more and more limited, maybe an extra weekend spent soldering new plugs on headphones would actually start to pay off—not just at work but on a global level.

Wonder if my neighbors would object to my putting the 10 kW AM transmitter in the basement?

Getting out of your sight,

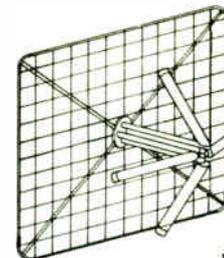
—Al

Al writes from WLAD/98Q, Danbury CT, and once again finds himself Radio's Most Eligible Bachelor. Send correspondence to RW and "truckloads of broken gear to my ex!"



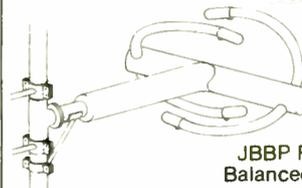
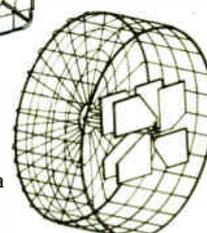
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The FCC Slips In A Filing Change

by Harry Cole

Washington, DC As Mick Jagger once said, "Please allow me to introduce myself." I'm your new legal columnist, here to 'splain some things, question some others and generally provide a different perspective on what the FCC does and doesn't do from time to time.

By way of introduction, I'm a member of what is familiarly referred to as "the communications bar." As with many of my fellow communications lawyers, I once put in my time at the FCC, where I worked for about 18 months in 1974-1975, right after I got out of law school.

After that, a large Washington law firm hired me, and over the next six years I represented a variety of radio and television licensees in a variety of matters, both routine and less routine. I also wrote the monthly "Washington Memo" for the late-lamented NRBA from 1977-1981, played guitar in various bands and appeared as an extra (specializing in rock 'n' roll and TV trivia and songwriting) on Howard Stern's morning show when he was on WWDC-FM here in Washington.

In 1982 I left the big firm to start up a communications law firm with another big firm alum, which pretty much brings us to where I am today.

Let's be clear up front on what this column is going to be about. Ideally, it's not going to be a dry discussion of what the FCC's rules say.

You probably all subscribe to the standard communications publications and presumably many (if not most) of you already have communications counsel whom you pay handsomely to keep you abreast of the latest developments—so the last thing you need is somebody else paraphrasing FCC news releases at you.

What I hope to provide here is a slightly different perspective on developments which may be of interest and/or importance to you. Those could include

stuff taken from FCC news releases (and, God knows, I am not above paraphrasing from any source).

But it is also likely to include information, analysis and speculation derived from various other, less public sources. And I will be happy to consider suggestions from readers.

COLE'S LAW

Oh yeah—don't expect objectivity. I will try to explain the ups and the downs of the issues, but I don't plan to be shy about taking positions.

With these guidelines in mind, let's tackle a subject which is likely to be a source of expense and annoyance to many of you.

Filing fees to Pittsburgh

You may not have heard much about it until recently, because the FCC never bothered to issue any announcement until the decision had already been made. I'm talking about the fact that, as of the end of May, any filing that must be accompanied by a fee must be sent to a bank in Pittsburgh. That's right, Pittsburgh.

As you no doubt know, historically all applications submitted to the Commission have been filed directly with the FCC's offices in Washington.

In the past several years limited exceptions have been made for certain filings deemed likely to generate huge numbers of applications, such as new low power television and cellular radio applications. But virtually all of your garden variety radio and TV applications were filed right at 1919 M Street.

Starting 21 May, 1990, however, that convenience will be a thing of the past (unless, of course, (a) someone is successful in getting the new procedure

stayed and/or reversed, or (b) you happen to live in Pittsburgh already).

Instead, as of that date all "feeable" filings will have to be sent to one or another address in beautiful downtown Pittsburgh. Why? Because, according to the Commission, handling the "fee processing" in Washington has led to "significant delays" in the processing of applications.

Bureaucracy in action

What, you may ask, are they talking about? Well, under the existing scheme, you file your application, with fee, at an office in the basement of the FCC and the Mass Media Bureau processing staff—which will ultimately act on that application—is located on, say, the third floor.

And yet, it takes as much as 15 days (count 'em, two weeks and a day) or more for the application filed in the basement to wend its way up the elevator (or the stairwell) to the appropriate processing person's desk.

Appropriately enough, the FCC is concerned about this delay. Unfortunately, the "best" way the FCC has found to deal with it entails filing the applications in Pittsburgh.

According to the Commission, because of anticipated increases in the numbers of applications likely to be filed, and the difficulties in "filling low paying administrative positions in Washington, DC," it is cheapest to farm out the fee processing function to a bank two states away.

For reasons that are not immediately obvious, rather than process applications in a single building in Washington, it is cheaper, quicker and more reliable to have applicants make the necessary arrangements to ship their applications to Pittsburgh. Then a bunch of non-FCC people will handle the initial processing of the applications there and ship them back to Washington.

No prior notice

It is worth noting that this change was made without any prior formal notice or opportunity to comment. It is also worth noting that it will affect even more people than you might think, because the FCC is, at the same time, increasing substantially the types of filings that are subject to fees.

For example, your annual ownership report, your call sign change, and your occasional STA request all used to be freebies; under the new rules, as of 21 May, 1990, they are all "feeable."

What does this mean for you in practical terms? Well, as matters now stand, (continued on page 16)

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Circle 12 On Reader Service Card

A Novel Way to Upgrade FMs

by Steve Crowley

Washington DC Though it has a religious format, WCVZ in Zanesville, OH prides itself on being informative and entertaining, as well as inspirational.

With a budget just breaking six figures, the station isn't rich. GM Paul Robertson, however, has larger concerns.

"There's a lot of unemployment and poverty in Muskin-

gum and surrounding counties," he says. "This area used to be roaring with industry . . . coal, railroads, potteries, tile factories. Most of that's gone. You can drive for miles and see nothing. But there are people out there. They'd like to feel they can tune to a local station. They'd like to hear what's going on at the Muskingum County Fair."

Getting a signal through the

hills of eastern Ohio is tough for any FM station, but especially so for a Class A facility like WCVZ. Two years ago, Robertson decided to upgrade.

Commercial rules apply

WCVZ is further distinguished by being a non-commercial station on a commercial channel. As such, it's subject to the same engineering rules as commercial stations—

including those for separation and city coverage.

Though a site could be found that met Class B1 separation requirements, it wasn't close enough to Zanesville to provide requisite 3.16 mV/m service.

The only way the site would work was if the community of license was changed. Under FCC policy, however, that

meant opening up the upgraded channel to competing applicants.

Robertson thought he should be able to change WCVZ's community of license without placing the station at risk, so he asked the FCC to change its

CONSULTANTS CORNER

rules. Last year, it did.

"I was elated," Robertson says. "Now we'll be able to get our programming to thousands more people." And now, other stations are taking advantage of the same rule to achieve the same result.

Section 1.420 of the rules has long allowed change of a station's class or channel if any of the following conditions are met: 1) There is no other timely filed expression of interest, 2) If other interest is expressed, there is another equivalent-class channel available, or 3) the modification of the license or permit would occur on a mutually-exclusive

. . . consult with your attorney when considering modification of your station's status . . .

higher-class adjacent or co-channel.

This third condition is the one most widely used by FM stations upgrading today. It allows risk-free upgrading.

The new rule is an additional subpart to Section 1.420. It says a new community of license may be specified without risk if the amended allotment would be mutually exclusive with the existing station.

To upgrade in the past, you had to worry about meeting separation requirements and serving your community of license. Now, if you only meet separation requirements, you can try to find another community.

Putting it to work

To take advantage of the rule, you don't even have to change your station's class. You might want to keep your existing channel and class and just change transmitter sites.

You don't even have to move. Maybe you just want a community of license with a little more cachet than Figville or Rickettsburg. The new rule can be used here as well.

Any catches? Plenty. Several tests must be met before the community change will be approved.

First, a community can't be deprived of its only local service. Second, there is the test of

(continued on page 16)

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Aim High, Strive for Quality Assurance

by John Cummuta

Downers Grove IL "Well Done!"

That's what it said on the official quality assurance report form, and it was addressed to me.

I had saved Rockwell International thousands, maybe hundreds of thousands of dollars. But, more importantly, F-14 Tomcat pilots would no longer have to worry about their tactical communications radios going south on them in the heat of battle.

ENGINEERING MANAGER

What was this marvelous discovery I had made?

Simply that Grumman, the builders of the Tomcat, were not installing Rockwell's ARC-159 transceivers according to specifications and were overloading the power supply.

After a little investigation, I discovered that the radios were supposed to have separate power supplies and when the circuit jumped an amp or two over the single power supply's rated value, it couldn't resist popping a breaker.

Was I some kind of electronic super-sleuth? Nope. Just a quality assurance engineer. Was this a top secret, high-priority Department of Defense project? Uh-uh. Just the quality assurance control loop in action.

Quality control

There are two primary "quality" disciplines in manufacturing: quality control and quality assurance. We in broadcasting can learn a lot from these industrial applications.

We can adapt the concepts of quality control and quality assurance to help us maintain quality in all our jobs and processes around the station—particularly engineering.

Somewhere in the middle of my career

in broadcasting, I decided that I'd like to get paid a living wage for what I knew, so I took a job with Rockwell International's Collins Telecommunications Division. There I was trained and put to work as a quality assurance engineer.

It took me awhile to really grasp the concept of quality assurance, because my broadcast engineering experience had instilled mostly a quality control mentality in me.

You see, quality control people are measurers. They look at a product coming off the assembly line, measure it to see whether it meets specs, pass it if its good, scrap it if it's bad. It's a kind of after-the-fact quality filter. It doesn't have any direct effect on how good or bad the assembled products are. It just makes sure that bad ones don't get shipped.

This respond-when-it's-broken attitude is primarily what I had developed in broadcast engineering. Sure I did maintenance. But most of my real engineering work was fixing something that was down.

Quality assurance

Quality assurance, on the other hand, works to directly affect the ultimate quality of the finished product, by controlling the quality of each stage or step in assembling that product. In other words, if each assembly step is carried out exactly according to its specifications, the quality of the end product is "assured."

How does that apply to broadcasting? Perfectly, because it applies to any process. And almost any job in any kind of business can be looked at as a process. So the principle expands to say that—no matter what task you're performing—if you control the quality of the steps involved in that task, then you assure the quality of its outcome.

If we're talking about a technical maintenance task, we would be considering how well we controlled the quality of each step we followed in the specific maintenance procedure. Did we use the

(continued on page 18)

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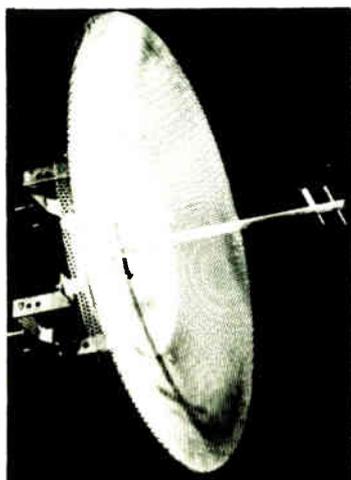
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License Changes for Upgrades

(continued from page 14)

mutual exclusivity. Your existing facility must preclude the modified facility.

Third, the proposal must result in a preferential arrangement of allotments. The yardstick used by the FCC is its FM allotment priorities. In order, they are: 1) first aural service, 2) second aural service, 3) first local service and 4) other public interest factors.

If your proposal results in an area receiving its first aural service, that's top priority. (Aural service means supplying a minimum-strength AM or FM signal to an area—for example, 1 mV/m for Class A FMs. Local service means

service from a station licensed to the community.)

There aren't many places that don't already have two aural services (at least where you'd want a station). It seems most community change upgrade requests use Priority 3 and change to a community having no local service from a town having several stations.

Priority 4 comes into play when both communities (licensed and proposed) have first and second aural services and local service.

The FCC gives the example of FM licensee X, which sought to change its community of license from community

A, in which it is one of two local stations, to community B, with five local stations.

Communities A and B have roughly the same population. Because second local service is a higher priority than sixth local service, X's petition would be dismissed as unacceptable.

Priority 4 concerns

Things can get murky fast when relying on Priority 4. Moreover, the Commission says its policy is to "apply the allotment criteria in a flexible manner where circumstances warrant." It's important to

consult with your attorney when considering modification of your station's status using these or other rules.

Approval of WCVZ's upgrade petition is expected any day. Paul Robertson credits the tenacity of his attorney, his engineer and himself for helping to bring about the new rule. He also tips his hat to the FCC.

"It's exciting to think that a little station in a town of 28,000 could cause the rules to be changed. That says a lot about the Commission."

■ ■ ■

Steve Crowley is a registered professional engineer with the consulting firm of du Treil, Lundin & Rackley, Inc., 1019 19th Street, N.W., Third Floor, Washington, DC, 20036. Phone 202-223-6700, or FAX 202-466-2042.

The FCC's Feeable Filings

(continued from page 13)

most communications lawyers are either located within the immediate vicinity of 1919 M Street or have some means of getting things on file there easily.

The filing of any particular item thus normally doesn't generate much of an additional fee. But if it now becomes necessary to send a person on a daily, multi-hour trip to Pittsburgh to accomplish the same function, you can be pretty sure that the obvious additional costs (plane fare, cab fare, personnel time, etc.) will show up on your bill.

This is not to mention the potential for misplacing any particular application. Now, the application is normally delivered directly into the hands of the FCC in the very building where all of the processing is to be accomplished; under the new scheme, the application will

travel a lot farther and will pass through a lot more hands.

I leave it to you to figure out which method is the safer.

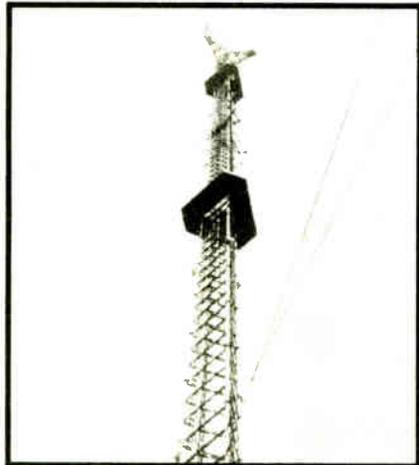
As unattractive as the prospect of Pittsburgh filings sounds, unfortunately, it appears that we are all stuck with it. The FCC will have to deal with any petitions for reconsideration which might be filed, so there is at least a chance that the new system could be scrapped.

In view of the FCC's usual budgetary problems, though, that chance is no more than a long shot. There may be no harm in trying, though. After all, these are your tax dollars at work.

■ ■ ■

Harry Cole is a partner in the Washington DC-based law firm of Bechtel & Cole, Chartered. He can be reached at 202-833-4190.

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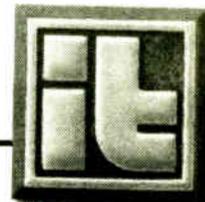
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(continued from page 15)

right test equipment? Did we precisely follow manufacturer's instructions? Did we get the exact readings we should expect?

If the answer to any of these questions is "no" then we can expect less than optimum quality from the outcome of the maintenance.

The quality loop

Whether we're talking about performing maintenance or trying to make an announcer follow the station's format, we are generally looking at a multi-step process with controls and standards.

These controls and standards might be a format clock or a manufacturer's maintenance procedure. Whatever the controls, there is a logical process to follow in using these standards to help us assure quality.

It's based on the same principle as every feedback loop you have ever seen in your electronics experiences. The performance is measured, usually at each step in the process and compared to the control or standard. Deviation from the standard is fed back to the control element, which implements a correcting influence.

Let's look at managing people as an ex-

ample of this process at work.

You have an employee who is doing a particular job. Periodically, you examine this person's performance and compare it mentally to the instructions or directions you provided. If the performance is precisely in line with your directives, you do nothing, or maybe in this case you give a little positive reinforcement. But you do not do anything to change the course of the performance.

But, if you find that the employee's work is not in accordance with the instructions you gave, you step in and take corrective action. You train, explain,

complain or try to install a brain.

In any case, you input a corrective force to change the direction of performance, moving it back towards the desired specifications.

In other words, you are using quality assurance. You are using the feedback loop of quality measurement back to process management, to stay on track.

A more formal application of this principle in personnel situations is the formal employee performance review. Although I feel that most managers misuse this tool, its real purpose is that of a quality measurement—control correction input, output realignment. It is the closing of the employee performance quality assurance loop.

You see the same principles being employed when you make an adjustment to a piece of equipment. You look at the change in the measurement reading and readjust accordingly. That's a quality feedback loop at work again.

Assurance is cheaper

The industry has enjoyed some benefits from implementing quality assurance systems—they lessen the burden of quality control and its associated costs. Quite simply, when the assembly process is better controlled, the products coming off the end of the line have a higher average quality level.

That means that fewer need to be scrapped, saving a great deal of money. In fact, when quality assurance is on the job, fewer products coming off the assembly line need even be looked at. Instead of examining every single one, inspectors can simply sample a small fraction to verify consistent quality and this again saves money.

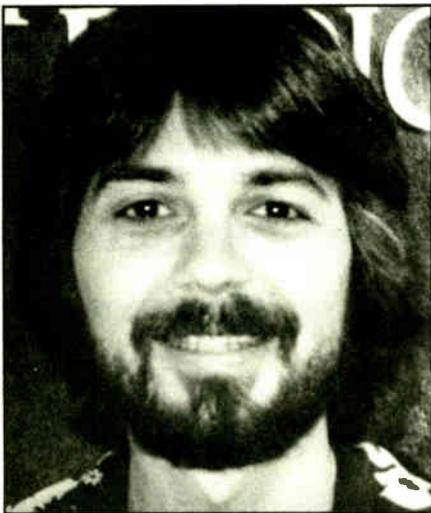
The point is that adopting the new posture of, "If it ain't broke, do fix it . . . or at least adjust it back to optimum specifications," is the way to maintain higher average quality in any process. And maintaining quality is always less expensive than trying to re-establish it once it's lost.

Don't just take my word for it. Ask Tom Cruise, or anyone else who has flown an F-14.

■ ■ ■

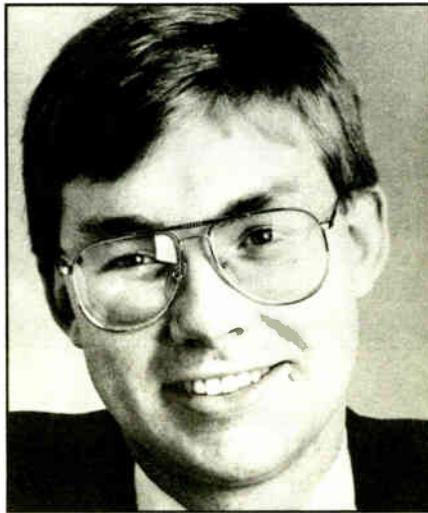
John Cummuta is president of Advanced Marketing Concepts, Inc. a broadcast management and marketing consulting firm, and a regular RW columnist. He can be reached at 312-969-4400.

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An Introduction To CMOS Interfacing

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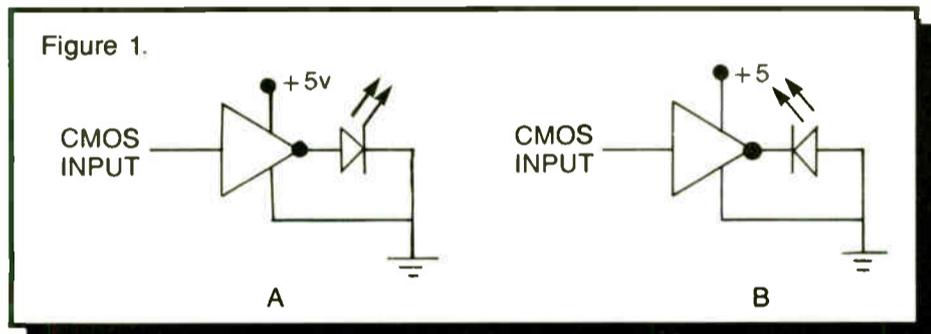
by Ed Montgomery

Part X of XII

Annandale VA There are six series of CMOS ICs: 4000M, 4000C, 4000BM, 4000BC, 54C00 and 74C00. "M" indi-

cates the device meets military requirements.

"C" indicates the device meets commercial standards and a "B" indicates a buffer stage is included in the chip's construction. A buffer state protects previous or succeeding stages from being loaded down by the device.



Complete minimum and maximum parameters for all devices can be obtained from data books supplied by the devices' manufacturer. All DC and AC characteristics are supplied in these publications.

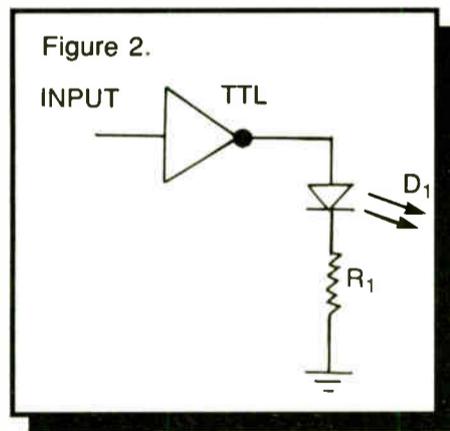
LED indicators
When digital devices are used, they are often connected to light emitting diodes to indicate how they are operating: low, high or pulsing.

Figure 1A is an illustration of how a 4000 series CMOS device can be connected to an LED. The LED requires 5 volts to be driven into illumination. In

and illuminates when a low signal is present. At higher voltages a current limiting resistor is required to protect the LED.

Light emitting diodes operate on a maximum current of 20-30 milliamps at 2 volts. They will produce illumination

with voltages as low as 1.7 volts. TTL devices are often used to directly drive LEDs, as illustrated in Figure 2.



When the output goes high, D₁ illuminates. R₁ is a current limiting resistor. This circuit can be improved by using a transistor to switch the LED on and

(continued on page 20)

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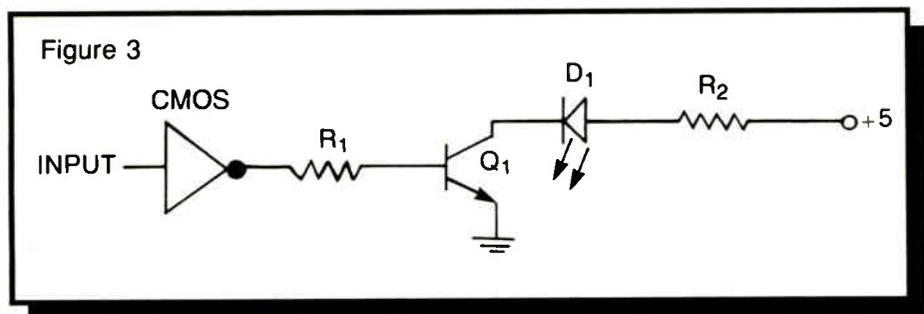


Figure 3
 (continued from page 19)
 off. This configuration requires less current demand from the CMOS device. Figure 3 is an illustration of how a transistor can be used to interface with a CMOS device.

LED D_1 illuminates when a high signal is on the output of the inverter. This signal forward biases Q_1 , permitting current to flow from the emitter to the collector, in turn allowing current to flow through D_1 .

Logic probe circuit

Figure 4 illustrates how a circuit can be devised to indicate whether the circuit is at a high or low state. It is actually a basic example of how a logic probe works.

In this circuit an NPN transistor is used for Q_1 and a PNP transistor is used for Q_2 . Because the transistors will display opposite characteristics, a high level

signal will force Q_1 in to conduction and cut-off Q_2 .

Conversely, a low level signal will cut-off Q_1 ; Q_2 will conduct and a low level

When digital devices are used, they are often connected to light emitting diodes to indicate how they are operating.

signal will be acknowledged.

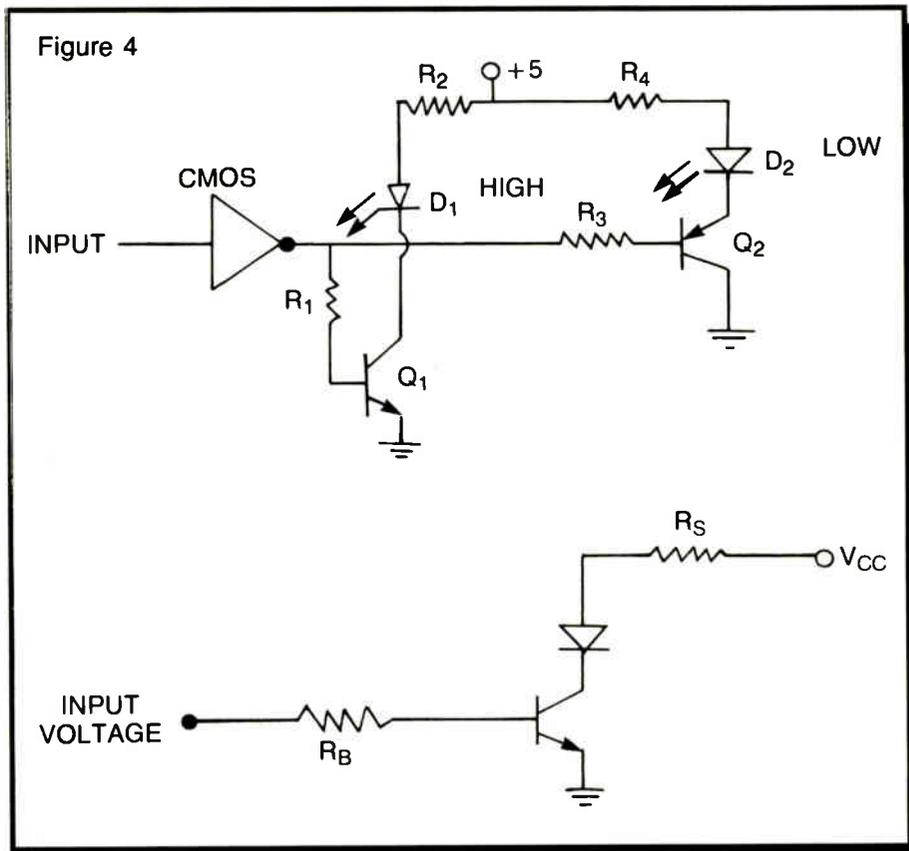
Because a transistor can handle much higher voltage and current than either TTL or CMOS devices, it can also be used to illuminate light bulbs if necessary.

However, because lamps can draw a

minimum of twice the power an LED requires, they are not normally used in much of today's contemporary circuits, especially where they are powered by batteries.

between +5 and +12 volts, depending on the circuit and transistor being used.

If the operating voltage exceeds what D_1 can safely operate at, the R_2 must be added. Transistor gain, maximum



When transistors are used to drive an LED or lamp, it is often necessary to determine specific values of resistance for the base and emitter circuits. This is illustrated in Figure 5.

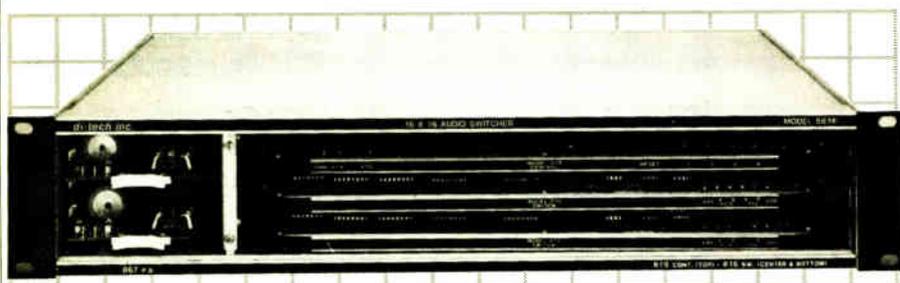
R_B is the base resistor and R_S is the series current limiting resistor in the collector circuit. The load for this circuit is D_1 .

The transistor will operate in saturation when conducting and will be cut-off at a low logic level. V_{CC} is usually

and minimum operating levels can be obtained from the manufacturer. Formula 1 is an illustration of how R_S can be determined. Formula 2 determines the value of R_B .

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

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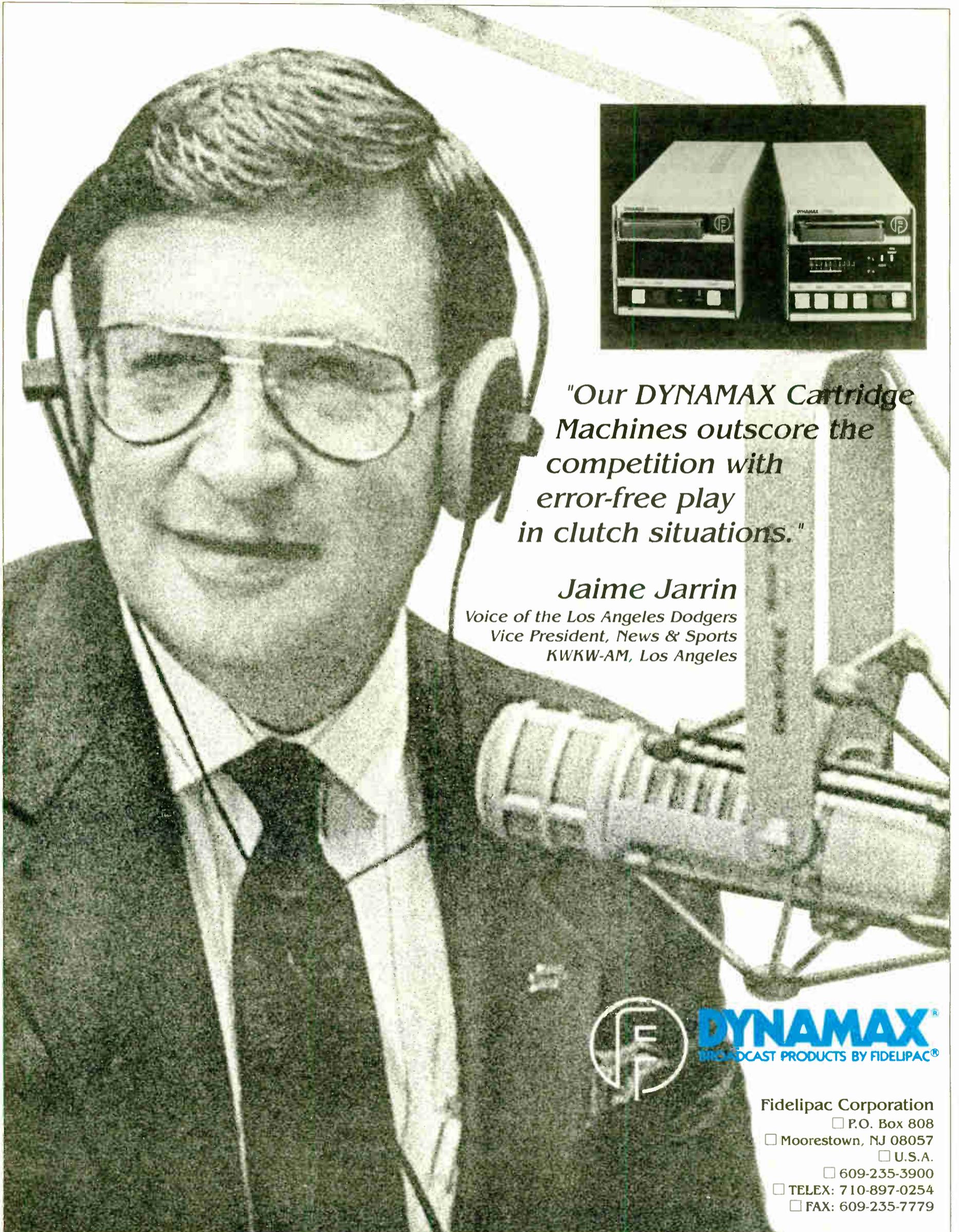


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Circle 33 On Reader Service Card

World Radio History

A Starter List of Computer BBSs

by Barry Mishkind

Tucson AZ Recently, we've been exploring the world of computer access: what's out there and how to dial in. This time, I'd like to take a closer look at what resources exist out there.

A good place to start is provided in Ta-

ble 1, which lists a number of BBSs that have broadcasting as their primary focus. As operating boards come and go it's hard to keep such a list up to date. But, we'll try.

By the way, there is a much more extensive listing available, updated monthly by Mark Leff of CNN.

Mark's list details broadcast BBSs as well as other boards that are of interest to programming news, and management. It's on many boards, including its home board, Rock & Roll BBS in Atlanta.

Look for a file called TVBRDXXX.TXT (or TVBRDXXX.ZIP if compressed), where XXX is the abbreviation of the

month. The latest, as this is written, is TVBRDAPR.TXT.

With either list, you can check to see if a BBS is listed in your locality. Dialing in, you can likely register and get on-line.

But, what about places where you would have to make a long distance call to the nearest board? Does that put a lot of the information out of reach?

No, indeed. One of the neat things I've learned about recently is the FidoNet and other national "echo" networks.

The broadcast echos

Many of the BBSs on the list have unique features such as a local message base, local SBE newsletter or a number of programs and utilities available for download.

Quite a few carry something special. It is an echo conference. An echo conference is where the messages are not

Table 1.

No.	Phone Number	BBS Name	Location	Modem Support Range	FEEs	SBE Chapter Affil	News files SBE FCC
01	206-443-6170	Western Washington Freq Coord	Western WA	300/2400			X
02	214-647-0670	DFW Frequency Coordination	Dallas/Ft. Worth	300/9600		67	X X
03	303-341-0129	Colorado Broadcasters BBS	Denver	300/1200		48	X
04	303-949-3253	Master Control (NSN)	Avon, CO	300/9600			X
05	315-457-5070	SBE Chapt 22	Central NY	300/2400		22	
06	317-935-0531	Allied/RW Broadcast BBS	Richmond, IN	300/2400			
07	404-320-6202	AV-Sync	Atlanta	1200/9600	Yes		
08	404-982-0960	Rock & Roll Party	Atlanta	300/2400			
09	414-771-3032	Second Opinion BBS	Milwaukee, WI	300/9600		28	X
10	419-228-7236	Black Hole BBS	Lima, OH	300/2400			
11	501-753-6536	Chapter 75 SBE	Little Rock, AK	300/2400		75	X
12	601-373-0160	Net-Works	Jackson, MS	1200/9600	Yes		
13	602-438-0459	CRL Customer Service BBS	Phoenix	300/1200			
14	602-872-9148	Broadcasters BBS	Phoenix	300/2400			
15	608-274-7776	The Communications Exchange	Madison, WI	300/9600		24	X
16	619-298-4027	So. California Media Line	San Diego	1200/9600			
17	713-937-9097	Broadcasting Computer Database	Houston	1200/19200	Yes		X
18	801-262-9971	UBA/UFCC	Salt Lake City	300/1200			
19	801-967-9716	Planet Vulcan	Salt Lake City	300/9600			
20	804-550-3338	Flamethrower B'cast Resource Center	Richmond, VA	300/2400			
21	804-973-8235	Broadcasters BBS	Charlottesville, VA	1200/2400			
22	818-248-3088	Hot Tips	Glendale, CA	1200/2400			
23	918-437-9004	The Radio BBS	Tulsa	1200/2400		56	X

KEYBOARD CONNECTION

only available on the BBS to which you are connected, but are echoed or repeated around the country on an arrangement similar to a series of hubs and spokes.

As a public echo, the broadcast echo is available to any FidoNet BBS in the country. As long as your local SYSOP (system operator) will pick it up, you can just use the closest BBS to you. Ask.

This conference is actually growing every day. According to John Anderson, sometime moderator of the echo, at least 86 different BBSs pick up the broadcast echo. Recent additions include BBSs in Indianapolis; Springfield, MA; and Miami Beach.

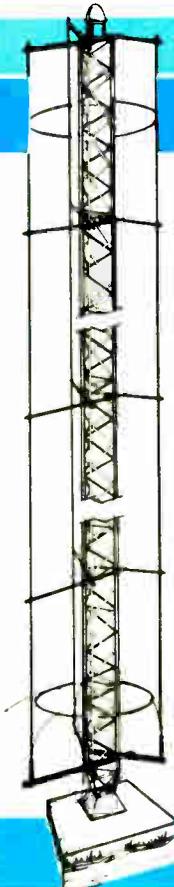
Actually, if you watch the tag lines, you'll notice that the echo is carried around the world, with participants in Canada, Europe and Australia.

Anderson and other SYSOPS, such as Lynn Osburn of National Supervisory Network, are trying to develop this and other echos into an effective communi-

(continued on page 26)

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Circle 51 On Reader Service Card

World Radio History

The Magic Kingdom of Radio

by Dee McVicker

Orlando FL In the world of imagination, all radio studios would have at least two of anything worth having. They would look comfortable in an art deco way, yet be functional.

In them, there would be no talk of ratings and certainly no talk of fixing the transmitter at odd hours of the morning. Studios would simply exist, without cost and without maintenance.

A few engineers have traveled not too far out of imagination's way to find at least one studio like this. It is called Radio Studio, and it can be found at Walt

From all walks of the radio industry, broadcasters have arrived at Radio Studio in Orlando, Florida, to uplink a signal to home. As the studio's one-

FACILITIES SHOWCASE

year anniversary approaches, more than 115 US radio stations, seven networks and seven stations from the United Kingdom will have had the opportunity to do just that.

According to Tom Daren, senior marketing representative for Walt Disney World, every type of broadcasting—from "Morning Zoo" remotes to a Radio Moscow simulcast—has been done from the facility. Everything, he joked, except play-by-play hockey, that is.

Radio Studio, with an on-air control room and two production studios, has yet to turn away a radio guest for reasons of limited capability.

In a small space that shows off curved-edge American cherry wood cabinetry with hidden track lighting underneath, the facility packs in just about every utility known to radio.

Ample utility is important, said Daren, "because we never know who is going to walk in the door the next week and say, 'I want to do this.'"

How is it that one studio facility can accommodate such a variety of uses?

The secret is in the planning, confided Daren. "A couple years ago we flew in engineers from stations from all over the country—big markets and small markets, and different formats. And we all sat around in a room, and said, 'Look, if you were building this for your format, what would you put in it?'"

Unanimous decision

The wish list was as expansive as one might expect of a roomful of radio engineers, but one point that was unanimous was who should build it.

"Strangely enough," commented Daren, "(nearly) every one of those engineers in that room, when the meeting was over said, 'Why don't you turn this over to Jack Williams and let him build it?'"

Jack Williams, president of Pacific Records & Engineering, joined the project to make it all work in only 1000 square feet of space.

In addition to the small area, ingeniously decorated in early Hollywood style by the Walt Disney Imagineering department, Williams was faced with many more challenges—including the queue to the nearby Monster Sound Show, which wraps around the studio and makes the facility visible from all sides.

Not only did Radio Studio have to be functional from every radio point of view in America, with little space to boot, but it had to look like part of Walt Disney World at all times for a captive audience just a few feet away.

Defying all logic of space

In a layout that defies all conventional logic of space, PR&E managed to fit one on-air studio, two control rooms, an equipment room, a combination closet and UPS room, a green room with coffee bar and refrigerator and a restroom that meets full code requirements!



When you wish upon a star...

This, said Williams, was accomplished in part by designing access passageways into each room and minimizing hallway space.

With all the radio guests that were expected as visitors to the studio, Williams had to fit as much programming flexibility into the small space as possible.

The control room, for instance, is designed for either combo or split operation. A cabinetry island dividing the producer/guest position and the on-air position makes use of valuable space. It houses some rudimentary studio wares, including source players and storage for source material.

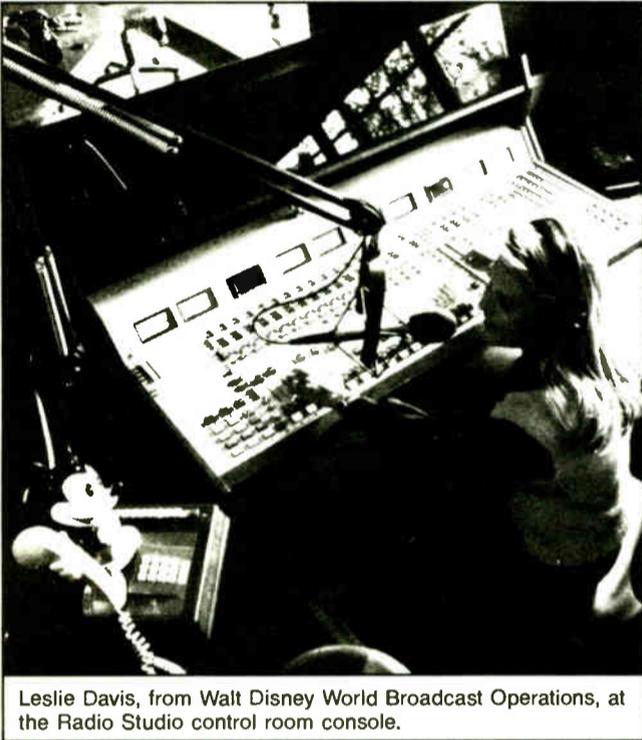
Tradition and effectiveness

In keeping with Disney-MGM's early Hollywood theme, the control room as well as the two production studios were appointed with polycylindrical diffusers—a wall treatment common in early radio days.

Not only does the wall treatment look at home in Radio Studio, but it is also very effective at controlling high frequencies and bass frequencies, the latter of which is the most common problem in a small studio.

"Each microphone in the room sounds like it's picking up a voice. If other people in the room are talking, you can barely hear it from that one microphone," said Williams, whose company

(continued on page 27)



Leslie Davis, from Walt Disney World Broadcast Operations, at the Radio Studio control room console.

Disney World in the Disney-MGM Studios theme park.

Radio Studio is a place where engineers can kick back for a few days, take in the new George Lucas ride and do a remote broadcast. That's what it's there for.

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Exploring Transmitter Efficiency

by Thomas L. Vernon

Harrisburg PA Summer months can bring problems with older plate modulated AM transmitters. These often take the form of arcing, overheating and noticeably short life from expensive power tubes.

STATION SKETCHES

Although inadequate air conditioning may sometimes be to blame for overheating problems, more often than not the difficulty is traced to a transmitter operating with poor efficiency.

Determining efficiency

Transmitter efficiency is expressed as a percentage and in this case represents the ratio of RF power output to DC power input of the PA amplifier. This is not to be confused with "overall efficiency," which is the ratio of RF power

Table 1.

POWER (WATTS)	EFFICIENCY (PERCENT)
250	65-75
500	65-75
1000	68-75
5000	72-82
10000	72-82

out to AC power in.

To determine PA efficiency, first multiply plate voltage by plate current. Let's assume we're checking a 1 kW transmitter with a plate voltage of 3000 volts and plate current of 470 MA: $3000 \times .470 = 1410.0$.

This means that the power input to the final RF amplifier is 1410 W. Assume we've determined that the operating power is exactly 1000 W. To get a figure for efficiency, we divide power out by power in: $1000 \div 1410 = 70.9\%$.

The other 410 W are dissipated as heat, mostly in power tubes, but also in the tank and coupling circuits.

Once you've calculated efficiency, you need to know what's normal for your transmitter.

Table 1 presents typical ranges for every power level. Please note that these values are for conventional high level plate modulated transmitters only.

If you come up with an overly high efficiency factor, say over 85%, this usually does not mean that you have defied the laws of physics. False high figures usually result from metering errors, or

from erroneous antenna resistance measurements from which power output was computed.

Low efficiency problems

Problems with low efficiency usually fall into three general categories: errors in metering, problems within the transmitter or difficulties with the transmission line/antenna system. The following is a methodical approach to isolate the problem to one area.

The plate voltage meter is easily

checked with an HV probe and DVM. A good point to do this is at the dropping resistors for plate voltage metering. Also be sure to check these resistors. In most cases they should be within 1% of rated value.

Plate current meters can be checked by substituting a DVM for the meter in question. Another method is by measuring the voltage drop across the plate current metering resistor and using Ohm's Law. This is a useful scheme when the meter terminals are very diffi-

cult to reach.

RF line current meters can be checked by inserting a known good meter in series with the one being checked. If your antenna tuning unit is in the same building as the transmitter, the meter jack on the input is a convenient place to do this.

Of course, proper precautions should be observed when working around high voltage. All voltage points should be tapped down with a shorting stick before working inside the transmitter, and

(continued on page 29)

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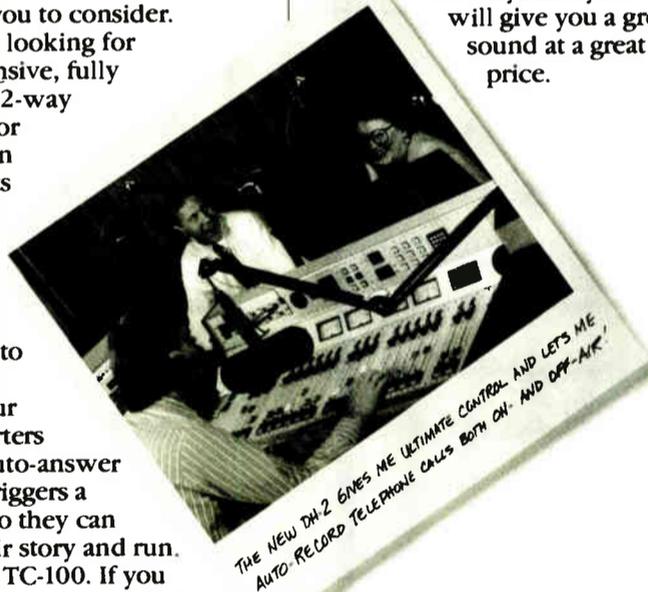
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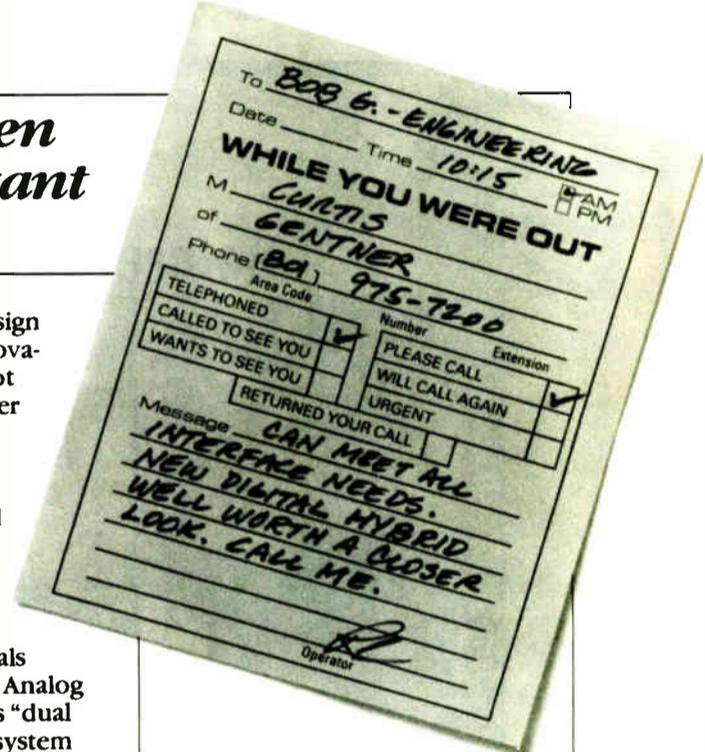
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Circle 10 On Reader Service Card

"Call me, I'm interested." Circle 34. World Radio History

"Send me literature." Circle 69.

Accessing Computer Echo Nets

(continued from page 22)

communications device for engineers around the country.

The more people who check in and participate, the more useful the echo conference will be in solving problems and sharing information.

Of course, the broadcast echo is not the only one out there. There is a national FCC echo, with discussions centering on FCC matters. John Anderson has also been trying to add several other interest categories, such as equipment buy/sell, jobs and CATV.

Some BBSs even have a professional engineer answering questions. Also availa-

ble are several conference areas with many users on CompuServe's BPFORUM.

As a public echo, the broadcast echo is available to any FidoNet BBS in the country.

(There is a time charge for CompuServe.)

Yet another network, MediaNET, operates out of its hub in San Diego, The

Southern California MediaLine. MediaNET is the largest media specific BBS in the country, according to SYSOP Steve Tom. Topics include engineering, writers, management, film, musicians and talent. While not yet as widely distributed as the broadcast echo, MediaNET's conferences are being added to a number of BBSs around the world.

Tailored offerings

As I come in contact with more and more SYSOPS of broadcast-oriented BBSs, one thing that keeps being emphasized is that they are trying to provide the information and services asked for by users.

Jeff Loughridge, SYSOP of Flame-thrower Broadcast Resource Center in Richmond, VA, was kind enough to call one morning and discuss the operation of his BBS. (If you call his BBS, you'll love the way he identifies broadcasters.)

Loughridge and Lynn Osburn have helped me see that the potential for sharing programs and information was far greater than I had previously imagined.

For example, it's even possible to send point-to-point messages through many of these same BBSs carrying the echoes.

It's important to note that most BBSs are run as a labor of love by the SYSOP. They appreciate any support offered by users to defray the costs of sending the echomail.

On the other hand, other boards ask for

a membership fee to provide support. Some of these, like Broadcast Computer Database in Houston, or Hot Tips in Glendale, CA, go far beyond broadcast topics. David Armstrong and Mike Callaghan, respectively, offer hundreds of megabytes of programs and other material.

The Houston BBS has over 120 conferences on line with nearly every topic you conceivably could want. Hot Tips has some 5400 files available to download! The possibilities seem endless.

Other BBSs are of more limited interest, oriented to supplying frequency coordination for an area. Some are supported by the local SBE chapter or state broadcasters association.

As an example, Mark Tympany is the SYSOP of the SBE chapter 28 BBS in Milwaukee. The focus there is support of the local SBE chapter, with newsletters on line, as well as files.

Down in Dallas/Fort Worth, they have been operating a frequency database since 1984 (the longest in the US) and news and information from SBE chapter 67.

I could go on and on. In fact, I hope to return to this topic again and share some more resources out there, like CRL's customer service BBS or NSN's Master Control.

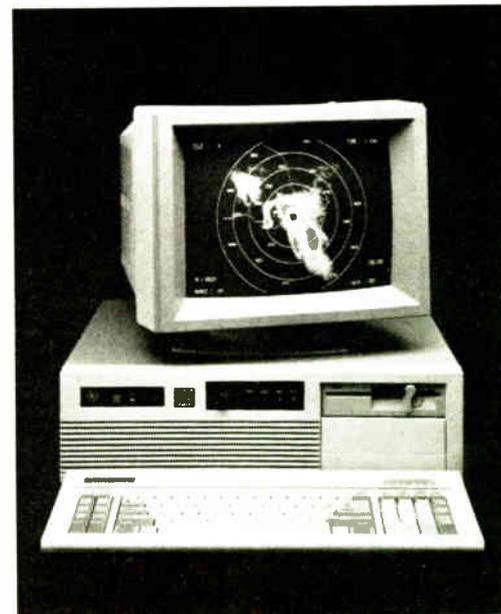
Table 1, then, is a starter list of BBSs to check. If I've missed something, let me know. And, don't forget to check with your local general interest BBSs for availability of the national echoes!

■ ■ ■

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

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Disney's Wonderland of Radio

(continued from page 24)

also supplied the custom-made furniture for the studios.

Two of every type of source equipment were installed in the control room: Technics SP-15 turntables, Studer A730 CD players, Studer A807 tape recorders and Studer A721 cassette tape recorders.

True to its function, the control room's BMX-26 Series III console is equipped with auxiliary send, telco mix-minus and the Telos telephone hybrid system, which is line-selectable from the console.

Carry-in equipment no problem

Each recorder can independently select console outputs (such as program, audition, or utility) as well as an external patch source via two LS-4 line selectors.

Of the eight LS-4 outputs available, two are reserved for feeding carry-in portable equipment. Inputs and outputs for carry-in equipment are also provided within the console cabinetry.

Giving the facility even more programming flexibility are internal cabling pairs in each studio that are routed to a terminal backboard in the equipment room.

These cabling pairs are used quite often by guests wanting to originate programming from their own portable mixers, or for special equipment.

For those radio guests who want to do production, the facility has two stereo production studios. "A lot of times stations will just come down and want to do voice

work, like they normally do on a remote situation. So then we will put them in Studio A or Studio B," said Daren.

Radio visitors can sit down to produce a segment with up to four guests and have

and headphone monitor.

Both production studios can air independently, providing guests interface on their portable mixers and the like.

Guests can also use Radio Studio as

The producer/guest position in the control room has a talkback mic and IFB system, so the producer can interface with each of the production studios.

An important feature not forgotten by PR&E was ease of use. With radio engineers and on-air talent coming from all over the nation, and from home studios that differ as much in function as in technology, Radio Studio had to be common ground for all, yet be flexible enough to handle any broadcasting situation.

A tribute to the success of this effort is in a comment made by Daren: "We've never run into a technical problem yet that we couldn't overcome."

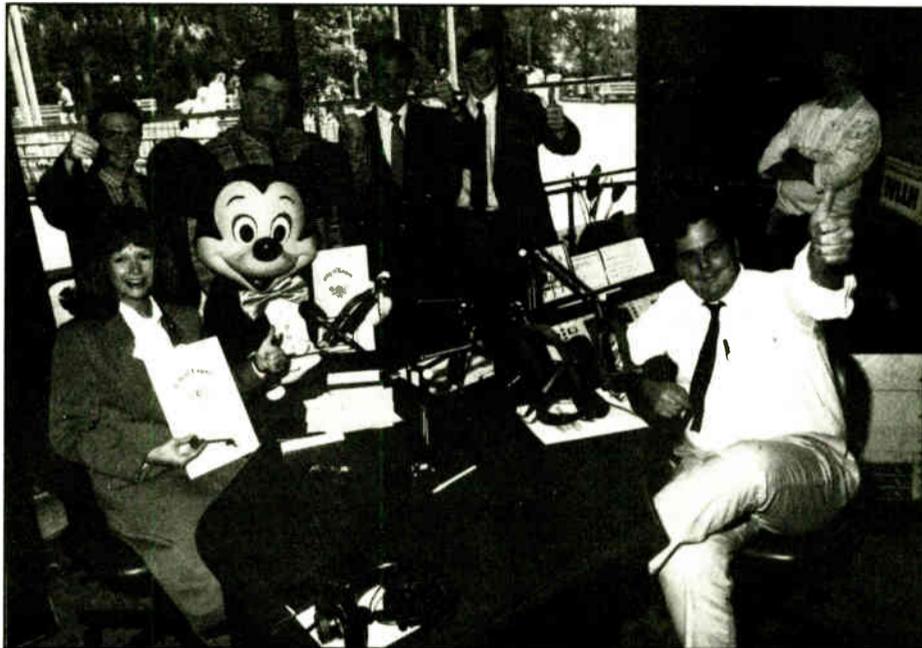
Host to all

From its sign-on in May of 1989, when the nation's first commercial broadcast station, KDKA, did the honorary broadcast, Radio Studio has played host to radio broadcasters and Walt Disney World patrons alike.

What could possibly be in its future? "I'd like to do a remote with every radio station in America," was Daren's reply.

To this end, Daren encourages stations interested in broadcasting a remote signal from Radio Studio to write: Tom Daren, Senior Marketing Representative, Promotions Department, P.O. Box 10,000, Lake Buena Vista, FL 32830-1000.

Dee McVicker is a free-lance writer and regular contributor to RW. To inquire about her writing service, call 602-899-8916.

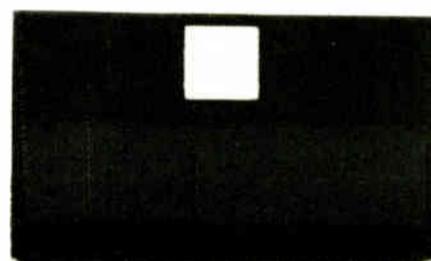
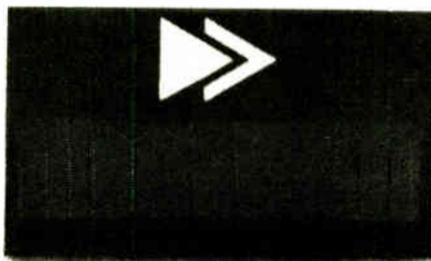
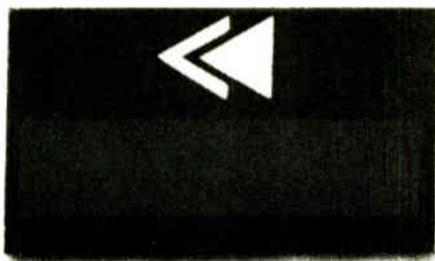


The crew from WLLH, Lowell, MA, gives Radio Studio "B" the thumbs up. Disney's Karen Tucker (second row, left) flanks everyone's favorite rodent.

such amenities as a digital clock (which is slaved to the master clock) and timer (with both local control and auto reset functions), mic buttons for "on," "off," "cough" and "talk to control room," and selectors for guest mic, group control and speaker

an integrated studio complex. A station bringing in an entire morning show, for instance, might find its news and sports team in one production studio, its guests in the other production studio and its on-air talent in the control studio.

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RsDAT Truly Caters to the Pro

by Ty Ford

Baltimore MD After I had worked with almost half a dozen DAT machines in as many months, it seemed obvious to me that most of the manufacturers were not as concerned with the professional market as they were with getting their share of the consumer market.

Had they been more concerned (or concerned at all) they would have quickly found that not having a cue-to-start feature was a major mistake.

It certainly could be argued that, with mindful use of the "pause" feature, some of the consumer DATs on the market could have been used in broadcast. Con-

. . . the Rs-1000 comes closer to meeting the demands of the broadcaster and production department than any other DAT machine I've tested so far. . .

sidering how easy it would have been to add the cue-to-start feature to the original design, the argument is very weak.

Enter RsDAT

The first DAT on the market that caters to the simple needs of the production professional is the Rs-1000 broadcast DAT machine from Radio Systems.

The Rs-1000 uses a Sony DTC-1000 consumer DAT machine that has been modified in several important ways.

The additional hardware necessary for these modifications is housed in an under-chassis to which the DTC-1000 is firmly attached. Even so, measuring 5.5" x 17" x 17", the RS-1000 takes up less space than the split chassis Sony 2500

professional model DAT.

Although the standard unbalanced RCA jacks on the DTC-1000's analog inputs and outputs remain active, Radio Systems provides balanced inputs and outputs via 9-pin female and male computer-type "D" connectors on the back of the under-chassis.

PRODUCER'S FILE

In addition, there are separate output and logging level adjustments and serial (9-pin), remote (25-pin), and automation (15-pin) ports.

The Rs-1000 records through analog or digital ports at 44.1 kHz and 48 kHz. Digital recording at 44.1 kHz is only possible if there's no 17th copy protection bit, which CDs have.

Although there is no oversampling at the input, the output is four times oversampled.

Serial protocol

If you've become terminally addicted to computers, Radio Systems will be happy to share its protocol for the serial port. When connected to a dumb terminal, with communications set to 9600 baud, 8 bits, 1 stop bit and no parity, the Rs-1000 will respond to simple commands and send back confirmation messages.

Keying in 'ST' for example, will start the machine in the play mode. The answerback message "playing" will then appear on your screen.

Using the retrofitted balanced outputs allows you to take advantage of one of the Rs-1000's most attractive features. The balanced outputs are preceded by a mute circuit which is tied into the logic system. The mute keeps audio from being heard during the machine's search and cue routines.

The logging output feature allows audio recorded on the left channel to by-

pass the balanced audio outputs and exit via the remote port.

The message must be recorded after the End-of-Message (EOM) circuit has muted the output and can be up to ten seconds in length.

My favorite feature is the reapplication of the Skip ID. Per the manual, "The RsDAT system uses the skip ID as an End-of-Message (EOM) tone. Record and erase these tones per instructions for skip IDs.

"Leave the skip switch on the Sony unit off to disallow the standard skip function. EOM (skip) IDs may be recorded at any point at (or near) the end of the cut for next-event-sequencing, fast cueing with mute function, end-of cut jock warning or as a combination of these features."

To put the tones on the tape, you simply press the "CUE 1" button on the front panel of the under-chassis. Both the button and the skip ID light on the DTC-1000's front panel light up to affirm the procedure.

Based on input from the broadcast in-

pushing the record button on the front panel of the under-chassis. When it lights up, hit the start button and begin recording.

Because the DAT tape transport is more complicated and a little slower than a cart transport, you'll have to learn the appropriate amount of delay between the time you hit the start button and the time the audio you wish to record actually starts.

The RsDat can automatically place start IDs when it senses audio, but these cues are normally a little too tight. However if starting accuracy is not a major factor and the audio "fades-in," you may find that the automatic start ID function is acceptable.

The automatic start ID function has been modified in the Rs-1000. The current modification lets you go into the "auto" mode for each cut, but reverts to the manual mode after the start ID has been laid down. That means, if you want to use the "auto" mode, you have to hit the "auto" button each time you add a cut.

Repositioning IDs

Unlike some DATs on the market, the Rs-1000 lets you reposition the start IDs.

Following the procedure in the manual, you first erase the existing start



RsDAT, from Radio Systems

industry, Radio Systems has intervened in the DTC-1000's logic system to make its operation similar to that of a standard cart machine.

Dubbing

Dubbing to RsDAT is very much like dubbing to cart. In the manual mode you put the machine into record by

ID, and then lay down another one manually, as close as you can to where it should be.

You can then preview the mark in .3 second increments up and down the tape until you find the right spot. The machine continually loops back to the start and plays a few seconds of audio to show you where the new start ID will bring in the audio.

Due to the fact that the DAT head is constantly revolving, and to the slack in the tape transport, there is a variance in the start time for any start ID.

I found it better to be slightly too loose. This allows for proper play in the worst case scenario.

Perhaps an automatic offset circuit in the "auto" Start ID mode could be included in the next update. When the audio sensing circuit was triggered, the necessary offset would be applied so that the actual cue would be placed the appropriate distance before the trigger point. This would reduce the time spent moving or manually placing Start IDs.

Time trials

Start lag on the Rs-1000 is minimal and very consistent. The time between pushing the start button and first audio, as timed by a hand-operated stopwatch, was between .90 and .97 seconds. That's a little more than the reel-to-reel and cart machines I'm used to using, but still very good. I was impressed by the consistent performance.

End-to-end fast forward times for 120, 90 and 60 minute cassettes was 40, 30 (continued on page 31)

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World Radio History

Keeping Transmitters Shipshape

(continued from page 25)

power should be disconnected at the breaker panel.

If all the meters test OK, your efficiency problem is real, and is either in the transmitter or antenna system. Again, a methodical approach is necessary to isolate the problem.

At this point a good dummy load becomes an essential piece of test equipment. This rules out strings of 100 W light bulbs mounted on a sheet of plywood. Such makeshift arrangements may be satisfactory for making PSA power, but their reactive component makes them invalid for testing. A proper dummy load will show 50 Ohms pure resistance at your operating frequency.

Now, check the transmitter into the dummy load. The meter readings should be almost identical to those you got on the antenna. A shift in plate current, improved efficiency or the need to retune for resonance all mean that there's a problem with the antenna system.

On the other hand, if you get the same bad efficiency with the dummy load that you got with the antenna, the problem lies in the transmitter and will most likely be due to insufficient drive, mistuning or components changing value.

Getting good grid drive

Sufficient grid drive to the PA is necessary for both good efficiency and low distortion. If the PA grid current is low, the PA has to work harder to make rated power and runs hotter.

The first step is to replace the driver.

If a new driver tube yields poor results, there could be a problem with the drive coupling network. Be suspicious of 20-year old mica capacitors in LC networks.

If your transmitter was bought used and returned, double check the manual for proper component values and coil tap points. If there's no information in the manual, drag out a calculator and compute the correct values yourself.

There are those who believe that if sufficient drive is good, overdriving the PA grid is even better. Not true. Excessive drive shortens the life of the driver tube, generates excessive heat and impairs positive peak capability.

A good way to check for bad or mistuned components in the PA is by running at full power with 100% modulation for about 20 minutes. Then shut down and discharge all HV points with a grounding stick.

Feel all of the components in the output network. Look for hot spots as well as loose connections. If you find either, you've probably found the trouble.

Neutralization problems

Occasionally, neutralization controls can go out of adjustment. Again, this will manifest itself by poor efficiency and frequently by arcing. Follow the procedure in the transmitter's instruction manual and recheck the neutralization adjustments. A grid dip meter may be helpful in making these adjustments.

A ground system in poor condition will be unstable and give erratic antenna resistance measurements. This makes

calculating power output (and thus efficiency) difficult at best.

A telltale sign of this problem is a good signal when it rains, and gradual deterioration as the ground dries out.

An antenna coupler not matching the transmitter to antenna properly will waste power and degrade efficiency. Again, feeling around for overheated components after shutdown will help locate the trouble.

If the antenna coupler is located some distance from the transmitter, you may well wonder if the transmission line is OK, especially if it is buried under-

ground. Insert the dummy load in place of the coupler and recheck efficiency. Good efficiency now means problems in the coupler, while continued poor efficiency means the transmission line is suspect.

Efficiency is a good indication of overall transmitter health. With patience and a logical approach most problems will surrender to your scrutiny.

■ ■ ■

Tom Vernon, a regular RW columnist, divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-367-1151.



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DEC 4 1989

Modulation Sciences Inc.
115 Myrtle Avenue
Brooklyn, NY 11201

Attention: Mr. Eric Small

Dear Mr. Small:

I was recently contacted by your attorney, Mr. Harry Cole, concerning Modulation Sciences' "Modminder" FM broadcasting modulation monitor. I understand your company has received several inquiries about the validity of FM modulation measurements made with this instrument.

Commission rules currently contain no requirements for FM modulation monitors. Technical specifications and other performance requirements did exist until July 1983 when the Commission, by Report and Order in MM Docket 81-698, deleted them as unnecessary. While the requirements for modulation monitors were deleted, the Commission retained the standards governing FM modulation. See Section 73.1570 of the current Rules.

Mr. Cole stated that the Modminder is designed to satisfy the pre-1983 technical requirements for FM modulation monitors. If the equipment does indeed meet the pre-1983 technical requirements (see the enclosed copy of former Section 73.332), I expect it would produce valid readings of FM modulation. Equipment meeting the pre-1983 requirements is satisfactory for determining compliance with the current FM modulation requirements.

Please let me know if I may be of any further assistance.

Sincerely,

Thomas P. Stanley
Thomas P. Stanley
Chief Engineer

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A DAT Player for the Pro User

(continued from page 28)

and 22 seconds respectively. Search and cueing takes more time.

From the far end of the tape, cueing to start ID #1 took 56.6, 49.05 and 33.19 seconds respectively.

The location finding logic is written in such a way that it takes more time to cue forward on the tape than backwards. In adjacent cut cue time tests, for example, it took 13 seconds to go from start ID #5 to start ID #6, but only 9.4 seconds to go from #6 to #5.

Points to consider

Even though the Rs-1000 comes closer to meeting the demands of the broadcaster and production department than any other DAT machine I've tested so far, it too has its drawbacks.

If you try to stack with the drawer closed, you have to wait for the first cut in the stack to cue up before adding additional cuts to the stack.

If you want to change an existing stack by adding cuts in a specific sequence, you have to wait until the unit is in the stop mode.

Cuts added to a stack while the machine is in the play mode are automatically placed at the end of the sequence, which may not be where you wanted them.

It's a good idea to dump the memory by opening and closing the cassette drawer from time to time. If you forget to clear the memory before starting a new stack, the result can be some surprisingly unwanted sequences.

This could result in serious problems if you're planning to use the Rs-1000 for commercial playback in the air studio.

There are other ways of confusing the logic. If, while playing a cut you enter another cut number, but forget to hit the memory button, either of two things happen.

If the cut you're playing has an End-of-Message (EOM) cue, the transport will stop when it senses that cue. The stop light will blink as if the machine was cued up to the next cut, but it won't be!

If there's no EOM tone, the machine continues until it begins to play the next cut on the tape. Sensing the Start ID, the machine stops with the stop light blinking also leading you to believe it is properly cued.

Time between cuts

Like most DATs I worked with, you need to allow at least 10 seconds between cuts. If you try to record any closer, the machine can't read the start ID and skip ID tones properly.

Before you start recording at the beginning of a DAT cassette, let the tape roll for about 10 seconds. This will give you enough room to go back and rewrite the first Start ID at some point in the future. If you don't leave extra room, the machine won't be able to fully erase the first Start ID and you'll never get the machine to renumber the cuts properly.

It's important to erase the old IDs completely. If you do a "punch in" record to add a cut to an existing sequence of cuts, it's a good idea to first erase the original Start ID at that location.

I found remnants of old Start IDs barely long enough to make the Start ID light on the front panel flicker were

enough to trigger the logic and confuse the machine.

Don't expect to put this machine on the air as soon as it arrives, especially if other people have to use it. Set it up "off-line" until your staff becomes comfortable with its operation.

Although the manual is fairly well written, and a new one is in the works, consider printing the basic instructions on a card taped to the machine for easy reference.

As equipment becomes more sophisticated, shipping becomes more of a hassle. The first two Rs-1000s that reached

my door were partially dysfunctional. The third attempt, with double boxing, reworked foam support and lots of styrofoam peanuts got the machine here in good shape.

Radio Systems' Gerrett Conover was perplexed as to why they could successfully ship units to the BBC, but run into such problems on the trek from New Jersey to Maryland.

Even knowing that shipments of an AMS AudioFile and a New England Digital direct-to-disk system to several studios in this area suffered similar fates doesn't make it any easier to take.

According to Conover, the BBC now has over 100 RsDATS. On this side of the pond, the list includes KBEE, WSSP, WIND, WBGO, WQCD, WMTR, WEZW and several other audio companies.

List price for the Rs-1000 is \$3495. Call Gerrett at Radio Systems (800-523-2133) for more information.

■ ■ ■

Ty Ford is an independent audio consultant and regular contributor to RW. He is currently writing an advanced production book for Focal Press. Reach him by phone at 301-889-6201 or by MCI mail at 347-6635.



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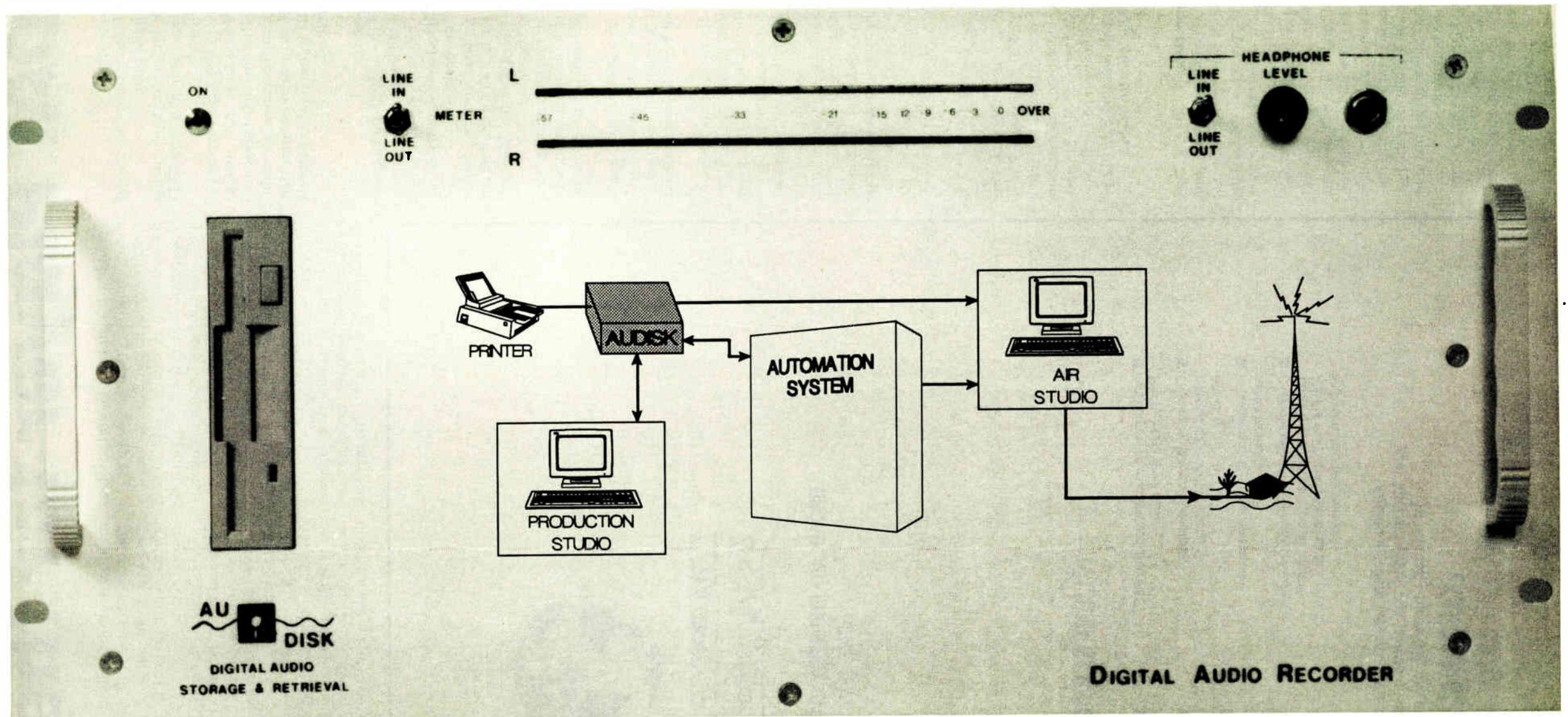
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BUYERS GUIDE

Antennas, Towers & Cable

Shively Tames Tiger Mountain

by Clay Freinwald, CE
KBSG-AM/FM

Seattle WA When it became clear that KBSG (known as K-Best) was going to be successful in its bid to move its FM transmitter site to West Tiger Mountain, it was time to begin the process of selecting equipment for the new location.

USER REPORT

There were some problems to keep in mind, however. Some years ago, our station had moved to the site of another station whose coverage was superior. After dutifully installing an antenna on the same tower and expecting the same results, guess what? Great coverage in all directions—except Seattle, the major city in the region!

The station fell victim to a severe case of pattern distortion. I vowed to not get caught in that trap again.

Antenna for harsh climate

The new transmitter site had never been used by broadcasters before; it was about 3150' above sea level, 16 miles east of Seattle.

At 47° north, this meant harsh winters with lots of ice. I knew that, with the snows that fall over West Tiger Mountain in the winter, we needed a rugged antenna.

Frank Kramer, Viacom's corporate radio DE, suggested a Shively—after all, Shively had supplied the system on Mt. Washington, NH. Surely West Tiger could not be any worse than that place!

At Shively's invitation, I visited the company's facilities in Bridgeton, ME. The high point was my tour of the company's antenna range. Shively determines the actual coverage of its antennas with scale models of towers and antennas and frequencies four times the actual.

On the way back to Seattle, I was convinced that the fellows in Maine could do the job.

Now it was on to the project and another consideration. The powers that be determined that our new tower should be able to hold a TV antenna on top.

This meant I was going to have to side mount our FM antenna on a tower big enough to support the multi-ton monster. At the same time, the antenna should neither distort KBSG's coverage pattern nor give me nulls over territory that must be served.

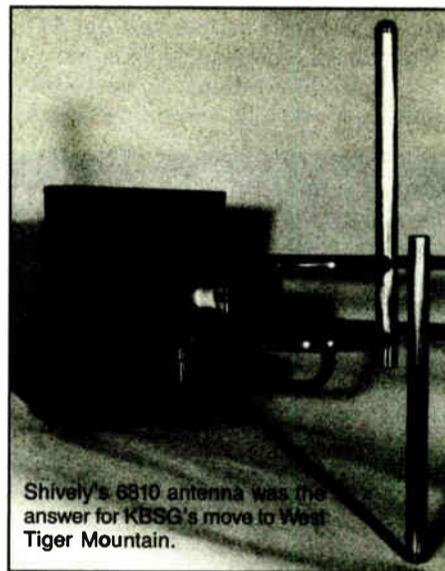
I had nightmares about the GM being able to see the tower on the mountain top, but not being able to hear the station on his radio, just like at the old site.

Home on the range

After we had determined the minimum size for the tower, it was back to Maine and the test range. Shively's old standby, the 6810, provided us good pat-

terns, with minimal nulls in the vital directions.

Also, due to the site's elevation, we needed to address beam tilt. At the projected 60 dBu contour, the angle was about one degree. Because of the minimal number of bays—four—I chose two degrees of downtilt; the array is center



Shively's 6810 antenna was the answer for KBSG's move to West Tiger Mountain.

fed.

With other stations at the site, it became clear that we would have to be alert not only to interference to the 100-plus land mobile installations from the K-Best transmitter, but also the cumulative effect of all the stations, intermodulation products, etc.

Shively came up with just the ticket.

Borrowing from the company's successful multistation combiner technology, we installed a four-section band pass filter at the output of the transmitter combiner.

This filter turned out great. With something under 20 ns of group delay, degradation to the K-Best signal would be minimal. In conjunction with the band-pad combiner system, IMD products would be addressed.

The antenna from the old main site was dissected and installed on the Tiger Mountain tower as a standby. A new Shively 6810 four-bay directional was installed in its place (to keep the standby site's 1 mV/m contour from overlapping that of the new site).

The proof of the pudding is in the eating and turning the new site on proved to be sweetness. The station played great, all over the place! A number of other stations in the market agreed, and shortly we were on our way toward a multiple FM station facility.

Keep in mind that almost any side mounted antenna will produce a pattern that could do your station considerable harm. Spend the extra money and have your pattern checked before you put up that FM antenna.

Call Shively. You'll be as happy as I am.

■ ■ ■

Editor's note: For more information on the 6810 antenna, contact Jonathan Clark at Shively: 207-647-3327, or circle Reader Service 26.

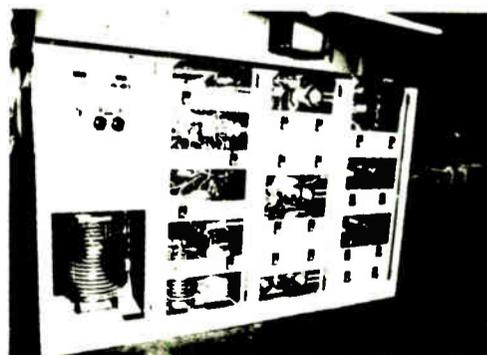
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Also, Technology Updates from LBA, Myat and Will-Burt; a Special Report from LPB; and a Buyers Brief from Delta

Stati-Cat Does the Job at WSCL

by Bruce Blanchard, Dir of Ops
WSCL-FM

Salisbury MD Lightning. At WSCL-FM, it became a matter of too many hits, too much down-time, and too much dead-air. With our tower being one of the tallest structures in the immediate area, it seemed that any lightning storm in the area was drawn to it, with the intention of knocking us off the air.

A public radio station located on the campus of Salisbury State University, WSCL serves the Delmarva Peninsula, a three-state area comprised of the eastern third of Virginia, the eastern half of

Maryland and all of Delaware. The station provides that area and southern New Jersey with in-depth news, information, classical music and specialty programs.

USER REPORT

WSCL's antenna is a 3-bay Shively that sits at the 600' level of a 659' tower owned by WHYI-TV of Philadelphia. The tower is located in Seaford, DE and also is home to the WDPB-TV antenna.

Other tenants on the tower are a microwave receiver for WDPB, UHF and VHF transmitting and receiving facilities for a local paging service and our STL.

This 12,000-plus square mile area of the peninsula is bordered on the west by the Chesapeake Bay and on the east by

the Atlantic Ocean. The Delmarva is subject to the weather patterns generated by both bodies of water.

the Atlantic Ocean. The Delmarva is subject to the weather patterns generated by both bodies of water.

the Atlantic Ocean. The Delmarva is subject to the weather patterns generated by both bodies of water.

Enough is enough

It was at this point that a joint decision was reached between Ray Fantini of WDPB, Bill Weber and John Durran of WHYI, and myself to install a dissipation system.

After a careful review of all the literature available, it was decided that the

to installation and was fascinated to watch as each nail-like dissipator was bent by hand and then carefully hoisted into position.

The Crow's Nest itself was placed on a four-rod support system and, along

The net effect is that the entire facility is rendered invisible to any ground-seeking storm.

with its dissipators, encased the top of the tower. Each dissipator is designed to discharge static before a buildup occurs.

The net effect is that the entire facility is rendered invisible to any ground-seeking storm.

No hits

Since installation, we have not experienced a single direct hit. Though there have been periodic power and phone outages due to ground-based land-line strikes, no direct strikes have been reported by our on-sight people.

Considering the amount of money we have saved in equipment replacement and lost air-time, the system has more than paid for itself.

Both stations are most pleased with Cortana, the "Equipment Saver!"

Bruce Blanchard is a 30-year veteran of radio and television broadcasting and spent most of that time in Massachusetts and Connecticut before moving to the Delmarva Peninsula to build WSCL at Salisbury State University. He can be reached by calling 301-543-6895.

For additional information on the Stati-Cat, contact Evelyn Nott at 505-325-5336, or circle Reader Service 49.

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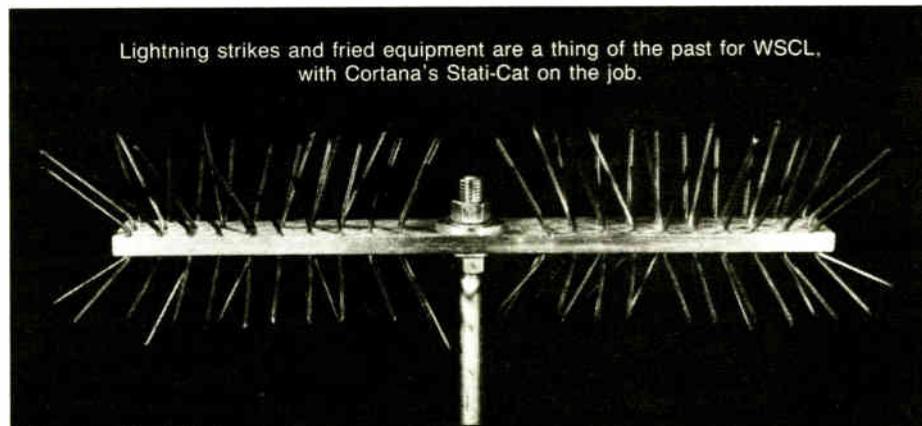
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Lightning strikes and fried equipment are a thing of the past for WSCL, with Cortana's Stati-Cat on the job.

An inviting target

High-intensity thunderstorms are a common occurrence from early April through late October.

As these multi-celled thunderboomers move over a terrain with an average ele-

vation of 30' above sea-level, our 659' tower presents a most inviting target.

It was not unusual to take several direct hits during any given storm. Our worst incident occurred in October of 1988 when a particularly severe storm hit from directly overhead.

The ensuing damage fried our high-voltage stacks, IPA, micro-processing controls in our Broadcast Electronics FM 30A transmitter, Gentner remote control and STL receiver. This resulted in days of on-again, off-again land-line programming.

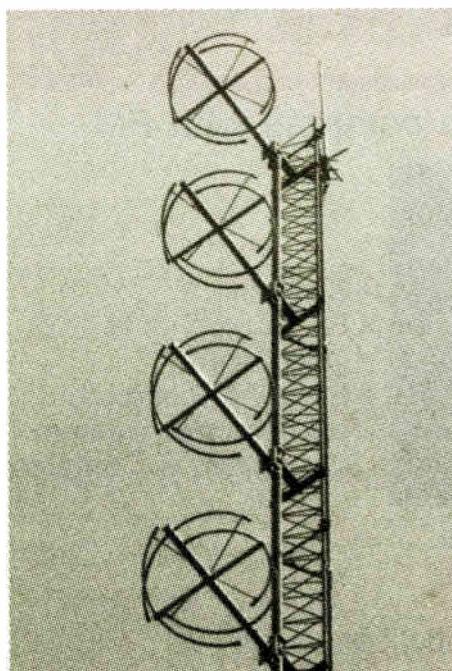
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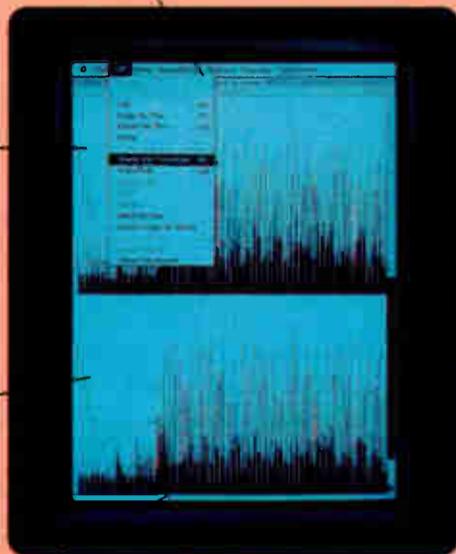
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World Radio History

FCC's DA Rules Breed Concern

by Alex Zavistovich

Falls Church VA When the FCC's directional antenna rules under Part 73.316 went into effect last year, a number of groups, including the NAB and some consulting engineering firms, filed petitions for reconsideration.

Since then, an *ad hoc* committee of petitioners has been established to arrive at a consensus of concerns, to be filed with the FCC in a single motion. It seems appropriate, because even some manufacturers, while admitting it means more business for them, are questioning the basis of the rules.

Chief among their concerns is modeling—that is, how to take into consideration a DA mounted on a tower. Petitioners have questioned whether modeling might better be done in full scale.

Also of concern is the FCC's tacit assumption that non-directional stations operate with omnidirectional patterns. Some in the industry have voiced concern that this is not necessarily true in the case of side-mounted antennas. Stations with non-directional antennas should also be required to model their antenna patterns, they say.

Mechanical characteristics

Steve Crowley, an engineer with the consulting firm of du Treil, Lundin & Rackley, commented that "mechanical characteristics of FM DAs are specified

in a limited sense in the rules," to the extent that no other antenna is permitted in the aperture of an existing DA.

INDUSTRY ROUNDUP

However, according to Bob Surette, manager of RF engineering for Shively, the realities of putting up a station often make such a regulation difficult to accommodate. "Because of FAA restrictions, there are a limited number of towers available," Surette explained.

Surette said that some in the industry some maintain that as long as you model everything completely—including all the towers—you can get a license for an installation where one DA's aperture is within another's. Denver, Kansas City and Washington, DC, are cases where such installations are pending, Surette noted.

That's the rub. "If the only way an allocated, licensed station can go up is to put its antenna in the aperture of another antenna, why shouldn't you be able to do it?" he asked. Although the option of a waiver in such cases exists, Surette questioned, "if you have to get a waiver, why have the rule in the first place?"

Another point of contention in the rules, added Crowley, is the 2 dB/10° rate of change and the 15 dB front-to-back ratio of the antenna pattern required by the FCC. Steep slopes and deep notches are

not allowed—the pattern has to roll off smoothly.

Crowley noted that a number of petitioners find this point too restrictive; they believe any rate of change ought to be permissible.

Others conjecture that the specifications are a legacy from the AM Branch and do not represent real-world concerns in FM. Surette indicated that in Boulder, CO, in the area of the National Radio Quiet Zone, front-to-back ratios of 30 dB are used, with no technical problems.

A standard pattern shape?

Finally, there is the issue of certification of pattern shape. According to Crowley, there are no standards for FM

to be panel antennas, you could come close to a single set of standards. But in the real world, you have antennas of different heights, different variables; you have to model each one very closely."

The FCC's FM DA rules have been called an "endowment" to manufacturers. To that, Surette admits, "There's no question it's going to lead to more business—my workload has increased.

"With these rules, when you look at the cost of a new antenna against the cost of a new transmitter, it's just as easy to go ahead and get the new antenna." Some stations may opt for a higher powered antenna, he said, with an eye toward upgrading overall in the future.

But Surette cautions that the rules also make it likely that "the spectrum will be more jammed up than ever." The reason, he says, is the FCC's limited perspective on FM.

"The Commission makes rules that sound good on paper. But the people

"The Commission makes rules that sound good on paper. But the people running the FM Branch today did not 'grow up' in FM."

antenna modeling at the FCC. This is left to the discretion of each manufacturer.

In this regard, Surette concedes that there is no one shape that suits all situations. Because of tower effects, each pattern has its own peculiarities, he said.

"To have a standard pattern is very difficult," said Surette. "If you could assume them all to be pole mounted, or

running the FM Branch today did not 'grow up' in FM," he said.

"They didn't come up through the FM system; they came from AM, or from other areas. Speaking as one engineer, it appears the FCC is trying to bring in influences from these other areas. Therefore the FM Branch seems like it doesn't have its own identity."

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LBA Introduces Tunipole for AM

by Jimmy Boykin, Mgr
LBA Technology, Inc.

Greenville NC A new antenna concept, the LBA Technology, Inc. Tunipole™, is being implemented by medium wave (AM) broadcasters throughout the Americas.

The Tunipole is a specialized implementation of the folded unipole. It consists of a cage of wires along with appropriate resonating or coupling devices that attach to the station's tower.

The base of the tower has no insula-

tor, but is tied directly to the station ground system. The Tunipole cage wires are attached to the tower at the top and

TECHNOLOGY UPDATE

to the antenna tuning unit at the bottom. Tuning elements, as required, are integral to the cage wire assembly.

Transmitter energy travels from the tuning unit into the fold wires, up to the

top of the tower, into the tower and down to the base, where it completes its circuit into the ground system. In so doing, the antenna system radiates a high efficiency, broadband signal.

Utilizing the Tunipole

Electrically speaking, the Tunipole is equivalent to the familiar folded dipole antenna, cut in half and stood upright on a ground system. It has the radiation pattern characteristics of a series-fed monopole antenna, with the fold wires functioning as impedance transforma-

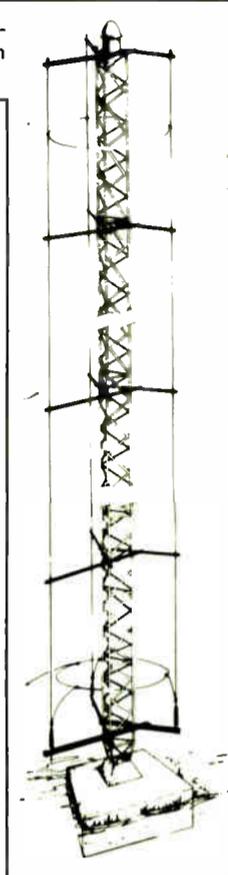
The Tunipole is completely adjustable in base impedance.

tion and control elements.

Unlike the series-fed antenna, the Tunipole is completely adjustable in base impedance, which facilitates tuning the unit adjustment.

Major advantages are inherent in grounding a series-fed MF broadcast tower and feeding it as a Tunipole. One of the first advantages is that lightning bolts go right into the ground system, saving the antenna tuning unit and transmitter from damage.

Also, with the Tunipole, one need not take special isolation precautions in order to mount other antennas on the
(continued on page 38)



WXYV Relocates with Dielectric

by Erich Steinnagel, DE
Summit Broadcasting Corp.

Baltimore MD Radio station WXYV-FM, Baltimore, MD, recently relocated its transmitting facility after operating from the same location since the station signed on the air over 43 years ago.

USER REPORT

The latest version of the old facility consisted of a six bay antenna on a 325' base insulated, AM self-supported tower. The site that we would relocate to consisted of a 365' base insulated, short guyed tower; it included another FM station which was pole mounted on the top.

Our new tower only had a 4' face and we were restricted to side-mounting the antenna near the top of the tower. This required replacement of over 40' of conventional guy cable with fiberglass rod.

Additionally, the tower would not handle the wind load of radomes, or the dead weight of de-icer transformers. To handle the compromises we were faced with at the site, we selected a Dielectric DCR-M4 four-bay quadrapole antenna.

Dielectric optimized the pattern of the antenna and, after submitting a surpris-

ingly omnidirectional pattern for our approval, delivered and installed the equipment at the new site.

Wideband design

This is no ordinary ring-type antenna. The sections have a diameter of 36" and are of a wide design that would be suitable for multistation operation should one choose to do so; we did not.

The wideband design gives the antenna a very low sensitivity to ice—possibly eliminating the need for radomes or de-icers. The antenna is rated at 18 kW per section.

When operations were transferred to the new facility, we noticed an immediate improvement. Transmitting with four bays rather than six enhanced our penetration within our coverage area.

In the downtown regions of the city where severe multipath had existed, it was all but eliminated. The installation has been trouble free since it went up in January 1989.

Ice

Shortly after we began operating from the new site, we experienced our first ice storm. We anxiously monitored the transmitter operating parameters to see what the effects of the ice would be, because we did not utilize radomes or de-icers with this antenna.

Approximately three-quarters to one

inch of ice had accumulated, from what we could see with field glasses. However, this only caused a total reflected power of 2% at the transmitter. The TPO at the site is normally 26.5 kW.

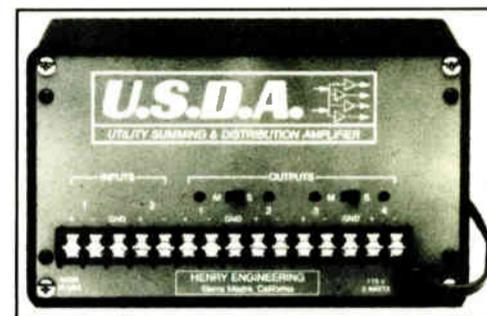
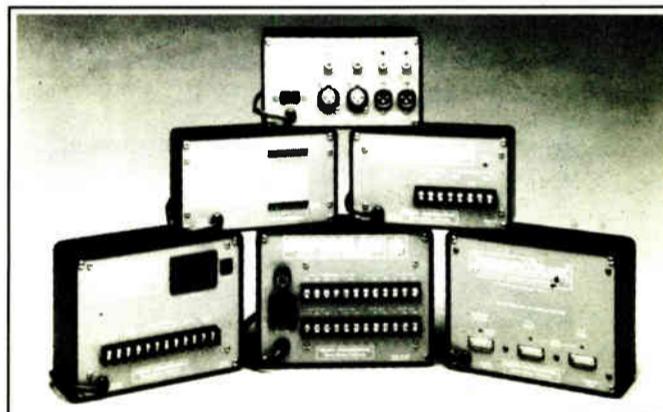
The DCR-M antenna began as the only choice for the heavily restricted installation that we were faced with. However, this would be an excellent choice for any installation.

■ ■ ■

Editor's note: Erich Steinnagel can be reached at 301-653-2200.

For additional information on the DCR-M antenna, contact Stan Thomas at Dielectric: 207-655-4555, or circle Reader Service 30.

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Tennaplex Fits the Bill at WCKW

by Sidney Levet, III, CE
WCKW-FM

La Place LA In January 1988, WCKW, 92.3 MHz and KHOM, 104.1 MHz began operation on a Tennaplex/Kathrein combiner with a crossed dipole (Twisted Sister) panel antenna system.

The antenna was chosen because it provided the bandwidth required to radiate both the 92.3 MHz and 104.1 MHz signals equally and the radiation pattern for both stations was truly omnidirectional. Both stations are now operating at the maximum limits allowed for Class C FM stations and provide reli-

able signals out to about 110 miles.

A 12-bay model antenna was chosen because in the flat Bayou country of south Louisiana it afforded the energy savings of lower transmitter power and provided the coverage required.

Configuration

Each of the 12 bays has three panel elements that are mounted on the face of a 6' wide tower. This tower is 125' long and is mounted atop a 1875' Stainless G-10.

The antenna was constructed on site. Using stainless steel fittings, the side skirts were bolted to the back panel or

grid. Then, the radiating elements were bolted to the back panel. Since this was a new tower, the various power dividers were installed in the tower on the ground.

USER REPORT

Next, feed cables were hoisted up and connected. Each cable has a weather proof ID tag, since each cable has a certain place to go for proper operation of the antenna. There are 12 1 5/8" and 72 3/8" Flexwell cables.

After installation, every fitting on the lines was wrapped with a special tape for protection from the weather. All coax lines are pressurized from the output of the combiner right up to the input jack at the panels.

Serious business

This is a serious antenna, one that is built to withstand the rigors of riggers and the elements over the years. It's really heavy metal.

WCKW and KHOM each use a BE Model FM-30 FM transmitter. Using unflanged 3 1/8" line, each transmitter is connected through its own Dielectric coax motorized transfer switch, to its separate input port on the combiner.

There is no forced air cooling required. The bandwidth of the combiner at each station's input frequency is in excess of 1.0 MHz, while the return loss is in excess of -35 dB. The isolation between stations is in excess of -77 dB.

WCKW and KHOM have great stereo separation. WCKW does not have an SCA; however, KHOM uses two with no apparent problems. Both stations operate with a forward of power of about 25 kW. The reflected power of each station is less than 20 W and there are no hot

spots on any of the transmission lines.

The antenna radiation elements look like the head of an arrow made of four galvanized 2" pipes in an 8 o'clock, 2 o'clock, 10 o'clock, 4 o'clock arrangement, mounted on a 32" long shaft. This assembly is centered on a 6' square panel. All exposed metal parts are at DC ground for lightning protection.

The cross dipole Twisted Sister panel system design has bays 2, 4, 6, 8, 10 and 12 physically rotated 90° with respect to bays 1, 3, 5, 7, 9 and 11. This 90° phasing system allows for automatic VSWR compensation.

Points to consider

Have the vendor send an experienced rigger who knows how the antenna should be installed to supervise the tower crew.

Have the vendor supply an engineer with a network analyzer to check the tuning of the combiner. The tuning of this unit is critical and easily knocked out of line by the shipping companies.

On arrival of our unit, the KHOM side of the combiner was found to be right on the factory setting; however, the WCKW setting of one of the coupling devices was slightly out. Marvin Crouch of Tennaplex, with the aid of the network analyzer, quickly got the combiner returned to factory specs.

The bottom line is that since this system was installed, both WCKW and KHOM have seen their ratings and revenues soar. The management of both WCKW and KHOM are very pleased with the operation and performance of the Tennaplex/Kathrein combiner and the Twisted Sister panel antenna and would highly recommend this system to other broadcasters.

Editor's note: Sidney J. Levet, III was named the 1990 Broadcaster of the Year by the Louisiana Association of Broadcasters. He can be reached at 504-535-2424.

For more information on the combiner and Twisted Sister antenna, contact Marvin Crouch at Tennaplex: 613-226-5870, or circle Reader Service 59.

Tunipole: New AM Helper

(continued from page 37)

tower. Transmission lines to FM, TV and two-way antennas come directly across the base of the tower without need of isocouplers or quarter-wave isolation stubs.

Compared with a conventional, series-fed MF tower, the tower equipped with a Tunipole tends to exhibit significantly better bandwidth. In general, the shorter the height of a series-fed MF antenna, the poorer its bandwidth becomes and the more difficult it becomes to transmit "clean" audio signals through it. This is a concern where tower heights are limited.

In new construction, shorter towers will save material and construction costs. In many cases, the Tunipole allows a short tower to be used without any sacrifices in broadcast quality and will almost always enhance existing series-fed short tower transmission quality.

Increasing MF efficiency

The Tunipole has the unique ability to increase the efficiency of many MF station installations. While theoretically producing the same radiated field as a series-fed antenna over a perfect ground system, the Tunipole normally produces a greater field intensity over poor or

short ground systems.

In instances where stations have been installed with limited ground systems, performance of Tunipole equipped stations have been comparable to those with complete ground systems. This is an important consideration in planning for new station construction where land is limited, or where a station is changing from a higher frequency to a lower frequency and wants to continue to use the same tower and ground system.

Installation of a Tunipole antenna system is not difficult. A typical system for a series-fed tower is fabricated with field-adjustable hardware, fitting most popular types of towers without cutting, drilling or welding. Installation time is often less than one day.

Tuning of this antenna system does require experienced engineering assistance and proper instruments to optimize performance. LBA Technology, Inc. provides complete field application and adjustment assistance, drawing upon its sister consulting engineering firm.

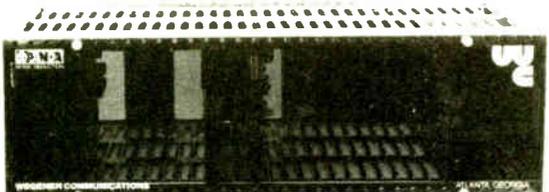
Editor's note: For additional information on the Tunipole antenna system, contact Jimmy Boykin at LBA: 919-757-0279, or circle Reader Service 85.





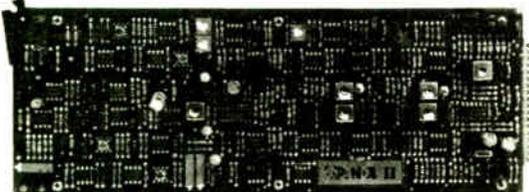
Series 1600 Audio & Data Transmission System

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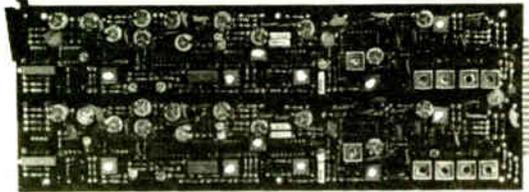
Model 1601

Demodulator



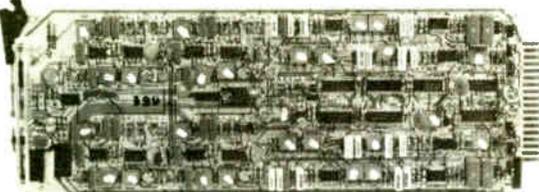
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Jampro Spiral Impresses WKYS

by Bob Clinton, CE
WKYS-FM

Washington DC During 1988, WRC-TV—an NBC owned and operated station in Washington, DC—decided to improve its coverage area with a new tower and antenna. This decision had a direct impact on lessee WKYS-FM because the FM antenna was to be on the same tower.

The height of the old antenna was 480' EAH. Most other stations in the area have towers an average of approximately

USER REPORT

200 feet taller. That upper limit of 659' EAH is a limitation common to stations inside Washington, DC limits.

In order to make the tower project more cost effective, it was decided to include a community antenna for the FM band, which was capitalized by Albimar Communications, owner of WKYS-FM.

Finding a target range

Research into the specifications for this type antenna revealed that even typical "broadband" antennas do not normally cover the entire FM band, so some portion of the band had to be targeted. A

study of local stations and their coverage needs indicated the range from 93 MHz to 104 MHz as the most desirable target.

The desired specifications included a circularly polarized antenna that could accommodate the band from 93.9 MHz to 103.9 MHz. A VSWR of 1.1 to 1 in the specified range, and no more than 1.2 to 1 over the full FM band, was selected.

A three-bay antenna also was desired. Furthermore, with the anticipated cost of this antenna, it would have been foolish not to ask for a proof on the test range. Jampro fit the bill with its model JTC-FM/1.5 spiral antenna.

A surprising development

At a time when talk within the engineering community seemed to favor the panel antenna and its various benefits, Jampro's JTC-FM/1.5 spiral antenna introduction caught many off guard.

The design was borrowed from Jampro's television model. The spiral antenna is designed to wrap around a pole of 28" in diameter, between the top of the tower and the bottom of the television antenna pole.

It is known as a traveling wave antenna. The gain of the antenna (1.45) is derived from its length (three wavelengths) rather than a number of bays. This is the first use of a spiral an-



The Jampro JTC-FM/1.5 spiral antenna borrows its design from its TV counterpart.

tenna for FM transmission.

Everyone at the station was happily surprised when final tests were run. The antenna exhibited the amazingly low VSWR of better than 1.07 to 1 over the entire FM band!

The test range pattern had almost textbook tolerance through the 360 degrees of its pattern at the center test frequency of 99.5 MHz. With the addition of the

feedlines to the TV antenna above, and WKYS's operation below the center frequency at 93.3 MHz, some pattern distortion was observed.

Improved coverage

An airplane fly-by and some good old-fashioned driving around and listening proved that the uniformity of coverage had improved immensely, as had the broadcaster's nemesis, multipath. The signal is strong well out to the fringe range, with rarely reported multipath within the 70 dBu contour.

The previous antenna was a four-bay panel antenna. With the increased elevation and reduced gain, WKYS's transmitter was still able to drop its output requirement by seven kilowatts. The only problem with the antenna after installation was an air leak caused by an improperly installed gasket.

Spiral antennas are typically designed for use in television transmission. They are circularly polarized, have wideband response, and a very smooth radiation pattern. The unusual Jampro JTC-FM/1.5 antenna has satisfied the technical requirements of WKYS-FM's owner, staff, and audience.

■ ■ ■

Editor's note: Bob Clinton can be reached at 202-686-9300.

For additional information on the JTC spiral antenna, contact Alex Perchevitch at Jampro: 916-383-1177, or circle Reader Service 48.

The engineers who know RF best already know us very well.

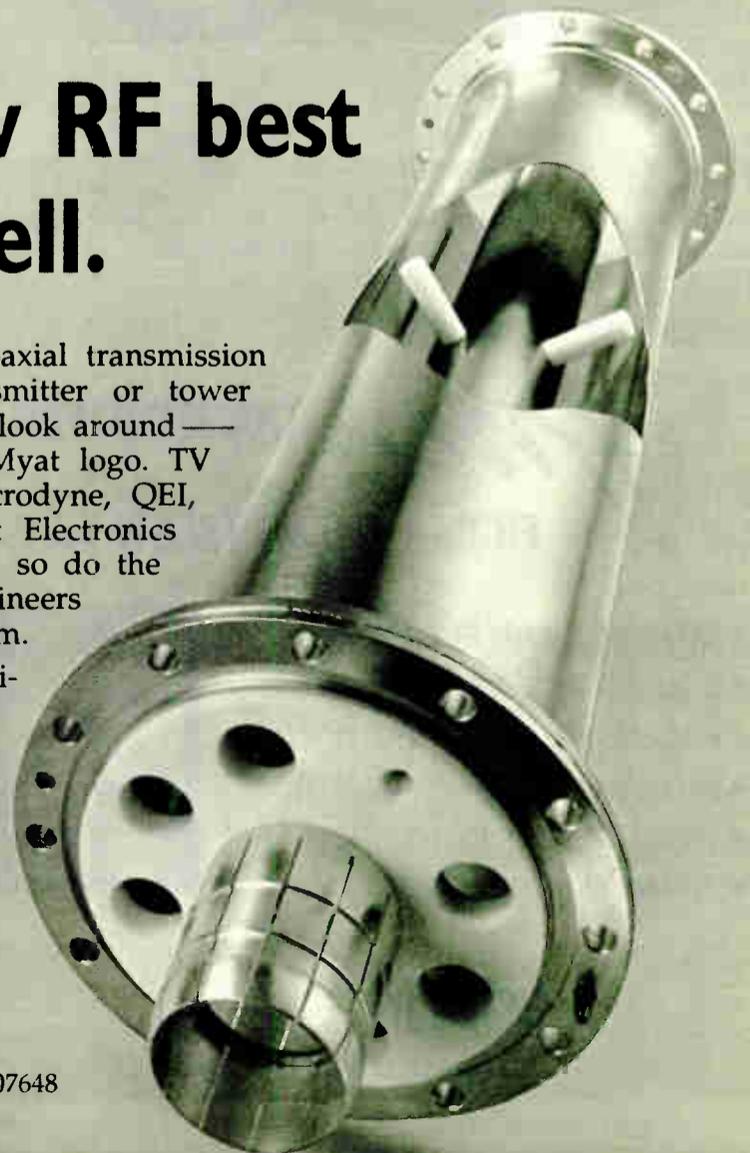


If you're looking for superior rigid coaxial transmission line and RF components, your transmitter or tower might be a good place to start. Take a look around—you'll probably find the bright blue Myat logo. TV and radio RF engineers at Harris, Acrodyne, QEI, Micro Communications, and Broadcast Electronics all routinely specify our products. And so do the antenna experts at Jampro and the engineers for the Navy's top airborne radar system.

All of these manufacturers demand long life and superior efficiency. They expect the highest quality materials, the toughest construction techniques, plus the most effective expansion compensation designs. And, like you, they have budgets and schedules to meet. All of them demand Myat, because they know Myat delivers.

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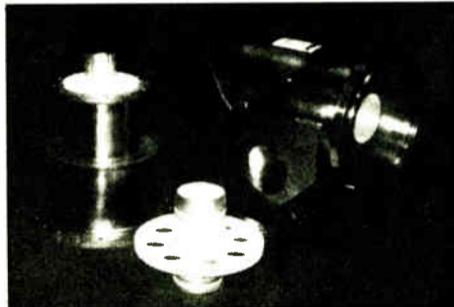


Myat Rigid Line Put to the Test

by Don Aves, VP Engineering
Myat, Inc.

Norwood NJ It's long been known that FM broadcasters in urban centers can realize substantial cost savings by sharing antenna towers.

Until recently, however, many RF engineers were concerned about the pos-



Myat's 9 3/16" rigid line fittings (left) played a central role in Portland's KGON tower project.

sible penalties in transmitter performance and signal quality involved in a multistation antenna installation.

The 603' antenna recently erected for KGON-FM in Portland, OR meets those concerns by combining four FM stations on a single run of 9 3/16" 50 Ohm rigid line.

The signals will be combined at the transmitter building and then sent via the Myat rigid line to a circularly polarized antenna at the top of the tower.

This solution has allowed KGON-FM to

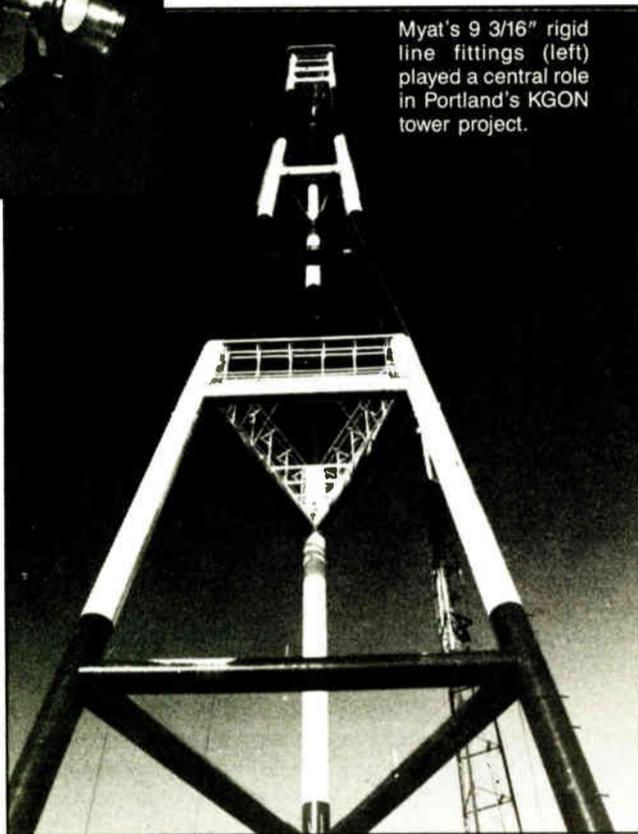
meet its new Class C height requirement, while simultaneously satisfying strict local and federal ordinances regulating RF exposure at ground level.

KGON-FM had two principal reasons for choosing 9 3/16" 50 Ohm line—maximum peak voltage fault protection

and mechanical ruggedness.

The high peak voltage capacity greatly enhances system survivability in the event of lightning or antenna problems involving high standing waves from the many frequencies carried by the transmission line. The mechanical ruggedness should help reduce maintenance costs and ensure a reliable system.

There are other reasons why 9 3/16" transmission line is suited to this type of multistation installation. Its 580 MHz cutoff frequency is high above the FM



band—in fact, it will accommodate UHF stations up to Channel 31.

With a peak power rating (at unity VSWR) of 5800 kW and an average power rating at 108 MHz of 430 kW, 9 3/16" line has ample capacity for several FM channels.

Power loss per 100 feet of line at 108 MHz is only 0.032 dB, giving a transmission line efficiency of 95.67% at 600'.

Unique and innovative project

KGON-FM chose Myat to supply the 9 3/16" rigid line for its new tower after evaluating competitive bids from several potential suppliers. This multiple FM installation represents a unique use of 9 3/16" line, so we were excited to be the supplier for this innovative project.

Like all Myat copper transmission line, our 9 3/16" line sections are formed from high-purity selected conductivity mill run copper tubing.

TECHNOLOGY UPDATE

Buying the mill's entire run ensures us the consistency and quality needed for RF line. In addition, we can control dimensions precisely for optimum RF performance.

To further minimize VSWR, four-port dielectric tuners are available. It is anticipated that when KGON's tower goes on the air later this year, it will have a VSWR of 1.05 or less over the entire FM band from 88 to 108 MHz.

We also made use of advanced construction techniques to enhance the reliability of Myat 9 3/16" RF line. All flanges are joined to the line sections and elbows with a technique known as MIG-welding, which reduces heat transfer into the welded materials, for

a stronger joint.

In any transmission line installation, elbows are subjected to the greatest stress. To prevent deformation as the line expands and contracts, the copper tubing used for our 9 3/16" elbows has walls that are twice as thick as those of the line sections.

Elbows are reinforced with heavy-duty brass box gussets. Each elbow is pressure-tested twice—once after the two legs have been welded together and again after the gusset has been attached.

Watchband contacts

To ensure clean friction surfaces and maximize thermal conductivity in the line anchors, four "watchband" spring contacts made of silver plated beryllium-copper alloy are used.

The design of the KGON tower includes a below-grade tunnel leading from the transmitter building to the tower, and a 6' diameter central tube that houses the vertical portion of the run.

Despite this protection from exposure to the weather, we elected to use stainless steel for all the hangers. To further enhance the reliability of the installation, all vertical line hangers have dual springs.

As ground-level RF limits become lower and FCC height requirements higher, it's likely that more and more FM stations will be looking at the merits of shared towers.

If an installation of this type is in your future, we urge you to consider the benefits of 9 3/16" 50 Ohm transmission line.

■ ■ ■

Editor's note: For additional information, contact Don Aves at Myat: 201-767-5380, or circle Reader Service 65.

People . . . Tascam has named musician, engineer, producer and arranger Karl Moet as its Show/Clinic producer. Moet's responsibilities will include various trade show duties, including booth setup, design and product display. Moet will also be responsible for creating and implementing training seminars for musicians.

Gentner Electronics Corporation has appointed Elaine Jones to the position of director of corporate projects. Mrs. Jones will oversee Gentner's



facilities management team. Previously, Mrs. Jones served as Gentner's distribution manager, supervising the training of Gentner's representatives, distributors and dealers.

Awards . . . National Public Radio has been honored with the First Place Robert F. Kennedy Journalism Award for a three-part series "Black Men: Lost Generation?" that aired on NPR newsmagazines last August.

Minnesota Public Radio has won a Corporation for Public Broadcasting (CPB) Gold Award and two Silver

Awards. "Armed in America," a documentary examining the country's controversial gun issue, received the Gold Award, as well as a Silver Award to honor outstanding technical achievement.

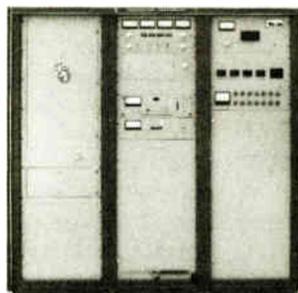
Increased sales, revenues . . . Harris Corporation reported net income in the third quarter ending March 30 of \$34.8 million. This figure represents a 14% increase over last year's income, from continuing operations of \$30.4 million. Third quarter sales were \$778.6 million, compared with sales from continuing operations of \$524.2 million the previous year.

New offices, new names . . . EME, Inc., and Broadcast Services Company have moved to newly constructed facilities near Raleigh, NC to keep up with the company's continuous growth. Additionally, a new telephone system was designed and installed to improve operational efficiency, and the staff was enlarged. Both companies are owned and operated by The Davis Group, Inc.

The Broadcast Financial Management Association has changed its name to the Broadcast*Cable Financial Management Association, effective 1 July, 1990. The name change accompanies a change of officers and directors. Elected president of the new B*CFM is Patricia Foley, currently vice president/MIS for NewCity Communications, Chicago.

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Radiating Cable Has Many Uses

by Richard Crompton, App. Eng.
LPB Inc.

St. Michaels MD Radiating cable can be described as a unique form of "antenna." Why? Read on.

The term "antenna" is actually a misnomer. A radiating or leaky cable is ac-

SPECIAL REPORT

tually operated as a terminated transmission line. The characteristic impedance load termination at the end of the cable is the actual antenna, but terminations do not radiate usefully.

Like all current-carrying transmission

lines, there is a field surrounding the cable. It is this field that we utilize, hence we incorrectly call the radiating cable an "antenna." This surrounding field is the induction field; it is highly localized to the immediate vicinity of the cable.

While most other types of antennas strive to provide maximum coverage area, a radiating cable system is used to provide coverage of a small and specific geographic area. Practical reception range from the cable, in the AM broadcast band, will be limited to approximately one hundred feet.

Cable forms and applications

To produce a controlled amount of radiation from a coaxial cable, the cable is manufactured with some form of openings in the outer shield.

Andrew "Radiax," originally designed for VHF use in subways, resembles a semi-rigid transmission line with a solid slotted outer shield. Other radiating ca-

Almost all applications of radiating cable have been in the AM broadcast band, where a standard AM radio is the receiver.

bles manufactured for specific AM broadcast band use employ a sparse copper braid for the outer jacket.

LPB produces the NF-1D cable for transmission zones of no more than 1000

feet. The NF-2D cable, also made by LPB, is a lower loss, heavy duty cable, which may be used for a linear transmission zone of up to 5000 feet. The cable is coaxial, with drain wire and a polyvinylchloride jacket.

Almost all applications of radiating cable have been in the AM broadcast band, where a standard AM radio is the receiver.

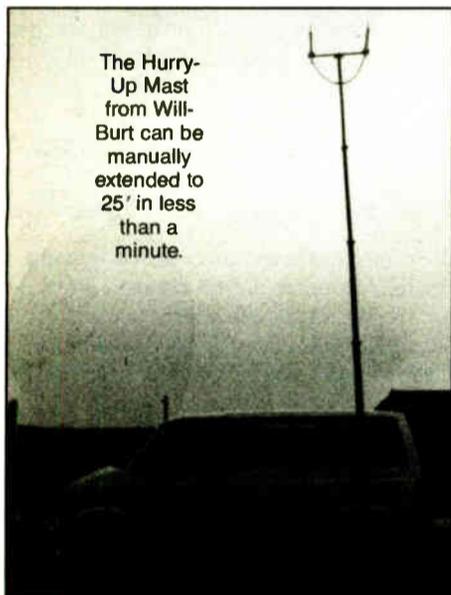
Travelers' information services (TIS), authorized in Part 90.242 of the Commis-

(continued on page 42)

Will-Burt Unveils Hurry-Up Mast

by Don Barlow, Mast Sls Mgr
The Will-Burt Co.

Orrville OH Will-Burt's 25' Hurry-Up telescoping mast is designed for fast and easy deployment of lightweight an-



The Hurry-Up Mast from Will-Burt can be manually extended to 25' in less than a minute.

ing up to 20 lbs.

The Hurry-Up consists of six graduated aluminum tubes nesting one inside another. The mast is extended manually by pushing up the sections and fixing them in position using quick lock/release collars.

It can be extended to its 25' height in one minute or less, even when wearing thick gloves. Positive stops prevent the sections from being extended too far.

The Hurry-Up mast design allows for quick direction adjustment with rigid azimuth locking. When supporting a two square foot topload, this mast has a survival wind speed capacity of 54 mph fully extended, and deflects less than 2' in 35 mph winds.

attached reinforced holding tube into which the telescoping mast is lowered and locked into position.

The vehicle mounting stand can also be used with Will-Burt's optional two-level guy kit if the mast is to be field-mounted away from the vehicle.

For permanent vehicle mountings, external support brackets are available.

Cost of the Hurry-Up mast with mounting stand is \$1000.

■ ■ ■

Editor's note: For additional information on the Hurry-Up telescoping mast, contact Don Barlow at Will-Burt: 216-682-7015, or circle Reader Service 88.



A typical equipment cabinet for a buried cable system along a road.

TECHNOLOGY UPDATE

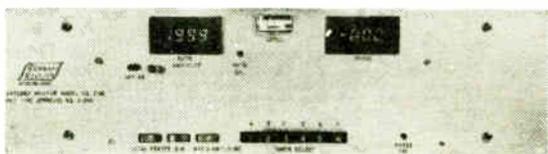
This new product utilizes a proven collar/clamp design, used by the US Army. Will-Burt has been manufacturing pneumatic telescoping masts for the US military and commercial broadcast markets for over 30 years.

The Hurry-Up is free standing—without guylines—in its universal vehicle mounting stand. This vehicle stand is a "drive on" aluminum plate with an

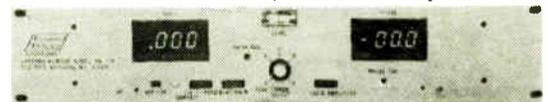
tennas and instruments. This portable 20 lb. telescoping mast can be used to elevate equipment such as small ENG microwave antennas, Marti antennas and meteorological instruments weigh-

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Radiating Cable Use

(continued from page 41)
sion's Rules, may use either a radiating cable or a short vertical antenna. The first TIS installation, at the Los Angeles International Airport in 1972, employed two buried cable transmission zones.

A more recent installation is the system on the approach road to the Dulles International Airport near Washington, DC. This system utilizes a single length of approximately 11,000 feet of cable.

Drive-in theaters and churches have long been users of radiating cable systems . . .

tem on the approach road to the Dulles International Airport near Washington, DC. This system utilizes a single length of approximately 11,000 feet of cable.

Unlicensed applications
Part 15 of the Rules allows unlicensed operation in the AM broadcast band under certain conditions which can be met by a radiating cable system operating at low power input.

A wide variety of applications have utilized this approach. Perhaps the best known are those on the entrance and exit roads to Disney's Magic Kingdom and EPCOT Center. A timely repeating message prepares visitors with information about daily features, hours of operation, ticket prices, etc., before they even get to the parking area.

In New Jersey, a visitor listening on 530 kHz while driving through the Animal

Safari at Six Flags Great Adventure hears a series of informational tapes as he progresses from one animal area to another. Clarity is excellent and there is no interference between the 17 adjacent message zones.

Drive-in theaters and churches have long been users of radiating cable systems buried in the parking lot, to provide patrons a system that does not annoy the neighbors and is less expensive to maintain.

Typical radiating cable systems
A length of approximately 7000 feet of type NF-2D radiating cable, a product found in most buried cable systems, can be driven by a small AM transmitter operating at about 20 watts.

These systems may be placed end-to-end to provide a sequence of messages as in the Great Adventure Animal Safari, or the system may be extended almost indefinitely using linear RF amplifiers and additional cable lengths.

The highly confined radiation pattern of a radiating cable system is advantageous for many specialized applications. In addition to the several examples above, the "smart road" of the future may prove to be based upon the induction field from a buried radiating cable.

Editor's note: For additional information on radiating cable and its applications, contact John Tiedeck at LPB: 215-644-1123, or circle Reader Service 17.

BUYERS BRIEF

Delta Electronics recently introduced a new surge arrestor which could be used with the company's TCA series RF ammeters.

The arrestor fits inside a cap that screws onto an "N" Tee Adapter. By placing the arrestor outside the RF Meter Box, when it is damaged by lightning, the engineer can replace the defective component in the field.

This new surge arrestor eliminates

the time consuming process of removing the RF Ammeter and returning it for factory repair. Complete adapter kits for existing RF ammeters are available from Delta for \$150. Over 7000 Delta ammeters are in service worldwide.

For more information, contact John Bisset, Delta Electronics, Inc. 5730 General Washington Drive, Alexandria, VA 22312. Phone: 703-354-3350, or FAX: 703-354-0216.

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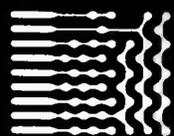
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John Soller, chief engineer at WAZU

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