

## Canadian Firm Acquires ITC

by Alan Carter

**Bloomington IL** 3M has signed an agreement to sell its International Tapetronics division to Canadian electronics entrepreneur Donald Carle, a deal that was expected to be completed by mid-January.

The purchase agreement was signed in December, said 3M spokesperson Laura Sutton. The sale includes the plant and laboratory in Bloomington, 55

employees and manufacture of cartridge machines and carts, she said. 3M, however, will supply tape to ITC for the carts, Sutton added.

Employees with ITC when it was bought by 3M in 1981 will go with the new owner and 3M employees transferred to ITC will have the option of staying with 3M, Sutton explained. ITC operations will remain in Bloomington, she said.

Carle, based in West Vancouver, Brit-

ish Columbia and described as a successful entrepreneur, owns companies that design and manufacture long distance radio communication systems, two-way radio terminal products and solid state digital audio systems for government, military and industry.

His companies operate as Spilsbury Communications Ltd., Race Technolo-

gies Inc., Brudon Industries Ltd. and MCK Telecommunications Inc.

The ITC division will operate under the name International Tapetronics Corp., its corporate identity before being purchased by 3M.

Marketing agreements for ITC product were expected to be maintained by Carle,

(continued on page 3)



## NOI Asked for AM Directional Antennas

by Alan Carter

**Washington DC** Five engineering firms have asked the FCC to re-evaluate performance verification requirements for AM directional antenna systems, in light of some rules that are more than 50 years old.

The petition, which calls for a comprehensive Notice of Inquiry, argued that with current computer modeling, the proof of performance for AM directional antennas can be made simpler and less costly for AM broadcasters.

The cost of engineering services could be reduced 50 to 70% under procedures recommended in the petition, according to several engineers involved.

The petition, however, is not expected to be received favorably across the board by consulting engineers. While

specific figures were not available, engineering work on AM directional antennas is more expensive than similar requirements for FM or TV. But collections on debt also are described as more difficult because some AMs are financially troubled.

### Discouraging broadcasters

The petition noted that the high cost of AM performance verification tends to discourage AM broadcasters from refurbishing or maintaining their antenna systems—actions that could help improve interference control and, in some cases, result in better service to listeners.

"The technology has changed a lot in 50 years but the regulations have not," said Ron Rackley of duTreil, Lundin & Rackley, one of the petitioners. "There

(continued on page 8)

## Cuba Eyes TV Marti

by John Gatski

**Havana CUBA** The Cuban government was polite and courteous to a US delegation of broadcasters and government officials during a recent visit here.

Cuban officials, however, made it very clear to its guests that interference against US AM stations will be stepped up if TV Marti begins beaming its western news and information toward the Communist island nation.

According to accounts of the 19-21 December fact finding trip, Cuban government officials were "frank" about what they will do if TV Marti goes on the air.

### Examining options

"They put it this way: They said they had several options (if TV Marti goes on the air). They never used the word

threat. They used the word 'option,'" Clear Channel Broadcasting Service President Wayne Vriesman said.

Clear Channel Broadcasting Service represents 59 clear channel AMs in the US. Vriesman also is VP of Radio Operations at WGN in Chicago.

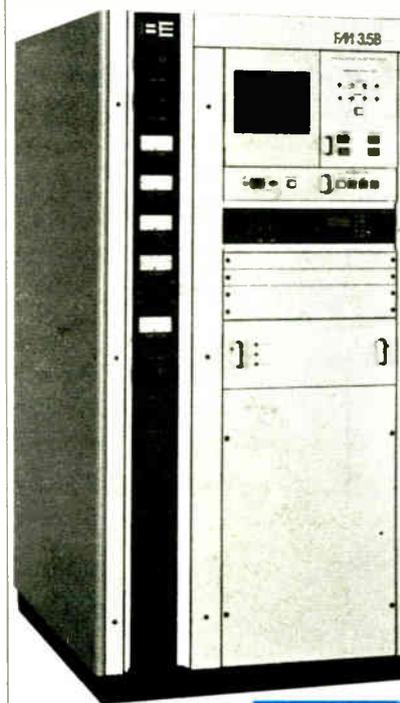
The US delegation visited Havana at the request of the Cuban government in order to discuss Radio Marti, TV Marti and Cuba's retaliatory interference against US AM stations.

The delegation was headed by Rep. Al Swift (D-WA), a member of the House Telecommunications and Finance Subcommittee, and included representatives of the radio and TV industry.

Vriesman said among the retaliatory options Cuba is considering is increased interference to US stations and/or jam-

(continued on page 8)

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## NEWS BRIEFS

### TFT Shortens EBS Tone Duration

**Santa Clara CA** TFT has incorporated shorter programmable tone-duration setting in its new EBS systems, Model 886 and 887, in anticipation and support of a proposed FCC regulation for shorter attention signals.

In making the announcement, TFT said it supports the recent NAB petition requesting the FCC to shorten the EBS attention two-tone signal from 22

seconds to eight seconds or less and the detection time from eight seconds to three seconds or less. Based on experimentation, TFT said it believes the reliability of the EBS will not be degraded.

For more than 12 months between March 1987 and April 1988, TFT experimented with on-air EBS alerts using 12 EBS receivers with varying test-tone response lengths of eight, four and two seconds. The 12 systems were connected to a com-

mon antenna feed and tuned to KNBR-AM in San Francisco, 50 miles to the north.

The intent was to observe and record daily whether the units would falsely turn on or fail to respond to the attention signal during the weekly on-air tests transmitted to KNBR.

After a year of on-air testing and 624 off-air receptions, no unit, including ones modified to a two-second response time, missed a test or were falsely triggered, TFT said.

### EEO Violations Alleged

**Washington DC** The FCC said it has conditionally renewed the applications of two

FM stations but cited both operations for alleged Equal Employment Opportunity (EEO) violations and issued fines totaling \$28,000.

The license for WOWW-FM in Pensacola, FL, was renewed subject to EEO reporting conditions, according to the Commission.

Additionally, because of the station's repeated failure to comply with FCC EEO rules, the Commission advised licensee Colonial Broadcasting of an \$18,000 fine.

The FCC also renewed the license for WSCQ-FM in Columbia, SC, for a short term, subject to EEO reporting, citing repeated failure to comply with

the rules. The licensee, Congaree Broadcasting, was notified of a \$10,000 fine.

### Processing Changes at FCC

**Washington DC** The FCC transferred processing of FM sales from the Audio division to the Video division to give Audio more time to focus on applications for new stations.

Mass Media Chief Roy Stewart took the action to speed up the processing for new FMs.

Also beginning this month, listings of applications for construction permits to modify FM facilities pending before the Audio FM branch will be in the public reference room. The list will be updated bi-monthly.

### Broadcast Audio Partner Dies

**Folsom CA** David W. Evans, 55, of Folsom, CA, and a partner in Broadcast Audio Corp., died 19 December following an extended illness.

Evans was active in the broadcasting industry his entire life, having owned a radio station and having been a radio and TV announcer. He also was involved in general aviation.

### CBS Radio Appointments

**New York NY** Susan Jacobi and Robert Leeder were named senior district directors for affiliate sales at CBS Radio Networks.

Promotions included: Kate Welch, district director, CBS Radio Networks; Pat Ryan, director, CBS Radio Programs; Suzanne Drolet, manager, CBS Radio Programs; Tara Meyers, manager, CBS Radio Sports; and Carol Schwam, manager, CBS Radio Networks.

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# Ice Storm Wreaks Havoc in VA

by Alan Carter

**Norfolk VA** Broadcasters had their fill of Mother Nature in 1989 with hurricanes and earthquakes. But with less than a month left in the year, she struck again. This time, it was ice.

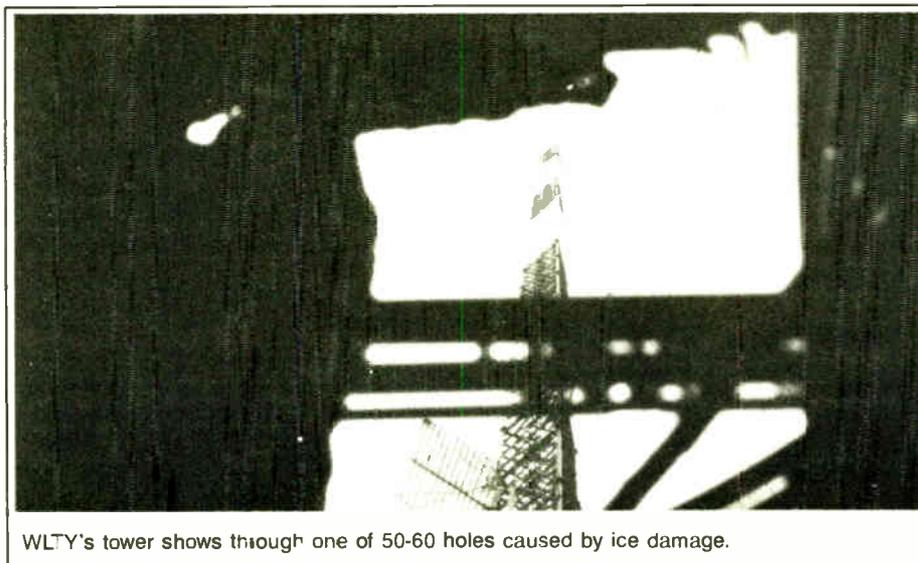
Chunks of ice falling from towers knocked holes, some two to three feet wide, in the roof of the transmitter building for WLTY-FM and WTKR-TV in Norfolk, causing damage that forced the stations off the air.

Ice also wreaked havoc at the nearby transmitter building of WVEC-TV with a similar result: no signal. Problems also were reported at WGNT-TV and WKZL-FM.

### NC also affected

If it was any consolation for broadcasters near here in Tidewater, VA, operators at stations in neighboring North Carolina were enduring a similar test of will. Raleigh's WRAL-FM, WRAL-TV and WPTF-TV lost signals in the same storm.

What started as a rain storm on 8 December turned into ice and by 10 Decem-



WLTY's tower shows through one of 50-60 holes caused by ice damage.

ber, chunks of ice were falling through roofs like they were made of plastic.

At WLTY-FM and WTKR-TV's transmitter building, some 50 to 60 holes were made in the roof. Incoming water ultimately damaged the RCA transmitter of WLTY, shutting the system down.

WLTY-FM went off the air 10 December but was able to broadcast for three

to four days with the auxiliary transmitter of WFOG-FM in Suffolk, according to CE John Zaun. By 15 December, the station was back on the air from the tower it leases from WTKR-TV. But a second ice storm forced Zaun to reduce power at the 40 kW station to accommodate the de-icers.

While on auxiliary power, Zaun said the station ran at 300 W at 400'. "It did surprisingly well. It covered our metro," he said, explaining the WFOG transmitter was closer to the city.

Sending a signal from WTKR-TV while the transmitter was down was more

complicated, according to CE Gene Gildow.

WTKR went off the air 1:05 PM on 10 December and by 7 PM the station was broadcasting via a cable system to about 170,000 homes. The next day the station hooked into other cable systems to eventually reach about 60% of its usual market. The station resumed broadcasting from its transmitter on 13 December.

### Microwave ENG adapted

To reach the first cable system, WTKR used its microwave ENG to send a signal. At that point, public station WHRO-TV picked up the signal from the first cable system and fed it to the other cable systems. WHRO also helped WTKR by feeding WTKR its CBS network programming because ice damaged WTKR's dish. WTKR also lost an STL microwave dish and a secondary network dish.

Gildow did not have a total amount for the damage, but he said the bills were at \$20,000 and not all of them were on his desk.

At WVEC-TV, Assistant CE Peter Dennant said the station also hooked into the area cable systems when water flooded the transmitter building.

Dennant, however, took the ice storm in stride. This was no comparison to what he saw while working in Wisconsin. "By ice storm standards, this wasn't anything," he said.

## Carle Buys ITC from 3M

(continued from page 1)

Sutton said. 3M ITC dealers were Allied, Broadcast Services Co. and Broadcast Supply West.

Broadcast Services owner Neal Davis said ITC employees were optimistic about the sale and indications were operations would be "business as usual. That is our feeling," Davis said. "If there is anything different, I would be surprised."

### Marketing agreements for ITC product were expected to be maintained by Carle . . .

Broadcast Supply West Marketing VP Tim Schwieger said, "We would hope they will leave the distribution channel intact." He noted that until recently there was considerable confusion with customers on ITC distribution.

3M confirmed in September that it was holding discussions on a sale of the ITC division, but the company declined to reveal details.

Canadian companies including Western International Communications, McCurdy Radio Industries and AEG Bayly, at that time, denied they were talking with 3M, although the names were noted in industry conversations.

3M bought ITC in December 1981. The company was started by a group of employees that left ATC (Automated Tape Controls) when it was purchased by Gates, which today is known as Harris Corp.

The sale of ITC comes almost two years after Capitol Industries sold its Capitol Magnetics broadcasting cartridge and tape manufacturing division to Capitol Operations VP Nick Krassowski. Capitol Magnetics now operates as Audiopak.

Krassowski, Audiopak president, said he welcomed the new owner into the business. "This tells me that the cart business is still a very viable aspect of the broadcasting industry," he said.

Another competitor, Fidelipac President Roger Thanhauser declined to comment and said he would not speculate until he read a public confirmation from 3M of the information and the agreement was finalized.

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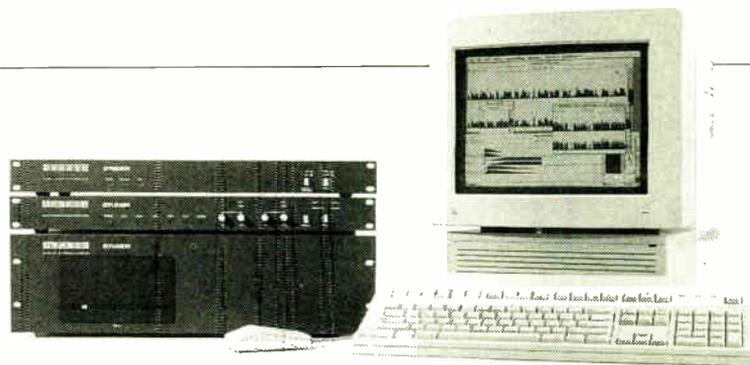
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# The Cart Biz Heads Northward

by Judith Gross

**Falls Church VA** Ya read it here first. Remember, we told you 3M had put ITC up for sale?

That was back away, then the rumor mill started working overtime. We heard all kinds of good ones. Next thing you know, I expected to hear the names of Frank Lorenzo, or maybe even Donald Trump whispered in some SBE chapter meeting.

But no. Thank goodness, nothing like that.

Don Carle, an entrepreneur out of British Columbia, up there in our neighbor to the north, acquired ITC with plans to restore the original International

Of course, when Capitol got out of the cart business, it did so because of overseas competition on other types of tape.

But now Audiopak has Winchester, VA as its headquarters. And then Fidelipac is still very much at home down there in Joisey.

So it seems for the most part the lubricated tape business is still happy to stay in the USA.

And another thing. Here we are, after lots of folks have predicted the premature demise of audio cartridges and entrepreneurs are still putting money into getting into the biz. So say what you will, the ubiquitous cart lives on and on.

What's that? A highly sophisticated new telephone system from Gentner? I

GMs are listening to their own stations. Even at 4 AM.

Loved a clipping of an editorial which appeared in the *Sacramento Bee* (a newspaper with a nifty name) shortly after the Frisco quake.

It was sent to me by Jim Hodges and it laments the sorry state of the Emergency Broadcast System. According to the editorial, some stations didn't even tune into it after the quake and those that did found their own news reporters in the field were getting better info.



The paper quoted a station owner who claimed the primary EBS station in Northern Cal had recently been sold and the new owners didn't know enough about emergency procedures. Then he said a message from Frisco's mayor meant to calm everybody down was broadcast over EBS—inappropriately.

And since the quake was over in seconds, the question still remains: did EBS serve any purpose at all?

EBS was spawned in part from the Cold War. Since that "war" has fizzled out more and more of late, isn't it time the FCC took a good hard look at EBS?

I mean, don't you think there are some newer technologies out there that would serve better?

I see where a petition by the NAB is asking the Commission to shorten the duration of the test tone used for EBS tests. But all that's trying to do is help stations with the "tune-out factor."

Personally, I keep the station on when the test airs. OK, so it's a little annoying. I don't flip the dial during commercial breaks, either. (Somebody's got to pay the bills!)

So how about some action on EBS? Oh, and if I ever start a newspaper, I

think I'll follow the example set by the *Sacramento Bee*. How 'bout the *Hoboken Cockroach* or the *Chattanooga Centipede* ("We got legs to cover the news!")?

"Spots From Space"—now here's an intriguing service. You knew it had to happen sooner or later. How about: commercials you get over satellite?

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But if you want, SPN will create the spot and send it by sat or FedEx.

'Course they charge for the service, but who doesn't? Now how's that for high-tech? If you're interested they're at 415-673-0737. It sounds nifty, but I would have named the service "Fax 'N Sat" or "Sats Are Us" or something.

Well, Allied's at it again. There's a company that loves to keep giving things away. Dave Burns says he hopes this helps to "fight those January blues."

You can win two Denon DN950 FA CD cart players, 100 Denon CD cartridge carriers and one dual rack-mount for the players. All FCC licensed stations are eligible.

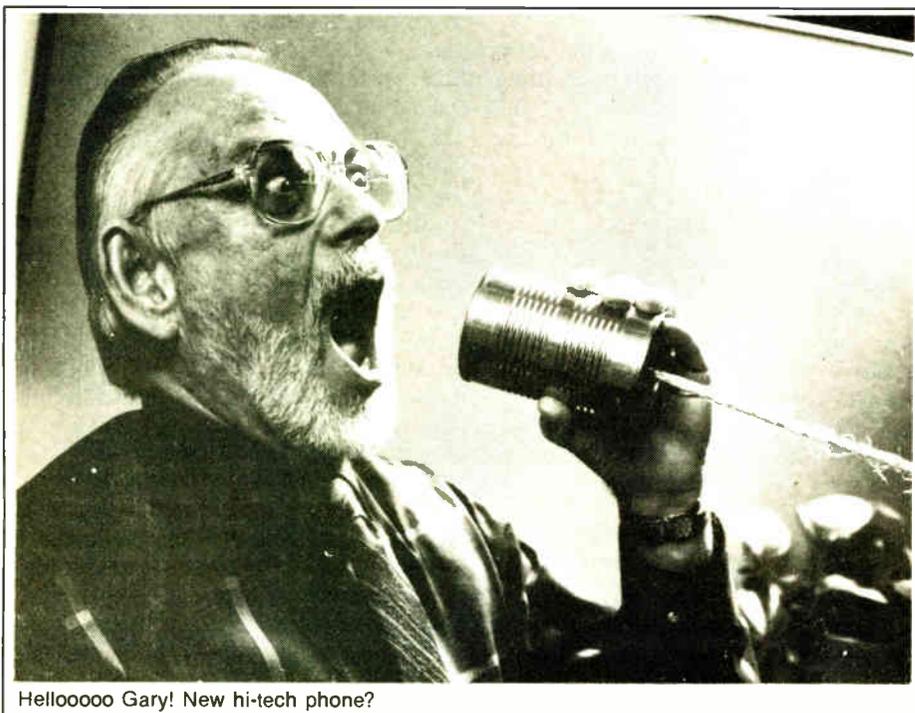
All you gotta do is mail a sheet of station letterhead signed by the CE, PD or GM to: Allied/Denon Prize Drawing; Dept. JGRW; PO Box 1487; Richmond IL 47375 by 23 April. The random drawing is 30 April, so good luck. I'll also announce the winner here.

And here's one that I love. WCGY-FM, Curt Gowdy Broadcasting's station in old Lawrence, MA wanted the world to know about its new talk show.

It's called *Tubetalk* and what do you suppose it's about? That's right. TV. On radio.

Huh?

Heard something interesting? Spill your guts to Earwaves. Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted 1990 edition *Radio World* mug.



Hellooooo Gary! New hi-tech phone?

Tapetronics Corp. moniker that was in place before biggie 3M took over.

Word is that 3M will still make the lubricated tape for the Scotchcart™ for ITC.

Was about two years ago that Capitol Magnetics became Audiopak. Makes you speculate about these cartridge companies. The 3M action makes the whole field less of a domestic enterprise.

think the photo of Gary Crowder says it all. Eat your heart out, Alexander Graham Bell! We'll dub it "Le Tin Canne" for now and let you see the company's real high-tech wizardry around NAB show time.

'Course, with what I've heard some stations use for on-air telephone interfaces, even Gary's "Tin Canne" would probably be an improvement. I hope the

## Two Transmitter Sites?

Lee Waller says "no problem" with Burk

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If you have comments for *Radio World*, call us at 800-336-3045 or send a letter to Readers' Forum (Radio World, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776). All letters received become the property of Radio World, to be used at our discretion and as space permits.

### STL deadline extension needed

Dear RW:

I've been reading your editorials on the July 1990 STL update concerning FCC rule 74.550. I feel your editorial dated 13 December is out of touch with what is happening in the broadcast industry.

Many stations in the smaller markets are not made of money as your article suggests. Many AM stations are having severe financial difficulty and \$3000 to \$6000 is quite a bite into the P & L. It is very difficult to find money for new equipment. I know in our plant a new STL is one of the last things we need. Much of our other equipment needs to be replaced long before our STL.

In my opinion the FCC should extend the deadline for several reasons:

1. When our STL equipment was purchased we bought the best with the intention of using it for many years to come. It is still very good equipment and operates flawlessly. Now we are told: just throw it away, it's junk. Logic now tells us to buy cheap, in case the FCC obsoletes it again in five years.

2. We, as many other small market stations, don't have a shortage of frequency spectrum. Three-quarters of the band is sitting empty. The FCC's job is to allocate the spectrum to the best advantage of the users, yet they are narrowing our bandwidth and trying to cure a problem that just doesn't exist in our market as well as many others.

I believe if the FCC really wanted to make the best use of the spectrum they would regulate the metro markets where the problem exists and let us use our equipment until we either have a spectrum problem ourselves or our equipment malfunctions. We of course would be glad to replace it someday with type-accepted equipment.

3. In our market we are spending quite a substantial amount of money on this update and we aren't seeing anybody benefit—not us, not the competition, nobody. It's just wasted money because someone made a ruling without considering the small markets again.

If your area has a crowded spectrum I can see where the improvements would be needed. Ours isn't. So change the ruling and let us use the spectrum to our advantage instead of creating more dead spectrum.

Tony Wortmann, CE  
WJAG-KEXL  
Norfolk, NE

### STL editorial off base

Dear RW:

I know that many sharp radio operators have been on top of the STL thing since 1985 but there are some of us who wear many hats that were taken by surprise. I try to keep up, but often the 18 hour days being GM, sales manager, announcer, color man, etc., doesn't leave much time for reading the trades.

I was unaware of the impending crisis with my STL until this week. I say crisis, because that is just what it is to me. Your smug editorial about tight-wad management needing a nudge off dead center was really way off base in the 13 December issue.

I would give my eyeteeth for a budget for new equipment, as would many of my colleagues in small markets. All my equipment is currently well within FCC specs and even though it's old, it's lovingly maintained. The slant of your editorial seemed to indicate that you feel that everyone should be able to afford new equipment, even if it is not justified in their marketplace.

The fact is that not all broadcast markets are the same financially, even though they provide the same services to their public.

Steve Benedict, Owner  
KLYQ-AM/KBMG-FM  
Hamilton, MT

### Class A's still need help

Dear RW:

Much has been written about AM stations needing help, but also in the same boat are the many Class A FM stations that were not permitted a power increase. These are the stations that needed an increase much more than those that were given the green light. It would appear that stations receiving the go-ahead were not faced with interference from other stations.

The Class A stations in the Mid-Atlantic states were given the raw end of the deal and must be content with ad-

The request by five engineering consulting firms for the FCC to re-examine AM directional antenna proofs makes sense and is long past due.

The performance verification requirements for AM DAs date back more than 50 years. While technology has advanced during that time, proof procedures have not.

Technological advances—such as computer modeling—have led to new techniques which, through the use of PCs, are available to many stations.

Insights gained from new technology can make the proof procedure simpler and less costly, with some firms estimating a 50-75% reduction in engineering fees.

While this may appear to take revenues away from engineering consulting firms, the firms themselves, in asking the FCC for a Notice of Inquiry, say

that it is often difficult to collect on DA proofs from financially-strapped AM stations.

A revamping of the DA proof requirements and procedures would ease the burden on such stations and free the time of the larger consulting firms for more pressing work. And their loss will be the gain of smaller contract engineers and suppliers of PC modeling and measurement programs.

Faced with a more affordable proof, many more AM stations may be in a position to refurbish their DA systems and take advantage of interference-reduction technologies.

In addition to the cost benefits, the FCC might consider revamping the rules in the interest of leveling the playing field between FMs and AMs, since similar work for FM stations is generally less expensive.

The Commission could also use the NOI as an opportunity to re-evaluate outdated nighttime interference protection requirements.

While the benefits put forth in the petition will have to be verified by the FCC, it's a good use of Commission resources at a time when the entire slate of AM technical criteria is being reassessed.

—RW

## A Kinder, Gentler DA Proof

adjacent channel Class B interference. Most unfair is the fact that short-spaced Class Bs on the adjacent channels are permitted to upgrade to 50,000 watts regardless of interference to the Class As in their 1.0 mV/m contour.

The Class A station is powerless to object and may not be granted the small by comparison 3000 watt increase, which would more than likely prevent such interference. It would hardly have enough punch, however, to interfere with the Class B 70 to 80 miles distant.

Strongly objecting to a blanket power increase for the Class As was the organization supposedly representing those stations, NAB. NAB, as you know, used the excuse that it would cause interference on the FM band. Well, the Class As are the only ones hurting in this respect, not the Class Bs. The Class As need the increase to prevent interference. Also, why should preference be given to the Class B station, especially if a Class A had its license before the Class B?

The Class A power increase proposal was not a case of a need to make this class of station "more competitive" as the Class A broadcasters explained it. It was a need in order for the Class A station to survive. The big money broadcasters no doubt have a great deal of influence where it matters. It is a clear case of discrimination against the small businessmen in radio.

Doug Henson, GM  
WIBF  
Jenkintown, PA

### Setting history straight

Dear RW:

I feel compelled to make two important historical corrections to Dee McVicker's "Where Does Time Come From?" (RW 13 December), though they are admittedly minor in terms of the article's subject.

She states "... time originated alongside the first radio station. That would be KDKA in Pittsburgh and the year was 1923."

No, the year was 1920 (which is partly why US President Warren G. Harding's election was notable—for being the first to have been covered by radio). In any event that is a secondary point since "the first radio station" is not KDKA, but rather WHA at the University of Wisconsin-Madison, which has been broadcasting on a regular schedule since 1919 (though its calls were 9XM at the time).

Other college and commercial stations have claimed to precede it, but 9XM/WHA is the oldest station with sufficient documentation to support its case.

At best, KDKA can be called the first commercial radio station.

I appreciate this opportunity to correct the record about the beginnings of regular radio broadcasting for your readers.

Glenn Gutmacher, Editor  
College Broadcaster magazine  
Nat'l. Assoc. of College Broadcasters  
Providence, RI

### Long-wave AM solution

Dear RW:

Most of the solutions proposed to "save" AM broadcasting appear to be dead-ends which will fail to retain and attract audiences. The two most significant technical problems facing AM are, quite simply, noise and interference. Until these two problems are eliminated,

(continued on page 10)

# Radio World

Vol 14, No 2 January 24, 1990

Editor, Judith Gross

Associate Editor, Alex Zavistovich  
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Next Issue RW  
February 7  
1990

# AMers Voice Opinions on Band

by Alan Carter

**Washington DC** AM daytimers want more hours. Clear channels want to maintain their current protection. And everybody wants something out of the expanded AM band.

Given one more say as part of the FCC *en banc* comprehensive hearing on AM, broadcasters filed a round of comments reiterating their positions and arguing against proposals counter to their interests.

## Public interest question

"Please explain to me how it is in the public interest for a radio station in Buffalo, New York, or Oklahoma City, Oklahoma, to serve a 500 mile distant community while that same community is precluded from local nighttime service," wrote WTCV-AM Executive VP Robert Scheibly.

"Will the station in Buffalo or Oklahoma City broadcast public service announcements for the PTA in the distant small community? Will they broadcast emergency weather information for the distant small town? Will they broadcast lost dog announcements?"

"There is not a chance that they can or would provide the service of a true local radio station to a far distant community."

Scheibly argued that the original intent of protecting the super-power clear

channels, namely that only large cities could financially support radio stations, no longer exists.

## Moving daytimers

He also questioned the viability of moving daytimers to the expanded band, because struggling AMs may not be able to afford the expense. "Even if it were affordable, it will be the year

2000 before the public figures out there are stations in the expanded band, if the stations have not gone dark," he said.

Expecting opposition to his position, Scheibly said the FCC must dismiss the position of NAB and similar organizations "who will surely cry to retain the status quo."

Not surprisingly, there was ample sup-

port for retaining clear channel protection.

Cox Enterprises said clear channel stations must be protected because they "anchor" the AM band.

The Clear Channel Broadcasting Service (CCBS), a clear channel association, said no rationale has been presented "other than the dissatisfaction of daytimer broadcasters" with current restrictions that warrant a new investigation into the public interest benefits of clear channels.

The CCBS, along with the Association  
(continued on page 12)

# AM Improvement: Image Issue?

by John Gatski

**Washington DC** As listeners become familiar with high quality AM stereo broadcasts, they are more likely to pay modestly higher prices for receivers that contain wideband reception, AM stereo and continuous tuning, according to a receiver chip manufacturer.

In written comments filed with the FCC following its *en banc* comprehensive AM hearing in November, Motorola Modulation Systems Manager Frank Hilbert and Panasonic Audio/Visual and Information Systems Assistant Director Robert Finger addressed questions that were raised at the hearing.

Listeners initially will be "resistant" to price increases of receivers with higher quality AM receiver sections because of AM's negative image, Hilbert suggested.

"It is our experience that consumer performance expectations from AM radio are minimal. That is, many consumers automatically equate AM radio with narrowband, monaural, non-hi-fi, non-music formats," Hilbert stated.

## Poor image

"Exposure to wider-band AM stereo receivers, quality receivers and quality music transmissions astound people," he continued. "Therefore, it appears that AM radio has an image problem that may well hinder initial marketing of high performance features. Repeated exposure to quality transmission (AM stereo) and reception should change this image over time."

Hilbert estimated that adding AM stereo and wideband capability to AM receiver sections would add 90 cents to \$4

per unit in manufacturing costs, depending on the model.

Finger cast a more pessimistic view on the marketability of improved AM receiver features.

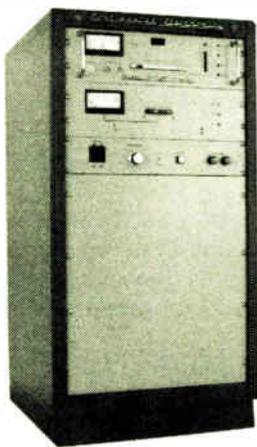
He said the market demand for AM stereo has grown slowly and "it remains to be seen" whether such efforts as the NRSC certification mark for AM receiver sections will have an effect.

Finger discounted continuous tuning as a marketable feature because it will increase the cost of basic AM/FM radios beyond what the consumer wants to spend and the consumer has "not indicated a desire for this change."

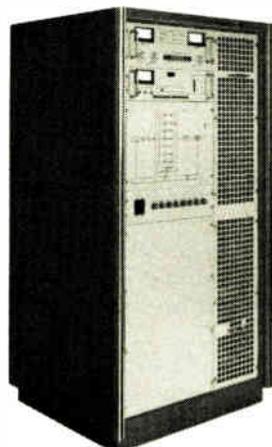
"The consumer does not mind using a (traditional) switch for band selection since physical proximity to the radio usually is the norm," Finger argued.

(continued on next page)

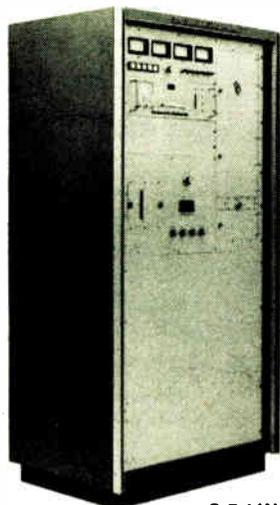
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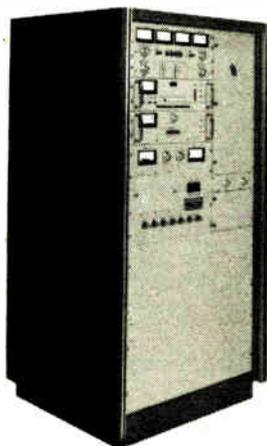
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# Kahn Upbeat About ISB in '90

by Alan Carter

**Washington DC** AM stereo designer Leonard Kahn is quite optimistic about the success his underdog system will have in 1990.

While Kahn declines to be interviewed by *Radio World*, two of his public filings at the FCC as part of the Commission's comprehensive hearing on the state of AM radio provide an insight into his business.

"... It is my belief that by the end of the year 1990 there will be some 200 stations operating with the Kahn/Hazeltine AM stereo pilot..." Kahn said.

He based that prediction on his belief that a New York federal court will stop

the manufacture of Motorola-only car radios, which receive the competing Motorola C-QUAM AM stereo transmission. Kahn has sued General Motors for patent infringement in the design of the automobile giant's C-QUAM Delco radio.

## Correspondence to broadcasters

Kahn expressed optimism in the FCC filings and a recent correspondence to "All AM Broadcasters," after a Chicago federal court denied Motorola's petition for a summary judgement to settle the dispute.

"When, as expected, the courts enjoin the manufacture of Motorola-only receivers, it is my belief that an overwhelming number of stations presently

operating with the Motorola system will decide to switch over, because their only reason for selecting that system will have been frustrated," Kahn stated.

He further noted that within one year after the federal court decision, he expects there will be more than 1000 stations on the air with his ISB system.

"The fact that I am able to forecast double the number of stations for a one-year sales period than Motorola achieved for seven years is based upon the fact that the (ISB) sideband system does not only accommodate the relatively few fortunate stations with power, dial position and interference conditions that allows them to discard coverage," he said, "it accommodates all stations including small and average stations that are forced to compete with less than perfect assignments."

## No de facto standard

Kahn argued that C-QUAM is not the de facto standard, as some in broadcasting, including FCC Commissioner James Quello, have indicated.

Less than 20% of AMs broadcast in stereo and most currently use C-QUAM. In addition, all AM stereo radios currently being manufactured and marketed in the US are C-QUAM-only radios.

Kahn maintained that the FCC should not reconsider its ruling that the Commission not set an AM stereo standard.

"This would set back AM stereo by years," Kahn wrote. "Most importantly, if the Commission was to select the Motorola system, and assuming the courts, as we expect, enjoined the manufacture of Motorola-only receivers, it would create complete havoc in AM broadcasting."

Kahn said the 1982 decision to let the marketplace select an AM stereo standard allowed his business to grow with development of various AM technologies.

He also promoted his POWERside,

which he dubbed "POWERside AM Stereo" in a letter to AM broadcasters dated 11 December and in the filings.

POWERside uses Kahn's ISB stereo exciter to allow AM stations experiencing interference to concentrate their signal on the sideband furthest from the interference. However, stations using POWERside are still broadcasting a mono signal, according to the FCC.

In the FCC filings Kahn said POWERside dramatically reduces co-channel interference and reduces close-in and long-distance fading, which presently limits coverage by some regional and clear channel stations.

## Facing Off on AM Growth

(continued from previous page)

Both companies agreed that the expanded band feature (to 1705 kHz) which both maintained was currently in development during oral testimony at the *en banc* meeting in November, eventually will become standard on all receivers.

Although both companies sell AM stereo radios, they stated emphatically they did not believe AM stereo should be mandated whenever a receiver has FM stereo. A congressional bill would create such a requirement if passed.

According to Finger, Panasonic's opposition to the bill stemmed from "the significant limitations the proposal places on consumer choice and the increased consumer costs that will be borne by the American consumer if AM stereo is a mandated feature.

"Further, it should be kept in mind that not all programming materially benefits from stereo reception and not all stations transmit in AM stereo," Finger added.

Both companies cited the FCC's 1982 decision not to select a single US AM ste-

reo standard as the major reason for the slow growth of AM stereo acceptance.

"The 1982 FCC many-systems decision, coupled with US antitrust laws, has been causative to slow broadcasters' conversion (to AM stereo) and non-automotive receiver availability," Hilbert said.

## At home and abroad

"Broadcasters continue to cite the lack of receivers and lack of a standard as reasons for not converting. In turn, foreign receiver manufacturers (the primary supplier of receivers in this country) cite the lack of stereo broadcasts and lack of a standard as reasons for not participating," Hilbert added.

Motorola suggested the FCC should choose a single standard in order to facilitate the acceptance of AM stereo.

Motorola's C-QUAM system is already considered the industry's de facto standard by many, with more than 700 stations broadcasting with the system worldwide. But only about 20% of US AMs use stereo.

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# TV Marti Has Cuba on Guard

(continued from page 1)

ming of the proposed TV Marti.

Interference to US AMs from Cuba is nothing new. Radio Marti initially triggered Cuban interference at US AMs when it began broadcasting in 1985.

Recently approved by Congress, TV

Marti will be a companion to Radio Marti, broadcasting similar programming from a transmitter tethered from a balloon thousands of feet above southern Florida. Testing is to begin this month.

The Cuban interference prompted by

Radio Marti is often aimed at clear channel stations on four frequencies: 710, 830, 1040 and 1160 kHz. The broadcasts consist of Cuban tourism information.

## A million watt headache

Vriesman estimated that Cuba has a million watt AM transmission capability that can be directed at stations on those frequencies. The result is that US stations are often overpowered at night.

Instead of their favorite programming on local stations, listeners have to contend with a Spanish DJ from dusk to dawn, according to station complaints.

House Telecommunications and Finance Subcommittee Minority Counsel Terry Haines said the intense radio interference is the result of a mindset that Radio Marti is an "attack on Cuban sovereignty."

Cuban officials told the delegation that broadcasting TV Marti will "grease the cannon" for increased retaliation against the US, Haines said.

The delegation saw firsthand how seriously Cuba is taking TV Marti, Vriesman noted.

## Jamming demonstration

The delegation witnessed a demonstration of a TV signal being jammed on channel 13, which included video and audio disruption, during a tour of Cuban broadcast facilities, he said.

Despite the warnings of future Cuban

retaliation against US radio stations and TV Marti, delegation members said the government officials were receptive and allowed them to tour Radio Havana and a TV satellite facility.

Their request to tour Cuba's AM transmitting facilities, however, was turned down, Vriesman said.

Delegation members emphasized they were not there to negotiate a treaty with Cuba but to obtain information about broadcast issues between the two countries.

Haines said a report outlining the Cuba visit is likely to be filed with the Telecommunications and Finance Subcommittee early this year.

The Cuban trip also included broadcasters William Bowman, new chairman of the Florida Association of Broadcasters

# AM Antenna NOI Asked

(continued from page 1)

is a lot of room for simplification, like with proof of performance.

"I think it's time we unshackled AM broadcasters and let them take advantage of current technology."

Another petitioner, Karl Lahm of Lahm, Suffa & Cavell, said that in addition to evaluating procedures, an inquiry should investigate whether current rules provide adequate assurances for interference protection—particularly at night.

Rackley said that among the five firms that filed the petition, there is no agreement on exactly how the rules should be changed. "We agree that a lot has changed since the rules were written 50 years ago," he said.

Also listed as petitioners were Hatfield & Dawson; Moffet, Larson & Johnson and Silliman & Silliman.

## New state of technology

The consulting firms maintained that technological advances facilitate a better understanding of antenna performance and electromagnetic field behavior.

Improvements in electronic technology permit more accurate measurement of important internal operating conditions of antenna systems, which was not practical when many of the present rules were adopted, the petition said. The effectiveness of other improvements in the Commission's technical assignment criteria is enhanced if the most practical and effective means of regulating actual antenna system per-

formance is used.

For example, the consultants said modern numerical techniques of antenna system analysis permit excellent modeling of antenna system operation. Excellent correlation between modeled and measured magnetic field strength results has been observed in the field, they maintain.

The insight into array behavior provided in numerical modeling techniques allows for the use of alternative methods of adjusting and monitoring AM directional array operations.

The development and proliferation of desktop personal computers makes these techniques widely available to the engineering community, the petition continued.

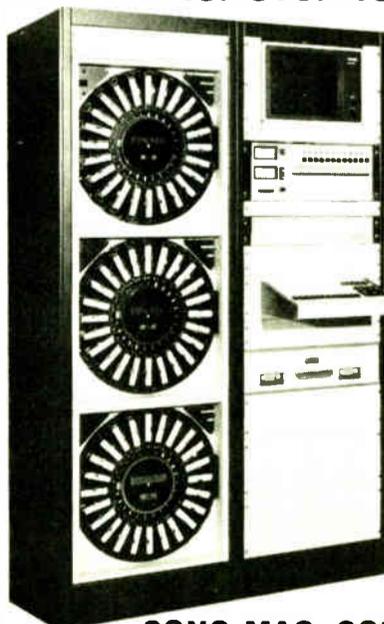
At the FCC, AM Branch Assistant Chief Henry Straube commented, "I think it's a great idea to take away some of the burdens." But he added that the suggestions in the petition will require extensive data to make comparisons to determine if the claims hold up.

Straube predicted it could be several months before the FCC would consider the petition, due to staffing limitations.

The petition suggested that an inquiry into directional antennas is in line with the FCC's comprehensive review of AM technical criteria.

"These actions (review of AM criteria) may be ineffective," the consultants stated, "unless the most practical and effective means of regulating actual antenna system performance is in place."

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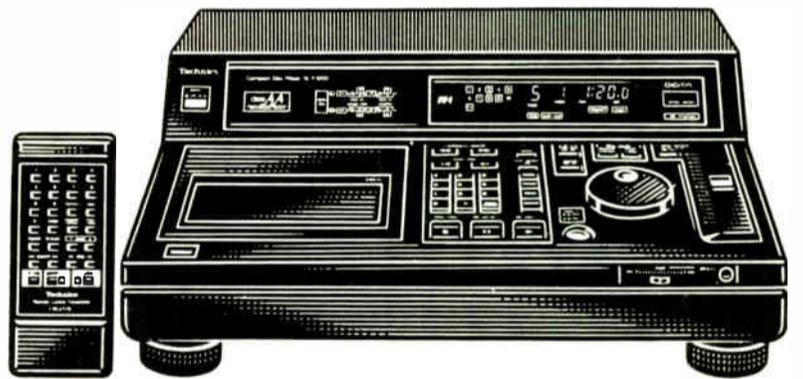
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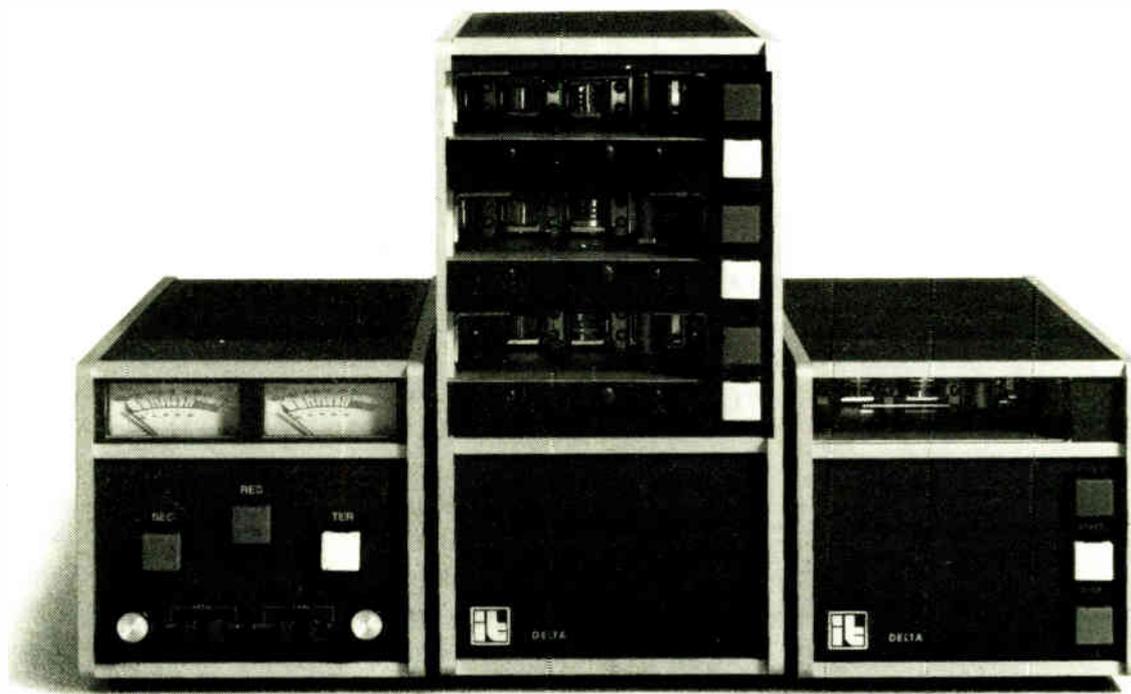
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# Anti-Skywave Test Inches Along

by John Gatski

**Washington DC** Slowly but surely is one phrase that could describe the progress of the NAB anti-skywave antenna project.

Despite being several months behind the original August 1989 schedule, however, the NAB is confident it can finally begin testing the performance of its ex-

liams said.

Williams said the NAB is looking for consulting engineers who want to monitor the transmitted signal.

### History of delays

Construction on the 190° base-fed vertical antenna, designed by Ogden Prestholdt, began last June. The project has faced numerous delays in the past,

AGL Inc. of Pacific Grove, CA, was selected to undertake the work.

AGL completed the first phase of the work, which involved identifying workable computer designs of an effective low profile antenna.

A well performing low profile antenna, about 50' in height, could afford stations an economical way to install a tower in areas that zoning forbids larger antennas, supporters of the concept claim.

### Tests by AGL

So far, AGL Inc. President Dr. Richard Adler and staff has made performance calculations of several different concepts, Williams said.

In a recent paper, Adler noted that limiting the calculations to 50' antennas also will limit the operating range to frequencies above 1000 kHz.

Also, because shorter antennas have poorer radiation resistance and low efficiency, AGL discovered that adding top hat wires and 50' radial wires theoretically could improve performance.

Williams said AGL now is working on the second phase of the project: identifying the concept that would work under normal broadcast conditions.

NAB has not decided whether it will actually build and test a low profile antenna, Williams added

For more information, contact Kelly Williams at the NAB, 202-429-5346.

## Williams said the NAB is looking for consulting engineers who want to monitor the transmitted signal.

perimental antenna in February.

Testing of a newly-designed four-wire elevated ground system, installed on the antenna during set-up last summer, is complete. The NAB, however, will not release the test results until the NAB spring show in March.

NAB Science and Technology Staff Engineer Kelly Williams said directional performance testing of the antenna, which theoretically can be tuned to minimize nighttime skywave interference in one direction, is first on the agenda.

The optimum area for testing was narrowed to about 250 air miles northeast of the Washington, DC, area for listening and measurement tests, Wil-

including zoning approval for the site from county officials.

The latest snag was getting the power turned on for the 5 kW transmitter, Williams said.

"It is just taking an overly large amount of time to get this done," he said.

The NAB is authorized to test the transmitter on 1660 kHz and will use about 400 W for much of the testing.

Among other NAB projects, calculations for an effective low-profile antenna concept are progressing on schedule, Williams said.

In 1988, the NAB commissioned a theoretical performance study of several electrically short AM antenna designs.

## More Mail from Readers

(continued from page 5)

audience erosion will continue.

Because spectrum space is extremely valuable, I strongly advocate a radical national policy which:

Promotes US government support of a program assigning the frequency range of 150 kHz to 280 kHz to broadcast.

Requires conversion of existing AM radio stations to FM transmission in the same band.

Requires the manufacture (or importation) and sale of appropriate receivers to be available for new transmission standards.

Let's look at how AM broadcasters will benefit:

1. The "long-wave" band noted above has long been assigned to broadcasting in Europe, Africa and the Middle East. This band is little used here except for navigational purposes. I propose using the band to develop the first "new-band" FM broadcast stations. Use of the "long-wave" band for development (and eventually) full broadcast service also provides the lead time to legislate, produce and market suitable receivers.
2. Once the "long-wave" band using

FM is developed and receivers available, today's AM broadcasters would be required to convert to frequency modulation, on the existing "medium-wave" band, perhaps over a period of one year.

I suggest that this is also an appropriate time to strive for "international" standards in long and medium wave FM broadcasting, such as 9 kHz channel spacing to match the majority of world broadcasters. It also provides additional channels within the existing medium-wave band.

3. The inherent noise-suppression and capture-ratio effects of FM would help eliminate the problems which will continue to plague AM.

I believe radio broadcasters should admit to themselves that standard AM will never sound the same ("as good") as VHF frequency modulation. It cannot simply because of bandwidth requirements. What I propose gives today's AM broadcasters a chance to eliminate or reduce the two most significant problems which drive away listeners and advertiser revenue. Other solutions already proposed are merely bandages on a wounded and dying public service.

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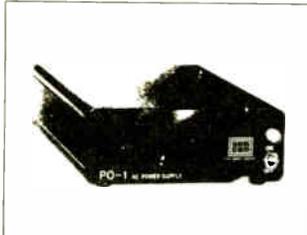
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is the tallest object for miles around. “We’ve been hit so hard the tower beacons were blown out of their sockets,” he told us recently, “and so often that the lightning rod looks like someone’s been beating chunks out of it with a sledgehammer. But so far our new Harris HT 20FM transmitter barely blinks at lightning. Occasionally we get a PA Plate Overload message, but that’s it.”

Robert also knows something about Harris reliability: Until they received a power increase to 50,000 Watts last year, WQPW had been on the air with a 3.5 kW Harris transmitter for thirteen years. “That transmitter was very good to us,” Robert reports.

“Still is, in fact—it’s our back-up now. Basically, we shopped around enough to be sure Harris could match or top the competition in both price and features: Things like Automatic Power Control for simple remote operation. Then we ordered a 20 kW HT 20FM transmitter.”

About 45 days later WQPW’s transmitter arrived (meanwhile, Robert supervised construction of a new transmitter building, tower and antenna). “We just took it out of the box and put it right on the air,” he says. “Even the tuning movements were small. The installation went so smoothly, I told the factory ‘You’ve got to do something—this transmitter’s boring.’”

After a number of months of service, WQPW’s HT 20FM remains just as “boring.” Robert has only shut it down for routine monthly maintenance. “Even that is minimal,” he told us. “I vacuum the cabinet out, check tube cooling, make sure nothing’s overheating, and that’s about it. Two or three times a week I do a meter check and log the readings. They hardly ever

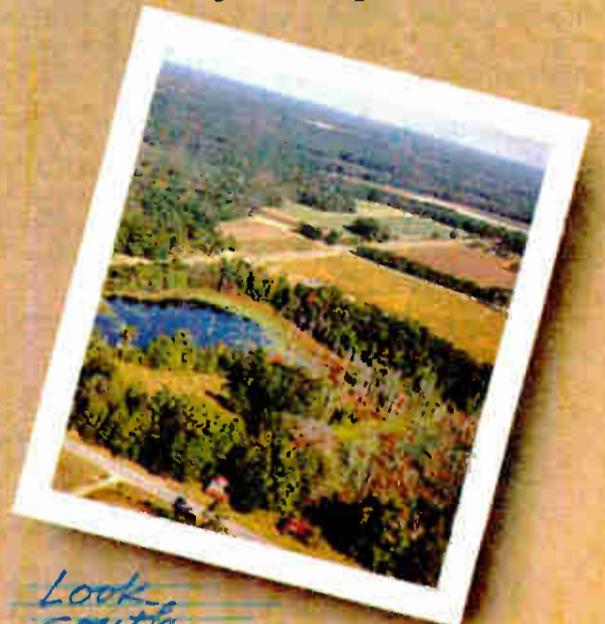
*Chief Engineer Robert LaFore*

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# UST Corrosion is EPA's Concern

by John Gatski

**Washington DC** Radio stations using underground storage tanks for emergency generators are exempt from meeting EPA leak detection requirements but must meet corrosion and spill prevention

**"The requirement that these tanks be monitored each month is unworkable . . ."**

requirements by 1998.

In its 1988 revised regulations of underground storage tanks (USTs), the EPA exempted emergency fuel tanks, which are often smaller capacity (less than 500 gallons), from having to monitor the tank's fuel level each month—by manual measurement or a fuel gauge.

According to EPA UST regulations (CFR 280 and 281), "The requirement that these tanks be monitored each month is unworkable . . . because they are often located in remote areas and are visited infrequently."

Leak detection requirements for USTs used for non-emergency purposes, such as retail gasoline storage, went into ef-

fect in December for tanks 25 years or older. Newer tanks that are not excluded will be required to meet the leak detection regulations as they are phased in from 1990-93.

The regulations require all UST users, including radio stations, to inform the appropriate state agency that it has a UST, its purpose, size and age. Stations should refer to the EPA to find out which agency in their state is responsible for

keeping UST information.

Radio stations also must join other UST users in implementing corrosion and spill prevention by December 1998.

Although the deadline for those requirements is eight years away, upgrading older tanks to meet corrosion and spill prevention specifications could be expensive if the tanks are old and in hard to reach locations, according to the NAB.

The corrosion protection options in-

clude installing coated and cathodically protected new tanks or adding those options to existing tanks.

Spill or overflow protection involves catch basins, automatic shutoff devices, overflow alarm or ball float valves installed in tanks.

For more information about USTs, contact the EPA Office of Underground Storage Tanks at 202-382-3000 or the NAB at 429-5346.

## AM En Banc Prompts New Comments

(continued from page 6)

for Broadcast Engineering Standards (ABES), suggested the FCC has adopted provisions giving additional opportunities to daytimers, without taking away protection for clear channels. Both referred to expanded pre-sunrise and post-sunset service and enhanced operations in daylight savings time, as several examples.

The CCBS encouraged "homesteading" of daytimers on the expanded band, a favorite idea of the NAB.

NAB said that under this concept, many existing AM daytimers, and perhaps other AM licensees, would receive the opportunity to operate on the expanded band and later discontinue existing facilities, reducing interference on the existing band.

The Corporation for Public Broadcasting and National Public Radio urged the Commission not to view the issue as a three-way competition for new spectrum—among public broadcasters, minorities and daytimers.

### Expanded band theories

"Instead, the Commission should first divide the expanded AM band between commercial and noncommercial uses by reserving a minimum of one channel exclusively for noncommercial educational use," CPB stated.

Once the expanded band is divided between commercial and noncommercial uses, the FCC should establish an appropriate system of preference and/or set-asides that can be invoked with respect to the application for any commercial or reserved noncommercial channels throughout the expanded band.

In the interest of upgrading AM stations to full-service stations and returning AM radio to a "real service," CPB suggested daytimers also should be afforded some meaningful advantage in the process, perhaps with a special filing window.

Global Broadcasting, interim operator of WNWK-FM, Newark, NJ, agreed that frequencies should be reserved for public broadcasting, but only in markets where there are no existing noncommercial stations. "In markets where there are significant multiethnic populations, the channel should be reserved for applicants who propose to provide multiethnic, multilingual broadcast service on a non-profit basis," the operator stated.

### AM mandates

Another issue debated in the filings was the lack of an FCC-sanctioned AM stereo standard and receiver standards.

ABES called for a mandated stereo standard, along with manufacturers. WEEU-AM, Reading, PA, also said

mandated stereo would encourage otherwise reluctant investors to make improvements.

Such a move, however, was opposed by others including Leonard Kahn and Hazeltine—who own the ISB system. Although only 20% of AMs broadcast stereo, the majority use Motorola's C-QUAM (see related stories).

The engineering firm of du Treil, Lundin & Rackley, along with Cox Broadcasting, suggested the FCC should move for mandated receiver standards.

Among possible improvements, du Treil, Lundin & Rackley noted the NRSC deemphasis curve and the "continuous tuning" concept. Cox suggested a requirement for AM stereo.

Among the filings, other improvements suggested for AM included a proposal from the communication law firm of Pepper & Corazzini that supported AM-AM combinations in the same community, a move desired by two of its clients.

Radio New Jersey, licensee of WRNJ-AM, Hackettstown, NJ, continued its support for the "FM2" concept, which calls for the assignment of additional broadcast frequencies in the MHz portion of the radio spectrum to which approximately 2000 AM stations would be transferred. A transfer would allow those stations remaining on the AM band, including clear channels, to increase power. It also would reduce interference, FM2 proponents claim.

Another idea promoted came from KGMI-AM, Bellingham, WA, which has filed a petition to operate an FM translator for AM broadcasting, a provision the station said has been permitted. The station cited interference from a Canadian station.

"This is not an attempt on the part of KGMI to improve its coverage area; this is a last chance at maintaining the present coverage area of KGMI," the station noted.

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The input may be switched to accommodate either mic or line levels. Two outputs are provided, one of which may be switched to provide either an independent auxiliary

output or a mix of the input and caller signals. Modular jacks are used for connection of the line and a phone instrument, if desired.

## TECHNICAL SPECIFICATIONS

### System

True digital. Second generation Texas Instruments TMS320C25 processor. 8 kHz sampling rate. Internal digital input and output gain processing, filtering.

### Trans-hybrid Loss

> 40 dB with pink noise or voice as test input. Test set-up as specified in our *Telephone Q & A*. All dynamic enhancement processing is switched off. With the override and output expander functions switched in, trans-hybrid loss is enhanced by approximately 12 dB. *Please note that we do not include any kind of dynamic enhancement when reporting trans-hybrid loss.* We do not feel this is an appropriate procedure. You would not measure a tape recorder's performance with a noise gate switched in, would you?

### Send Level to Phone Line

-10 dBm average level. Maintained by internal digital AGC.

### Frequency Response (caller to output)

200 - 3400 hz  $\pm$  1 dB.

### Noise and Distortion (caller to output)

**Distortion:** < .5 % THD + N. 1 kHz at any level from -48 to -8 dBm.

**Signal-to-Noise:** > 60 dB referred to -18 dBm phone level. > 72 dB ref to 0 dBm phone level.

### Send Audio Input

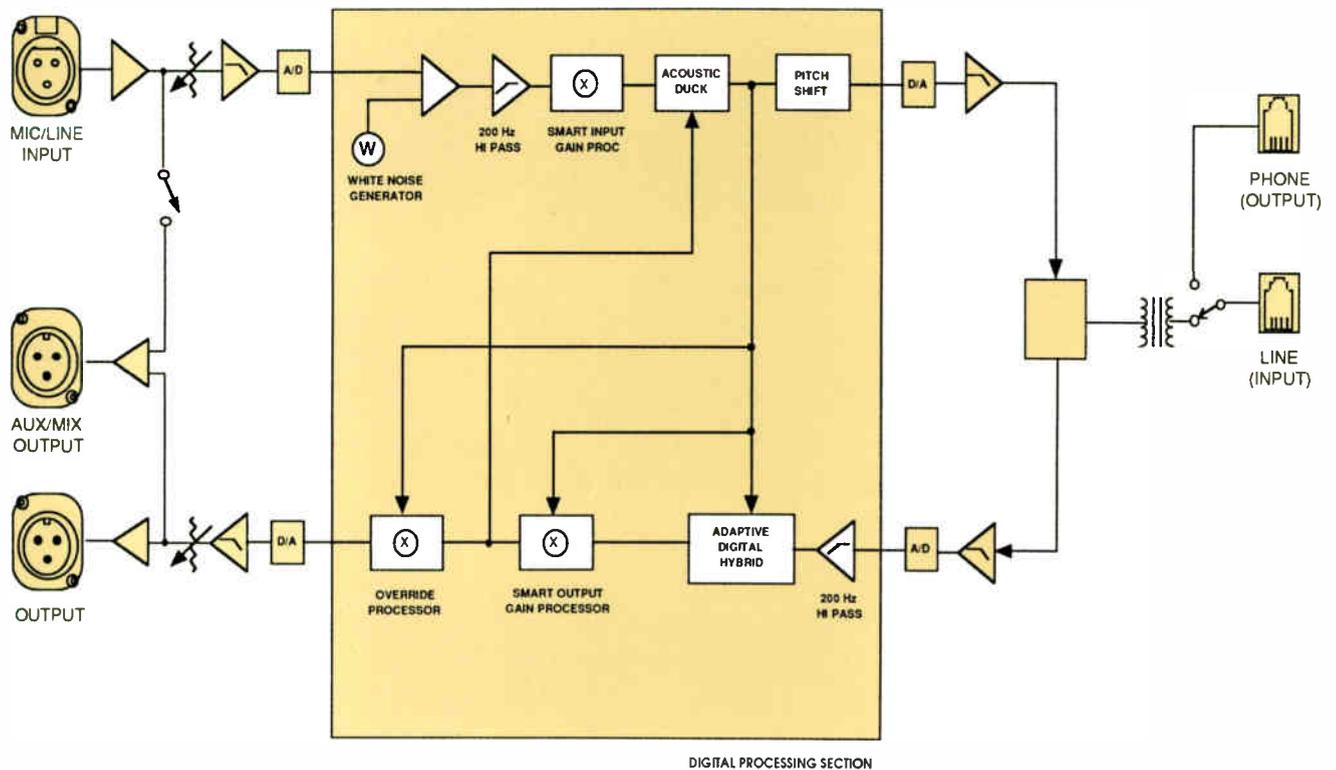
XLR female connector. Active balanced. Accommodates -24 to +12 dBm levels in LINE mode; -68 to -35 dBm in MIC mode. Front panel screwdriver level adjust.

### Caller Audio Output

XLR male connector. Active differential. Output levels to +14 dBm depending upon caller telephone line level and adjustment of front panel level adjust. Drives 600  $\Omega$ .

### Aux/Mix Output

XLR male connector. Active differential. In AUX mode, this output is an isolated second output. In MIX mode, this is a combined send and caller output. **INPUT to MIX Output:** Unity gain. < .04 % THD. +12 dBm clip point.



TELOS ONE SIGNAL FLOW BLOCK DIAGRAM

*The secret to the Telos One's exceptional performance at low cost is the use of digital signal processing for all audio functions. The auto-nulling hybrid as well as intelligent gain control, a pitch-shifter, and other dynamic functions are accomplished digitally.*



**If you have any questions or you'd like more information, please contact your Telos dealer or call us direct at (216) 241-7225. Or write to: Telos Systems, 1729 Superior Avenue, Cleveland, OH 44114.**

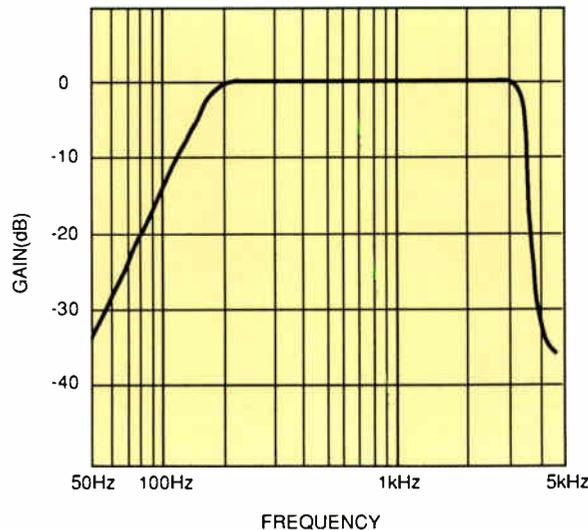
# SOME QUESTIONS ANSWERED

*You mentioned an acoustic duck function. What is this?*

This is a function unique to Telos which significantly improves feedback margin when the hybrid is used with an open speaker as you would use a speakerphone. It is a linear ducker in the send path which reduces gain dynamically when the caller talks. Because it is linear rather than on-off switching, it allows natural conversation without the negative effects of speakerphone-style hard switching. It is also much shallower in its gain reduction than the usual switching and very fast. Of course, the pitch-shifter also helps by preventing feedback from building up.

*What has been sacrificed for the low cost?*

Noise and distortion are poorer than in the top-of-the-line Telos 100 since 14 bit audio converters are used. While not as good as the full 16 bit conversion used in the Telos 100, this compromise still results very good performance. We oversample at 512 kHz, and digitally filter down to the processing sample rate.



Unlike in the Telos 100, the override and expansion threshold are fixed rather than knob adjustable, and metering is not as thorough.

Also, we've packaged the Telos One in a low cost "modem-style" case with an external power transformer.

The all-digital design approach contributes to low cost since the component count is kept to a minimum.

*Can I use the Telos One with Telos 100 family line selection equipment?*

Yes. The DB-9 remote connector provides appropriate control capability for use with our full range of Interface Modules and consoles.

*How about connection to electronic phones?*

If you can get access to an audio feed from the phone, you can connect the Telos One directly. The sophisticated, fast nulling approach used in the Telos One allows it to be used as an analog hybrid, but with better performance. This kind of scheme works well most of the time for casual use of phones — recording request calls and the like — but would not be ideal for heavy phone use since the line select "clunks" will not be muted. Also, the hybrid might take a couple of syllables of speech to adjust to a line which has a significantly different impedance characteristic than the preceding line.

## TELOS ONE FREQUENCY RESPONSE

*Digital high and low-pass filtering serve to clean up noise and bum while maintaining flat response within the telephone passband.*



# FEATURES AND BENEFITS

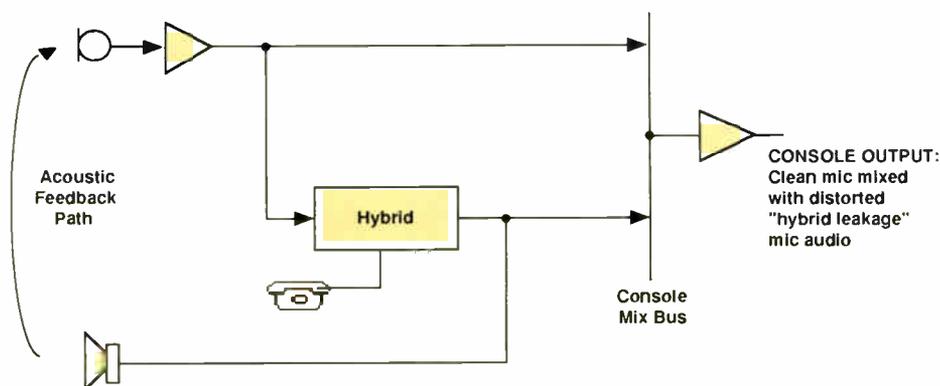
The Telos One is the perfect low-cost solution for any telephone interfacing application. We kept the cost low by using *intelligence* rather than hardware. *All* processing is performed in the digital domain, including:

- An advanced digital auto-nulling hybrid with excellent send audio rejection. Very pure caller audio appears at the output.
- An input gain processor with a smart floating freeze-gain gate.
- A sophisticated output gain processor which provides level control as well as a smart downward expander. This section is cross-coupled to the input section so that telephone line noise and residual hybrid leakage are carefully and cleanly attenuated without low level callers being gated off.
- A switchable *override* function to duck the caller about 8 dB when input audio is present.
- A pitch-shifter combined with an *acoustic duck* function in the input audio path to allow large feedback margin when used with open loudspeaker monitors.

- High and low-pass filtering to clean up phone line noise and hum.

While the inside is sophisticated, we made your work simple and easy:

- The input is switchable for either a microphone or line level. Two outputs are provided, one of which may be used as a second independent output or may be switched to a mix of the input and caller signals – very handy for tape feeds.
- Gain adjust for input and output are front panel multi-turn screwdriver adjust pots.
- Metering of input and output levels as well as the respective gain processing is provided by an LED meter.
- Standard modular jacks are used for the telephone connections. A loop-through connection is provided for a desk set. An “A-lead” relay contact closure is provided on the outer two wires of each modular jack. This function may be used to operate external phone equipment.



SIMPLIFIED STUDIO SIGNAL FLOW

*Excellent trans-hybrid loss combined with dynamic processing and pitch shifting reduce acoustic feedback and announce mic coloration.*

## OVERVIEW



The Telos One interface brings the superb Telos digital hybrid performance to applications where cost is an important consideration. It embodies a state of the art approach to interfacing telephone lines for broadcast or teleconferencing use.

The fast and precise digital automatic nulling allows smooth, natural, simultaneous conversation without the usual speakerphone up-cutting effect or the audio distortion and feedback problems often experienced with hybrid-type interface devices.

The Telos One is housed in a small modem-style case. Rack-mount is available for one or two units per panel.

- True digital, with *all* processing performed in the digital domain.
- Trans-hybrid loss greater than 40 dB.
- Sophisticated input and output AGG functions.
- Advanced caller downward expand and override functions.
- Built-in pitch-shifter for feedback reduction!
- Excellent for applications where open monitors are required.
- Second output with optional mix of caller and send signals.
- Full metering of input and output levels and gain reduction.
- May be used with Telos 100 family members for line selection.
- Remotable.

## TELOS ONE DIGITAL TELEPHONE INTERFACE

# FROM THE TRENCHES

by Alan Peterson



## Saving the Corn Crib

Dear JG:

When I last touched base with you, I was bemoaning the impressions of my fellow broadcasters towards AM radio. How tragic it seems to me they would all but abandon an old friend.

Sometimes it actually takes a tragedy to realize just how valuable it can be, and how much life the ol' band has.

In earliest December, a fire in a nearby community wiped out a nearby emporium: the Corn Crib. This was once a farm stand which over the years had grown into a craft store, fruit and vegetable market and lots more. The fire took down the big barn and several apartments housing the employees of the shop.

Readers of RW in more urbanized areas may not realize the significance of

space and (good lord!) room by the bathroom doors was stacked with sweaters, coats, shirts, pants and boots.

Clothing was stacked in the jock lounge, sales office, engineering... AEs, our corporate programming VP, our station manager and jocks folded, stacked and sorted, while comforting the victims as they came in to select a whole new wardrobe to begin piecing their lives back together. Remember, my station's not in a city. These are the Berkshire Mountains of Massachusetts! And we're a local station!

As word spread, so did the support. Other farm-oriented businesses (advertisers on our stations) helped with replacement stock, contractors came by with building materials...

For me, the most touching moment



The author (2nd from left) and staff of WSBS/WBBS sort through over two tons of clothing for Corn Crib fire victims.

this event. After all, in larger cities everywhere, apartment fires and business fires and whole-city-block-fires occur, normally broadcast with the closing line "about a dozen families homeless tonight." To most, the fire of a family farmstand is dismissed as "Oh, how awful... what else happened today?"

But boy, in our broadcast area, all it took were the lines "everybody got out OK," followed by "they lost everything," and the phone calls began—listeners asking how they could help.

I won't be so pompous as to say AM radio alone carried the weight of the movement to help the Corn Crib fire victims. After all, the business was long established, everybody went there, and when an overheated wood stove got the catastrophe rolling, it didn't take long for word to spread. The fire affected hundreds of faithful customers.

Both our AM and FM stations were in high gear covering the event and helping out. All we had to do was say on-air "we need clothing" for the displaced apartment renters. The photo shows a fraction of the over two and a half tons of donated clothing, using WSBS/WBBS as the drop point.

Every useable piece of floor, desk

happened when, at the very start of deer-hunting season in Western Massachusetts, several hunters dropped all plans they had that day to hunt. They spent the whole day nailing up a new roof, for folks they've never met.

All the while, the magic phrase was there: "I heard about this on WSBS (our AM side)... is this where I can drop off a sofa for the families?"

There have always been events where disasters—great and small—are dealt with quickly and effectively through the support and cooperation of the media. But it's what happens after the disaster is over when radio begins to shine.

"To serve the public interest as a public trustee..." I recall playing that cart twice a month near license renewal time. In time of hardship, AM radio comes through again and again. I call it "the trench." But time and time again it's the Taj Mahal.

"It's only AM"? Look again. "It is AM." Happy to be pitching in,  
—Al

...

Al Peterson writes from WSBS-WBBS, Great Barrington, Massachusetts. In addition to his broadcast talents, he now can fold a mean sweater. Write care of RW.

# Sometimes We're Judged



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World Radio History

# WAZU Joins Downtown Beat

by Dee McVicker

**Springfield OH** What separates Springfield from Dayton, Ohio, is a mere 20 miles. A small distance for the suburb's commuters, but for WAZU-FM it was a chasm that divided the station from its market.

Recently purchased by Osborn Communications and licensed to Springfield, WAZU-FM needed to move out from under the shadow of its primary market and into Dayton's limelight.

**In tune with the city**

Said CE John Soller, "(We needed) to get the feel of the city and to be more involved with the city's larger events." On the second floor of an old newspaper building in downtown Dayton, where the beat of the city once made its way into print and would now be sent out over the air, WAZU-FM set up shop for an on-air studio, a newsroom and an eight-track production studio.

Along with its new presence in the market, WAZU also brought in a new presence in pre-wired studios. Wheatstone, well known for its consoles and rock-solid cabinetry, had recently expanded its broadcasting services to pre-wired studios.

In Wheatstone's facility in Syracuse, NY, the total pre-wired package was assembled into shippable modules and sent to the station. "All we had to do," said Soller, "was bolt the furniture back together and put in the equipment."

Except for a few inches trimmed or added here and there, the new studios had few problems accommodating the furniture layout. Soller attributes some of this to the collaboration between the contract architect and one of the officers of Osborn Communications, who is also an architect.

Aside from the facility's offices which were basically ready-made but needed to be modernized, WAZU-FM started from scratch to build its presence in downtown Dayton. Soller generated a heat load requirement for the new studios' air conditioning needs, which required a main as well as backup air conditioning unit, and oversaw the installation of 10" studio walls.

**Cueing up**

Since the station's AOR format originates and is fed directly to air from a CD library, Soller wanted to avoid the cueing problem experienced in the old Springfield facility. "The old CD players," he said, "cue to the beginning of the track, not necessarily to the beginning of the music."

Soller replaced the consumer

grade compact disc players with three Tascam CD-701s for the new on-air room, machines that provide automatic cueing to the

SP15 turntable was placed in hideaway cabinetry. Because the station rarely uses turntables, except for a syndicated program that comes in on vinyl, Soller wanted to keep the turntable out of harm's way and open up space in the studio.

To record telephone bits and a satellite feed that comes in on the weekends, the station wheeled in two

MCI JH110B reel-to-reel recorders. "We bought them used from NBC—they used to be used on the David Letterman show," commented Soller. Four Fidelipac Dynamax CTR100s provide the studio with cart recording of commercials, drop-ins and sound effects.

Overseeing all this source material is the station's new Wheatstone A-500a console, designed for stand-up operator control. Re-

mote input from the newsroom and the production studio is picked up via a console line selector module, built into the console.

Also mounted in the console are 2x8 distribution amplifiers and microphone processors, part of Wheatstone's pre-wired package for WAZU-FM. Made by Wheatstone, the SDA-82A distribution amplifiers offer LED indication of activity. "At a

(continued on page 28)

## FACILITIES SHOWCASE

music.

To the left of the on-air studio's operator control, a new Technics

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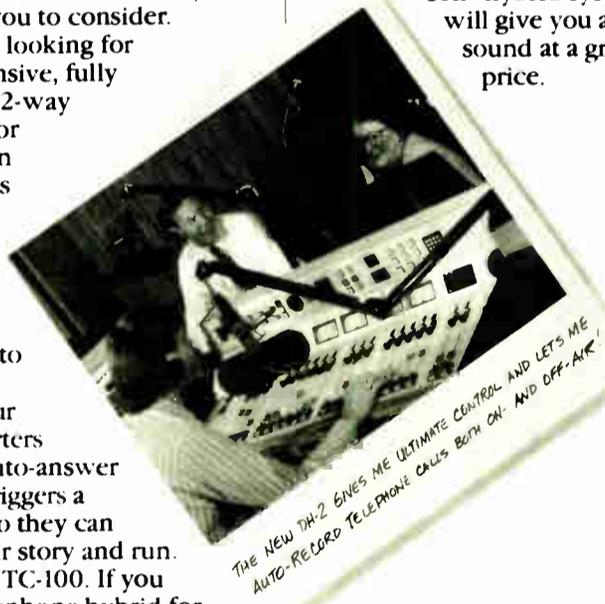
Maybe your field reporters need an auto-answer line that triggers a recorder so they can dump their story and run. That's our TC-100. If you need a telephone hybrid for on-air interviews or recording calls in the production studio and newsroom, you can rely on our SPH-3. It's a full blown hybrid that's been the workhorse of many stations for years.

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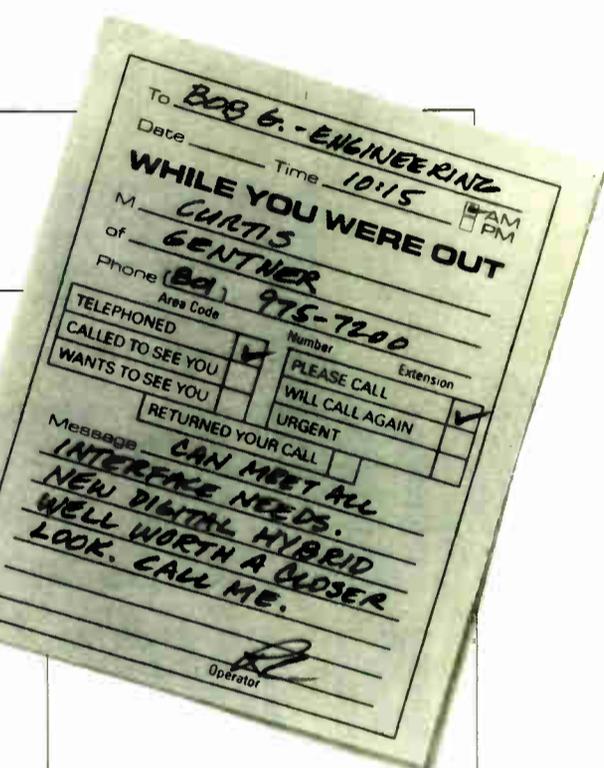
**New Solutions To Old Problems.**

The latest additions to our growing line of hybrids, the DH-2 and SPH-5, take proven Gentner technology to new heights.

Thanks to some real design and manufacturing innovations, we've packed a lot more features into higher performing packages. With 16 bit processing and 2X oversampling, the DH-2 Digital Hybrid gives you auto-nulling, full digital separation of "send" and "receive" signals and a sound quality that rivals analog. The new SPH-5 Analog Hybrid with its "dual coil" hybrid system will give you a great sound at a great price.



Both the DH-2 and SPH-5 give you a CUE button to toggle send audio between the console and the announcer's mic. This allows your announcer to easily use the hybrid like a speakerphone before putting a caller on-air. And a RECORD button lets you automatically record calls, both on- and off-air, for later playback. Finally, telephone hybrids designed to work the way you work.



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"goof-proof" broadcast-ready features like remote control, quick cue/review, end-of-message, Index cue, selectable 2% speed increase and reliable manual cueing to  $\frac{1}{75}$ th of a second. It's even designed for rack mounting.

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# OET Report Reveals New Facts about RF

by Steve Crowley

**Washington DC** Of all the broadcast services, AM has the most unique radio-frequency radiation (RFR) concerns. Antennas are on the ground, for one thing. Also, when ANSI guidelines are exceeded, they are exceeded in the near-field regions of the antenna, so separate consideration of electric and magnetic fields is required.

## CONSULTANTS CORNER

To help address AM RFR problems, the FCC's Office of Engineering and Technology has released a report dealing specifically with the matter.

Prepared by consultant Richard Tell, the report bases its conclusions on actual measurements performed at AM stations. Some of the results have been experienced by others, but this is the first time a study of this depth has been documented.

### Compliance and distance

The most widely used tool for determining AM RFR compliance is the FCC's Office of Science and Technology (OST)

Bulletin No. 65. Among Tell's conclusions are that the predicted "clearance" distances from OST Bulletin No. 65 are generally considerably greater than necessary. For example, the distances for quarter-wavelength towers operated non-directionally can be four times larger than required.

Why the big difference? The bulletin distances represent those at which a station would be in compliance for both electric and magnetic field strength. The distances also apply to any frequency or electrical height—they are worst-case representations.

Another finding is that fields near towers can exhibit large azimuthal variation—an antenna tuning unit can greatly alter readings, for example. When making compliance measurements, the report recommends taking readings along the entire perimeter of a controlled area.

The report determined that measurements should be made beyond where the first "good" readings are found. A chain-link fence, for example, may act to shield radiation resulting in low readings close-in. These readings may increase with distance from the tower as the shielding effect of the fence is reduced.

For the quarter-wavelength towers

studied, the report found that magnetic field strength limits were reached before electric field strength limits. In the case of a floating (disconnected) tower, however, there were low magnetic fields and remarkably high electric fields at its base.

There can be significant induced current flowing in floating towers. At the base (and the top) the current must go to zero and the tower, behaving somewhat like a transmission line, forces the electric field to a maximum.

### Current determines fields

In a larger sense, tower current distribution, and not power, determines what fields will result.

## This report may lead to a revision of the AM guidelines contained in Bulletin No. 65.

The common practice of using array phasing system power distribution to determine ANSI compliance cannot be relied upon. However, because the bulletin distances are so great, and because there is often correlation between power distribution and tower currents, this method often produces the desired result.

A draft revision of the ANSI RFR guidelines (which could be finalized in a year or two) contains a provision for limiting contact current—current flowing

through the body when touching a metallic object—to 100 milliamperes. That level of current was suggested in order to reduce the likelihood of RF burns.

Tell found locations at guy anchor points where the 100 milliamperes level was exceeded. It was worst where the last segment of a guy wire was connected to an earth anchor without an insulator. The addition of sufficient insulators at ground level can eliminate this problem.

### Revised guidelines?

This report may lead to a revision of the AM guidelines contained in Bulletin No. 65. Many 1 kW AM stations have fences "3 meters" from their towers, when in reality the ANSI guideline values are not exceeded beyond two or three feet.

I've had good results shortening fencing distances of new or modified stations using the MININEC numerical electromagnetic code modeling program, followed by measurements for verification. Modeling of complex feed structures is a problem. The greater the complexity, the greater the tendency for MININEC (and regular NEC) to give inaccurate results.

It would be much easier—and less expensive—for stations if Bulletin No. 65 distances could be reduced, perhaps by creating a family of tables encompassing various frequencies and tower heights. This latest report may lead to such a refinement.

■ ■ ■

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. FAX 202-466-2042.

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# Space: The Final Audio Frontier

by Ty Ford

**Baltimore MD** Production Rat shifted his weight under the electric blanket. He was not quite awake yet. It was in this semi-consciousness Alpha state that many great ideas came to him. He sometimes wished he could arrange to spend the whole day this way.

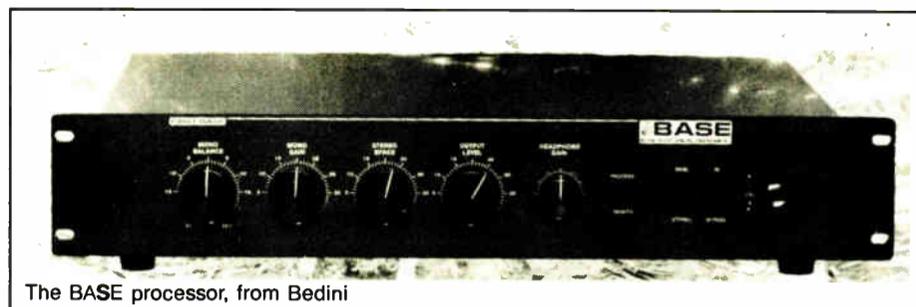
The clock radio popped on and yanked him into full alert. The station was in a spot break. Even though the audio was playing through a cheap two-inch speaker, Production Rat (PR to his friends) analyzed every element; agency spot, hired voice, retail copy ... not bad. Too much reverb! When would people realize that too much reverb made a spot sound really retro and cheesy!

## PRODUCER'S FILE

It wasn't that he didn't like effects processing. In fact PR often used multiple processing during different stages of production. Applying a little reverb on the voice track followed by just the right radical early reflections later in the mix created strikingly different ambiances. The secret was in how to combine several different effects rather than a lot of just one.

After years of practicing his craft, Production Rat had gained an apprecia-

tion for this kind of subtlety. It not only made his work sound better, it drove the competition crazy. Because he never overused any one effect, it was almost impossible to tell what made his work



The BASE processor, from Bedini

sound the way it did. It stood out.

Even if he used no music at all, voice tracks he recorded had a certain sound to them that had nothing to do with intonation, projection, articulation or enunciation. He had learned by experience how to vary the effects slightly so each project had its own sound.

### Voicing complaints

When it came to doing his job, one of PR's biggest complaints was production music that was arranged so that certain instruments ate up space that should have been left open for a voice track.

The worst was when a producer would put a wailing saxophone solo or killer snare drum dead center in a mix. The only way you could get a good

voice-over was to drop the level of the whole bed so the instruments didn't get in the way. When you did that the music wasn't strong enough.

Production Rat had tried notch EQing

the music track to make room for the voice track. With a parametric equalizer he experimented with reducing the gain of the music track between 200 Hz and 4 kHz—where most of the voice frequencies were—to make room for the voice. It worked ... sometimes.

What he really needed was a box that would let him get the center channel, or mono signal, under control. And because each piece of music was different, the control had to be variable.

### The BASE experience

Did such a box exist? It did! It's name? The Bedini Audio Spacial Environment, or BASE. Bedini, as it turns out, has been somewhat of a pioneer in the "three dimensional" audio movement. If

you're an avid reader of movie credits, you've probably seen the box credited on a number of major films.

Much of the Bedini box is the result of work based on the theory that, "more information exists on audio source material than the brain can assimilate through current playback equipment. The BASE processor allows you, the listener, to hear more of the ambient acoustics that were present during the actual recording."

Inputs and outputs on the unit are unbalanced TS jacks or XLRs (pin 3 hot, 1 and 2 ground). The BASE unit also has a mono side-chain loop accessible by 1/4" jacks on the back panel which allows independent processing of the extracted mono audio. Stated input impedance is 47 kilohms, output impedance is 47 kilohms into 600 ohms. THD is .0025%, 20 Hz to 20 kHz. Maximum input before clipping is 2.5 volts RMS. This is a single-ended device, which means it doesn't require a second decoding box.

A close look at the BASE processor reveals some simple yet sophisticated circuitry. The BASE processor separates the mono information from an incoming stereo source. It then allows you to vary the gain of the mono signal as well as pan it across the stereo outputs.

The phase of the stereo signal is reversed before it is fed to the "stereo space" control. As you increase the "stereo space" control the phase reversal causes the stereo image to widen.

Unlike reverb and delay, the BASE widening effect disappears when the signal is combined to mono. Also, there is a slight decrease in what was center

(continued on page 25)

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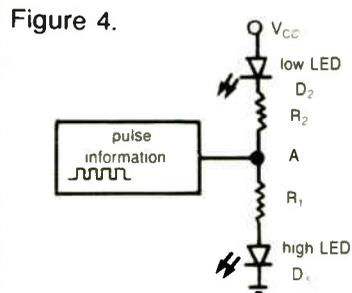
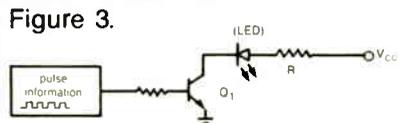
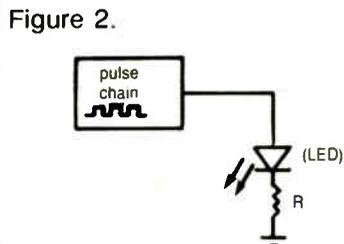
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# How to Test for a Digital Signal



This is the second in a 12-part series called An Introduction to Digital Electronics. Northern Virginia Community College will offer 1.3 CEUs (continuing education units) to registered students who successfully complete the course and an examination mailed at its conclusion. To register use the coupon below.

by Ed Montgomery

Part II of XII

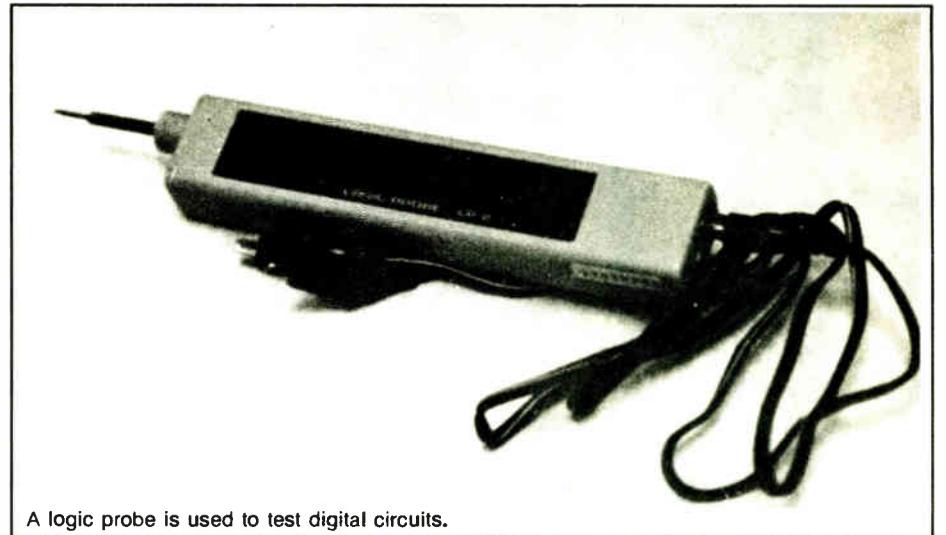
**Annandale VA** Once there was a time when an electronic circuit could be diagnosed with a multimeter. An oscilloscope was handy to have, but the multimeter could give a technician most of the information needed to solve a problem.

Digital electronics is a different matter. Circuits are always operating in one of two states. Figure 1 is an illustration of what the two conditions are.

### Highs and lows

The circuit is considered to be high (1) or low (0). Low is usually in the range of 0 volts or the ground potential of the circuit and high is usually in the range of 3 to 5 volts. Anything in between

these levels will be considered to be undefined. Thus, if for some reason a system is incapable of reading in the "high" voltage level range, the circuit will not function.



A logic probe is used to test digital circuits.

The high and low pulses are sent in sequences. This is often referred to as the "Baud rate."

The term "Baud rate" originated from the Baudot-encoded teletypewriter that encoded signals for radio-teletype trans-

mission. The system consisted of five information pulses (levels) encoding the alphabet, numerals and symbols.

The speed at which this information was sent was defined as its rate and expressed in words per minute or characters per second. Because the information is transmitted at such a high speed, a multimeter normally will not respond accurately to the level indications.

One simple indicator of a digital signal level is the light-emitting diode. The LED will respond to a high level and be illuminated (illustrated in Figure 2). The resistor in the circuit is a current limiter to protect the LED from damage.

A transistor can be used to drive the LED (illustrated in Figure 3). The purpose behind using the transistor rather than just operating the LED as demonstrated in Figure 2 is to reduce the current drain on the circuit. LEDs tend to draw much more current than the average digital circuit is capable of delivering.

### Determining signal level

It is often convenient to determine whether a circuit is exhibiting a high or a low level signal. This can be achieved by using two light-emitting diodes. Using just one LED will work, but there will be doubt as to when a low level indication is present—in other words, is it really a low level or due to loss of power or component failure? For this reason, the illustration in Figure 4 will produce more accurate results.

In this circuit, when the input is high, LED D<sub>1</sub> will illuminate and LED D<sub>2</sub> will be off. If the voltage at point A enters the undefined region between high and low, both LEDs will be illuminated. When the voltage output is at the low level, only D<sub>1</sub> will come on. Both high logic level and V<sub>cc</sub> voltage are equal in this circuit.

Digital electronics equipment is often filled with light emitting diodes giving information regarding the status of the circuitry.

The test instrument that is indispensable in testing digital circuits is the logic probe. This device derives its power from the circuit being tested.

The logic probe has LEDs that indicate high and low levels, and pulse rates. The probe is capable of measuring voltages of TTL logic and CMOS logic. CMOS (complementary metal oxide semiconductor) can handle levels as high as 15 volts.

...

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 a broadcast engineer for several radio stations.

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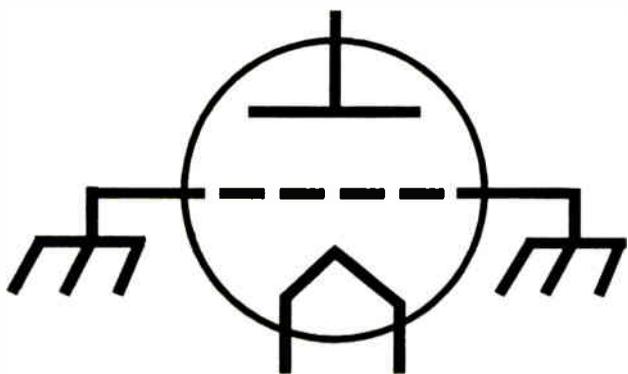
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ITC Omega Series (2) playback desks, program cards need minor repair, otherwise excel cond, \$800 ea pls shpg. D Kelley, KISZ, POB 740, Cortez CO 81321. 303-565-1212.

BG Engineering BGE-1T new 10 minute digital up timer for retrofit into Spotmaster/ITC cart decks, BO; new semiconductors, IC's, lamps, motors, switches, rack ears, accessories for PDII, Delta, RP, SP, 3D, WP, Series 99 cart decks, BO. B Royster, KQM, 1019 Cordova, San Diego CA 92107. 619-223-3413.

Telex MC-PR III RP audio, excel cond, \$995. L Chatman, IVA, 424 Commerce Ln Ste 1, Berlin NJ 08009. 609-768-5006.

Automated Broadcast Controls w(4) Otari ARS-1000DC reproducers, (2) 24 cart Carousels, 80 event sequence controller & audio controller, w/manuals, gd cond, \$10,000 pls shpg. B Herrera, KCRF, 100 Fisher, Trinidad CO 81082. 719-846-3355.

Sentry complete automation system including (5) Revox PR-99 stereo PB machines; Instacart; (2) IGM Carousels; (2) Audicord stereo cart machines; PC compatible computer w/software & interfaces, excel cond. B Ferguson, WMMJ, 400 H St NE, Washington DC 20002. 202-675-4800.

BE 2000 R/P, 2 decks, one has new motor, manual, \$700/both; (3) Ampex 602 R-R decks for parts, BO. B Coatsburg, KCKY, POB 6, Coolidge AZ 85228. 602-983-9290.

UMC Beucart RP stereo record w/spare parts, manual, 3 tones, \$1125. B Carr, WRED, 1201 Fremont Pk, Toledo OH 43489. 419-837-9696.

ATC Criterion Series mono R/P, gd cond, \$300. B McKittrick, 331 Mulberry, Catashtuqua PA 18032. 215-264-5295.

SMC 510 single cart player (2), \$150 ea/BO. J McDonald, 303-889-3442.

Telex MC-PR III R/P, like new, \$950. L Chatman, IVA, 424 Commerce Ste 1, Berlin NJ 08009.

Rapid-Q ROM-2 R/P mono, fair cond, \$200 or trade. D Kohn, KESM, 200 Radio La, Eldorado Springs MO 64744.

Fidelipac Zenith & height gages for head alignment, never used, \$50. D Bailey, 3422 Beech, Rowlett TX 75088. 214-475-9796.

BE 5302B mono, triple decker, gd cond, \$1300. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-6348.

3M/ITC Delta I stereo, gd cond, presently working. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-6348.

SMC 792 mono, gd cond, \$900. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-6348, Fax 512-542-4108.

3M/ITC Delta I stereo, gd cond. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-6348.

BE cart tape winder, almost new, w/timer, both in original packing, \$425. G Cahill, Invisible Inc, POB 5786, Hudson FL 34674. 813-725-5003.

BE/Spotmaster TP-1A cart winder, without timer, \$100, will throw in 100 plus carts for \$150; (3) record amps, mono, for RCA RT-27BA-27 series cart machines, \$40 ea. F Vobbe, Great Northern Bldg Co, POB 5031, Lima OH 45802. FidoNet 1:234/16.

## Want to Buy

ITC 3D mono w/WRA record amp, triple deck. C Waltman, KNEW, 66 Jack London Sq, Oakland CA 94607. 415-836-0910.

Parts & manuals for RCA 7 Series; record amp for RCA 7 Series; parts & record amp for Harris Criterion ATC Series. C Gill, POB 371, Indianapolis IN 46208. 317-923-2800.

Rapid cue R/P mono or stereo, any model, schematics & operative units, must work, need several, may be interested in units for parts. N Williams, WTJZ, 553 Michigan, Hampton VA 23668. 804-723-1270.

Eraser splice finder, KDKB, POB 6184, Kingman AZ 86402. 602-753-KDKB.

Tapecaster P & RP 700, any cond from junk to excel, call or write w/descriptions & lowest prices, complete or parts only. T Crockett, Hot Tracks, Box 10501, Blacksburg VA 24060. 703-853-0222.

Stereo record in gd working cond, used carts 40 sec, 70 sec, 100 sec, 2.5 min. A Moll, KLXQ, 128 Memory Trail, San Antonio TX 78232. 512-496-0677.

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Tascam 38 1/2" 8 trk, low hrs, excel cond, \$1875; Tascam 40-4 4 trk w/dlx, low hrs, \$925. K Flory, The Production Co, Box 1027, Siloam Springs AR 72761. 501-524-4826.

Scully 280-14SP, mono 14", fair cond, \$250; Kahn Symetra-peak SP 58-1A, gd cond, \$50; SMC 282 time announce, gd cond, BO; CBS Audiomax 4450 stereo, gd cond, \$200; CBS Volumax 4100, mono, excel cond, \$200. J Thomas, WLEW, Bad Axe MI. 517-269-9931.

Scully 280B 2 trk stereo in factory roll-around cabinet, manuals, new heads, spare capstan motor & other parts, excel cond, \$1000 pls shpg. B Mounjoy, WIDD, 610-1/2 Hattie, Elizabethton TN 37644. 615-543-5849.

Stancil Hoffman CRM-7 logger Young, WJON, POB 220, St Clair

Crown motor, capstan, Dale HI bi-directional, Crown player, new athon 702-7 & 702-10 portable bi-directional, auto reverse, call prices. E Davison, 135 N Illinois, IL 62702. 217-787-0800.

Ampex AG-440C 1/2" 4 trk in around cabinet, manuals, heads 1 tie wear, spare set of R/P electro spare parts, vgc, \$1000 pls shpg. WIDD, 610-1/2 Hattie, Eliza 37644. 615-543-5849.

Technica 1520 isolated loop R control in fair cond, \$500. R Sanz POB 83111, Lincoln NE 68501. 41

Scully 270-2 (2) 14" stereo reproducers, 3.75-7.5 ips; also (6 capstan motors, BO; Ampex 35 only w/Schafer elect, excel cond, heads, parts, relays for 350 & 4 BO; PR&E Multisync MDA motor ble speed amp for Ampex & Scull B Royster, KQM, 1019 Cordova, S 92107. 619-223-3413.

Telefunken M15A 24/32 trk 15K & variapd, \$25K; Telefunken M15/ \$4K; Tascam 80-8 w/dlx rack Nakamichi 550, BO. R Rhodes, NNYNY 10101. 212-245-5045.

Pioneer CT-F2121 stereo (2), ic need minor repair, \$80 ea or \$100 mon, WBZK, POB 398, York SC 884-4241.

ITC 850 Series, gd cond, BO. D 1 9001 E Pike Blvd, Weslaco TX 785 1548.

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Revov A-77 157.5 ips w/Dolby B \$450/BO; Revov B-77, 157.5 ips, \$1250/BO. B Henry, KLLK, 12 W lts CA 95490. 707-459-1250.

Otari MIX5050-4, 1/4" 4 trk, lapped, \$950. B Petrucci, Rouse: E Old Hickory, Madison TN 371 8518.

Ampex 1200 24 trk matched 1 mods, great shape, heads have b many spares, \$30K/pr, will cons breaking set. D Hewitt, Remote f 334, Lahaska PA 18931. 215-79-

Ampex 601 tape transport, as \$30; (3) Rotron 115 V Whisper far ment cooling, \$10 ea or \$25/ea Welch Media, POB 1455, Moncks 29461. 803-761-7585.

Recordex 330W cassette duplicat & 3 slaves, 16X duplication s matic rewind, erase heads, long-li ord heads, LED level meters, \$70K ry, Int'l Ministries, 4725 Peachtr Circle Ste 250, Norcross GA 3006 6766.

Sony/MCI JH-110B-2 R-R consok (2), light use, new heads & pinch capable, (2) technical manuals & control, \$2900/ea. B Kohz, KBAY San Jose CA 95150. 408-370-7377.

Otari 5050B2 7.5 & 1.5 ips 2 trk, less than 1 yr old, excel cond w/manual, \$950/firm. S Mahaffey, Mahaf Prod, 3592 N Delosa Ste 12, Vineland NJ 08360. 609-692-3439.

Otari ARS-1000 in excel cond, (4), \$700 ea. C Krner, KCNA, 139 SE J St, Grants Pass OR 97526. 503-474-7564.

Scully 1/2 trk tape heads (28) play; (12) mo no Magnacord Presto, play; (16) Magnacord stereo lapped Presto, play, sacrifice price. Call 616-782-9258.

Ampex AG 440B 2 trk, 7.5-15 ips in Ruslang console (2), \$700; Ampex 351-2 2 trk 7.5-15 ips w/inovonics 380 electronics in Ruslang console (2), \$400; Ampex 351 FT 7.5-15 ips in Ruslang console, \$250; Ampex 351 elect (4), \$100. B Reider, WGUC, 1223 Central Pkwy, Cincinnati OH 45214. 513-556-4444.

Scully 280B 4 trk 1/2" in factory roll-around cabinet, manuals, new heads, spare capstan motor & other parts, excel cond, \$1200 pls shpg. B Mounjoy, WIDD, 610-1/2 Hattie, Elizabethton TN 37644. 615-543-5849.

Ampex 350 FT w/inovonics electr in roll around walnut floor cabinets (2), \$800 ea; Scully 280B 4 trk 1/2" recorder, gd cond, in roll-around cabinet, \$800. B Mounjoy, Elizabethton TN 37644. 615-543-5849.

Revov tape recorders, top-shape factory rebuilds. New heads, etc. Accessories. A77, \$850; B77 (1/4 trk 7.5 ips), \$1000; G36 (tube mdl) 1/4 trk 7.5 ips, \$500. Send phone number & address to: JM Technical Arts, POB 8156, Hermitage TN 37078.

Ampex AG-440e-1-r, gd cond, \$450; Ampex AG-602-2-p, new, \$775; Ampex PR-10-2-p, very gd cond, \$850; many others, call Martin at 219-322-7090.

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Sony TC 788-4 4 trk in gd cond & w/maintenance manual. C Fuller, Voices, POB 153, LaGrange IL 60525. 312-579-9578.

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Scully 255 reproducer, 1/2 trk, stereo, BO. KDKB, POB 6164, Kingman AZ 86402. 602-753-KDKB.

Ampex 350, 7.5-15 ips, FT, cabinet mounted, \$400; Teac A1200, complete, cond unknown, \$100/BO. J McDonald, 303-889-3442.

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## CONSOLES

## Want to Sell

Autogram AC-8/IC-10 spare parts, lamps, switches & bridging input transformers, BO. B Royster, KQM, 1019 Cordova, San Diego CA 92107. 619-223-3413.

Numerik DM 1550 4 chnl DJ mixer, 2 phono inputs, 2 line inputs, 2 mic inputs, 6 band graphic EQ, always in road case, excel cond, \$150. B Fisher, KPOK, Box 477, Bowman ND 58623. 701-523-3883.

Autogram AC-8/IC-10 spare parts, lamps, idging input transformers, BO. M, 1019 Cordova, San Diego CA 3-3413.

1550 4 chnl DJ mixer, 2 phono inputs, 2 mic inputs, 6 band ways in road case, excel cond, r, KPOK, Box 477, Bowman ND 23-3883.

h Systems 8 16 input, 8 subs, 3 effect sends, +4 or -10 level cond, \$3000/BO. M Mantell, 1st 15 Perkins, Brockton MA 02401.

Executive 10 chnl stereo solid-in clean, vgc w/manuals, \$1000 Aountjoy, WIDD, 610-1/2 Hattie, TN 37644. 615-543-5849.

d cond, BO; Cetec 2000 8 pot, r supply, gd cond, BO. D Wolfe, Pike Blvd, Weslaco TX 78596.

Grandson 18 input console, neck 33X16 rcdg console 3-band patch bay plus 24 tr harness, Freeman, Pranava Prod, 1227 ay, Los Angeles CA 90069. 213-

o 80 complete w/pwr supply, iders new, works fine, 3 mic in-t, includes book, \$800. C Ben-40 Domino Ln, Philadelphia PA 13-8900.

10 chnl, all plug-in amps, digi-complete set of spare PC boards, wn, WPRS, POB 367, Paris IL 35-6336.

#5 8 chnl stereo, excel cond, all extras, \$5500. R Trumbo, KNLF, incy CA 95971. 916-283-4144.

AC-6 6 chnl 23 input stereo, in includes ESE built-in timer, shpg, D Kelley, KISZ, POB 740, 1321. 303-565-1212.

12x8x8, lots of extra features, t cond, \$2900. K Flory, The o, Box 1027, Siloam Spring AR 4-4626.

ee A/B 20x16 w(8) 9-band ull patch bay, producers desk, rch, Box 889, Greenville CA 34-6929.

112, 12x4x2, \$1500. C Green, rogramming, 800-937-2100.

12 in, stereo out & mono & mon-1, \$500. D Bailey, 3422 Beech, 5088. 214-475-9796.

), modified to 7 inputs, complete & manuals, gd cond, BO; (2) remote broadcast console w(2) proof speakers, gd cond, BO. J, POB 1070, Sunbury PA 17801.

7500 stereo console parts, P&G in preamps, etc. J.C. Aegerter, W Center, Milwaukee WI 53210.

w4 pots; (2) Ramko solid state; 2 tube type w6 pots; ATI 8 chnl supply, call for details. Adolph,

IL 16x8 monitor mix console, 9 EQ pads, solos, etc, \$950. B use St Prod, 804 E Old Hickory, 37115. 615-868-8516.

20 20 chnl, mint cond, 6 mos Miller, Airborne Audio, 11847 W neza KS 66214. 913-492-8822.

1 5000, 24 inputs, 4 outputs, 3 band, 5 frequency EQ, Duncan spare modules & case, \$2300. ouse St Prod, 804 E Old Hick-TN 37115. 615-868-8516.

Midex Pro Custom Recording, 16x8, Remix switch-over, (8) Pro 5, (8) Pro 3 modules, peak meter, clock/timer, flight case, \$10,500. H Al-rich, Box 889, Greenville CA 95947. 916-284-6929.

Harris Micromac 16 input mainframe, manuals, spare pwr supply, \$10,000/BO. V Kilion, KRVN, POB 880, Lexington NE 68850. 308-324-6717.

RCA BC8A dual mono console, clean shape, \$500 plus crating & shipping. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

Allen & Heath Systems 8 16 input, 8 subs, 16 monitors, 3 effect sends, +4 or -10 level options, excel cond, \$3000/BO. M Mantell, 1st Impressions, 15 Perkins, Brockton MA 02401. 508-580-1844.

Gates/Harris Executive 10 chnl stereo solid-state console in clean, vgc w/manuals, \$1000 pls shpg. B Mounjoy, WIDD, 610-1/2 Hattie, Elizabethton TN 37644. 615-543-5849.

RCA 8 pot, gd cond, BO; Cetec 2000 8 pot, 16 input w/pwr supply, gd cond, BO. D Wolfe, KRIX, 901 E Pike Blvd, Weslaco TX 78596. 512-968-1548.

Auditronics Grandson 18 input console, \$3800/BO; Speck 33X16 rcdg console 3-band sweep EQ, patch bay plus 24 tr harness, \$3795/BO. G Freeman, Pranava Prod, 1227 Sierra Alta Way, Los Angeles CA 90069. 213-457-8390.

Gates Stereo 80 complete w/pwr supply, most rotary faders new, works fine, 3 mic input 4 line input, includes book, \$800. C Benner, WUSL, 440 Domino Ln, Philadelphia PA 19128. 215-483-8900.

ORK Omega 10 chnl, all plug-in amps, digital switches, complete set of spare PC boards, \$4500. B Brown, WPRS, POB 367, Paris IL 61944. 217-465-6336.

Ramko DC8M5 8 chnl stereo, excel cond, all manuals & extras, \$5500. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

Autogram AC-6 6 chnl 23 input stereo, in excel cond, includes ESE built-in timer, \$4200/BO pls shpg, D Kelley, KISZ, POB 740, Cortez CO 81321. 303-565-1212.

Tascam M-50 12x8x8, lots of extra features, low hrs, mint cond, \$2900. K Flory, The Production Co, Box 1027, Siloam Spring AR 72761. 501-524-4626.

Sphere Eclipse A/B 20x16 w(8) 9-band graphic EQ, full patch bay, producers desk, \$6000. H Alrich, Box 889, Greenville CA 95947. 916-284-6929.

Ramea WR 8112, 12x4x2, \$1500. C Green, Century 21 Programming, 800-937-2100.

EV EVT 5212 12 in, stereo out & mono & monitor, mint cond, \$500. D Bailey, 3422 Beech, Rowlett TX 75088. 214-475-9796.

RCA BC5A (2), modified to 7 inputs, complete w/spare parts & manuals, gd cond, BO; Kel-don KD20A remote broadcast console w(2) T's, (2) waterproof speakers, gd cond, BO. J Keller, WKOK, POB 1070, Sunbury PA 17801. 717-286-5838.

McCurdy SS-7500 stereo console parts, P&G taders, plug in preamps, etc. J.C. Aegerter, Salsom, 5431 W Center, Milwaukee WI 53210. 414-445-2300.

BE 4BEM 50 w4 pots; (2) Ramko solid state; Collins 212 F-2 tube type w6 pots; ATI 8 chnl stereo w/pwr supply, call for details. Adolph, 915-849-2112.

Interface 104L 16x8 monitor mix console, 9 freq, 3 band EQ pads, solos, etc, \$950. B Petrucci, Rouse St Prod, 804 E Old Hickory, Madison TN 37115. 615-868-8516.

Tascam M-520 20 chnl, mint cond, 6 mos old, \$4250. D Miller, Airborne Audio, 11847 W 83rd Terr, Lenexa KS 66214. 913-492-8822.

Sunn Magna 5000, 24 inputs, 4 outputs, 3 aux sends, 3 band, 5 frequency EQ, Duncan spare modules & case, \$2300. B Petrucci, Rouse St Prod, 804 E Old Hickory, Madison TN 37115. 615-868-8516.

Midex Pro Custom Recording, 16x8, Remix switch-over, (8) Pro 5, (8) Pro 3 modules, peak meter, clock/timer, flight case, \$10,500. H Al-rich, Box 889, Greenville CA 95947. 916-284-6929.

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RCA BC8A dual mono console, clean shape, \$500 plus crating & shipping. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

## MICROPHONES

## Want to Sell

# A Manager's Task is Getting Things Done

by John Cummuta

**Downers Grove IL** One of the titles I've held in radio is Vice President, General Manager. The "Vice President" was for my ego. The "General Manager" was my job description.

The station's owners left little doubt about which title I'd be evaluated by, and I rarely suffered from a split personality because of my double billing. But this does represent a potential pitfall for all managers, particularly new ones: the "Executive Syndrome."

## ENGINEERING MANAGER

With few exceptions, the people reading this column are managers, not executives. The difference is important. Executives decide what is to be done. Managers get it done. Managers who don't realize they are being evaluated by

**Executives decide what is to be done. Managers get it done.**

productivity and results are vulnerable and may find themselves and their titles out in the street.

### Know thy business

One of the most important elements of becoming a good manager is the transition from being concerned only with the job at hand, to being concerned with the business.

Forget the good old days when you could just concentrate on the task you were assigned and let someone else worry about whether the bottom line was written in black or red ink. The manager's view must include the big picture, the one that shows how his or her department fits into the overall organization—and contributes to its profitability.

When you become a manager, spend your early days learning everything you can about how the whole station or organization works. Understand how you and your troops contribute. Find out what is expected of your department, in clear, concise and measurable terms.

### Leadership

The next quality the manager must develop is leadership ability. Like salespeople, leaders are made, not born. You can learn to be a good leader by understanding three key elements of leadership: communications, motivation and commitment.

Communications is the cornerstone of any effective relationship, and a leader must have a strong working relationship with each of his or her subordinates.

Critical to real communications is that it is two-way, meaning that it is used for more than just passing down instructions or directives.

### Mark of a good communicator

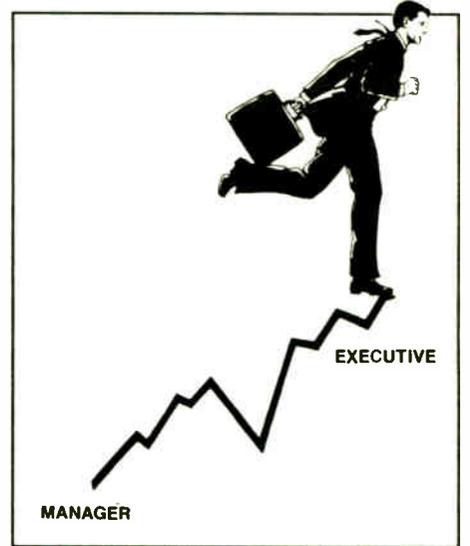
Good communicators mostly listen. They gain understanding of each subordinate's strengths and weaknesses and then they provide information and in-

struction to maximize each person's productivity.

When a manager assigns someone a task, it is the manager's responsibility to determine whether the person is knowledgeable enough to complete the job successfully. The manager's communications skills must be used both to evaluate the individual's capabilities and to fill in the blanks with training and assistance.

Remember, it's the manager's job to *get things done*. That's true whether the manager simply assigns the task to a completely capable subordinate, or sits there during the whole job, training a less experienced employee. The manager is measured by the results.

(continued on page 24)



# MIX TRAK

## YOU'RE LOOKING AT IT!

It's not easy to sort through the crowd of radio consoles in search of the *perfect* model. Yet your needs are probably well defined:

- Three Mix-Minus busses for phone or monitor feeds.
- Built-in provisions for separate speech and music processing.
- Straight forward modular design; simple to operate and maintain.
- Rugged, reliable construction.
- State of the Art audio performance.
- RF Interference protection.
- No tricks or shortcuts which hamper installation.
- Balanced inputs and outputs throughout, even all patch points.

The search for this console isn't *really* so hard. You're looking at it! Plus there are lots of other benefits to owning a Mix Trak 90. That's why many of America's top broadcasters have selected the Mix Trak 90 *above all* other consoles.



# Cable Documentation by CAD

by Tim Frye

**Zanesville OH** For those of us fortunate enough to be using Computer Aided Design or Database (CAD) programs at our facility, we know the real advantages of using computerized documentation. Unfortunately, wiring documentation is one area that has always been difficult to accomplish with a computerized system.

The problem is that the information on those pretty CAD drawings cannot be directly transferred to an external data-

base program.

However, I have found a nice solution. If you are using the OrCAD Schematic Capture program for your wiring diagrams, you can create coded wiring drawings with the cable codes accessible by an external database program by utilizing several OrCAD utility programs.

At Ohio University-Zanesville, we use a color coding scheme for cables, but any alphanumeric system will work just as well.

The first step involves creating a cus-

tom library part for OrCAD to use in your drawings. This is an easy process. First, using DOS, make a library sub-directory. For example:

```
MC\ORCAD\LIBRARY
CUSTOM.LIB <ENTER>.
```

The next step is to create your custom part. I called mine "code," but you can name it anything you like. Using DOS EDLIN or any text editor create the file CUSTOM.SRC as shown in Figure 1.

Save the file on the OrCAD directory. At the DOS prompt type:  
COMPOSER CUSTOM.SRC

Figure 1.

```
PREFIX
END
code
REFERENCE
3 1 0
L1 PAS
R1 PAS
(00)
(01)
(02)
(03)
(04)
(05)
(06)
(07)
(08)
(09)
(10)*****
(11)
```

```
ORCAD\LIBRARY\CUSTOM LIB
<ENTER>.
```

You have just created your custom part. By the way, be sure to configure OrCAD to load your new CUSTOM.LIB. This procedure, as well as how to use the utility programs, is well documented in the OrCAD user manual.

It is now possible to call up the part for your wiring diagrams simply by typing "CODE" at the "GET?" prompt. Once you place the part on your drawing, simply edit the part name and refer-

(continued on page 29)

## Software Overview

by Barry Mishkind

**Tucson AZ** Not long ago, an article appeared in a trade magazine, describing how to build a PC compatible computer.

It included tips on how to locate the parts needed at the best prices, just as the clone makers do.

## ECLECTIC ENGINEER

Putting the parts together was said to take no more raw talent than building a Heathkit, with the opportunity to see the entire system as it was constructed. The result was a complete PC starting at under \$500.

Of course, "rolling your own" has its share of potential problems.

### The bad and the good

First of all, if the completed computer doesn't work right away, there likely is no toll-free technician to hold your hand and walk you through the process. Similarly, relatively simple pieces of information on setup, batch files, configuration files, etc., can all seem like mountains in front of the prospective first-time computer builder.

Once again, "warranty" repairs and upgrades become the builder's responsibility, unless he'd prefer to pay the local computer store repairman to do it.

On the other hand, there is great personal satisfaction in getting it built. Indeed, you learn a lot about the internal layout of a computer by building one.

User groups often are sources of help. However, the information you might need and the person who has it may not always be available when you are in need.

A better alternative may be to go to a locally owned computer store and get to

(continued on page 30)



Tim Achterhoff, President  
Greater Muskegon Broadcasters, Inc.

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# The Need to Get Things Done

(continued from page 22)

Motivation is tougher than communications for two reasons: you can't really motivate anyone other than yourself and no two people are motivated by the same things.

an environment within which they motivate themselves. This is trickier than it sounds, because people are as different as snowflakes and what motivates one might crush the next.

At one time, American businesses

ton rarely considered the needs of the individual people in his command. While that approach may be necessary during the heat of battle, it's totally inappropriate as a management style—mostly because it doesn't really work very well.

While one of your employees might be a slow starter and need that kind of boot-to-the-butt motivation, others might emotionally implode from it. You could either lose them from the staff, or simply lose their cooperation and contribution.

Your job, as a manager, is to create the optimum environment and challenges to bring out the best in each subordinate.

**... as a manager, your job is to get your troops to feel as if they own your department's goals.**

Motivation must come from within each of your subordinates. You can't motivate them. All you can do is provide

thought that all managers should be like the World War II figure, General George S. Patton. Completely task centered, Pat-

This really is the interesting and exciting challenge of management. It's rather like juggling. The test is to keep all the balls in the air, to keep all the different personalities in your charge motivated and operating at peak efficiency ... to get things done.

## Do what it takes

Don't cop out and say that it's not your job to be mother, father, coach and cheerleader. If that's what it takes to get the job done, then you must be all those things and more.

Commitment to the station's and your department's goals must be freely volunteered by your subordinates. It cannot be imposed on them.

Commitment comes from ownership—every human is most committed to his or her own goals and values. So, as a manager, your job is to get your troops to feel as if they own your department's goals. The way to get this "ownership" feeling is to let them participate, as much as possible, in establishing the goals.

A simple way to begin that process is to say something like, "Here is what we feel we must accomplish over the next (week, month, quarter, year); let's discuss ways that we feel we can do it."

From that genesis discussions will blossom, and you might be surprised at the quality of some of the suggestions. You should also maintain an open mind that your people might give you some very good reasons why the goal itself is inappropriate. Balance this with your own understanding that, properly motivated, your people can probably perform at a higher level than even they think they can. In other words, be reasonable.

As much as is practical, let the team create the timetables and tactics, while you fit those into the overall strategy. Just keep in mind, and remind your people, that getting the job done is what you all will be evaluated by.

## Moving up to executive

If you perform well as a manager, making the machinery of your department run well, you may find yourself tapped for executive assignments. When this happens, you'll once again have to re-vamp your thinking.

Translate the term executive into enabler. Think of yourself as someone who creates environments and systems that help managers and their subordinates get the job done.

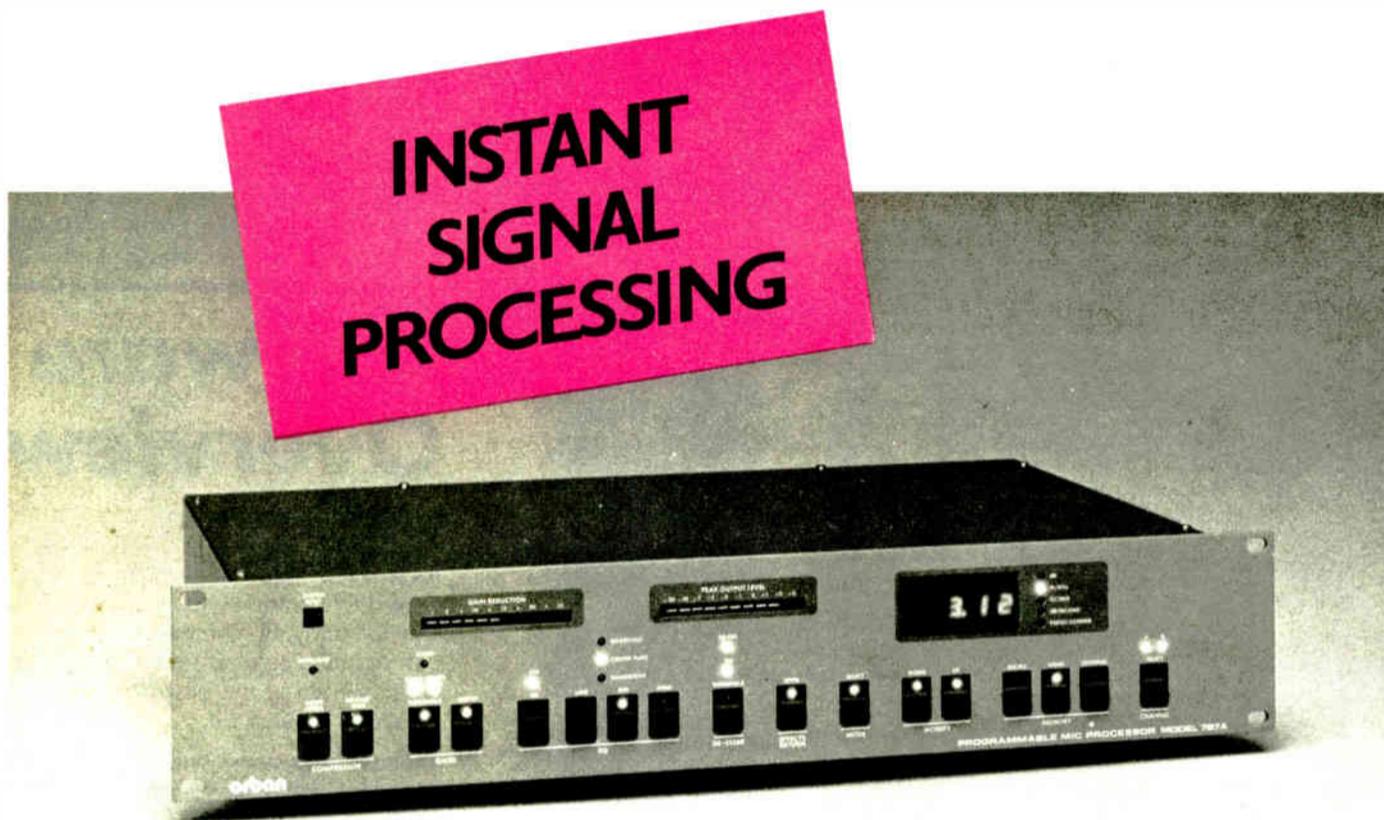
Systems are the tools of efficiency that enable a boss at any level to achieve results. It is the job of the executive to create systems to manage diverse situations, so that every task does not have to be approached from scratch.

A key quality of the executive is the ability to handle diversity. Things are changing, in this wonderful world, at an ever-increasing rate; and the executive who can develop strong systems to get things done—while simultaneously resisting the "We've always done it this way" trap—will be the most successful.

The bottom line, as you climb your career ladder, is to know which rung you're on at the moment. Just take your job title to your boss and say, "How would you describe someone who is successfully executing this job?" Then, once you know what's expected, get it done.

■ ■ ■

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.



Orban's new digitally-controlled 787A Programmable Mic Processor integrates an unprecedented combination of vital signal processing functions into one powerful, compact package. It delivers fully programmable **mic- or line-level** processing with access to 99 memory registers through MIDI or RS-232 interfaces, or a console-mounted remote control. All you do is add the talent.

The 787A offers a space-saving, elegant solution to many annoying problems (voice or instrumental deficiencies, poor room acoustics, noise, sibilance, wandering levels) in multi-track and MIDI recording studios, commercial production, video post, audio-for-video, and film scoring facilities. The 787A increases production efficiency through consistently repeatable processing. Less time need be spent tweaking separate processors, so more attention can be devoted to capturing top creative performances as they happen.

The 787A is complete audio processing arsenal in a box—a flexible parametric EQ, a smooth compressor, noise and compressor gates, and a handy de-esser. The 787A can be operated in mono or dual-channel/stereo (with the addition of a second-channel slave). An optional Jensen transformer mic preamp with 48V phantom power adds further flexibility.

Orban's 787A Programmable Mic Processor will help you remember tomorrow the way your talent sounded yesterday.

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FAX: (415) 957-1070

**orban**

# The Bedini Spatial Image Box

(continued from page 18)

channel information when processed stereo is combined to mono. This means that the levels you set while recording in processed stereo still work if heard in mono.

As might be expected, the effect is more noticeable when listened to with headphones. When the "stereo space" of a stereo music track increases, strange things start to happen. The perception is that the music is being pushed toward the ends of the stereo spectrum, leaving a space in the middle.

As you max out the "stereo space" control, it sounds as though the music is pushed up the walls of an imaginary container. It's as if the music has a finite spatial volume which acts like a physical mass. In visual terms, it's like the effect they used when Moses parted the Red Sea in the movie *The Ten Commandments*.

## Hole-y music track, BASEman

So now you have this extra wide stereo music bed with a hole in the middle. You can fill the hole back in with music by increasing the "mono gain" control, or by mixing in other audio sources... like a voice track. If you choose to fill in the gap with music using the mono gain control, you also have the option of panning the mono anywhere on the stereo spectrum.

The amount of separation depends a lot on the nature of the stereo signal you're using. In one particular case, a Paula Abdul CD was fed to the BASE processor. The output was then fed to stereo line inputs on a mixer and played through a set of studio monitors about 15 feet apart. A/B comparisons made it obvious that separa-

tion had increased. So much so that a moderate amount of "mono gain" had to be used to fill in the gap.

Another noticeable effect was that the intricate percussion overdubs seemed more defined. The increased definition was partially due to a perceived increase in the 5 kHz to 10 kHz range, perhaps a by-product of the phase twisting. While this improved the ability to hear the leading-edge transients of those instruments, it also brought Paula's vocal closer to the sibilance threshold.

The increased separation seemed to spread out instruments in the mix. Percussion instruments that were almost on top of each other in the unprocessed mix began to move apart as the effect was increased.

Next stop was the voice-over studio. Stereo CD production music was fed directly into the BASE processor, which was then fed to stereo console inputs. A mic was brought up on another channel. When the processing was kicked in, the music track moved outward in both directions from the center channel, leaving a nice space for the voice.

When processing was removed, the music became so loud that it interfered with the voice track and had to be lowered.

This phase of the experiment had been done under headphones; however, we had been rolling tape on the mix. We were curious to hear if the effects were as audible on studio monitors as they had been in our cans. Even though the separation was not quite as apparent in the monitors, the notch left for the voice track was very obvious. When the processing was removed, the music crept up on the voice track.

Because the unit allows separate control of mono and stereo information—and because most vocals are mono and most music is stereo—you can change the relationship between the voice and music levels on an already mixed stereo master!

It's worth mentioning that the BASE does its processing without noticeable noise increases.

Jim Harmon of Soundwave, Inc. in Washington, DC has been using the BASE processor in his studios for the last year. He commented that it was especially useful in creating a larger sound when the processed audio was to be

played back in an acoustically confined area. He also found that stereo sound effects became more apparent when processed by the unit.

Listing at \$3000, the BASE processor is more expensive than the average piece of processing gear. For the moment, however, there is nothing else quite like it on the market. For more information call Sylvio Pennucci, director of public relations for BASE, at 818-500-4171.

■ ■ ■

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

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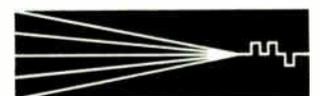
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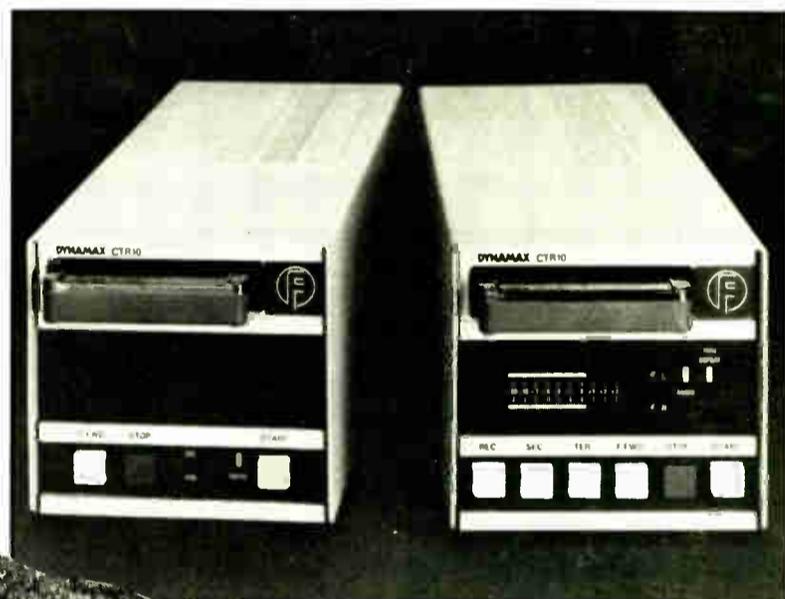
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Circle 16 On Reader Service Card

World Radio History

# Revamping Frequency Counters

by Bill Higgs

**Louisville KY** This started out as a complete construction project for an audio frequency counter. Honest. Armed with a few CMOS chips, a defunct pocket calculator and unbounded ambition, I planned to describe a handy gadget which would "find a place in every toolbox."

Then reality struck. It was going to take about 15 74C series chips to do the job and I did not look forward to either drawing the print or wiring the thing. The easy way was to use the Harris/Intersil chip set, but the cost (about \$30) began to put the thing out of the casual category.

## BOTTOMLINE BROADCASTER

What I really needed was a way to measure audio frequency rather than a new instrument. My aging Heathkit counter (remember my fondness for things quaint and antique?) steadfastly refused to measure anything in the audio range.

When pressed it would cough up a

times be used if the multiplexing frequency is developed separately from the counter timebase.

Second, you must be able to interrupt the timebase generator at a point before the signals are separated into count, reset and enable. This usually means separate chips.

**Several applications suggest themselves immediately. Frequency response can be accurately tallied, for one thing, and you can do your proofs "dead-on."**

Older counters are usually easier to modify because the functions are separated into separate chips. My solution was to add three inexpensive chips into the timebase chain, with a switch to set the divisor ratio. This allows for one, two or three extra decimal points of resolution. On my counter, this allows me to read to the nearest 1/10 Hz.

The circuit is shown in Figure 1. I used CMOS 74C90s because I had some handy; if your counter uses 5-volt TTL circuitry, you may want to use 74LS90s.

As each counter circuit will be differ-

and 14. See the Harris/Intersil data book for more information.

By the way, don't try modifying a counter simply by dividing the crystal frequency by a factor of 10. You may run into problems with rise times, current draw and generally unpredictable results. Also, if you slow down a multiplexing clock, the displays get unreadable.

and 14. See the Harris/Intersil data book for more information.

By the way, don't try modifying a counter simply by dividing the crystal frequency by a factor of 10. You may run into problems with rise times, current draw and generally unpredictable results. Also, if you slow down a multiplexing clock, the displays get unreadable.

### Applications

Several applications suggest themselves immediately. Frequency response can be accurately tallied, for one thing, and you can do your proofs "dead-on." I have used the system to set turntable and tape machine speeds accurately using 1 kHz test records and tapes. Stereo

and SCA pilot frequencies can also be measured with good resolution.

One other thing: If I count my old 1950s vintage HP oscillator with my modified counter, will I get my readout in cycles instead of Hertz?

As several of you have noted, the gremlins got into the schematic for the utility tone generator in the November 22 issue. As printed, the circuit may not work reliably because feedback levels are marginal. A good filter, but not what we wanted.

The circuit can be made to work by increasing the value of the 47K resistor until the circuit oscillates consistently. Also, make the 4.7K resistor into a trimpot for distortion adjustment.

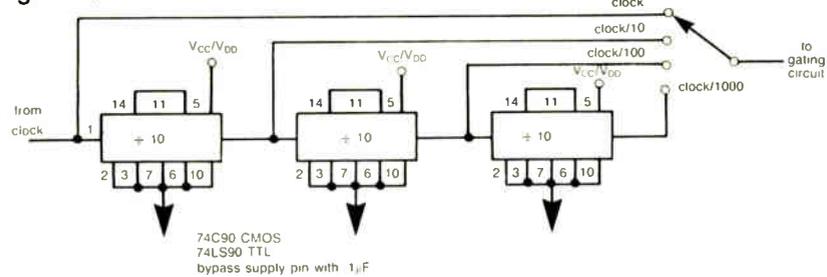
A better solution, however, is to replace the 47K resistor with a 1K trimpot (connected as a rheostat), and replace the 10K resistor from pin 2 to ground with a #344 pilot lamp.

This will cost an extra dollar or two, but will stabilize the output and give more reliable operation. Sometimes I am just too cheap for my own good.

Bill Higgs has had radio and TV experience in small market broadcasting and has also done consulting work. He can be reached c/o WHAS-TV, 520 Chestnut St., Louisville, KY.

Are you a small-market engineer with projects, ideas and tips to share? Fax a brief note to RW at 703-998-2966 or call JG at 703-998-7600. RW pays for articles published.

Figure 1.



string of leading zeros and maybe one digit. After all, when the counter reads out in kHz the least-significant digit is virtually non-significant.

The problem was that the counter was designed to read RF in the range between 500 kHz and 20 MHz. The time base was much too short; in the neighborhood of 1 ms. To provide a readout in Hz, the timebase needed to be 1 sec or 10 sec. The solution was to modify the instrument to a different time base.

### Setting conditions

Two conditions need to be met in order to modify your counter to give meaningful audio readings. First, the displays must be direct drive rather than multiplexed.

In other words, the common anode/cathode or backplane of the readouts must return separately to individual chips. A multiplexed display can some-

ent, a schematic of the unit will be necessary to find out where to insert the new dividers. If your counter has an existing switch to change the frequency range, this is a likely place.

You may need to make one other change. If the input circuitry on the counter is capacitor coupled, it may be necessary to increase their value to insure proper operation. Some experimentation may be necessary here.

The modern trend in frequency counters is toward large-scale integration, or the combination of many functions on a very few chips. Many counters these days use the Harris/Intersil 7207-7208 chip set. This offers high reliability and low chip count, but does not allow for the modification outlined here. This set utilizes a multiplexed display and the gating and reset functions are contained in the 7207.

• All is not lost, however, for a counter

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# WAZU Gets the Beat of the City

(continued from page 15)

glance, you can look at it to see what's active and what is not. You don't usually find that with a DA," said Soller.

Wheatstone also supplied microphone processing for the four RE20 Electro Voice microphones. Each mic position

In addition, each microphone in the on-air studio is slaved to a Nakamichi cassette recorder that automatically toggles on or off to the mic. "Instead of taking a four-hour cassette—which doesn't exist—and letting it roll, the cassette machine will only turn on to the micro-

have this capability. It's really given us a creative edge in our production."

Every Thursday, for instance, WAZU's morning show will host a live band performance in the production studio. And after the show, said Soller, the band will record customized music.

This activity is coordinated by a Wheatstone SP-6 console, which is operator-controlled in a sit-down configuration. "The console is a cross between a typical on-air console and a recording console," said Soller. "It has the flexibility to do anything you want as far as special effects."

Included in the design of the SP-6 are EQ modules for each channel, which eliminate the need for external equalization. For added special effects, such as echo, flanging, stereo fading and more, Soller brought in an SPX-90 Yamaha unit.

The studio's four microphone positions, which are housed in Wheatstone's microphone turret, are equalized from the console. Three currently in use—again RE20 Electro Voices—have the same Wheatstone compressor/limiters as the on-air studio.

The mic turret, like the mic turret in the on-air room, has a read-out panel that functions as a timer.

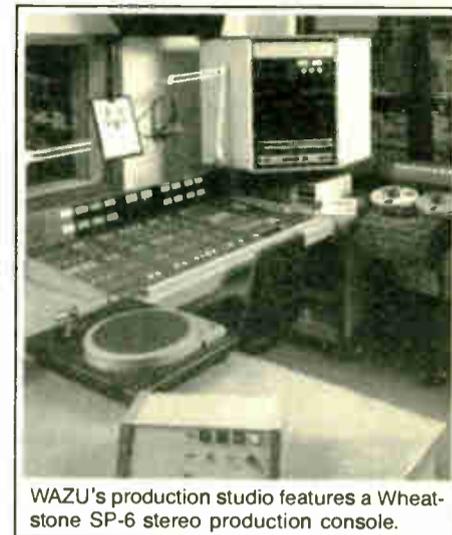
Since cueing to music is not a big consideration for production functions, Soller brought in the two consumer grade CD players from the previous facility in Springfield. These CD players reside in an equipment turret to the right

of the SP-6 console, which also houses two Fidelipac CTR100's as well as two Otari MTR-10 tape recorders and an eight-track Otari MX5050-Mark III reel-to-reel recorder.

The newsroom, besides its news function, provides overflow production with a Wheatstone A-20 console presiding



The air studio of WAZU wears the clean lines typical of Wheatstone design.



WAZU's production studio features a Wheatstone SP-6 stereo production console.

has its own dedicated processing, which is rack-mounted underneath the console and consists of a Wheatstone model 1202 compressor/limiter and a 4200B equalizer.

phone," said Soller.

The eight-track studio, according to Soller, is key to the station's new presence in Dayton. Said Soller, "I don't think a lot of stations, if any in Dayton,

over two two-track Otari MX5050B-II reel-to-reels.

A quality about all the studios that is hard to ignore, said Soller, is the Wheatstone presence. "One of the big factors in their furniture is the stability of construction; the second thing is the extremely good looks." WAZU-FM's new presence in the market, backed by Wheatstone studios, will no doubt leave a lasting impression in Dayton.

■ ■ ■

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

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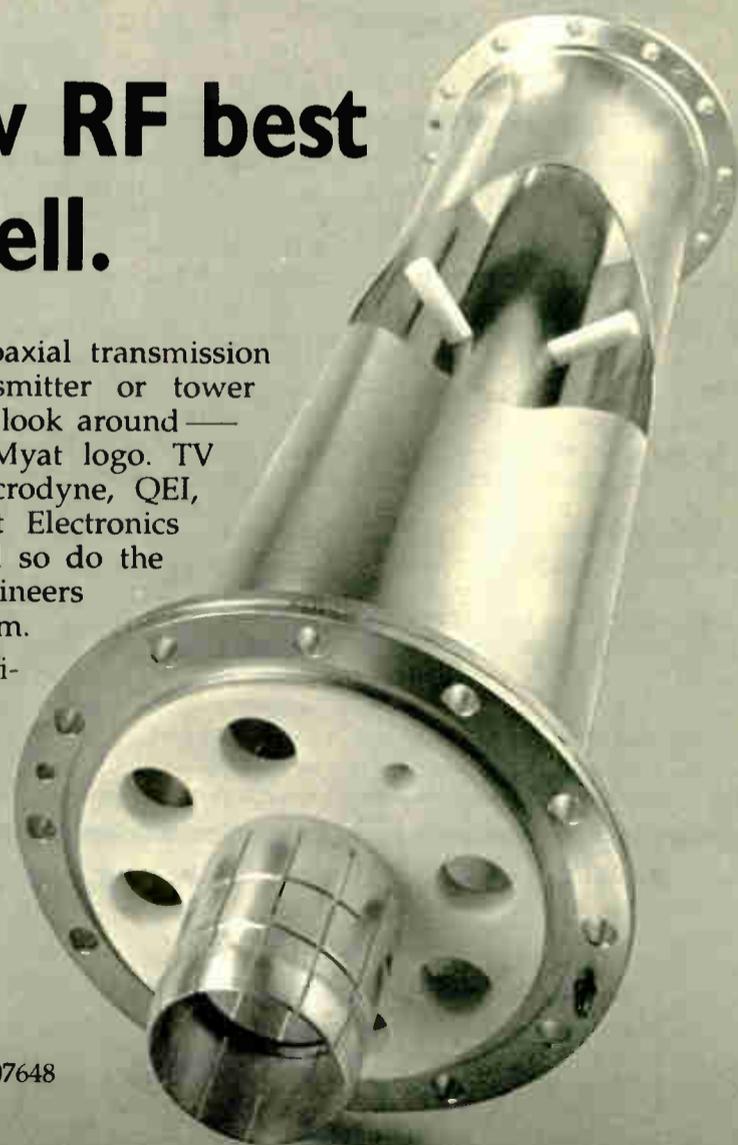


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# CAD and Database Integration

Figure 2.

ITEM	QUANTITY	REFERENCE	PART
1	2	R-B, W-G	GGGG
2	14	O-B, Bu-B, Bu-R, G-B G-R, O-R, R-B, V-B, V-R, W-B, W-R, Y-B, Y-O, Y-R	RRRR
3	1	R-B	RRRG
4	1	R-B	RRRBu
5	1	R-B	RRRO
6	1	R-B	RRRY
7	1	R-B	RRRV
8	1	R-B	RRRW
9	1	R-B	RRROB
10	1	R-B	RROR
11	1	R-B	RRROO
12	1	R-B	RRROY
13	1	R-B	RRROG
14	1	R-B	RRROBu
15	1	W-B	RRROV
16	1	?	RRRYB
17	1	W-G	RRROW
18	1	R-B	RRRYR
19	1	R-B	RRRYO
20	1	W-B	RRRYG
21	1	W-B	RRRYBu
22	1	R-B	RRRYV
23	1	W-G	RRRYW

(continued from page 23)

ence to input your cable identifier and pair color. For example, "CODE" and "?" might become "10G456" and "R-B."

This next section details the process for transferring the cable identification data to a database. After completing your cabling drawing use the OrCAD PARTLIST utility to create an ASCII text file by typing: **PARTLIST (YOUR DRAWING) (YOUR TEXTFILE)/S <ENTER>**.

This creates a list of cables and pairs. If you inadvertently forget to edit cables, or have duplicate identifiers, PARTLIST will produce a warning message, and identify the problem (see Figure 2).

You can now import the information into any database program that will read a standard text file. The only real trick here is to format the first four fields of your database to capture the information correctly. Once the information is in your documentation database, it can be added to or sorted, which is what makes databases so great to use in the first place

(See Figure 3).

Updating the database from this point becomes a matter of simply adding or changing cables on the drawing, generating a new partlist file and reading it into the database using the cable code as an exclusive sort.

This alternative can simultaneously generate a drawing and provide all the pertinent information at the touch of a button.

■ ■ ■

Tim Frye is an instructor of telecommunication technology at Ohio University-Zanesville. He can be reached at 614-453-0762.

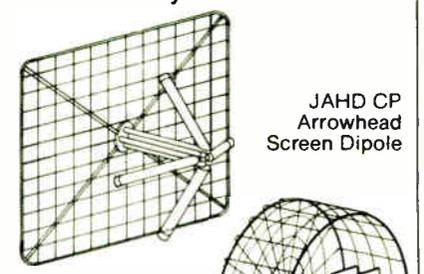
Figure 3.

OHIO UNIVERSITY—ZANESVILLE						
WIRING DATABASE						
© 1989 Tim Frye						
CABLE COLOR PAIRS	PAIR COLOR	LOCATION	ORIGINATION	DESTINATION	INFORMATIONAL NOTES	
GGGG	2 R-B, WG	E 241	Orban 674 EQ line out	PB-2 PJ 47 and 48	Left = R-B right = W-G	
RRROB	1 R-B	E 241	Turntable 2 LEFT channel	PB-2 PJ 4		
RRROBu	1 R-B	E 241	Otari 5050B #2 LEFT out	PB-2 PJ 11		
RRROG	1 R-B	E 241	CART 1 line out	PB-2 PJ 1	Mono mix line output	
RRROO	1 R-B	E 241	Otari 5050B #1 LEFT out	PB-2 PJ 6		
RRRO	1 R-B	E 241	Turntable #2 Right output	BP-2 PJ 5		
RRROV	1 R-B	E 241	OTARI 5050B #2 RIGHT out	PB-2 PJ 12		
RRROW	1 W-G	E 241	PB-6 PJ 26	PB-2 PJ 38	Studios B&D interconnect	
RRROY	1 R-B	E 241	OTARI 5050B #1 RIGHT OUT	PB-2 PJ 7		
RRRBu	1 R-B	E 241	LPB 6x2 DA line 2R out.	PB-2 PJ 24		
RRRG	1 R-B	E 241	LPB 6x2 DA line 2L out	PB-2 PJ 23		
RRRO	1 R-B	E 241	LPB 6x2 DA line 1L out.	PB-2 PJ 21		
RRRR	14 O-B, Bu-B, Bu-R, G-B,	E 241	PB-2 PJ 27,29,30,16	PB-6 PJ 27,29,30,16	15 PAIR BELDEN CABLE 8766	
RRRR	G-R, O-R, R-B, V-B, V-R,	E 241	PB-2 PJ 14,35,26,21,17	PB-6 PJ 12,14,25,13,10	Interconnect between 241	
RRRR	W-B, W-R, Y-B, Y-O, Y-R	E 241	PB-2, PJ 25,18,28,19,36	PB-6 PJ 1,36,19,28,22	and 245 Elson Hall	
RRRV	1 R-B	E 241	Turntable #1 LEFT output	PB-2 PJ 2	Post TT preamplifier	
RRRW	1 R-B	E 241	Turntable #1 RIGHT output	PB-2 PJ 3	Post TT preamplifier	
RRRY	1 R-B	E 241	LPB 6x2 DA line 1R out.	PB-2 PJ 22		
RRYB	1 ?	E 241	PB-2 PJ 40	PB-2 PJ 40	Example of unedited part	
RRYBu	1 W-B	E 241	PB-2 PJ 42	5050B #1 RIGHT line in		
RRYG	1 W-B	E 241	PB-2 PJ 41	5050B #1 LEFT line in		
RRYO	1 R-B	E 241	PB-2 PJ 46	CASSETTE RIGHT line in		
RRYR	1 R-B	E 241	PB-2 PJ 45	CASSETTE LEFT line in		
RRYV	1 R-B	E 241	PB-2 PJ 43	5050B #2 RIGHT line in		
RRYW	1 W-G	E 241	Otari 5050 B #2 RIGHT out	PB-2 PJ 44	Cable replaced 10/4/88	



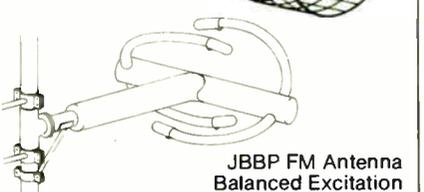
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# Tethering the Power of the PC

(continued from page 23)

know the manager/owner. Buy your first unit there, perhaps even order components for building your own.

By paying just a few dollars more (as your share of the overhead), the manager will usually be happy to spend time with you and provide those esoteric pieces of information you need. It is the cheapest training around.

However, whether you build or buy the computer, you likely will not write every program you'll use. With that in mind, let's consider program applications.

## Something to put inside

It is true that in the early days, many stations had someone who knew some BASIC—perhaps the most common, easy to use programming language.

There was even a BASIC listing published in one of the computer magazines a decade ago that scheduled spots into a program log. As I remember, it was in "Level 1" BASIC and was really just a video log. Serviceable, even ahead of its time, but a far cry from what is now available.

What you find today if you wander the aisles at the trade shows is many companies providing sophisticated software—everything from traffic to copy management to music rotation to news to billing.

Probably the primary requirement of any station, and usually the first soft-

ware purchase, is for traffic and billing.

While many stations make the mistake of buying by price, or by the personality of the salesman, it is much wiser to involve the traffic and billing people and acquire the package that best meets the needs of your individual station.

Believe it or not, many packages drive traffic people crazy over simple things like needing two cartridge numbers for half cash/half trade accounts. Or, trying to insert a message or make a change in a heading.

Some programmers offer toll-free support and will quickly assist in customizing. Others will only ship the periodic updates.

Since such programs are so user specific, it is a good idea to be sure you have the level of support you need before buying. In this case local computer stores can't really be of much help.

## Spreading the word

Word processing is usually the second acquisition. This covers the wide range from the GM's secretary to sales letters and proposals.

Additionally, news and public affairs, and other departments including engineering, can easily find uses for word processing.

The various programs available range from the simple line print of BASIC to packages costing hundreds of dollars.

Of course, what is fine for home use is not necessarily sufficient for the office. Again, it is important to discern the needs of the station; how much technical support will be needed, for example.

The variety of documents generated and how visually oriented you are will lead you to one word processing package or another. Some programs work better than others with different printers,

provided free or as shareware to assist in many of the calculations the engineer needs to do periodically.

But other programs for more specialized needs come with a price tag. Last time we considered FMPC from BDS as a very cost effective way to do "what if" projections on FM upgrades and site moves.

Many other programs are available for everything from STL path analysis to

## . . . in most of the computer industry copy protection has become a thing of the past.

such as a laser unit.

Some stations have even moved up to a desktop publishing package with optical scanners to get the quality and complexity they require. Other users may be content with an integrated package, or even a popular shareware package that can even be more flexible than the big expensive programs.

In the news area, the wire services have come up with combination word processing/database programs to bring newsrooms into the '90s.

Not only does this reduce the volume of wasted paper generated by older teletype machines, it can speedily search for specific stories and allows efficient storage of material for future needs.

In programming it is music scheduling programs that need to be evaluated.

Here again, as with traffic and billing, these are usually customized programs to cope with complex rotation.

## The list goes on

Then just when you thought it was safe to close the software budget, there are the engineering applications.

As mentioned previously in this column, there are many programs

directional antenna tuning and maintenance.

Few of these are substitutes for a good consulting engineer, but saving just a few hours of your consultant's time by doing the preliminary work does save a lot of money.

## Considering security

To end our overview of applications, consider security.

First of all, your security is threatened if the company goes out of business. This doesn't happen very often these days. Still, if you are buying a traffic and billing program, for example, it may still be a wise precaution to ensure access to the source code if necessary.

Security is also on the programmer's mind.

To prevent "pirate" (unlicensed) use of their programs, some software writers seem to delight in making it hard to use them.

Sometimes this is an embedded "clock" that kills a program after a certain date. Other programmers use so-called "hardware locks" that must be installed in the printer cable.

Either way it becomes difficult to make backup copies or run the program from another computer in the station or allow the user to work at home.

On the other hand, in most of the computer industry copy protection has become a thing of the past.

Many computer magazines recommend *not* buying any program that includes some sort of software or hardware obstruction to its unrestricted use.

The bottom line is that just like everything else in your facility, care shown in selecting and purchasing computers and software will be rewarded by fewer operating problems.

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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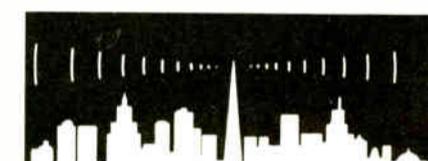
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# RadioWorld® BUYERS GUIDE

Test & Monitoring Equipment

## SNG-1 is an Asset in Testing

By Bud Aiello, DE  
EZ Communications, Inc.

**Fairfax VA** In the spring of 1989, Delta Electronics introduced the SNG-1 stereo noise generator. The SNG-1 is designed for the stereo broadcast industry as a high quality test signal source for rapid setup and evaluation of audio and transmission equipment, using proven noise measurement techniques.

For a number of years, many of us have used real time analyzers (RTAs) and their internal noise source as a test signal. None of these units have provided the ideal output signals to easily deal with the demands of the modern broadcast facility.

### USER REPORT

The SNG-1 provides an accurate stereo (or mono) noise source with a low output source impedance for driving almost any load with high output level capabilities.

#### Tradition of excellence

The SNG-1 follows the tradition of other Delta products with its excellent construction and simplicity of operation. The front panel contains the operational controls for selecting "Noise Type" (pink, white or USASI), "Noise Mode" (cw, ext gate or NRSC pulsed), "Output

Level," balanced left and right output jacks (1/4" TRS) and the "Output Selector."

The output selector, coupled with the left and right balanced outputs, are what make the SNG-1 a powerful service tool.

The output selector will produce Left-only; Right-only; Mono (identical noise, no L=-R exists); Stereo (independent left and right noise); NRSC for AM stereo testing (left and right channels are partially blended so the sub-channel level is 3 dB below the main channel level); L=-R, (left and right are derived from a common source, so no L+R exists); and finally a "Clipped" position.

The positive peaks of the left channel and the negative peaks of the right channel are clipped. This source is useful for checking phasing and polarity throughout a stereo system.

Finally, there is an LED to indicate power on. The rear panel contains XLR-type left and right output jacks. (They are disconnected when using the 1/4" front jacks.) A BNC connector is used for the applications of an external gating signal, the power fuse and power connector. The unit contains no power switch.

#### Usage with an RTA

The SNG-1, along with a real time analyzer and oscilloscope, make excellent tools for rapid frequency response evaluation and maintenance of tape recording equipment. Once the reproduce sections of the recorder are properly aligned using standard align-

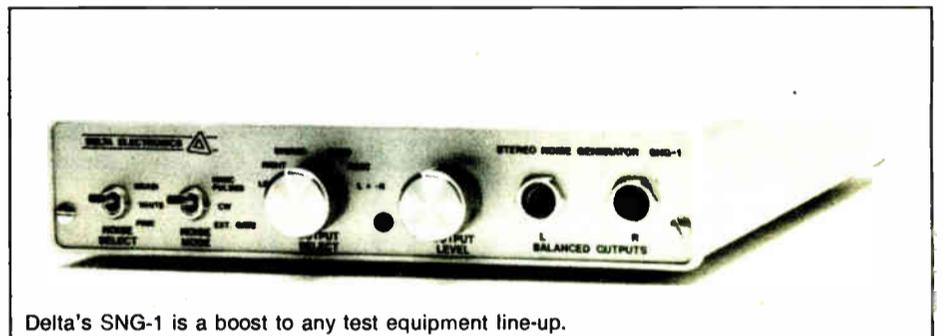
ment tapes, the record sections can be set up in a matter of seconds using the SNG-1, RTA and scope.

A particularly useful procedure is to carefully align your master cartridge recorder, and then generate a series of azimuth alignment tapes using pink noise. The tapes are then used to phase align all the reproducers in the station to the master recorder.

area where the SNG-1 and RTA can be of great value. Any engineer that employs several mic processors throughout his studios has spent countless hours trying to duplicate setups.

#### Easy duplication

Once a setup is arrived at on one processor, its response characteristics can be easily duplicated with the RTA.



Delta's SNG-1 is a boost to any test equipment line-up.

In the design of the SNG-1 very careful attention was paid to the level tracking of its left and right outputs. This provides an extremely accurate signal for the alignment of multiband audio processing equipment. The SNG-1 and RTA can be used to make very accurate and fast frequency response and level tracking adjustments to multiband audio processing systems.

By gating the SNG-1 on and off with a very low repetition rate square wave you can easily set the gating circuits of your processors for identical thresholds.

Microphone processors are another

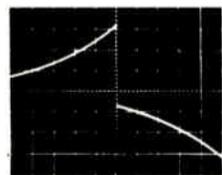
Compression, expansion and gating thresholds can be easily duplicated using the "External Gate" function and the output level setting of SNG-1.

Under the realm of FM stereo transmission system evaluation, the dynamic stereo separation of the entire system can be measured easily. Simply apply left or right only signals to the system input and read the separation on the modulation monitor. This is a real world acid test for what the audio processing, STL, stereo generator, transmitter and antenna system are really doing.

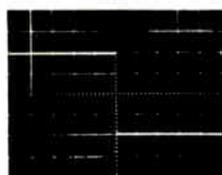
(continued on page 40)

## Monitor Modifications for Maximum FM Loudness

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**BEFORE MODIFICATION**  
Peak Indicator Pulse Response  
50Hz - 10us Rise Time  
Note: 60% Overshoot



**AFTER MODIFICATION**  
Peak Indicator Pulse Response  
50Hz - 10us Rise Time  
Note: Absence of Overshoot

Four years ago, Modulation Index introduced a modification to a major manufacturer's FM monitor to improve its dynamic accuracy. The result was the most accurate monitor commercially available. Monitor-induced overshoot at the peak indicator is reduced from approximately 17% (on typical program material) to less than 1% (on any program material). Since the monitor-induced overshoot is eliminated, modulation and loudness levels can be increased with complete legal confidence by knowing that only real over-modulation will be indicated.

Competitive solutions to this problem involve the use of time-delayed peak indicators, indicating over-modulation only on peaks of a minimum duration or longer. This method, although alleged to be in accordance with the pre-1983 FCC Rules & Regulations regarding monitors, causes certain accuracy problems under dynamic modulation conditions. Most monitor-induced overshoot is low frequency related. The time-delayed peak indicator solution affects mostly high frequency problems by a blindfold method. Claims that processing levels may be reduced and modulation levels increased are false, since the ultimate peak level is determined by the long duration peaks as well as the short duration, which presumably are of the same peak level in a non-overshooting system.

### Modulation Index

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Monitors are supposed to provide reference-quality demodulation that reveals every aspect - good or bad - of the broadcast signal. A monitor that encourages wishful thinking is not worthy of the name. A monitor should be a microscope, not a blindfold.

The Modulation Index modification can turn these monitors into microscopes. The basic monitor design is good, but the transient response as seen by the peak indicator is poor. By correcting the transient response, the Mod Index modification creates a monitor that correctly measures even the most aggressively processed audio. If the transmitted signal is truly overshoot-free, the modified monitor's peak indicator will be highly active at 99% and never turn on at 100%. All this is achieved by fixing the basic problem - not by using trick add-on circuits.

The Modulation Index modification has not compromised any monitor specifications to eliminate overshoot, and has improved several. Frequency response, distortion, separation, crosstalk, and rejection of second-adjacencies are all addressed. (Second-adjacency rejection - a real problem in areas where the spectrum is crowded - was apparently neglected in the original design.)

The Modulation Index modification provides much the same DC-coupled demodulator performance used by the FCC when monitoring, by use of an integrator feedback loop. Monitor-induced overshoot is virtually eliminated, permitting accurate peak reading of dynamic modulation levels including all additional modulation due to sub-carriers. In addition, the modification provides a delay-equalized baseband low-pass filter to replace the original non-delay-equalized filter. Such equalization not only reduces overshoot, but also improves the separation capabilities of the companion stereo monitor.

The Modulation Index modification costs just \$700, including calibration, complete documentation, and any minor repairs. Since type-approval is no longer required, the modification is fully legal, and conforms to the pre-1983 FCC Rules & Regulations regarding FM monitor specifications. The modified monitor will equal or exceed the accuracy of any new monitor allowing maximum legal loudness - but the modification costs 50% to 85% less than replacement or other questionable solutions!

## BUYERS GUIDE INDEX

### Delta Electronics SNG-1 Stereo Noise Generator

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by Russ Mundschenk, WEAZ-FM 40

Also, a Special Report from Neutrik  
and a Technology Update from  
Bradley Broadcast Sales.

# Dorrrough Pleases WQXR

by Herb Squire, CE  
WQXR-FM

New York The Dorrough Stereo Test Set Model 1200 is

racks of radio master control rooms 50 years ago. The Model 1200 not only monitors and tests static signal conditions, it will do the job dynamically as well.

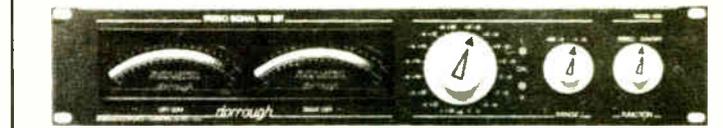
I saw the Model 1200 for the first time at the 1989 NAB Convention in Las Vegas. I needed a gain set-type device

with analog meters to finish up the test position in the new WQXR master control room.

The Model 1200 did exactly what I needed, and I got more than I bargained for.

## A variety of uses

Besides being a basic gain set, the Model 1200 checks polarity and phase compatibility. But wait—that's not all! It also measures system headroom, noise floor, crosstalk, multitrack azimuth and the effectiveness of dynamic signal processing. It doesn't slice or dice, but it sure



The Dorrough Model 1200 wins kudos from WQXR.

will help light up your control room in a festive holiday mood with eighty flashing light-emitting diodes!

The Model 1200 is a relatively small package, taking up 3½" of rack space. The unit uses two Model 12-B relative loudness to peak modulation meters.

These meters are combined with a pair of input amplifiers,

a precision 30-step range attenuator, a high/low range selector and a function control for left-right stereo monitoring or L+R and L-R (sum and difference) monitoring. A buffered headphone monitor output jack also is included.

The key components in the Model 1200 are the loudness meters. The 12-B and its big brother, the 40-B, have been around for a few years as stand-alone units. Besides program level gain-riding, these meters are great for setting up audio processing chains.

## Confirming your ears

The meters in the Dorrough unit simultaneously monitor peak and average audio levels. They confirm your ears in monitoring loudness comparisons. Unlike your ears, however, these meters don't fatigue.

How many times has this happened: You've been working all night setting up processing chains at the transmitter. After a few hours, "bad" starts to sound "good" ("Gee, it sounded great when I left the transmitter at 6 AM!").

The Model 1200 should do the trick. Attached to a good tuner, it also makes an excellent monitor for checking which station is winning the latest skirmish in the "Great Modulation War."

Time and space do not permit a thorough operational walk-through of the unit, but the Model 1200 has an excellent instruction manual. It's well-written and simple to understand.

The unit works well. A minor short on the headphone jack to the case in my unit was the only flaw. That took a few minutes to clear up.

## Real time comparisons

The ability to compare average levels to peak levels in real time is, in my estimation, the most exciting feature this unit has to offer.

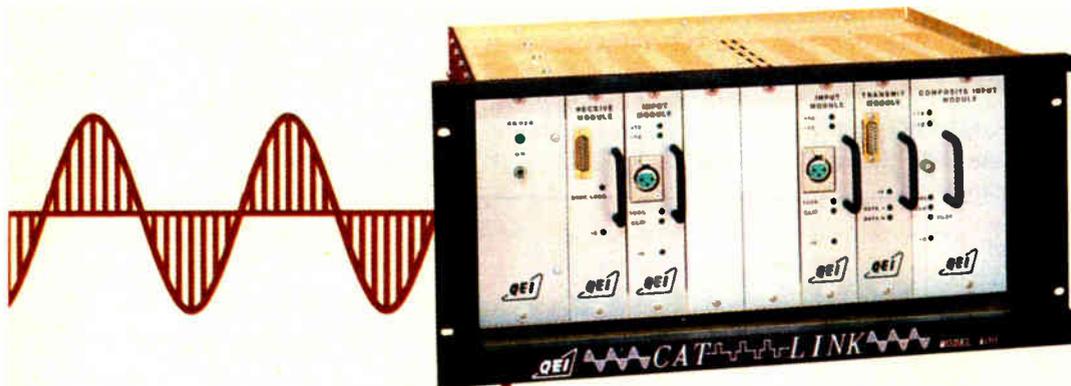
Here's a case in point. We have all faced problems with marginal circuit performance. Telco lines are a great example: Let's say it's 25 minutes before air and the lines for an important stereo concert broadcast are still being equalized by the phone company.

The lines are tweaked, the frequency response looks great and the noise floor is where it belongs. However, with audio on the circuit it sounds "funny." There is a distortion problem. There isn't time to bring out the scope and/or distortion analyzer to interpret the readings.

(continued on page 35)

## USER REPORT

perhaps the best thing to happen to a "gain set" since the Daven 10B Gain-Set filled the



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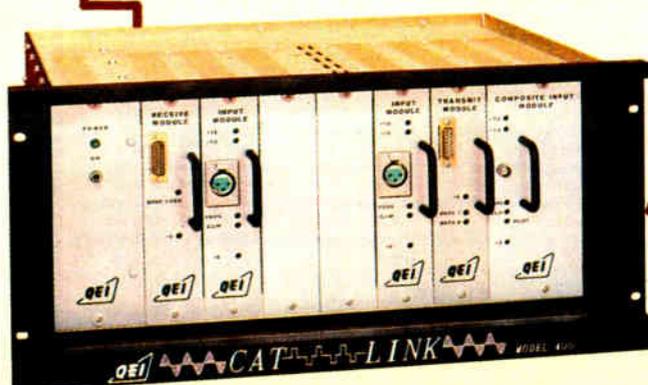
CATLink encodes the fully processed *composite* signal and decodes it at your transmitter, so you can run the stereo generator and processing at the studio. At the same time, CATLink configurations can send and receive SCAs, control channels, voice communications, RS232 data, AM audio, transmitter readings, and satellite or remote programs.

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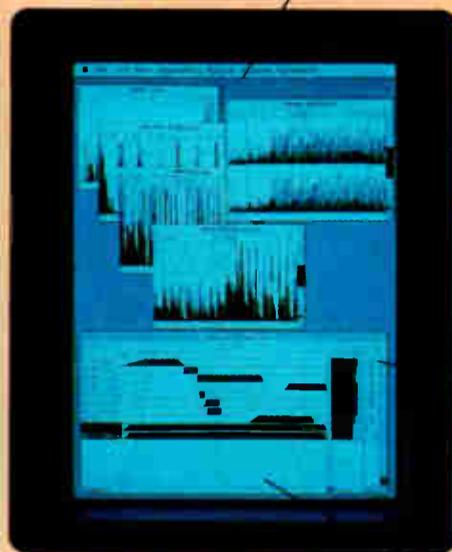
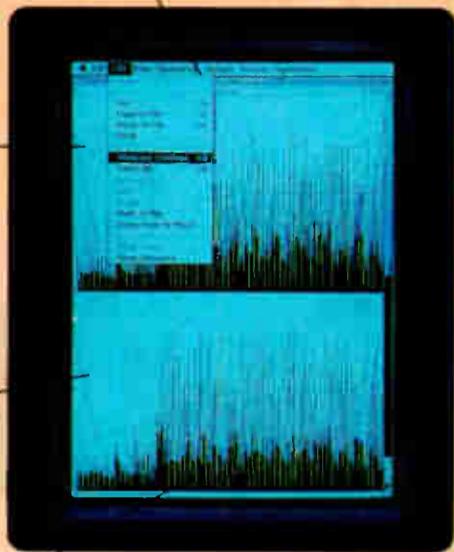
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World Radio History

# New Tech, New Look At Rules

by Richard Farrell

**Falls Church VA** In trying to survey the past year's events in the test and monitoring field several questions beg answering. For instance, what is causing all of the fuss over the Modulation Sciences ModMinder? Does the FCC need to rethink its position with regard to measurements? And in what areas do stations still lack in terms of being able to monitor themselves?

The ModMinder, as many are now aware, ignores brief (less than one millisecond) spikes that, Modulation Sciences contends, have no impact on occupied bandwidth. By ignoring these short peaks, the system purports to offer a more truthful picture of modulation than past monitors might have.

The company says that conventional monitors, with what they see as excessively fast response times, offer little information of real value regarding the modulation of real program material.

Thus, where other monitoring equipment might suggest to a station that it is overmodulating, the ModMinder would suggest that it may not be and indeed can even raise its average modulation until only the "real" peaks trigger the ModMinder's flasher.

## FCC stands pat

All of this happens in accordance with the FCC's pre-1983 regulatory rules concerning modulation, rules to which Modulation Sciences says it has adhered in its development of the ModMinder.

FCC Mass Media Bureau's Assistant Bureau Chief for Engineering, Bill Hassinger, confirms that FCC OET CE Thomas Stanley wrote to Modulation Sciences saying in effect that if the ModMinder was built to conform to the old specs, then the FCC would find it satisfactory (See RW 27 December cover story).

"As far as we know," says Hassinger,

## Dorrrough

(continued from page 32)

This is where the Model 1200 comes into the picture. Looking at the audio from the remote you can see a problem. The difference between average and peak readings is 2 dB or so. There is an amplifier in the circuit that is misadjusted and clipping the audio.

Depending on time, telco readjusts levels, or the transmit level at the remote site is lowered to give enough overload protection. You can see on the meters where you can get a good compromise. Maybe there still is time for a quick cup of coffee and a chance to catch your breath before the show starts. Wow!

In conclusion, the Model 1200 is a very practical piece of test equipment that may fit the ticket for non-technically-oriented operators who are intimidated by scopes, analyzers and the rest. I would recommend the Model 1200 to those who want to "see" what's happening to their audio.

■ ■ ■

Editor's note: Herb Squire may be reached at 212-633-7600.

For more information, contact Doug Schauer at 206-282-2555, or circle Reader Service 51.

"that has taken care of Eric Small and his ModMinder."

The ModMinder, however, worries some audio purists who question the product's ability to accurately reflect program modulation. The snowball effect of which, they fear, is that stations, in the mistaken belief that they are within legal modulation limits, will end up in a state of overmodulation.

## INDUSTRY ROUNDUP

"If you put random SCAs into the ModMinder, it can actually cause you to overmodulate," says Modulation Index Owner Greg Ogonowski. "My principle objection to the ModMinder," Ogonowski says, "is that if you are going to try to ignore peaks on the basis of trying to ignore multipath, then you are going to end up ignoring your signal as well."

MSI's Eric Small, the company's VP of engineering, disputes Ogonowski's claim. "The ModMinder gives you the right reading. When you put in the SCAs, it gives you the correct sum of all the components and is not subject to any subtleties of interpretation," he says.

## The clipping issue

Ogonowski also disagrees with the premise that the ModMinder will ultimately allow a station to turn down its clipping. "If you turn down the clipping, you're still going to have long duration peaks come up to the 100% modulation point, which is going to still determine the same amount of peak deviation," he says.

Therefore, argues Ogonowski, you are not allowed to turn up your modulation, given the pre-1983 standards. "If you have the device connected to an accurate monitor, it is the low frequency, long duration peaks that establish the 100% indication on the ModMinder. The fact that it ignores the little peaks is of no consequence to the reading at which the ModMinder is indicating," Ogonowski says.

On this point, Small says he agrees, but only in the case of stations using extensive amounts of clipping. He maintains that with the ModMinder stations have the opportunity to back off of their high frequency limiting and still maintain high average modulation.

## Move to studio-type processing?

With over 200 stations now using ModMinder, and no FCC action taken on a single one to his knowledge, Small says ModMinder "is going to create a whole new generation of broadcast processing that will be much less brutal."

This, says Small, is because ModMinder's technique of removing a station's concern with having to act on short peaks will promote the kind of processing that is typically found in recording studios. To that end, says Small, ModMinder "is going to shift the focus back to audio quality."

Bob Orban, chief engineer for Orban Associates, thinks the ModMinder is still an unknown quantity and that it brings with it some unanswered questions, among them the question of adjacent ra-

dio protection. "Somebody needs to do subjective adjacent ratio tests," says Orban of the ModMinder, to see if interference is heard in the test case's first adjacent.

"If you don't hear interference," says Orban, "then it means the ModMinder is not causing problems. But you must make this test on a lot of common radios and perform it at more than one wanted-to-unwanted carrier powers."

"It may be that the ModMinder will cause no problems. I'm not against the ModMinder," Orban says. He says what he is against is introducing a new way of measuring modulation without performing tests such as that mentioned above.

"To go past the one millisecond response time, I completely agree," counters Small. "But one millisecond was in the pre-1983 FCC rules. And what's wrong with the FCC rules?"

## FCC reevaluation necessary?

What all this debate brings to light is a question which surfaced two years ago when the FCC saw fit to redefine its policy in light of new dial-up remote control policy.

Namely, as new technology, especially measurement technology is developed, does the Commission need to go back and reexamine rules which are dependent on certain types of monitoring to determine compliance?

In the case of ModMinder, does the FCC need to restate its modulation requirements to reflect new technology the way it did when it clarified its remote-control requirements?

The Commission's OET CE Stanley has pointed out that the FCC did away with the need for type-accepted monitors in 1983 in part to allow newer monitoring technologies to be developed.

Bill Hassinger says the measuring question "hasn't risen to the point where we feel we have to step in and have a rule-making. One reason is we are stretched to the limits with everything we are doing now. Consequently, unless something becomes a problem, we don't really have the resources to go at it."

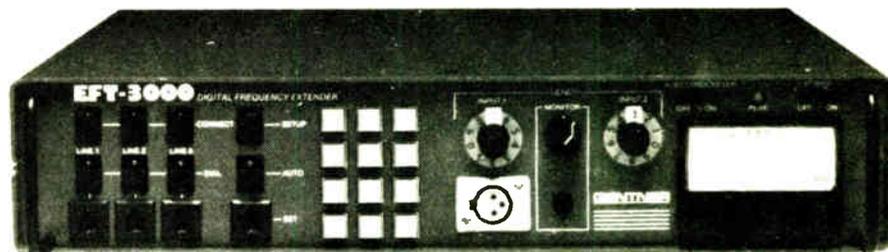
## Stations watch themselves

Jesse Maxenchs, TFT marketing manager, says that right now the only time the FCC would analyze a station would be if other stations had complained, something he feels is somewhat rare. "Back when deregulation came out, I think the FCC was saying: 'licensee, police thyself,'" says Maxenchs.

"I don't think the FCC has ever really done a lot of policing on modulation," offers Frank Foti, president of Cutting Edge Technologies, makers of the Vigilante limiter. "I think radio stations are doing a lot more of it. The FCC has more work to do than just drive a truck around the country all the time fining stations," says Foti. "So I think you will see continued supervision by stations among themselves," he adds.

(continued on page 41)

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# Bonneville Picks ModMinder

by Bill Loveless, VP Eng  
Bonneville International

**Salt Lake City UT** Bonneville engineers have always felt the FM broadcast industry has incorrectly applied AM's unique physical peak modulation limits and constraints to FM, which has few if any physical constraints. This has worked to the detriment of FM radio's achieving its full quality potential in the real world.

What Bonneville program directors want is loudness without trashing the audio. ModMinder from Modulation Sciences is a tool to deliver that goal. It

is not an audio processor, but an accurate method of measuring FM modulation without losing loudness. By legally ignoring very short modulation peaks that do not contribute to radio interference, a station can use less audio processing while retaining the same loudness.

Bonneville found out about ModMinder early, because much of the device's on-air testing was done at

than FCC rules ever required. To keep those false peaks from indicating as over-modulation, the average modulation must be reduced significantly.

However, by using ModMinder, with its FCC-approved 900  $\mu$ s response time, brief, false peaks are ignored. The result is more modulation with less processing.

## Reducing processing

We found that the more processing in use, the less increase in modulation ModMinder permitted. Measuring moderately processed stations with ModMinder allowed as much as a 15% increase in modulation, with no readjustment of the processing.

But we found something far more important in its long term implications for FM broadcasting. With ModMinder we reduced, and even removed, some processing from the air chain *without* any loss in average modulation.

And because removal of processing made the audio "brighter" and less muddy, the net result was often a subjectively louder signal.

With all the attention focused on ModMinder's response time, many of its

peak modulation of the previous second. In conjunction with ModMinder's peak flash indicator, the display eliminates the endless flasher threshold knob twisting normally associated with trying to determine peak modulation.

A true one-minute rolling peak counter displays at all times the number of peaks during the previous 60 seconds. This allows slightly higher modulation and displays continuously exact over-modulation counts per minute, as per the pre-1983 FCC ATS rules.

The remote control capabilities of

**(It is) an accurate method of measuring FM modulation without losing loudness.**

ModMinder permitted significant improvement in modulation at several Bonneville stations by making it possible to locate the monitor at the transmitter. By avoiding the multipath inherent in off-air monitoring, ModMinder permitted a 15% increase in the accuracy of modulation measurements available at the studio of WNSR.

ModMinder has two types of remote

## USER REPORT

WNSR, our station in New York City. As a result of those tests we decided to purchase units for all seven of our FM stations.

### Surprising controversy

Since its introduction, ModMinder has created a surprising amount of controversy. The controversy has centered around Modulation Sciences' decision to equip the ModMinder with a peak response time of about 900  $\mu$ s instead of the less than 200  $\mu$ s common to conventional modulation monitors.

We examined the response time issue carefully during the WNSR testing. MSI supplied us with copies of its communications attorney's opinion of counsel, the FCC Report and Order deregulating modulation monitors and the pre-1983 FCC rules dealing with FM stereo modulation monitors.

So, long before the recent FCC declaratory ruling about ModMinder, we were convinced that using a monitor that complied with the pre-1983 rules would ensure compliance with today's over-modulation rules. The FCC ruling confirmed our earlier conviction.

Most modulation monitors have peak indicators with response times of less than 200  $\mu$ s. Therefore, the indicators false-trip on peaks that are much shorter

other unique features have been overlooked. For one thing, its response need not be 900  $\mu$ s. By altering one resistor, the response time can be varied from about 200 to 2000  $\mu$ s. At 200  $\mu$ s, the ModMinder behaves much like a conventional monitor.

### Digital display

ModMinder's digital modulation three-digit display indicates modulation to a resolution of 0.5%. The display updates once each second with the highest

interfaces; one for conventional remote controls, the other a modem-based computer interface. Bonneville stations have not made much use of the standard remote control interface, but many of our stations use the modem/computer interface to great advantage. It provides a serial data stream at 1200 bits/second for total remote operation of ModMinder.

Everything that can be observed or adjusted at the front panel can be done from a remote personal computer via an

(continued on page 41)



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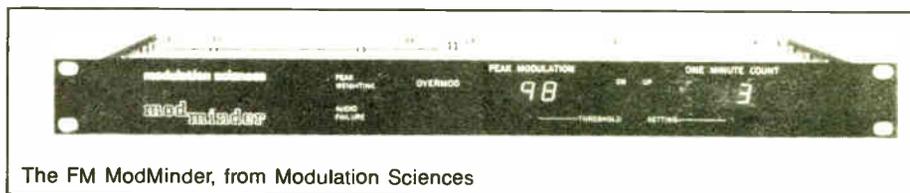
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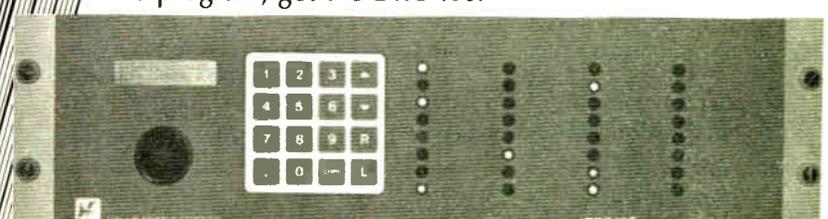
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# Neutrik the Choice at the BBC

by Dave Higton  
Prod Mgr Test Instruments  
Neutrik AG

*Editor's note: What follows is an interview Dave Higton of Great Britain's Neutrik AG conducted with former BBC employee John Packman about automated and manual testing from a British perspective. Packman was head of BBC Transmission, which oversees all distribution and transmission of BBC program material.*

*Part of his responsibilities included providing test and measurement facilities for the entire BBC Transmission organization and buying equipment for its maintenance teams.*

*These duties spanned approximately 150 radio stations, about 1000 sites transmitting television and 11 satellite-fed World Service sites.*

*Packman worked at BBC Transmission for many years before leaving the organization last fall. He is now self-employed.*

**Higton:** Can you tell me something about BBC Transmission's audio testing requirements?

**Packman:** Very often the installation test gear was of a more complex, higher priced nature. We used the Neutrik TT402A in both Operation and Maintenance and Capital Projects. Whereas you might have a cheap portable spectrum analyzer for maintenance, you'd have to have something perhaps two or three times as much on the installation side, where portability was not so important.

Automation is used there for a different purpose, because you need to send a preordained sequence so that the receiving end knows what signal to expect. CCITT 0.33 is extremely important for testing networks. I don't think anybody uses it too much for testing local circuits, but if you can inject the signal at the studio center and leave 0.33 receivers scattered all over the country, and, say, test Radio 3 at midnight on a Tuesday night, you can get performance tests.

You don't want to send a man to spend a whole day to get the results. You need them back to a central point where they can be processed and any problem areas highlighted. There are telephones there, part of the ordinary public dial networks. You have Radio 1, 2, 3 and 4, and you really want to measure both the received and transmitted signals at the site.

So you need to be able to remotely control an eight-way switch. You can automate that, of course. You can call them up on the phone during the day and arm them to go to Radio 3 and wait for the signals.

**Higton:** Do you have many automated desks within the BBC?

**Packman:** At the moment there are few desks which can be remotely controlled, though I believe they are likely to come before very much longer. There are some very simple ones. Portsmouth Guildhall, for instance, has an unattended BBC interview studio, where people can actually go in and be interviewed without a reporter being there. "Mixing" is quite a strong word for it; there are only two microphones there! But automation is certainly coming.

**Higton:** You've talked quite a lot there about automatic testing methods. What about manual testing methods?

**Packman:** Well, manual, to my mind, is what you do once your automatic tests

show you have a problem. But there's also a lot of room for manual testing during development and repair. In the context of transmission, it's more repair.

**Higton:** What about the economics of automatic and manual testing, and the test equipment to do it?

**Packman:** Take the case of testing a radio network. Radio 2 is on 24 hours a day. One of the immediate requirements you get is for something short. So the test has to be automatic. I wouldn't like to do 0.33 as a manual receiver. Even that takes 29 seconds. To do tests during transmission hours, you really have to have something automatic. You have to do it during the night, because there are too many people listening during the day.

Consider what would happen if you did it manually. You'd have to put an engineer at every measuring point. This could well be 3 AM. How many measurement points are you going to do? Let's say two dozen. It's dubious whether you could have one man working up on a dark mountainside.

## SPECIAL REPORT

You might have to have two men in every position. It depends on the site. You are really talking about employing 30 to 50 people at 3 AM. Almost two days' work, because how much work do you get out of them on the normal day before and after? A very inefficient use of staff.

Your costs of doing a manual test are very high. Which tends to mean not so much that you save a lot of money by doing it automatically; it unfortunately means that the tests are not done, which is not a very professional way of going about things. You tend to rely on people to complain that something's wrong.

**Higton:** How has the BBC established how often these tests are to be done?

**Packman:** No simple answer. All I can say is that the BBC would like to do it a lot more often than they, practically speaking, can. I just know that when they are done, typically a lot of problems are highlighted.

**Higton:** What sort of problems do you get?

**Packman:** From my observation of tests over the years, the problem most often is noise. It's something which creeps up on you all the time.

There is another aspect which has caught me out quite a lot, and immediately puts down quite an expensive solution. Modern transmission circuits are not linear. They compand, they do all sorts of things. Therefore you often need something like an FFT to get the right answers.

If you're feeding through something like an Optimod, how do you measure frequency response? You can sit there and do all these tests and then you say, "It's not going to work because that's processing it." To which some people say, "Ah, well you switch the Optimod out when you're doing the test." Which is all very well, but how do you test the Optimod?

There is certainly a tendency which worries me; people are bypassing all the processing sections of the circuit in or-

der to do their tests. So an FFT, although it costs a lot of money, might be something that'll be forced on people in the future. The use of compressors and various other forms of processors is a distinct fly in the ointment these days to testing networks.

Versatility counts a great deal in this business. More and more to do live news and things like that means you've got a lot of measurement to do. Therefore automated measurements are extremely important. But you have to think in terms of coming back to manual if it's wrong as well. So the whole thing is flexibility, availability of manual use, and also the capability of fully automatic unattended operation.

test equipment. You normally talk about test equipment being an order better, but it really has to be an order better than the individual parts, which means it has to be two parts better than the end product.

**Higton:** Have you received complaints from the "man in the street" that you've had to follow up yourself?

**Packman:** On many occasions, yes. A lot of them are actually extremely useful. A lot of people who complain actually do know what they're talking about, and can be very useful.

One of the things nowadays, since the advent of CDs, is that the studio noise and distortion is now considerably below the effects of the transmission net-



**NEUTRIK**  
THE SWISS CONNECTION

**Higton:** Let's make this very consumer-oriented. Why should anybody bother to test to such high standards? Does it actually make a difference in the end to the customer?

**Packman:** There does seem to be a certain pursuit of perfection, doesn't there? If you have a long distributed network you need to be able to exchange modules when they go wrong, and to be able to test those modules to a very high standard so that they slip in without having to retest the whole network each time.

So you do need to measure very accurately. You need to be able to forget the

work. When FM first came out, it was better than anything else around. Playback and sound reproduction facilities have now considerably overtaken it. I would strongly suspect that the weakest link in the chain is probably now the transmission.

I do feel that automatic operation is extremely important for network testing now. You just can't afford to have people stationed all over the country. And what's more, with things in use more and more hours every day, you can't afford long periods for manual tests.



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most important product for broadcasters brought out in 1989" in a *Radio World* article published in the issue of August 23rd.

Jim Stagnitto's not alone in his opinion, either. Modulation Sciences has already shipped over 100 ModMinders to stations in all formats, in cities all across the country. So if you don't have one yet, the odds are your competition does.

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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

Enclosure

It's only been a short while since we introduced ModMinder™ and changed the rules of the processing wars. But it seems everyone in radio has expressed an opinion about this revolutionary digital modulation measurement instrument.

Here's the one that really matters. This letter from Dr. Thomas Stanley, Chief of the FCC's Office of Engineering and Technology, confirms that the ModMinder takes "...valid readings of FM modulation. Equipment meeting the pre-1983 requirements is satisfactory for determining compliance with

the current FM modulation requirements."

We designed ModMinder to meet the pre-1983 requirements. And to measure FM modulation like nothing else, pre- or post-1983. For more information on how ModMinder can help you be louder and cleaner—and legal—call Modulation Sciences at 800-826-2603, toll free.

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Circle 44 On Reader Service Card

# Belar Keeps EZ-101 Neighborly

by Russ Mundschenk, CE  
WEAZ-FM

**Philadelphia PA** RF real estate has become a very valuable commodity due to changes in frequency allocation procedures and deregulation. As more and more stations avail themselves of new power upgrade opportunities, the "people next door" will be that much closer to our doorstep.

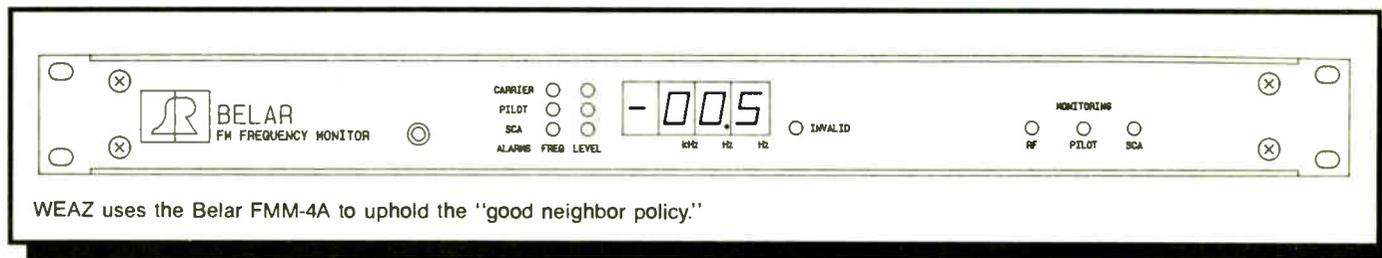
When Belar told us they would be producing a digital monitor, the FMM-4A, that would continuously monitor our main carrier, pilot and subcarrier frequen-

We performed a number of tests on the unit to determine the effectiveness of this averaging function in reducing errors caused by modulation. A stable count with

input levels from producing erroneous readings. When the optional relay interface board is installed, the FMM-4A can be used in a variety of ATS applications.

### Keeping time

The monitor uses a temperature-compensated 6 MHz time base that has a frequency drift specification of better



WEAZ uses the Belar FMM-4A to uphold the "good neighbor policy."

## USER REPORT

WEAZ-FM has been continually committed to close maintenance of modulation and center frequency to uphold the "good neighbor policy."

Since we are short spaced, with co-channel stations in New York City and Washington, DC, we have a significant area of signal overlap midway between

cies, we requested one of the first units.

We installed the monitor at the studio and bridged the on frequency output of the RF amplifier to the unit's RF input. We then connected the pilot output of our Belar FMS-2 stereo monitor to the frequency monitor's pilot input. In this configuration, the FMM-4A can be programmed to automatically alternate between the carrier and pilot frequencies.

The unit also will measure the fre-

quency shift of any subcarrier when connected to the output of a Belar SCM-2 subcarrier monitor. The FMM-4A is frequency agile, and will measure the deviation from any 100 kHz center frequency in the FM band. When coupled to the LO and IF outputs of Belar's RFA-4 frequency selective RF amp, the frequency of any station in the market can be observed.

no modulation could vary as much as  $\pm 50$  Hz with modulation and no averaging. After turning on the averaging function, we observed a maximum 10 Hz change. One of the unit's features I particularly like is its ability to poll the three frequencies in sequence and display each on a 3.5-digit LED readout while performing out-of-tolerance tests. A two-color LED on the monitor is set to alarm if three center carrier counts exceed  $\pm 1$  kHz (yel-

low) or  $\pm 2$  kHz (red). Similarly, two other LEDs give visual alarm status for a 2 Hz pilot or 500 Hz subcarrier variation. A failsafe circuit in the unit prevents invalid counts and low

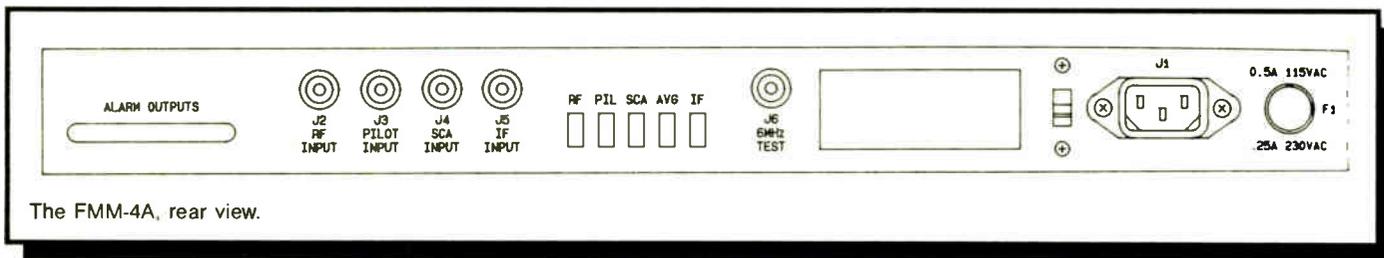
than 5 parts in  $10^7$  per year. That translates to better than 50 Hz per year at 100 MHz. Since we receive an independent frequency measurement each month, the unit's accuracy is easy to spot check. The 6 MHz time base has a buffered output for even more accurate calibration. Where you are and what space you take up are two prime criteria in today's highly deregulated FM band. Monthly frequency measurements by an independent service are good as a check, but without continuous monitoring your station could be operating off frequency for up to 30 days.

An automatic monitor such as the Belar FMM-4A will let you know immediately if something causes your exciter, stereo or subcarrier generator to stray out of frequency tolerance.



*Editor's note: Russ Mundschenk can be reached at 215-667-8400.*

*For more information on the Belar FMM-4A, contact Arno Meyer at Belar: 215-687-5550, or circle Reader Service 23.*



The FMM-4A, rear view.

Philadelphia and these cities. Tests have shown that minimization of the amplitude beat frequency (and subsequent multipath reduction) in these areas can be achieved by keeping as close as possible to our center frequency.

### Repeat customer

EZ-101 has always been impressed with the quality, accuracy and cost effectiveness of Belar monitors, having purchased two FMM-1/FMS-1 monitors (one of them serial number 1) and one FMM-2/FMS-2 monitor. All three units are still in continuous use and none (not even the old guy) have given us a bit of trouble.

quency shift of any subcarrier when connected to the output of a Belar SCM-2 subcarrier monitor. The FMM-4A is frequency agile, and will measure the deviation from any 100 kHz center frequency in the FM band. When coupled to the LO and IF outputs of Belar's RFA-4 frequency selective RF amp, the frequency of any station in the market can be observed.

### Digital averaging

A digital averaging function can be enabled to perform successive averages on each two-second reading. The approximation then becomes the average of the average, and so on.

low) or  $\pm 2$  kHz (red).

Similarly, two other LEDs give visual alarm status for a 2 Hz pilot or 500 Hz subcarrier variation. A failsafe circuit in the unit prevents invalid counts and low

## SNG-1 Earns High Marks

(continued from page 31)

Our measurements show that a properly aligned system can yield 50 dB of separation. But, remember, this is a dynamic measurement with a wide-band test signal. The results you obtain may be less than desirable if all the

system components are not aligned correctly.

On the bench, one can rapidly evaluate the effects of composite processing devices on stereo separation. Measure the separation of the stereo generator directly into the mod monitor. Then insert the composite processing device in series with the generator and mod monitor. It is quite easy to degrade stereo separation 20 dB or more with too much composite processing!

### Satisfies NRSC tests

For AM broadcasters, the SNG-1 meets the requirements of NRSC-1 and NRSC-2 for testing AM radio transmission facilities. The USASI noise pulsed output can be used to measure the audio response delivered to the transmitter and the RF spectrum of the transmitter output.

For any technician charged with the maintenance of stereo broadcast facilities, the SNG-1 is a very useful item to add to your test equipment line-up. In today's rapidly changing world one must use new and fast measurement techniques to stay on top technically. The SNG-1 certainly is one such device. It is modestly priced and, for the time saved and the many new avenues it opens, it is money well spent.



*Editor's note: Bud Aiello can be reached at 703-591-1000.*

*For more information on the SNG-1, contact John Bisset at Delta Electronics: 703-354-3350, or circle Reader Service 6.*

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IMITATED, BUT NOT DUPLICATED

Circle 90 On Reader Service Card World Radio History

# Symetrix Measures Up to WABS

by Bill Ashley, CE  
WABS-AM

**Arlington VA** From the earliest days, audio levels have been of paramount importance to broadcast and recording engineers. This is because, in the physical world, there are distinct limitations on dynamic range. If levels are too high, overmodulation or tape saturation occurs; too low, and your signal approaches the noise floor.

For many years, our measuring instrument has been the analog VU meter. This is an average responding AC voltmeter, with specific ballistics, calibrated in audio terminology.

One VU (volume unit) is equal to 1 dB. In broadcasting and recording, 0 VU is usually made equal to 0, +4 or +8 dBm. The traditional analog VU meter suffers from limitations including limited range, lack of accuracy and fixed ballistics.

Enter now Symetrix with its SX205 Precision Audio Meter, an LED readout

mode is also available; switching from one to the other is accomplished using the front panel mode switches. The hold time, too, is adjustable. One knob controls both displays and is continuously variable from zero to infinity.

The only other controls on the front panel are the screwdriver-adjust calibra-

The other feature, which will probably be of more interest to service technicians than to broadcast and recording engineers, is its ability to measure power amplifier output.

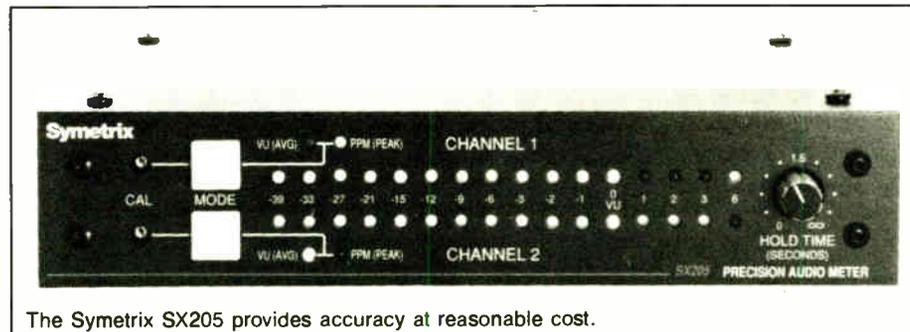
A rear panel barrier strip accepts the input, while two rear panel switches select the power level (100 W or 1 kW) and

be switched into the input circuitry would have permitted the SX205 to measure noise levels, too.

### Silkscreening criticism

One other small criticism I have of the SX205 is the PC board silkscreening. Many of the component designators are under the components they designate. For example, try to find R29 when you're in a hurry. It seems the silkscreen artist has never had to service a piece of electronic equipment.

All in all, though, the Symetrix SX205 is a great device for continuous level monitoring, as an aid in setting up your processing or as a piece of test equipment on your bench. It's compact, easy to use, very accurate, quite reasonably priced and I'm crazy about it!



The Symetrix SX205 provides accuracy at reasonable cost.

tion pots. These merely set the input level for referencing to your system's operating level; they do not affect the unit's accuracy.

### Right on the money

Speaking of accuracy, I compared my SX205 to a laboratory grade AC voltmeter; it was right on the money! Obviously, when Symetrix put the word "precision" in the SX205's name, it wasn't just hype.

Two other features of the Symetrix SX205 should not be overlooked. One is a built-in 1 kHz sine wave oscillator, putting out +4 dBm from a rear panel TS phone jack. This is quite handy in recording and maintenance situations for system level setting.

## ModMinder

(continued from page 36)

ordinary dial-up phone line. Modulation Sciences supplies an excellent introductory software package with ModMinder free of charge. It allows for full remote operation, password protection and a histogram data display not available with the ModMinder alone.

### Histogram advantage

A histogram is a new and very useful way to display modulation information. It makes setting up processing much easier. The ModMinder histogram shows how much time peaks spend at each percentage modulation. Using the arrow keys of the PC, a window showing any 25% of modulation may be displayed. The numbers below the modulation are the percentage of time that modulation occurs.

To sum up, the ModMinder is the first real innovation in measuring modulation in a long time. By applying modern digital technology to measuring and analyzing modulation, ModMinder will pave the way to improved FM audio quality. ModMinder is radical in that it allows for improved quality by reducing processing—without a loudness penalty.

Editor's note: Bill Loveless can be reached at 801-575-7530.

The opinions expressed above are the author's alone. For more information, contact Eric Small at Modulation Sciences: 718-625-7333, or circle Reader Service 72.

the impedance (2, 4 or 8 Ohms). A supplied overlay, calibrated in watts, adheres to the front panel display.

Frankly, I would have preferred the PC board and rear panel space occupied by this feature to have been used for an additional range or two for the line level inputs. An extra 40 dB of gain that could

Editor's note: Bill Ashley has been CE at WABS since 1968. Then it was a full time chief's job; now, it's part time. His full time job is now with Bradley Broadcast Sales in Gaithersburg MD, where he can be reached for comments or questions at 800-732-7665.

Or, for more information, circle Reader Service 39.

## Monitoring Rules Eyed

(continued from page 35)

"The FCC has been operating on an approximation for the interference-causing potential for a given modulation. It may be time to rethink that, given the 1989 technology, to see if there are ways we can measure modulation and assess its interference-causing potential more accurately," says Bob Orban.

Orban finds FCC efforts towards the whole FM issue "pretty paltry by comparison" to those it imparted on AM improvement, largely, he says, because FM presents more difficult problems. Orban's hope is at some point to see an industry committee dedicated to the issues surrounding occupational bandwidth in FM.

### Room for improvement

And are there areas in measurement where radio could stand to see some improvement? Maxenchs, for one, thinks the THD, or lack thereof, of current CD players exposes a shortcoming of today's modulation monitors.

"They're talking about 100 dB down in SNR. I know of no monitor that can look

at an audio signal and measure 100 dB SNR short of a very sophisticated Rohde & Schwarz package or something like that." Thus, says Maxenchs, most monitors can look at SNR down to 75 dB and distortion down to 75 dB, making them unable to measure CD THD.

Frank Foti agrees. "There are a number of areas that could cause a monitor to misread or an exciter to overshoot." Foti says. "As of yet we don't have the ability to control that as much as we would like to. There are still little anomalies that we're working to understand better that deal with the modulation and demodulation of an FM carrier. As we all work harder to eliminate these little nuisances, radio is going to benefit from it."

So this much seems to be clear in the current measurement world: that Modulation Sciences' ModMinder will continue to make news and spark opinion; that the FCC believes its letter to MSI clears up the questions which have surfaced and that measuring techniques—although presently sound in the eyes of many—can certainly benefit from further study.

## TECHNOLOGY UPDATE

meter that is the newest member of the well known SX family. Like the other members of the family, it occupies very little space—one rack unit in height and one half rack in width.

Installation was simple: four screws hold the SX205 to its rack frame, the power transformer cord plugs into the rear panel and two TRS 1/4" phone jacks on the rear panel accept the audio input. The audio inputs are capable of being fed from either a balanced or an unbalanced source; the input impedance is high enough to bridge any source.

One important point regarding the power supply. By using a plug transformer, the SX205 qualifies as a low voltage device, therefore not requiring UL approval. The transformer itself, of course, is UL approved.

### Ideal for stereo monitoring

The SX205 works wonderfully! It has two channels, making it ideal for stereo level monitoring. With the channels one atop the other, viewing both simultaneously is easy.

Both VU (US standard) and PPM (European peak reading standard) scales are available at the touch of a button. Its range is +6 VU to -39 VU. By switching between VU and PPM during a recording session, you're able to quickly determine your peak-to-average ratio, thereby achieving the best level consistent with headroom, dynamic range and signal-to-noise ratio.

My favorite use of the SX205 at WABS (a mono AM) is to parallel the two channels across the audio output of the modulation monitor. Then, with one channel set for average (VU) and the other set for peak (PPM), I'm able to see quite clearly how hard and how well my processing is working.

The smaller the peak-to-average spread, the harder I'm processing. For this use, I have the SX205 set for the bar mode with about one second of hold time.

While I prefer the bar mode, a dot

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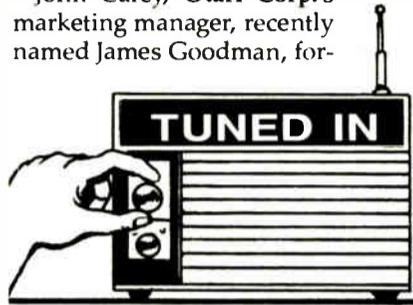
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People ... CCA Electronics has appointed John T. Binsfeld to the post of director of sales. Binsfeld is the former VP at Broadcast Technical, Inc. in New Orleans.

Jed Wilkinson has also joined CCA's Test and Customer department.

Electro-Voice has named Keith Clark as public relations director. Clark comes to the company from the Juhl Agency in Mishawaka, IN where he worked as an account executive.

John Carey, Otari Corp.'s marketing manager, recently named James Goodman, for-



merly the company's eastern regional sales manager, to the position of national sales manager. Carey also appointed Jorge Fuentealba Otari's Latin American regional sales manager.

Orban Professional Products announced new representatives, appointing William J. Ray and Assoc. to represent the company's professional products in the southeastern states (NC, SC, GA, MS, TN) while AMH Sales will represent the company in the Rocky Mountain territory (E. MT, ND, SD, CO, NM).

AKG Acoustics, of which Orban is a division, has established a new marketing staff for its dbx professional products. David Roudebush will perform marketing and sales for North and South America, while doing the same for the Orban division throughout the same area.

dbx Sales in Europe, Asia, Africa and Oceania will be handled by Howard Mullinack in addition to his current responsibilities to Orban in the same regions.

Orban also recognized SIGMET Corp. as the company's "Representative of the Year" at the recent AES show in New York. The company is Orban's independent representative in the Mid-Atlantic states.

Meanwhile Harris Corp. has named Jim Burke as its director of media relations, where he will be responsible for working with local, national and international media on corporate-related issues. Burke comes to Harris from IBM, where he served on the company's marketing and corporate public relations staff.

Wins contract ... Continental Electronics has received a large contract to supply broadcast transmitters to three radio stations in Mexico. Two stations, XEPRS in Tijuana and XEG in Monterrey will install a total of three 50 kW Type 317C-3 transmitters, while station XHRL in Monterrey purchased a Type 815A 5 kW FM transmitter.

New service center ... Electro-Voice has opened a new full-line service center in Richmond Hill, NY. The facility, operated by ECS Inc., will provide service for the eastern region of the United States. The telephone number for the new facility is 718-846-2600.

Company founded ... The founding of JNS Electronics has been announced by John Leonard, formerly of Gentner. The new company is associated with JNS Electronics Pty. Ltd. of Australia and will design, manufacture and sell audio, video and RF products to the broadcasting, communications and telecommunications industries. For further details, call JNS Electronics at 408-729-3838 or write to POB 32550, San Jose, CA 95152.

Awarded patent ... Gentner Electronics Corp. recently announced the issuance of US Patent No. 4,872,195 for the technology used in its VRC-2000 radio and TV remote control unit with synthesized voice reporting.

Earnings reported ... For the first quarter ended 29 September, Harris Corp. reported net income of \$25.6 million, an increase of 11% from last year's totals during the same period. Sales for the quarter were reported at \$722.7 million, compared with \$430 million a year ago.

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