

Radio World

**RUNNING
RADIO**
A new section,
beginning in this
issue of **RW**.
See pp. 25-29

Vol 16, No 2

Radio's Best Read Newspaper

January 22, 1992



Music City, U.S.A.:

The RAB's Managing Sales Conference takes place at the Opryland Convention Center in Nashville. For details, see p. 25.

AM Rules Create Mood Of Cautious Optimism

by Alex Zavistovich

WASHINGTON Now that broadcasters have had a chance to look over the FCC's AM technical rules, opinions about the rules' impact on the band are mixed, but generally optimistic.

The FCC's Report and Order on the AM technical review was adopted Sept. 26, 1991. The text was released Oct. 25, 1991.

At least one consulting engineering firm believes broadcasters can work with the new rules, although the FCC's so-called

"ratchet" provision, which requires a 10 percent power reduction for voluntary modifications, is considered an impediment to upgrades.

The NAB also seems satisfied with the new rules. The association planned at press time to file a petition of reconsideration only to clarify two minor aspects of the FCC's rules.

As for stations, **RW** contacted broadcasters who were authorized to move to the expanded 1605 kHz-1705 kHz band under the new rules. All those contacted were cautiously optimistic about the relocation of their stations. They were primarily concerned about the cost of such a move, and further linked a successful relocation with development of an in-band digital audio broadcasting (DAB) system for AM.

NEWSWATCH

CNN Joins AfriSpace

WASHINGTON AfriSpace and Turner Program Service International have announced an agreement that would allow AfriSpace to carry CNN radio programming to Africa.

AfriSpace plans to begin satellite-linked programming to Africa and the Middle East by 1993, using digital transmission on S-band. The FCC granted AfriSpace experimental authority in June 1991.

AfriSpace President Noah Samara said "CNN will find a vast audience in Africa" and will become a primary source of information to the continent.

According to the AfriSpace plans, CNN will mix the CNN signal in Washington, D.C., then link it to its satellite, AfriStar 1, which will be located at 12 degrees west. The satellite will then beam signals to the specially built AfriSpace radios.

AfriStar 1 is now under construction by International Technologies, Washington D.C., according to AfriSpace.

DAB Meeting Cancelled

WASHINGTON The NAB's Digital Audio Broadcasting (DAB) Task Force's Technical Advisory Group (TAG) cancelled its Jan. 23-24 meeting due to a "lack of interest." The meeting was scheduled to allow various DAB systems proponents to reveal technical information about their particular system.

According to TAG Chairman Don Wilkinson, the group cancelled the meeting because most of the in-band systems proponents were concerned about revealing proprietary information.

continued on page 2 ▶

Canada Pursues L-Band DAB

by James Careless

TORONTO The FCC will not be budged from its support for 2.3 GHz (S-band) for digital audio broadcasting (DAB)—despite new Canadian field tests showing L-band to be an efficient DAB transmission medium.

That's the word from FCC International Division Engineer John Reiser, who also is the U.S. chair for CCIR Study Groups 10 and 11. "The U.S. has established its position . . . the research in Canada cannot change the U.S. position," Reiser said.

He added the U.S. still intends to pursue the S-band allocation for DAB at next month's World Administrative Radio Conference (WARC) in Madrid.

The DAB research in question comes from a test conducted in Toronto. In early December, the Canadians verified earlier analog L-band propagation characteristics that had been compiled in Ottawa and Montreal in mid-1991.

What made the December test different (and significant, according to L-band DAB proponents) is that this time the Canadians broadcast actual DAB terrestrial transmissions on 1497 MHz to a mobile Eureka 147 receiver mounted inside a roving mini-van.

This was not just a simulation, but a test under actual conditions, test engineers said. The results revealed that L-band can deliver low-power DAB signals over a large area, according to Steve Edwards, chairman of the Canadian Association of Broadcasters' (CAB) Engineering and Technology Council.

Using a 1,300 ft. transmit antenna that broadcast nine channels of 200 watts ERP each, "our average reach was 45 kilometers" during the test, Edwards said. "We were limited not by signal, but by terrain."

As well, these L-band DAB signals showed surprising robustness, Edwards said—even when received inside an interior room with all doors closed.

The bottom line is that "watt for watt, DAB at 1500 (MHz) covers about the same as FM," he noted.

Despite the validated performance of DAB at L-band, NAB digital communications engineer Ken Springer isn't surprised at the FCC's continued opposition to L-band. "I don't think the U.S. position was based on any technical consideration. It was based on the fact that it was a compromise between the Department of Defense and the Communications Commission (FCC) on what spectrum would be available . . . that's what it really came down to, and I don't expect that this test will do much one way or another" to change the U.S. position.

"Upbeat" reaction

Ron Rackley and John Lundin, partners in the D.C.-based consulting firm of du Treil, Lundin & Rackley, said their company is "upbeat" about the FCC's new technical rules.

According to Rackley, technical allocation studies under the new rules "haven't found a whole lot of difference in nighttime studies" from the old rules, except

continued on page 10 ▶

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NEWSWATCH

► continued from page 1

tion in the presence of other system proponents. Most decided not to attend.

Two proponents of Gannett's USA Digital Radio—"Project Acorn"—are members of TAG, but they had promised to leave the room during the meetings if the presenting systems' proponents objected.

Wilkinson said he understood the in-band proponents' concern about revealing proprietary information, but said, "we need to get the information to properly

advise the (DAB) task force."

At presstime, the TAG meeting had not been rescheduled.

BOCA Seeks Approval
WASHINGTON The Broadcast Operations Coordinating Authority (BOCA) has requested the FCC approve it as the frequency coordinating body for the 1992 political party presidential nominating conventions.

The volunteer committee has also requested the FCC assign temporary operating authority to BOCA for communications

equipment in UHF channels 16 and 18.

According to ABC's Mike Chiarulli, BOCA's chairman, frequency coordination requests received after Feb. 3 will be accommodated on an as-available basis. Request forms can be obtained by contacting Chiarulli or Joseph Nuzzo at ABC: 212-887-3442/3969. Requests will be handled on a first come, first served basis.

NPR Names Lockett as VP
WASHINGTON National Public Radio has named Donald Lockett as VP for Audio Engineering. Lockett has led the division in an acting capacity since Oct. 1, 1991. He had

been NPR's director of engineering and operations since Jan. 1987.

Lockett is a member of the Society of Broadcast Engineers and the Society of Motion Picture and TV Engineers. He is also a technical advisor to the NAB's Digital Audio Broadcasting Task Force. He is a 1970 graduate of Virginia State University, and received an M.S. degree in Television and Radio from Syracuse University in 1974.

NAB Fly-In Set
WASHINGTON The NAB will hold its annual Radio Group Head Fly-In Feb. 10-11, 1992 at the Grand Hyatt in Washington, D.C.

Topics for discussion will include digital audio broadcasting, LMAs, marketing strategies, sales problems/opportunities, stretching operational dollars, income-producing plans and recruiting and retention.

Cost of attending the fly-in is \$225 for NAB members, \$350 for non-members. For additional information or to register, call NAB Radio at 202-429-5402.

Kayla Goes Public
CLEARWATER, Fla. Kayla Satellite Broadcasting Network, Inc. is offering up to 400,000 units of securities at \$10.50 per unit. Each unit consists of two shares of common stock and one redeemable common stock purchase warrant to purchase one share of common stock at \$6.50 per share.

Kayla, a Wisconsin corporation, is owner of the Sun Radio Network and the North America One Satellite Network (see related story, above).

The offering is being managed by A.B. Watley, Inc. For more information, contact Charles Badalamenti at A.B. Watley, 1026 Harvard Place, Fort Lee, N.J. 07024, or call 800-728-8434.

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Jay David Saks Brings Met to Radio

Editor's note: In the Jan. 8 issue of RW, correspondent Frank Beacham explored the intricate technology used in broadcasting the New York Metropolitan Opera worldwide. In this issue, Frank talks to the Met's music mixer, Jay David Saks, one-on-one prior to the start of the 1991-'92 season.

NEW YORK For the millions who listen each week to the Metropolitan Opera live on the radio, from New York's Lincoln Center, the ears of Jay David Saks are the key to their interpretation of each broadcast performance.

A veteran producer of classical and Broadway soundtrack recordings for the RCA Red Seal Label, Saks is faced each week with the challenge of pleasing listeners ranging from audio purists with exotic sound systems to buffs with tiny portables.

RW: How do you approach an opera broadcast for radio?

Saks: Well, it's live. Once you start you can't stop. It's not like a recording session where if you don't like what you have, you can call a halt to the proceedings and make adjustments. And because it's a live performance in front of a paying audience, you can't place microphones everywhere you would like. If I didn't have an audience, I'd put those microphones in some significantly different places.

RW: Describe your basic radio broadcast set-up at the Met.

Saks: On the stage, from left to right, we set up eight microphones. Those eight microphones are grouped into four pairs: left, right center, left center and right. Each pair consists of a shotgun (Neumann KMR-82) and a cardioid microphone (AKG C-460B). We use about 10 microphones in the orchestra pit. Most are cardioid . . . some omni. They are a little closer to the instruments than I would like.

About 80 feet above the orchestra pit

we have two microphones for a diffuse blend of the orchestra and also audience applause. We have a pair of mics that



Jay David Saks checks lineup of a microphone in the orchestra pit at the Metropolitan Opera.

hang from a lighting bridge about 30 feet upstage—usually 50 to 80 feet in the air—to pick up off-stage music or singing that would be clearly heard in the house but which might be too soft for broadcast.

RW: How do you approach the stereo mix?

Saks: I do a full wide stereo mix. I pan the orchestra full from left to right. I pan ambience hard left and right. I try to be generally faithful to what the stage action is but I don't feel like I'm locked in to doing it exactly.

RW: Do you have feedback with the director of each production?

Saks: Never, never! No feedback with anyone from the artistic side. I generally have no contact with the artist and I think it's better that way. I guess you can deduce that the artistic director of the house (James Levine) trusts my work. Most of

them know what these broadcasts sound like and they are a known quantity. I don't want this to be taken the wrong way, but I think we do a pretty good job here and I think they know it. They leave me alone.

RW: What about processing?

Saks: With radio we use compression. For me there are two pairs of limiters (dbx 160X) which are essential. There's a pair for vocals. A lot of opera singers have voices with huge peaks, which come out on certain notes and then drop back down again into very little level. They have a tendency to get swamped by an orchestra, or they force us to have the general level setting rather low to accommodate the peaks.

We limit the entire mix of the vocal microphones first, and that comes out of the stereo mix. Then we combine it with the orchestra and the ambience together. That combination of orchestra, ambience and compressed vocals goes through yet another pair of compressors for an overall compression.

RW: You also add reverb with a Lexicon.

Saks: Without it, the house would sound dry. The pit itself is dry and the microphones are close in there. The stage is dry

as well. I found that without adding artificial reverb it has that kind of dead, as James Levine says, "newsreel quality." We carefully set up the reverb to bring a little more life, a little more depth, a little more detail.

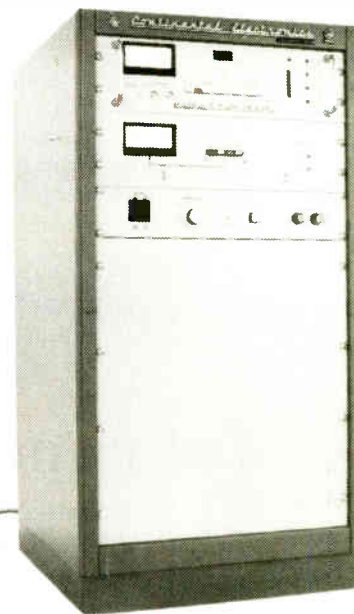
Purists will argue that we are not presenting the real Met. That argument means nothing to me. The minute the sound goes through microphones it's subject to the mix. I don't regard this as some kind of scandal—that we are adding reverb. It simply makes the sound better.

RW: So you ride 22 microphones live on a Studer board. What goes on during the broadcast?

Saks: I don't do one of these set 'em-and-forget 'em mixes. I am constantly adjusting things as we go. I usually know the operas well or at least fairly well. I have the music in front of me, I have the full orchestral score. I'm a trained musician. I follow the score.

I have a view of the stage. I have a closed circuit monitor to watch the conductor. I'm really in touch with everything that's going on. I'm trying to give the broadcast the qualities of a good recording but with the presence, excitement and values of a live performance. Sometimes we get it.

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Time Flies When You're Having Fun

by Alex Zavistovich

WASHINGTON I'd be willing to bet most of you out there haven't fully recovered from making the rounds during the fall convention cycle—I know I haven't. Well, break the news to your feet: The winter and spring show cycle is getting ready to roll.

That's right, a whole new roster of conferences, expositions and trade shows, each of them paving the way for the NAB spring show in Vegas, April 12-16. Here's just a sample of what's in store for you:

Coming up this weekend is the National Religious Broadcasters' (NRB) 49th Annual Convention and Exposition. It will be held Jan. 25-29 at the Sheraton Washington Hotel in Washington, D.C. For more information, contact the NRB at 201-428-5400.

The Michigan Association of Broadcasters will be holding its winter conference (formally known as the Great Lakes Broadcast Conference and Expo) Feb. 25-26 at the Lansing Center in Lansing, Mich. For more information, call 517-484-7444.

The National Association of College Broadcasters (NACB) is planning the Midwest Regional Conference of College Broadcasters for Feb. 7-8 at Indiana University in Bloomington, Ind. The 4th Annual Western Conference of College Broadcasters is slated for Mar 20-22 at the University of Southern California, Los Angeles campus. And the 3rd Annual Nid-Atlantic Regional Conference of College Broadcasters is scheduled for April 4 at Luzerne County Community College, Nanticoke, Pa. For more information, contact NACB at 401-863-2225.

For those of you with more cosmopolitan interests (and a bank account to match), the 92nd Audio Engineering Society (AES) convention will be held in Vienna, Austria. More information can be obtained by phoning the AES at 212-661-8528.

The National Federation of Community Broadcasters (NFCB) has scheduled its Annual Community Radio Conference March

12-15 in Seattle, Wash. The Conference will feature the NFCB's Golden and Silver Reel awards for creativity in community radio broadcasting. For more information, contact Wendy Muzzy at NFCB: 202-393-2355.

Speaking of awards, the Broadcast Promotion & Marketing Executives (BPME) International Gold Medallion Awards Committee is calling for entries in its 31st annual awards competition. The contest includes print, audio and video entries introduced between Jan. 1, 1991 and Dec. 31, 1991.

The deadline for entries for the BPME competition is Feb. 8, and winners will be announced during the BPME & BDE Conference & Exposition, to be held June 14-17, likewise in Seattle. Information and entry forms are available at BPME's Los Angeles headquarters. Contact Spencer Mains or Susan Morrell at 213-465-3777.

Whew, I'm worn out already.

Of course, there's one conference that I missed, and it's only a week away. The Radio Advertising Bureau's Managing Sales Conference will be held Jan. 30-Feb. 2 at the Opryland Convention Center in Nashville, Tenn.

**Pilot
Tone**
... Radio A to Z

This year the RAB's tackling the touchy subjects of survival and adaptation in a changing economic climate, and it's the main topic of a brand new section of *RW*, which we have cleverly entitled *Running Radio*. Managing Editor Lucia Cobo is at the helm of this new section, which will appear monthly in *RW*.

In addition to her preview of the upcoming RAB conference, Lucia talked with the bureau's new president, Gary Fries. The interview sheds some light on Fries' long- and short-term goals for the RAB. Finally, a contribution from Professor Sammy Parker of Murray State University in Murray, Ky. provides some tips on staying profitable when the economy seems to be going against you.

Look for *Running Radio* in *RW* every month. These days, it pays to stay on top of all aspects of the broadcast industry, and *Running Radio* is our way of helping you do just that.

★★★

We've all heard clever commercials before—heck, the *really* good ones are recognized with annual awards like the BPME Gold Medallion competition I mentioned earlier. But have you ever heard one so good you felt like calling up the station to *request* it? The listeners of WCLV-FM in Cleveland, Ohio have. And station management listened.

Heinen Food Stores in the Cleveland area has been running a series of three 60-second spots that satirize the Metropolitan Opera broadcasts carried by WCLV, a fine arts station that serves northern Ohio. The spots are so true to the Met style that, according to WCLV Program Manager Robert Conrad, listeners kept calling to ask when the commercials were scheduled, so they could tape them.

In fact, listener reaction was so heavy



Is The Boss really a Golden Oldie?

that the station decided to air the spots as *programming*! At 4:15 p.m. on Dec. 26, during WCLV's program of popular arias, the station ran all three commercials *at no charge to Heinen's*.

Wow. All I can say is, these must be killer commercials. With radio ad sales being relatively soft this past year, to run three spots during early p.m. drivetime free of charge is downright amazing. The phones must have been lit up like crazy to get a station's attention like that. And you know Heinen's wasn't complaining about the extra promotion.

On another note, I got a taste of what it's like to be a real old-timer the other day, as I was looking over the Top 500 Oldies from WCBS-FM in New York. The station compiled this list as its end-of-the-year blockbuster.

In among the usual suspects, like Bobby Darin, Elvis Presley and Frankie Lyman and the Teenagers, I was dismayed to see such "dinosaurs" as Kenny Rogers, Billy Joel, and Bruce Springsteen!

Yes, I know that some of these guys have careers going back 20 years now, and of course Led Zeppelin's "Stairway to Heaven" probably does qualify as an Oldie these days (it was listed too, by the way), but there's nothing like having those names staring you in the face on a list like that to have the point hammered home: You're not getting any younger.

There it is, in print. Man alive, time is flying by. Bruce Springsteen is an Oldie, John Cougar is a grandfather... I better stop, I'm wearing myself out. Isn't it time for my nap? Where's the Milk of Magnesia?

Oh, yes, one last item: Congratulations to *RW* columnist Dee McVicker, who on Dec. 5, 1991 gave birth to a seven-pound, 15½ ounce baby boy. The little guy goes by the name of Dylan Todd Adams, carrying the surname of his father, Chuck Adams of Circuit Research Labs.

All of us at *RW* wish wee Dylan a belated Happy Birthday, and we're incredibly envious that Chuck and Dee got another tax deduction so late in the year (although we're glad not to have to wash those diapers—yuck).

That's it for now. Tune in next time,

Alex

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Crowley on the money

Dear RW,
Steve Crowley's article entitled, "Do Microwaves Cook S-Band?" in the Nov. 20, 1991 issue of RW was right on the money.

We got interested in the effects of microwave ovens because one of our clients in Sao Paulo, Brazil was having problems with his MMDS system. The government of Brazil had granted him frequencies in the 2300 to 2400 MHz band. We suspected microwave ovens.

Our engineers researched everything they could learn about microwave ovens, the klystrons which drive them and even the government mandated radiation standards. As near as we could learn, all microwave ovens, no matter where they are made, operate at a center frequency of 2400 MHz, ±50 MHz. Therefore, anything operating between 2350 and 2450 is subject to interference from these popular household and restaurant devices. Even though they are properly operated and maintained, the permissible radiation is enough to overload sensitive receiving front ends.

Jack A. Rickel, President
Comex Worldwide Corp.
Miami, Fla.

EBS's problem not the system

Dear RW,
I look forward to every issue of your paper, especially *Readers Forum*. For the first time, I am adding my two cents.

This is in response (rather belatedly) to the WCBS EBS issue. But since it was voted number 3 of the Top Ten for 1991 (RW, Dec. 25, 1991), I wanted to air my views.

I feel that the idea of re-vamping the entire EBS system due to the WCBS incident is akin to throwing the baby out with the bath water. As best I can see, the failure was the result of *people* not learning how EBS works.

Here in the Pioneer Valley, we were also at risk from Hurricane Bob. The EBS was activated in our area, too. It worked at WMUA without a flaw. The CPCS-1 station (WHYN-FM) activated our EBS re-

ceiver/recorder. The message went onto cassette. The operator at WMUA (John Vasquez) interrupted his show, activated the two-tones, then ran the cassette message on-air. There was no panic in the control room. John had been trained exactly how to perform this procedure, and did so without consulting me. Where's the "failure of the system"? I don't see one.

What is most important to make note of is that WMUA is a 1 kW FM station operated by the *students of the University of Massachusetts*. If EBS can work in an environment where there is a different operator every three hours, each day, it is beyond my comprehension why it cannot work where there is a regular staff five days a week. It worked because the operator knew what to do.

Before we start pulling EBS apart, I think we should look closely and honestly at whether the problem is truly with the *system* or with the *people who use it*.

No system that we adopt will work unless we learn to use it and make sure that the people who are "at the switch" know what they are doing.

Dan Ferreira, CE
WMUA Radio
Amherst, Mass.

RDS: An opposing view

Dear RW,
For over a year RW has run stories about RDS, implying that it was going to be a valuable innovation for broadcasting. RDS or RBDS may prove to be nothing of the sort!

First of all, automatic station format identification and selective scanning will reduce the likelihood of a listener discovering a different station/format that they just might enjoy.

Second, if your creativity flourishes and you invent a new format, you may not have an available code, short of "miscellaneous," with which to identify it.

Third, how many broadcasters will honestly switch codes to agree with day-parted format changes? The pressure will be on to keep the most popular code up all the time.

Fourth, after we spend lots of money on hardware that in no way improves our signals, who will really benefit? Might it be the radio manufacturers? After all, it will provide them with more bells and whistles for sale of their products, a superficial improvement that does not require them to provide better RF or audio performance, which they feel is not very marketable anyhow.

Fifth, RBDS may actually degrade our signals! Many of my FM clients have intentionally avoided any subcarriers so that they could maximize the quality and loudness (modulation depth) of their primary program audio. Those who do run SCAs have switched from 67 kHz to 92 kHz to reduce the birdies and crosstalk that inevitably occur in very rugged multipath-prone terrain. A 57 kHz subcarrier, even at the proposed three percent injection level, will add noise to FM stereo reception in multipath-prone areas.

There is one plausible use for RBDS that would not require full-time degradation of our carriers, could enhance our service to the public and would eliminate a programming annoyance. EBS tests could be run

Learning Survival

From 1991 up to the present, the media—television, print and radio alike—have had some tough times. Advertising expenditures decreased in most categories and in most markets. Through it all, though, radio has fared better than its visual or print counterparts.

Now another bright spot is emerging on the radio horizon, in the form of the re-energized Radio Advertising Bureau. Under the leadership of newly-chosen president Gary Fries, the sales association is mounting a drive to rejuvenate the radio business. The RAB already has targeted radio creative (throwing its name and support behind Group W's Radio Creative Fund) and sales training (allowing George Hyde, executive VP, to concentrate on improving and expanding the RAB sales seminars).

The RAB also is striving to provide better service to its members by, among other things, slashing registration costs to the Managing Sales Conference (MSC), to be held January 30 through February 2 at the Opryland Convention Center in Nashville. The timing couldn't be better; this year's conference will be an important one.

Many operators worry about DAB and the future of radio, but many more want the tools and skills to ensure they survive *now*. The MSC is one sure way to acquire those tools and learn those skills.

The RAB is promising a "radio survival school" of sorts at the conference (see story, page 25). The training seminar roster reads like a "Who's Who" of radio sales training. Seminars are designed to give attendees systems they can implement immediately upon returning to their stations.

The RAB deserves the support of the industry it is trying to serve. Operators and sales executives, small and large market alike, can benefit from the three intensive days of sales classrooms that the RAB is hosting.

Radio has consistently proven itself to be a resilient medium. Attending the MSC is one way to find a way to survive in these lean economic times and stay on the cutting edge in the business of radio.

—RW

without disrupting normal programming and traffic bulletins or other occasional travelers information could be broadcast to listeners. And the subcarrier need not be injected when idle.

At a time in our technological history with DAB promising to smite FM broadcasting because of its potential to provide direct wired sound quality through the ether, is it not great folly to consider adding ancillary bells and whistles that will further burden our ability to deliver a good primary product over the analog airwaves?

Ira A. Wilner
Wilner Associates
Putney, Vt.

More on front end mix

Dear RW,
I read with interest Cris Alexander's new column *Feed Line* in the Oct. 9, 1991 RW. (I always read Cris Alexander's articles.) I disagree with one of his comments at the end related to "receiver front end mix."

Intermodulation interference, regardless of the source, is considered by the FCC as a matter not beyond the control of the broadcaster. Section 73.317(a) requires that spurious emissions from the FM transmitter comply with Section 73.317(b) through 73.317(d) but goes on to say that regardless of compliance with these subsections, "... should harmful interference to other authorized stations occur, the licensee shall correct the problem promptly or cease operation."

In the case of a new facility, the FCC has, upon receipt of extensive interference, revoked program test authority and required the new facility to first demonstrate compliance with Section 73.317. Once it is determined that the problem is due to receiver generated intermodulation interference, the FCC will require that the new facility establish a procedure and promise to correct the problem. Then the FCC will issue limited program test authority, renewable only upon submission of satisfactory progress reports.

Fortunately, the Commission is follow-

ing the guidelines of Section 73.318 (blanket rules) and does not require treatment of portable or automobile receivers, because of their transient nature. Regardless, this can be a troublesome and costly problem that should be carefully evaluated whenever two or more FM transmitters are located near each other.

You will notice that I refer to this form of interference as "receiver generated." An earlier title that has become popular is "receiver induced third order intermodulation effect." I object to the use of the word "induced," since the intermodulation product is not induced into the receiver. The two authorized fundamental frequencies are induced into the receiver, but the intermodulation product that causes the interference is generated within the receiver.

Charles I. Gallagher
Gallagher & Associates
Clarksville, Md.

Fee-free broadcasting

Dear RW,
What about the abolishment of the \$35 licensing fee the FCC charged for about a year? Non-comm broadcast stations (such as WMCO) were required by FCC law (passed in 1990) to charge \$35 to license our future on-air personnel.

When I was licensed (oh, so long ago!) there was no such thing as a charge—God forbid the FCC be cruel to broadcasters—and our new incoming staff felt a little betrayed, with good reason. The number of in-comers didn't diminish too much in 1990 and early 1991, despite the charge.

Now that our friends at the FCC have recently abolished the ugly \$35 license fee for non-comms, those who had to pay felt screwed over (again, with good reason). It feels like "business as usual" for our station—and the rest of non-commercial radio as well, I'm sure—without that infamous \$35 pall over our headphone-clad ears.

Shannon A. Mayfield
WMCO-FM
New Concord, Ohio

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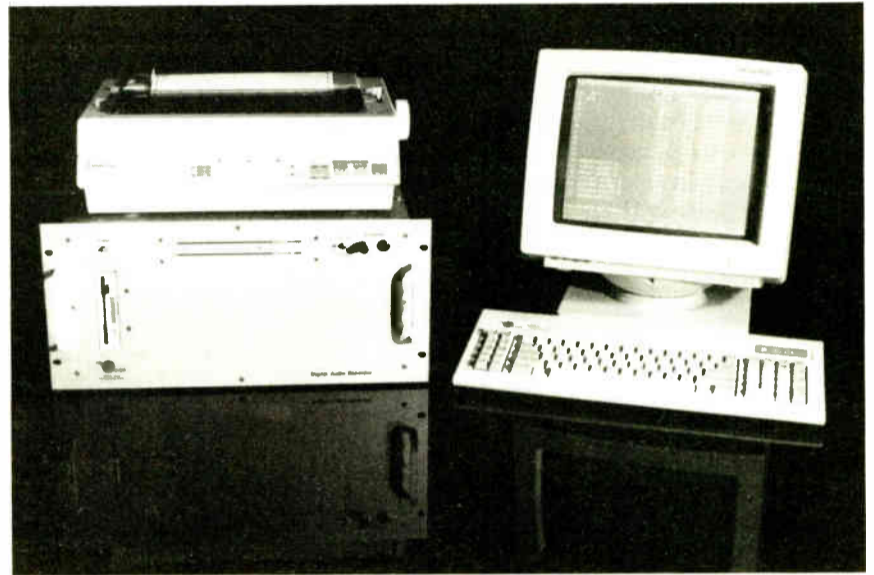
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Study Examines Sibilance Distortion

by John Gatski

STELLENBOSCH, South Africa A South African engineering professor has concluded that overmodulation of the carrier can cause distortion of the sibilance sounds (S's) that sometimes occur in FM receivers, according to a study printed in the September 1991 "IEEE Transactions on Broadcasting."

Based on a laboratory model and technical assistance from the South African Broadcasting Corp., University of Stellenbosch Electrical and Electronic Engineering Professor J.G. Lourens said that overmodulation after pre-emphasis can cause the hiss-like, sibilance distortion that is more predominant with female voices on FM.

The study recommended using clipping after pre-emphasis to eliminate the problem, and it mentioned that newer FM transmitters already are being equipped with clip peak deviation at 100 kHz.

According to his predictive model, Lourens said that "when this overmodulation

happens, the instantaneous frequency of the overmodulated carrier falls outside the receiver's intermediate frequency (IF) filter. This will cause a loss of the carrier to be demodulated, resulting in the

The study recommends fixing the problem through the use of clipping.

demodulation of the RF noise."

The report noted that when overmodulation of the sound occurs, the receiver will produce the offending off-station noise, instead of reproducing the modulating signal.

Lourens cited several elements of "circumstantial evidence" for his research. First, he said, the phenomenon became prominent over the last 10 years as the frequency range improved in audio equipment. In essence, he said, the equipment

can pass more of the power in the wide-band sibilant sound range.

"This causes the distribution to be wider, which in turn increases the chance of the instantaneous frequency falling outside of the IF filter band," Lourens explained.

The study also said that the receivers are now being made with IF filters that cut off sharply, giving better adjacent channel and noise interference protection, "but at the same time, the signal is largely attenuated if the instantaneous signal falls outside the IF band."

The problem is exacerbated in car radios because radio signals tend to be weaker, the report added.

The study recommends fixing the problem on the transmission end through the use of clipping.

"The solution is to clip the modulating signal after pre-emphasis to a level that will ensure that the instantaneous signals will stay inside the IF band," according to the study. The maximum deviation could be limited to 100 kHz of either

side of the center frequency.

Lourens said that clipping does alter the sound somewhat, especially the "noise-like S" sounds, because they have frequency content that is amplified by the pre-emphasis.

"The spikes will be clipped by the proposed solution, which means distortion to a certain extent. However, because these spikes are so fast and so few between, this clipping action hardly has any influence on overall power.

"Clipping harmonics do create some noise and distortion because of the attenuation through de-emphasis, but since S's are mainly noise the small amount of added noise will not be noticeable."

Modulation Sciences Offers Peace of Mind

SOMERSET, N.J. Modulation Sciences is offering something rare among broadcast equipment manufacturers—a guarantee against FCC fines for overmodulation, providing you use the company's ModMinder modulation monitor properly.

The company recently kicked off a campaign promoting "The Program," which guarantees that customers who purchase the ModMinder along with the DemodCard will not be fined for overmodulation.

If a customer enrolled in "The Program" meets its conditions and is fined, Modulation Sciences will provide legal representation to defend the station or pay the fine.

Modulation Sciences President Eric Small said the guarantee is the result of strict production standards and the highest quality calibration. ModMinders also are

calibrated directly traceable to the National Institute of Standards and Technology's (NIST, formerly the National Bureau of Standards) standards.

The ModMinder is guaranteed within one percent from 0 to 50 degrees centigrade (32-100 degrees Fahrenheit) for two years. After two years, the guarantee calls for the ModMinder to be sent back—at the customer's expense—to Modulation Sciences for recalibration.

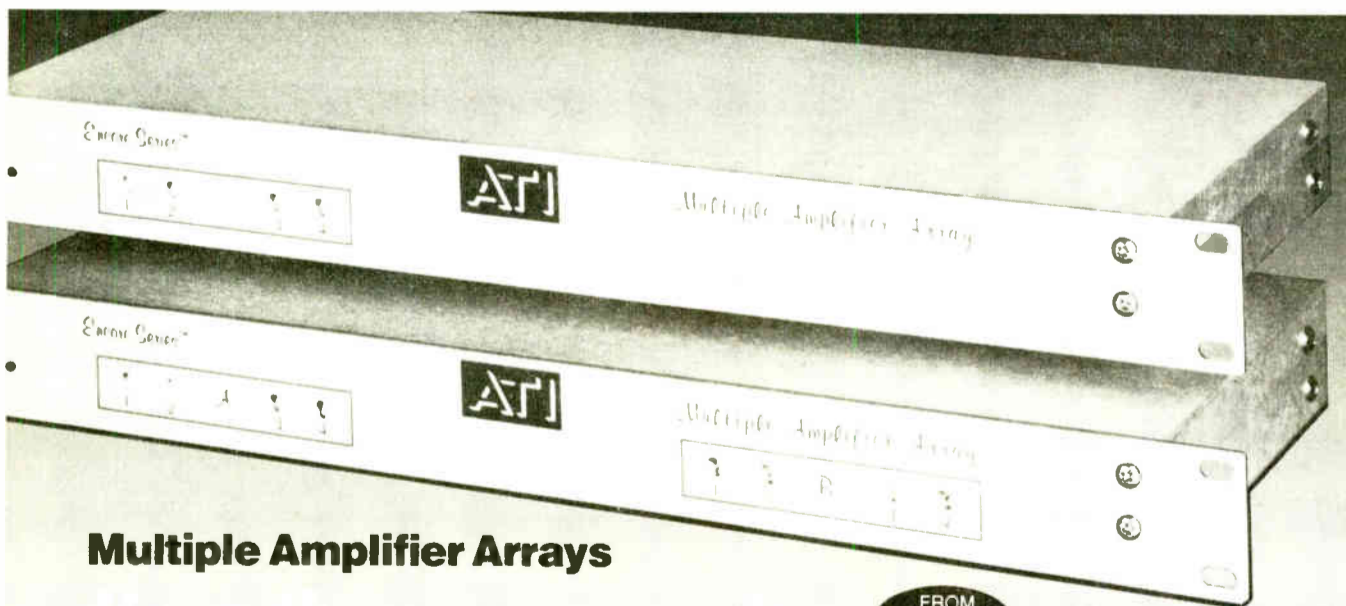
Under "The Program," calibration is sealed. If the seal is broken, the guarantee is void. To make sure that the provisions of the guarantee are adhered to, (that is, that the station is not purposely overmodulating), Modulation Sciences will check the monitors at "random intervals" via ModMinder remote software.

Under the terms of "The Program," if

the station is found to be overmodulating more than twice in random checks, the guarantee is terminated. The program also is terminated if Modulation Sciences cannot contact the ModMinder via remote after five attempts in three days.

The ModMinder meets the current FCC-approved pre-1983 deregulation FCC modulation response time, enabling it to ignore very brief peaks, often allowing a significant increase in legal modulation, depending on the audio processing used, according to the company.

Small told RW that "The Program" is a kind of insurance against overmodulation and is based on ModMinder's high quality. Said Small: "ModMinder goes a long way towards removing the setting ambiguities and subjectivity in modulation for competitive radio."



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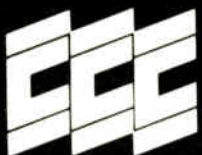
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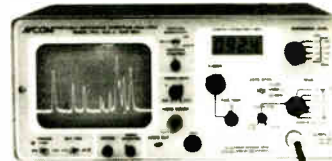
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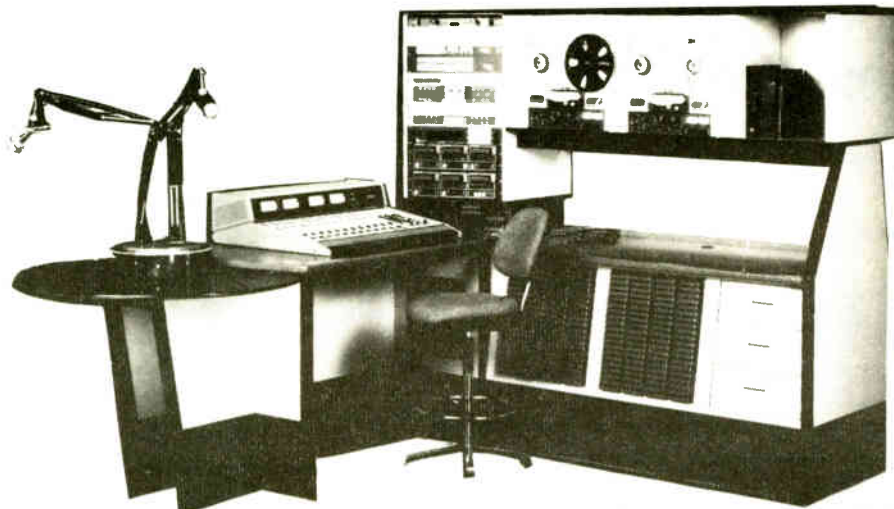
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KPFA Renovates Facility Despite Oakland Hills Fire

Listener-Supported FM Raises Funds for Facelift

by Pamela Watkins

BERKELEY, Calif. Employees of KPFA-FM (94.1) were happy to move into their new facility last fall, but they had to endure one more hardship before the move was completed—the devastating Oakland Hills fire.

KPFA is a listener-supported radio station with an eclectic, multi-cultural, rambling format. The station spent years operating from a rundown old rooming house.

Station Manager Pat Scott said that KPFA, as part of the Pacifica Foundation network of five stations, realized it would be more prudent to purchase and update its own building instead of continuing to pay \$4,500 per month for the old place. The station raised \$2.5 million of its \$3.5 million needed for the complete renovation in just two years.

KPFA Program Director Melanie Berzon said, “we moved into a clean, newly-equipped, bright, light facility and I think people’s attitudes changed. People began to enjoy rather than dread coming to work.”

After purchasing the new building on Martin Luther King Way, engineers started wiring the main studio and work progressed well—until October.

On Oct. 20, the Oakland hills blazed with windswept, drought-fed flames. Many residents lost their homes, and KPFA lost its signal. Unlike other radio stations in the area, which have their transmitters located on top of San Bruno Mountain, KPFA has its 59 kW transmitter located in the Oakland hills.

As the flash inferno raged, KPFA went off the air because the telemetry lines burned up. “We have a microwave (STL link) between the station and the transmitter; the remote control of the transmitter from the station is done through phone lines. So when those phone lines burned out (during the fire), the transmitter automatically shut itself off,” KPFA Operations Engineer Michael Yoshida said.

Under normal circumstances, KPFA’s engineers would go up to the transmitter and place control in the local position if remote communications are lost through the telemetry lines. This allows the transmitter to operate without automatically shutting down. Unfortunately for KPFA, local police and fire departments sealed off the area and no one was allowed through the barriers until the next day. “And shortly after the telemetry lines failed,” Yoshida added, “the power lines going up to the transmitter failed.” Consequently, KPFA was completely off the air for 24 hours.

Doing double duty
KPFA engineers headed for the hills on the following Monday to get the station back on the air. The transmitter was put in

the local position which later required the engineering staff to be put on six-hour shifts to continually check it. Finally, three days later, a temporary line was spliced to the burned-out one.

With a watchful eye on the temporary line and an engineer always at the transmitter, KPFA operated at 50 personnel capacity for one week.

The disarray the fire caused left the engineering staff scrambling to finish the new facility; that is, installation of new equipment and six-hour transmitter shifts virtually were incompatible.

The fire set the equipment schedule back about three weeks.

According to Yoshida, once the delay was worked through, the station started realizing the benefits of its upgrade.

The new equipment included Audiotronics 210B consoles with 24, 18 and 12 frames, a 360 Systems DigiCart and an Orban Digital Optimod. The console equipment is important not only because it is state of the art, but also because it is standardized, Yoshida said.

“Basically, plans were made to standardize every broadcast console in the building,” Yoshida said. “And so we made a conscious effort to make everything the same as possible so that an operator we trained for one room could work in another studio.”

Standardizing with Audiotronics
Like the station’s programming, the consoles in the old building were eclectic. An operator could not go from studio to studio and find the same equipment, and therefore, often could not operate it. The 360 Systems DigiCart impressed KPFA staffers with its sound quality and storage capability. This system allows the station to schedule its carts less often and allows it to start them from one source, Yoshida added.

The Orban Digital Optimod provides KPFA with the ability to change the processing parameters to match the programming. For instance, a talk show can be set differently from a music show with just one touch of the computer, he explained.

Presently, the station is experimenting with the Optimod software to find the right configurations. Meanwhile, KPFA has the Optimod on pre-set. “We just use the factory pre-sets; however, for us it’s a big step because we didn’t have a multi-band processor before,” Yoshida said.

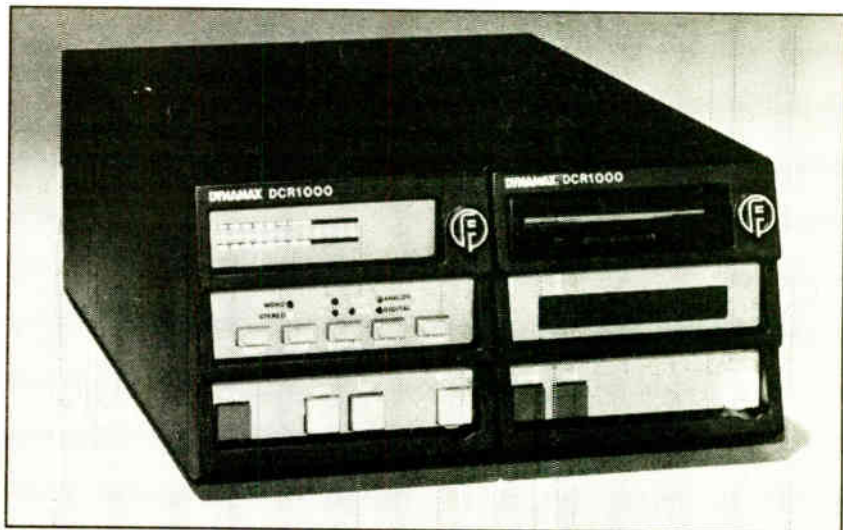
Other components in the station’s arsenal of updated equipment include: Panasonic SV 3700 and SV 3900 DAT recorders, Eventide’s Digital Logger VR 240, the Otari Amex 55 and Otari MTRs 10, 12 and 15.

With the updated equipment, KPFA listeners have registered their satisfaction by letting the station know its signal is a lot clearer—even comparable to some commercial stations. According to Berzon, technology and listener satisfaction are intertwined.

“It’s just like two sides of the same coin: If you ain’t got one, you ain’t got the other,” she said.

The disarray the fire caused left the engineering staff scrambling to finish the new facility.

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AM Rules Create Cautious Optimism

► continued from page 1

where the 10 percent "ratchet" provision applies.

"Things have changed for every station," Rackley acknowledged. He noted however, that "while the allocation picture is a little different, it's not very different." Rackley added that tightening up of protection ratios and the addition of adjacent channel protection "offset" each other in terms of their effect on stations.

Lundin added that the company's chief complaint about the new rules is the 10 percent ratchet clause. "Stations should be allowed to maintain their radiation rights," he said, noting that the ratchet provision "handcuffs stations' improvement possibilities."

Rackley noted that the rules in general

were workable, but said there was some station apprehension. Still, he added that "the marketplace is working in this case to improve interference, and would have done the same things as the (new) rules" in terms of reducing interference on the band.

As far as it could go

NAB Manager of Technical Regulatory Affairs John Marino said the "new rules are probably fair. The Commission has done its homework." While acknowledging that not all stations are helped by the rules, he added that the FCC has "gone as far as it could to help as many stations as it could."

The NAB, with input from its AM Improvement Committee, plans to submit a petition for reconsideration to the FCC to clarify two points in the rules, Marino said.

First, the NAB wants a clarification of the waiver process for stations requiring involuntary changes, he said. The rules are vague about the process by which such waivers are requested, he noted.

Also, the NAB is requesting the FCC examine how Class IV stations are allocated. In the past, Marino explained, such stations were engineered using 250 W engineering criteria, but given 1,000 W at assignment. Marino said the NAB will request that if any new Class IVs are allowed to go on the air, they should be engineered as 1 kW stations.

Stations worries: cost, DAB

At the station level, engineers and managers noted their concern over costs of moving to the expanded band and the unknowns surrounding DAB. In particular, they're waiting to see if the U.S. adopts an in-band approach to digital broadcasting that works on the AM band.

The stations filed non-binding letters of intent to move during the FCC review of the AM rules.

"Stations may or may not (move) depending on the cost," said Bud Walters, president of the Cromwell Group, which has four AMs on the list. "When it comes down to the wire, that's what owners will

have to decide."

The costs include a new transmitter, possibly a tower and definitely duplexing equipment. Another consideration would be if there were any tax advantage to going dark versus the expense of moving to the expanded band, Walters added.

One of Walters' stations, WKCM in Hawesville, Ky., is number one on the FCC list with a 12.50 improvement factor (IF). Located at 1160 kHz with a new allotment of 1640 kHz, the station is 2.5 kW daytime,

The FCC AM improvements are designed to help about 95 percent of AM broadcasters, but it will take 10 years for the effort to be put in place fully.

Bud Walters, President, Cromwell Group

1 kW nighttime, directional at night.

Walters, who testified before the FCC on AM improvements and chaired the NAB Daytimers Committee, stressed his belief in the band.

"AM can sound good," he said. "We've made it sound bad."

"If you can find the right niche, AM can make it. But, you have to wrestle with it. If anybody says AM is dead, they are mistaken. If AM had stayed the way it was, they would be right."

Walters said the FCC AM improvements are designed to help about 95 percent of AM broadcasters, but it will take 10 years for the effort to be put in place fully. "Now, whether we can make it 10 years," Walters continued, "is another matter."

Exploring possibilities

Edward W. "Spike" Santee, general manager of KJLA in Kansas City, Mo., said his company, which just bought the single AM, is exploring all possibilities for moving. KJLA broadcasts at 1190 kHz, 5 kW daytime, 250 W nighttime, directional

at night, and received an allotment of 1650.

"We've decided to put the wheels in motion on all fronts," Santee said.

But factors such as the cost of moving and the future of DAB play a key role in the decision making. Digital is one of Santee's main concerns because of the station's new audio chain and digital studio with broadcasts from CDs.

Erich Steinnagel, director of corporate engineering for Summit, with three AMs on the expanded band list, also said the group is committed to AM. The stations are: WAOK in Atlanta at 1380 kHz, new allotment 1670; WONE in Dayton, Ohio, at 980 kHz, no new allotment assigned, and KHVN in Fort Worth, Texas, at 970

kHz, new allotment 1660.

Questions about DAB, however, surfaced immediately. "The potential for an in-band system for DAB on AM could make these properties very attractive," Steinnagel said.

A subject that Steinnagel said also affects the decision to move and its success is the penetration of receivers with the expanded AM band.

Receivers are also a concern of Paul Rebmann, CE at WLKF in Lakeland, Fla., because it will cost "a pretty good chunk of money" to move. WLKF broadcasts at 1430 kHz, and received an allotment of 1680. The station has a 6.8 improvement factor.

Sister station WNDB in Dayton Beach, Fla., also is on the list. It broadcasts at 1150 kHz, and received an allotment of 1640. The station has a 2.20 improvement factor.

But as other station officials noted, Rebmann said, "I think (the success of the relocation) is going to depend on what's happening with in-band DAB."

Radio World International Editor Alan Carter also contributed to this story.

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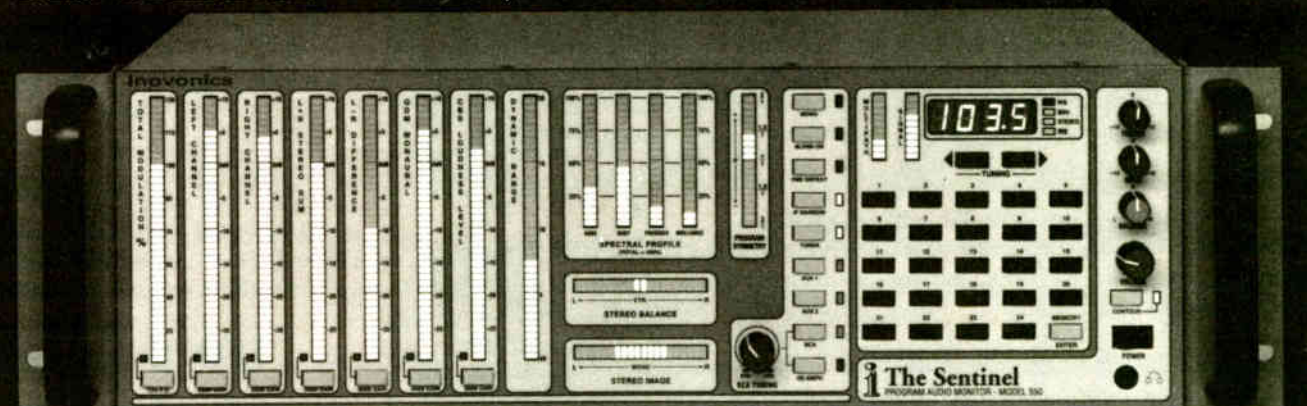
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↪ 2



↪ 4



↪ 1



↪ 3



↪ 3



↪ 4

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↪ 2 MX-50 1/4" TWO-CHANNEL RECORDER

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- ↪ Accepts 5" EIA to 11.8" DIN reels
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- ↪ Built-in 5 digit tape timer

MX-50 SERIES OPTIONS:

- ↪ Voice Editing Module (2X playback at normal pitch)
- ↪ Remote control (CB-127)
- ↪ Fader start

↪ 3 MX-55N, MX-55NM & MX-55TM 1/4" TWO-CHANNEL PRODUCTION RECORDERS

- ↪ Console versions (MX-55NM & TM) include Dolby HX Pro Headroom Extension plus GSKIPO™ (gapless, seamless punch-in, punch-out)
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- ↪ Three-point locator with return-to-zero and looping
- ↪ Built-in three-frequency oscillator plus front panel record and reproduce trimmers
- ↪ Dump Edit and Electronic Lifter Defeat

MX-55 SERIES OPTIONS:

- ↪ 30/15 ips (MX-55N-HS)
- ↪ Voice Editing Mode
- ↪ Footswitch control with programmable selection of VEM, punch-in, reel brakes and search start
- ↪ Remote control (CB-127), 8-memory locator (CB-119), tach- or timecode-based 99 memory locator (CB-120)

↪ 4 MX-5050 SERIES TWO, FOUR AND EIGHT CHANNEL PRODUCTION RECORDERS

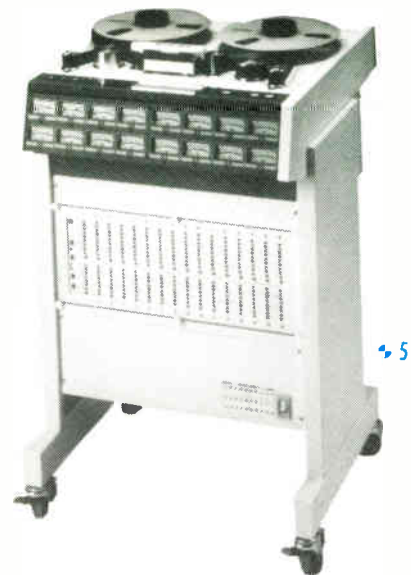
- ↪ Compatible with your dbx™ noise reduction system
- ↪ Optimized three-head design
- ↪ Built-in test tone oscillator
- ↪ Front panel calibration
- ↪ Servo-controlled direct-drive capstan motor with ±20% varispeed
- ↪ Four point autolocator with search to zero and repeat functions built in
- ↪ Tape timer/tape speed display

MX-5050 SERIES OPTIONS:

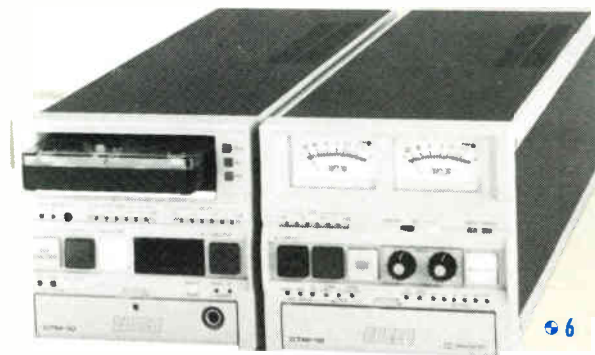
- ↪ Gapless, seamless punch-in punch-out (BQ-III, Mark IV-4 and Mark IV-8 models)
- ↪ Autolocators
- ↪ Remote controls
- ↪ Time code Synchronizer & Resolver

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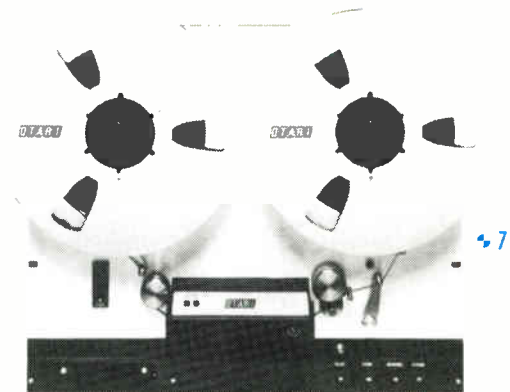
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6



7



5 MX-70 SERIES 1" EIGHT AND SIXTEEN TRACK RECORDERS

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6 CTM-10 SERIES CARTRIDGE RECORDER/REPRODUCERS

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**FOR ALL THE
RIGHT REASONS**

Understanding and Using Resistors

Editor's note: This is the seventh in a 10-part series called DC Fundamentals. Northern Virginia Community College will offer 1.2 CEUs (Continuing Education Units) to registered students who successfully complete the course and an examination mailed at its conclusion.

To register, contact the Director of Continuing Education, Annandale Campus, 8333 Little River Turnpike, Annandale, Va. 22003, or call 703-323-3159. The fee for the course is \$30.

by Ed Montgomery

Part VII

ANNANDALE, Va. The most common electronic device is the resistor. Resistors are used to limit current to a specific level or provide a desired voltage. Resistors are considered passive because they are manufactured to have a specific value that

desired resistance. This combination produces reliable resistors in the rating of 2 watts or less.

The drawback to using carbon composition resistors comes with the aging process. As years go by, the resistors lose their manufactured values.

Film-type resistors are a newer development producing a longer-lasting device that produces less noise in amplifier and switching circuits. They are readily available and are used to replace carbon composition resistors when they fail.

Film-type resistors can be recognized by the "bulges" that appear on the ends of the device. The resistance is established by placing a metal film of platinum, palladium, and rhodium on a ceramic core. The composition of the film determines the value of the resistor in ohms.

For high power ratings, wire-wound resistors are used. Resistance wire is wrapped around an insulated core, often made of porcelain, cement or paper products.

Figure 1 is an illustration of how resistors are constructed, and the schematic symbol for the component. Resistors can be made fixed or variable. How a resistor is connected in a circuit determines whether it is considered a potentiometer, or a rheostat.

Rheostats and potentiometers

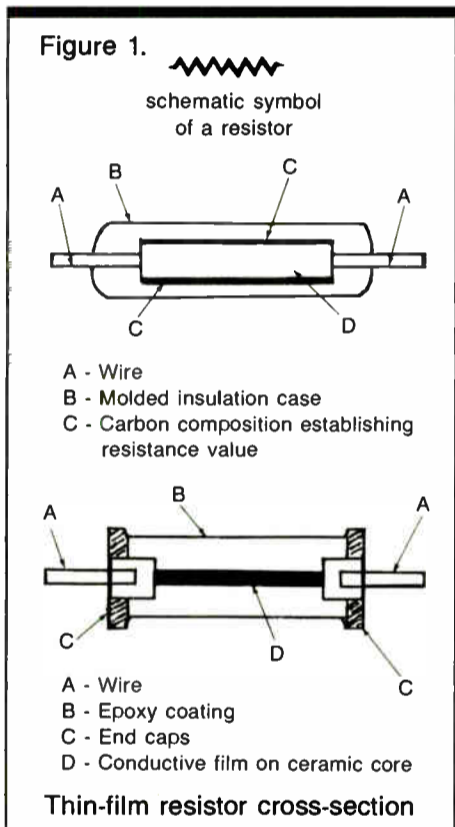
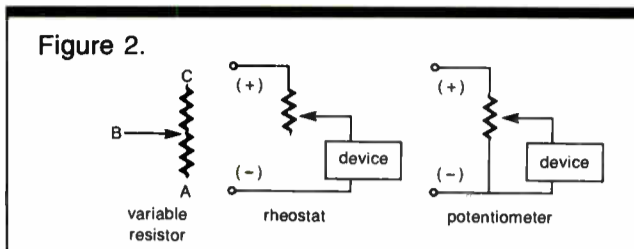
Rheostats are often used to control voltage or current while a potentiometer keeps voltage in a circuit constant—allowing a small portion to be tapped off for use elsewhere. Rheostats are often used to control outputs of power supplies, while potentiometers are used as volume and tone controls in amplifiers. This is illustrated in Figure 2.

Variable resistors have their value and power rating printed on them. Wire wound resistors also employ this method of identification. However, carbon-composition and film-type resistors used a time-honored cumbersome tradition in electronics: the color code.

This system evolved from the early years of electronics when printing was far less sophisticated than it is today. Bands of paint are applied to the resistor and a code is used to identify the value of the device. The color code is illustrated in Figure 3.

Reading the code begins with the band

multiplier indicating how many multiples of 10 the significant figures must be multiplied

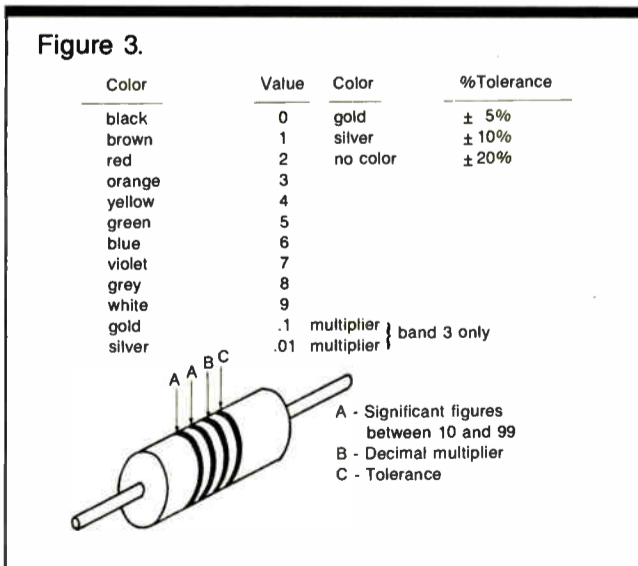


will not change under normal operating conditions.

The resistor's value is measured in ohms. Voltage is established across a resistor using Ohm's law: $V=(I)(R)$. The product of the current permitted to flow through the component times its value in ohms will produce a specific voltage.

The product of voltage and current is power, or the work required to move electrons through the component. The power rating is measured in watts and is dissipated as heat in a resistor. Thus resistors of the same value come in different physical sizes, depending on the amount of energy passing through them.

Resistors are manufactured out of various materials. For years the most common were carbon composition components. Carbon or graphite is proportionally mixed with insulating material, such as bakelite, to give a



closest to the end of the resistor and reading from left to right. The first two bands are known as "significant figures" and will always read between 10 and 99.

Red, Orange would be 23; White, Green would be 95. The third band is the decimal

Yellow, Green would be 6.4 million ohms.

The fourth band indicates the percent accuracy of the resistor. Orange, Orange, Black, Silver would be 33 ohms plus 10 percent of the stated resistance. Sometimes a fifth band is added to indicate a reliability standard required by some electronics equipment manufacturers.

Review

- A resistor's color bands read: yellow, blue, orange, and gold. What is its value?
- A resistor's color bands read: violet, green, gold, silver. What is its value?

Ed Montgomery is a communications teacher at Thomas Jefferson High School for Science and Technology. He can be reached at 703-750-5090.

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KEYBOARD CONNECTION

Word Processing for the Novice

by Barry Mishkind

TUCSON, Ariz. Probably the first application any computer user gets is a word processor. Few people go through a day without a letter, memo, or note that needs to be printed or saved.

Whether a simple memo or a critical business letter, it's most important that the process of writing doesn't get in the way of your thoughts.

As soon as I used my first computer word processor, I knew my life had changed for the better. I could see and correct most errors right on the screen. Even if an error still existed after printing, it was a simple matter to correct it and print it out again. If forests were not saved, at least they now had a fighting chance.

The earliest word processors didn't do much more than basic things. Perhaps you even remem-

ber the first computer generated letters you saw a few years ago? They were a little rough looking, although a major step forward.

Soon more flexible formatting and better printer support came along, as well as other enhancements like spell checkers, merging, search and replace, etc. That's all most users need.

Quite Write™, Version 2.0, from Parsons Technology and

DacEasy™ Word, Version 3.0, are both good choices for tight budgets or novice users. What you get are not stripped products, but programs that support *all* the features the average user will need, and then some.

Easy loading

For example, both load and configure quickly and easily on your computer. Quite Write is the smaller of the two. That may be important if you're running a small hard drive, or stuck with floppies only.

Starting either program brings up an editing screen with built-in ruler

and margin markings. Hot keys "pop up" various menus for formatting and enhancing your work. Macro keys can be custom programmed for often-repeated tasks.

Spell checkers, multiple windows, context-sensitive help screens, mail merge from databases, and the ability to customize the printer driver come with both programs.

Word also has a punctuation checker to prevent missing capitals, quote marks, parentheses, etc., and a Mail List Manager to print labels and envelopes. Quite Write has an automatic timed save feature to protect you from loss of work and a line draw feature that can be used for lines or boxes to enhance text.

These simple programs shouldn't be hard for you to learn. Priced at \$49 to \$69, all you have to do is decide which features are most important to you. Both companies have 800 order lines to answer your questions. Parsons' is 800-223-6925; DacEasy's is 800-877-8088.

On the other hand, technical support costs a lot of money for any company (just ask your transmitter manufacturer). DacEasy and Parsons have different ways to prevent these costs from driving up the purchase price.

DacEasy tech support is available by yearly fee, charge card or 900 number. Courteous, knowledgeable support people are ready to help, but at what they call "a fair price."

Parsons still provides free support, although you pay for the long distance charges. Parsons' game is to hook you with the value offered by its line of budget programs so that you'll check out its catalogue, buy more and tell your friends.

Take a test write

Want to look even before you buy? Perhaps a copy of the Shareware program PC Write™ is what you need. Available for download from many BBSs, or \$19 from Quicksort (800-888-8088), you can take your time to "kick the tires" and look this one over before deciding to pay for it.

PC Write is the word processor I use for this column. It has many features, and yet using them doesn't require navigating a long series of screens that can get in the way of my thoughts. PC Write comes in three "levels," depending on your needs. I've recommended it highly in the past, and even though it's gotten a bit more pricey recently, it's still a super program.

Do you have a need for some more sophisticated features? Next time out we'll look at some of the higher end word processing packages as well as the reason many users are moving up to graphical based word processors. I'll even explain that funny word you keep seeing, WYSIWYG.

□ □ □
Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant in Tucson, Ariz. He can be reached at 602-296-3797, or BMISHKIND on CompuServe, or "barry@coyote.datalog.com" on Internet.

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WORKBENCH

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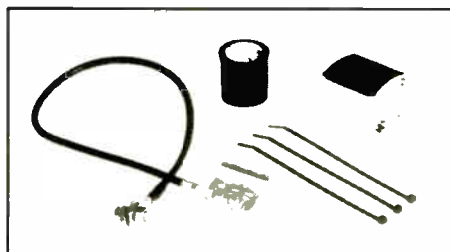
by John Blisset

FALLS CHURCH, Va. A few months ago, Jack Stadlander, at WGOJ in Ohio, noticed that the original library of music tapes screamed and screeched when played. Careful examination disclosed that the backing was flaking off and clogging the tape guides and coating the heads.

The original library was mastered over 30 years ago on Ampex 406, and comprised nearly 100 ten-inch reels. After talking to Ampex engineers, who recommended a baking process that only temporarily solved the problem, Jack began experimenting in the production room.

Though the tapes seemed to travel "noise free" on the Otaris, the lack of lubrication

started to cause considerable wear on the Otari heads. An old Scully was pressed into service, but the screeching returned. About to give up, Jack started rewinding the tape and noticed no noise. He then played the



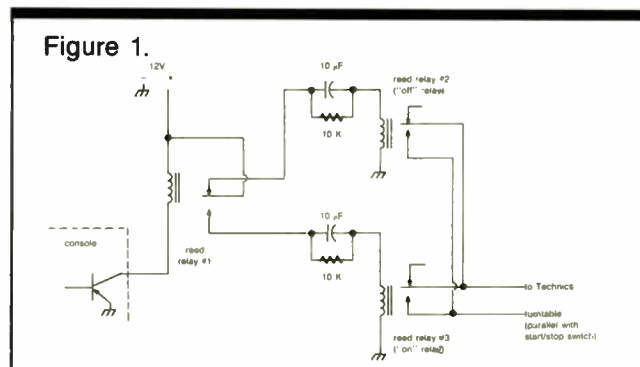
Scully in reverse and heard only music. The screeching was gone! The tapes were rewound and reversed, so they would play

back correctly in the reverse mode. The pinch roller was allowed to become dirty, since the residue kept the "popping" down and also allowed the old tape to travel with less resistance.

Using a Nortronics playback head, Jack noticed very little wear after ten two-hour reels of transfer. Though it's hard work, it can bring a happy ending to anyone with an old tape library. Jack Stadlander can be reached at WGOJ in Conneaut, Ohio. His number is 216-599-7252.

★★★

Grounding small diameter coaxial cables has just been made easier with a new series of grounding kits manufactured by Andrew. As you can see from Figure 1, these are miniature versions of the grounding kits used with larger size line. In addition to being useful on Andrew's 1/4-inch and 3/8-inch HELIAX.R cables, the kits can also be used on conventional braided cables such as RG-8/U or RG-213/U.



For more information, contact the Andrew Customer Support Center at 800-255-1479, and ask for Bulletin 1766. Or, circle Reader Service 79 to receive your free copy.

Bill Ashley, one of the sales engineers at Bradley Broadcast Sales, recently came up with the circuit shown in Figure 2. Using three reed relays, the circuit interfaces the

open collector output of a console's remote start circuitry to the Technics turntable. Bill suggests that you experiment with the capacitor and resistor values so that relay #2 and relay #3 each pull in for about a quarter second, then drop out.

Bill Ashley can be reached at Bradley Broadcast Sales toll-free. His number is 800-732-7665. For a new Bradley catalog, circle Reader Service 146.

★★★

If you put off that quarterly tower inspection we spoke about last issue, Aaron Wasilewski, CE at KMWX in Yakima,

Wash. wrote in with some suggestions as you poke around inside the ATU (with power off, of course). Aaron's suggestions were borne of a fried 45µHy 10 Amp coil in the output network.

After doing a little digging into the cause of the failure, he found that a pick-off clip had worked itself loose, and fallen onto the coil. The problem was caught when it

continued on page 18 ►

ENGINEERING MANAGER

Accepting the Role of Leader

by John Cummuta

DOWNERS GROVE, Ill. While large engineering staffs are going the way of the dinosaur, delegation is still an important skill for managers. It may be necessary to delegate across staff lines, as a contract engineer delegating to the air staff or as a station manager to a contract engineer. And, as contract engineering companies grow, delegation opportunities develop within those organizations.

But maybe the first question should be: "Why delegate?" Let me answer with another question. Suppose you walked to work for years, before you bought a car. When you finally did get your new car, would you push it to work—rather than letting the engine take over responsibility for providing the motive power?

Many managers have a hard time making the transition from top performing worker in the group, to group leader. They operate under the old instincts that drive them toward "doing" the job rather than toward leading others to do the job. But, if they're going to succeed in their new post, the transition must take place.

Successfully managing

There is a big difference between the responsibilities of a manager and those of a worker within the managed group. Managers are hired to make sure the group accomplishes its objectives. You'll notice I did not say the manager was supposed to get the job done. The group does the "doing" and the leader does the "leading."

If you were always the whiz kid engineer, your ego is strongly identified with that image as its self-worth affirmer. There is a strong tendency toward getting back to where you got the praise and glory before, especially if there are one or more other good engineers on staff who are taking over your spot in the limelight.

The key to making the transition to a delegating manager is to fully understand how success in your new position is defined. When you become a manager, you are no longer evaluated solely on the basis of how good a cart machine sounds after you work on it or how solid the pattern is today. You

are now graded on how well you develop people, and how effectively they accomplish a variety of tasks.

In other words, if you short-change your people-development and task-management responsibilities to roll your sleeves up and dig into specific engineering projects, you are likely failing as a manager—regardless of how well you handle the engineering tasks.

Subordinates can obstruct your effective delegation of responsibilities by mistakenly interpreting your actions as an imposition on them. In other words, if you've complimented them on doing a good job on a special assignment, then you attempt to transfer future such jobs to them, they could feel penalized for their good performance. You must make it clear that this is a reward for their growth, and

continued on page 23 ►

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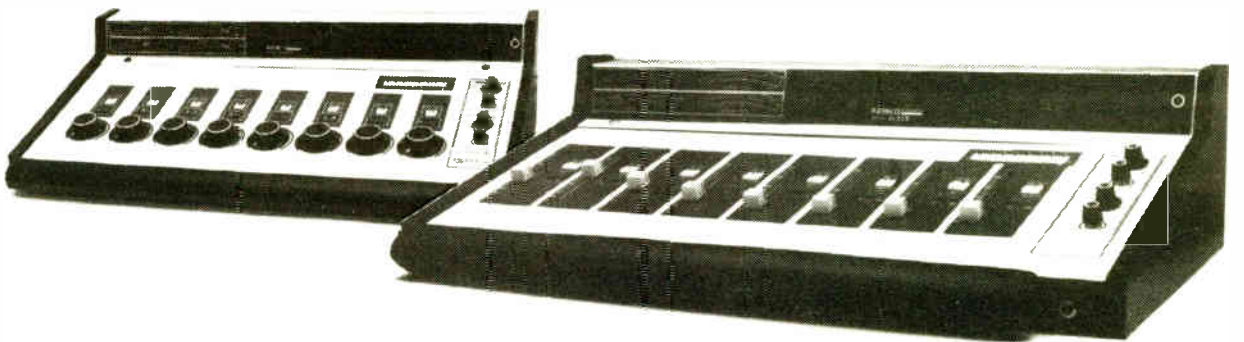
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CONSULTANT'S CORNER

Illuminating FCC Tower Lighting Rules

by Steve Crowley

WASHINGTON Over the last two years, the FCC has been busy with an aggressive educational and enforcement program concerning tower painting and lighting requirements—an effort that is paying off. The Commission recently reported increased compliance to about 95 percent; that's an increase of over 20 percent in just two years.

One area that can still be confusing concerns temporary lighting requirements. The FCC is holding licensees and permittees to a higher temporary lighting standard than the one that appears in the rules. This is important to know for anyone involved in building or modifying a tower.

The FCC normally specifies painting and lighting requirements for towers where necessary. These specifications, found on the construction permit or license, are based on recommendations the FCC receives from the FAA concerning each tower. The permit, however, doesn't contain explicit temporary lighting requirement information.

Reading the rules

If you check the FCC Rules, the only part dealing with temporary lighting requirements is Section 17.45. The Commission, however, is enforcing a stricter temporary lighting standard that can be found in its Field Operations Bureau Bulletin No.

13, "Radio Tower Painting and Lighting."

The requirements in that bulletin are based on newer FAA standards, and are stricter than present rules. The FCC is going to be updating Part 17 of its rules to conform with the FAA's new standards. Meanwhile, if you are going to be involved in tower construction, get a copy of the FCC's tower painting and lighting bulletin from any field office or from the Field Operations Bureau in Washington.

Here are some temporary lighting requirements found in the bulletin:

"When tower lighting is required and you choose to install temporary warning lights during construction rather than permanent lights, you must install these temporary lights at the uppermost point of the tower. As the height of the structure exceeds each level requiring permanent obstruction lights, you must install two temporary lights at each level.

"When aviation red obstruction lights are required, you must use them even for temporary lighting. You must turn them on each night from sunset to sunrise until you have installed permanent lights. "When high or medium white obstruction lights are required for the permanent installation, you must use them for the temporary lighting. You may not use incandescent lights or lights that do not produce the illumination required by your station license or construction permit.

"When dual lighting schemes are required (for example, medium intensity white lights for daytime operation and red lights at night), you must use both types of temporary lighting while constructing the tower."

Planning ahead

FCC staffers I talked with emphasized that temporary lighting must be equivalent to the planned permanent lighting. This usually isn't a problem because the tower lighting is installed as the tower is erected. Sometimes, though, temporary lighting is

ignored or some barely visible junk is hung on the tower.

Temporary lighting can be easy if it's planned before construction starts. Make sure your tower crew knows the requirements. If there are any questions concerning the applicability of lighting requirements to your facility, be sure to check with a communications attorney.

□ □ □

Steve Crowley is a consulting engineer with the Washington, D.C. firm of du Treil, Lundin & Rackley, Inc. He can be reached at 202-223-6700 or by fax at 202-466-2042.

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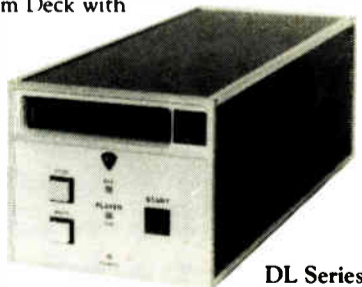
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PRODUCER'S FILE

Gorby's Loss Is Gotham Audio's Gain

by Ty Ford

BALTIMORE When it was announced earlier this year that Sennheiser had acquired Neumann, many questions were raised about the future of the distinguished Neumann line of microphones. One of the most important questions for Gotham Audio (now Gotham Technology Group) in New York was, "What next?" After all, Gotham had been the long-time distributor for Neumann.

I got my answer from Gotham's Jerry Graham at the most recent Audio Engineering Society (AES) convention in New York.

Gotham has made arrangements with Microtech Gefell of East Germany, to distribute three microphones that were originally designed by Georg Neumann, but that had been "lost" behind the Iron Curtain. The UM 70S (\$1,150), UM 70 (\$995) and M71 (\$795) are all priced well under the \$2,200-\$2,400 to which Neumann mics have been raised within the last year or so.

Positioned as the "Perestroika Microphones," the mics are built with Neumann's M7 large diameter dual membrane capsule. In case you're thinking that this is just another noisy "old technology mic" trying to hang on in a digital world, you're wrong. The mic's internal amplifier system has an FET input stage coupled to a hybrid amplifier specially built for the M7 capsule and requires phantom power.

I tested both the UM 70 and the M71. Both mics were plenty quiet.

You'd know it anywhere

While the price, heritage and technical evolution of these mics are important, the big question is, "What do they sound like?" Having heard my own voice on many different high quality mics over the years, I knew I was speaking into a Neumann the instant I heard myself in the headphones. If you know the sound, you know what I'm talking about.

My evaluation of the mics was conducted with Louis Mills at Baltimore's Flite Three recording studios. Again, the sound was immediately recognizable as Neumann.

This brings me to an important point. A few years back, before the economy began to wither, a lot of radio stations replaced their dynamic mics with Neumann TLM 170, U87 or U89 mics. I've heard from a number of these people who were ultimately disappointed with the performance of these mics. They complained that these mics weren't bright enough, that they sounded bad when worked "close," and that they picked up everything in the room, including aging cart machine bearings and air conditioner noise.

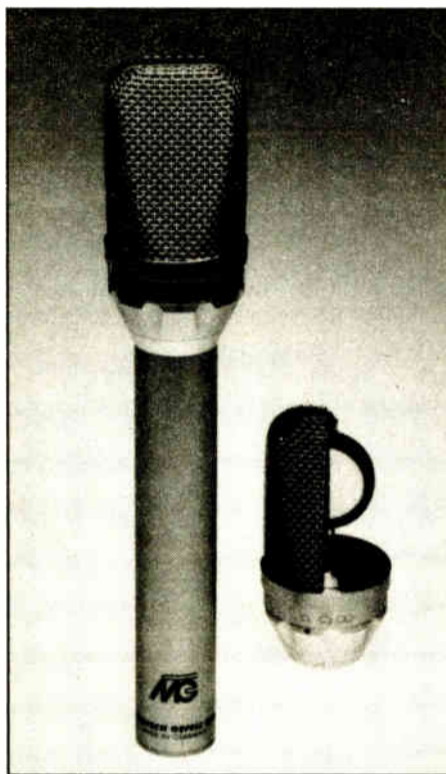
Part of the close-working problem was that the high output of these mics was overdriving the mic preamp. Complaints about lack of brightness came from situations where the mics were just plugged into the board without any EQ. I think a lot of radio station people saw the aforementioned mics being used to record voice at recording studios and assumed that all they had to do was plug them into the console. Wrong assumption.

The rule for this kind of operation is very simple. Any time you work a close mic using a large diameter condenser mic with a cardioid pattern, you're going to have to roll off the low frequencies that are picked up when you're that close to the mic. Most engineers also peak the 3 kHz to 6 kHz a few

dB, which allows the voice track to cut through better.

I'm not suggesting that you'll be happy just plugging in the UM 70 or M 71 without EQ, but I was happy with the sound without EQ on both my voice and another voice. Both mics have a richness in the lower midrange (part of the Neumann soundprint) that gave my voice a cross between power and presence, without the "boominess" most mics create by having too much bottom.

In fact, working with these mics has changed my entire approach to voice EQ. Like a lot of people, I typically mess with the 100 Hz-200 Hz and 3 kHz-5 kHz ranges.



The Perestroika microphone UM 70S

These mics taught me that there is a lot of power in the 800 Hz-2 kHz range that I had overlooked.

Patterns

The M 71 is a fixed pattern cardioid. The UM 70 and the UM 70S are three-pattern switchable: omni, bidirectional and cardioid. The slightly more expensive UM 70S is a bit quieter version of the UM 70.

The omni pattern has very good polar response, with the high frequencies dipping only slightly at 30 to 50 degrees off-axis.

The bi-directional pattern has great nulls and very uniform frequency response from front to back. All three mics have -10 dB pad and bass roll-off switches. The MKV 8 swivel/stand adapter and the WS 86 acoustic foam wind and pop screen come with each

mic. All three mics are shipped in classy little foam-lined wooden boxes.

Gotham strongly suggests that you use its three-conductor, double reusen-layer, shielded cable. Although I had no problems at my studio with my own cables, using the house cables at another nearby studio turned the mic and cable into a great RF noise antenna. Switching to Gotham's cables eliminated the problem.

Gotham makes these cables in black, red, yellow, green, blue and gray. A 10-foot cable with XLR connectors runs \$25, with 25- and 50-foot extensions at \$35 and \$45, respectively.

The EA25 elastic suspension (\$125) is optional, \$100 if you order it with the mic. Reaching in through the cat's cradle of elastic bands to close the clasp took a little getting used to. Orthodontists should have no trouble with it.

The proof, though, is in the product. Currently, I'm using these mics on my voice for radio spots that run from Boston to Richmond, and on other voices in the Baltimore/Washington area. I use more than the average amount of clean, high-speed compression and limiting. The soundprint remains recognizable.

You owe it to yourself to hear these mics. For more information contact Jerry Graham at 212-765-3410.

□ □ □

Ty Ford may be reached at his studio and beta test site at 410-889-6201, via MCI Mail 347-6635 or America Online (Tford).

Restoring Old Recordings

► continued from page 15 occurred, but a little preventive medicine can go a long way when properly administered.

To contact Aaron Wasilewski, call KMWX/KFFM, Northwest Broadcasting in Yakima, Wash. His number is 509-248-1460.

★★★

Looking to update your remote/sound reinforcement gear? Spring (and remotes) will be here before you know it. If you are in the market to buy power amplifiers, the folks at QSC Audio Products are interested in helping you make the right choice. They've published a pamphlet titled, "How to Buy a Professional Power Amplifier," which includes sections on comparing specs, making connections, protection for your amplifier, and speaker wire tables.

The booklet is easy reading, and is free by circling Reader Service 61. QSC Audio Products is located in Costa Mesa, Calif. The company's number is 714-645-2540.

□ □ □

John Bisset is a principal with Multiphase Consulting, a contract engineering and projects company. He can be reached at 703-379-1665.



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RUNNING RADIO

A new section, beginning in this issue of **RW**. See pp. 25-29

STATION SKETCHES

Building Your Own Bipolar Power Supplies on a Budget

by Tom Vernon

HARRISBURG, Pa. Before we begin this month's column, one clarification on my last topic, grid dip meters. While they can be used to check coils, those coils must be part of a tuned circuit. They must be placed in parallel with a capacitor before testing.

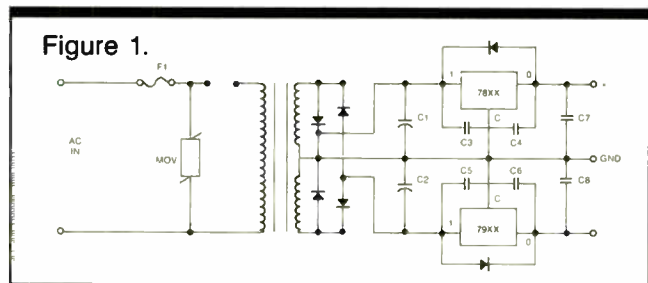
If you need to know the exact value of the

the power line; they should be installed after the fuse in the transformer primary. The failure mode of these devices is usually a short circuit, and a short across your power line can only make matters worse.

Budgeting concerns

If you're on a tight budget and do a lot of scavenging, you may easily turn up some surplus telephone company power supplies. Usually these are very rugged 24 or 48 volt single pole units. Figure 2 shows how a few components can be added to modify these to bipolar supplies.

The purpose of the current limiting resistors is to protect the zeners. The supply's output voltage should be at least two volts above the zener's combined voltage to ensure good regulation. Of course this supply can be used as a



coil, rather than just a pass/fail analysis, use a capacitor of known value and accuracy. The coil's value can be determined mathematically using the formula for resonant circuits.

This month we'll look at bipolar power supplies and regulator circuits. Bipolar supplies came along with audio integrated circuits. Their advent added much to the sound quality and reliability of audio circuits.

Poles & capacitors

Basically, a bipolar supply has two poles, or voltages referenced to a common neutral or ground terminal. It's made up of two identical supplies, the positive terminal of one, and the negative terminal of the other, connected together, making a ground reference for the other two terminals.

Modern bipolar supplies can be quite elegant, including transient and noise suppression, regulation, and short circuit protection at a modest cost. Figure 1 shows a typical example, including series regulation with 78XX devices for positive voltages, and 79XX series for negative voltages.

Capacitors C1 and C2 are large filter capacitors used to smooth out ripple. C3-6 are smaller units, usually less than 1 μ F. Their function is to limit transients. This is especially critical if the regulator is located some distance from the filter capacitor, and there's a chance for transients to develop on the line connecting the two.

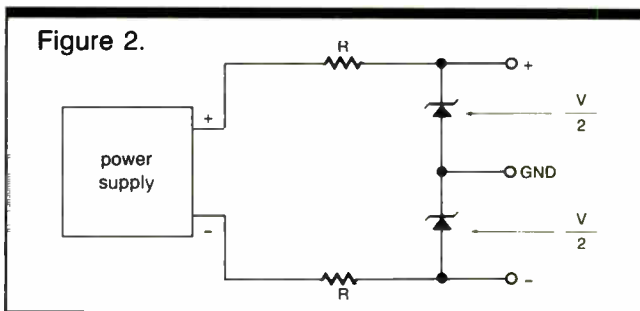
For this reason, the input capacitor is located as close to the regulator as possible, sometimes soldered directly to the terminals. Capacitors C7-8 are there to take care of surges that occur during power up and power down. Anything from 10-100 μ F will do nicely.

The diodes located across the regulators protect them from input shorts. Because these devices are designed to source current, and not sink it, input shorts are much more serious than shorting the output. If the input shorts, current will discharge from C7-8 through the diode, and will be shunted to ground through the input short.

Often, metal oxide varistors (MOVs) are added to the power supplies of older equipment to enhance transient protection. While this is a good idea, placement is critical. MOVs should never be placed directly across

supply's output voltage should be at least two volts above the zener's combined voltage to ensure good regulation.

Of course this supply can be used as a



single-ended positive 12 volt supply to run pilot lights, relays, or logic circuits at the same time it's powering audio ICs. If the ground is floating, it can supply the full 24 volts between the plus and minus terminals.

Tom Vernon, a regular RW columnist divides his time between consulting work and attending graduate school. He can be reached at 717-367-5595.

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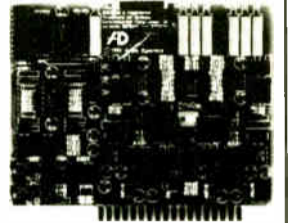
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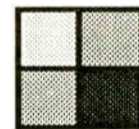


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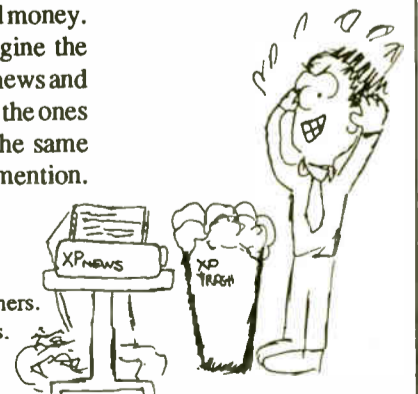
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READER SERVICE NO. 62

LOWPOWER LOWDOWN

Toeing the Protected Contour Line

by Howard L. Enstrom

MOUNT DORA, Fla. Interference. Just the word can invoke a feeling of indignation, especially in these rights-conscious times. Social and other conflicting interests always are settled by compromise and tolerance. And so it is among users of the radio spectrum.

In months past, I discussed incoming interference to a translator's primary signal. Now, we'll take up outgoing interference—to what degree a translator might erode the listening audience of other services, including other translators.

In this, a "protected contour" pertains to a reference station, and an "interference contour" to a translator.

Critical considerations

Critical considerations are: channel relationships of the reference and translator station signals for co-channel, but including up to the third higher and lower adjacent seven channels; location of a translator station's predicted F(50,10) interference contour, according to channel relationship; and finally, location of a reference station's predicted (F50,50) protected contour, according to class and channel relationship.

Whether portrayed graphically or by tabulation, the idea is that an interference contour shall not overlap a protected contour.

If yours is a class A, C1, C2 or C3, protection is out to the predicted 1 mV/m (60

dBu) contour. If it's a class B1, protection is to the predicted 0.7 mV/m (57 dBu) contour. For class B, to the predicted 0.5 mV/m (54 dBu) contour.

Let's say we've determined a reference station's site-to-protected contour distances, accounting for terrain elevation changes (from three to 16 kilometers) along pertinent azimuths, or radials. The shape of the area within the contour may differ from that which is radiated because the effective antenna height isn't the same for all directions.

In parts 74.1204(a)(1)(2) and (3) of FCC rules, we have tabulations showing permitted interference contour levels as a function of channel relationships for various class reference stations. See Figure 1 for an abbreviated form.

Natural terrain shielding

A reference station's contour can be protected by natural terrain shielding. Alternatively, if the translator is to use an omnidirectional pattern, simply limit the ERP to the value that avoids overlap by an interference contour. A better way may be to radiate a carefully shaped coverage pattern with suppressed ERP toward the reference station's contour.

It's bad, when from a certain site, you have to suppress radiation in the same direction as the community to be served. If the site can't be changed, surely either the frequency or ERP would have to. That's why "location is everything."

Ah, but there's more to outgoing interference, folks: respect for TV channel 6. Discussion of that problem, for non-commercial educational translators, would take too much space. Best advice: In Channel 6 country, operate as far from FM Channel 201 as possible. TV receivers have broad-as-a-barn selectivity.

Looking at FCC rules under 74.1404(f)—even if a translator's interference contour clears a reference station's protected contour—if the station has listeners within the translator's 1 mV/m contour, co-channel or adjacent, the translator may be viewed as interfering.

I think it's lousy that a metropolitan 100 kW Class C station, with a few listeners in its fringe signal at a smaller community, can legally claim "interference." But that's the way it is. Some stations would claim the last 10 feet.

Outgoing interference generally is associated with a translator's operating frequency radiation toward an outlying area served by a reference FM station. But other systems that use receive equipment, usually close to a translator, also can be adversely affected. For example, "blanketing" is receiver desensitization (shutdown) for intended signal reception. Or RF energy at the fundamental frequency can mix with that of another service to produce new signals called IM (intermodulation) products.

A translator's harmonic and spurious energy output also can cause another form

of interference with other services. After all, no stand-alone translator or transmitter generates absolutely pure output.

Sometimes even equipment conforming to FCC type acceptance standards radiates just enough spurious energy on a critical frequency to cause close-in interference.

Some causes of interference can be weird, such as when loose, rusted antenna and guy cable hardware act as non-linear impedances. When shock-excited by FM signal radiation, the hardware may generate interference on harmonically related frequencies. Diagnosis can be tough, greatly aided by spectrum analyzer test equipment.

"Feeable" versus "non-feeable"

Turning to another issue, my September column's answer about FM translator application processing needs correcting. "Feeable" applications are sent to Pittsburgh, and "non-feeable" ones to the FCC in Washington.

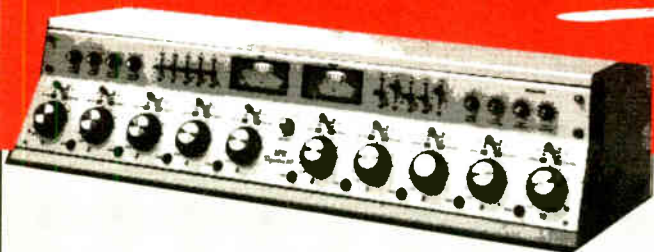
Eventually, mailrooms send the three application sets to the Auxiliary Services Branch. Here, applications and exhibits are examined for correctness. One copy then is sent to the data automation bureau (FCC database). Another copy goes to an analyst, where records are generated, including public notice (tendered for filing, etc.)

In about 45 days, applications get on an acceptance and cutoff list, and engineering studies are made. Further acceptable proposals are put on public notice as accepted for filing, with a cutoff date for other applications. Shortly thereafter, proposals are ready to be designated for a grant.

□ □ □

Howard L. Enstrom is a broadcast consultant. He can be reached at 904-383-3682.

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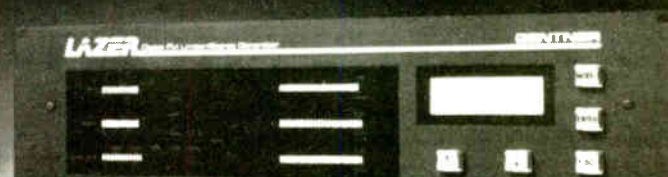
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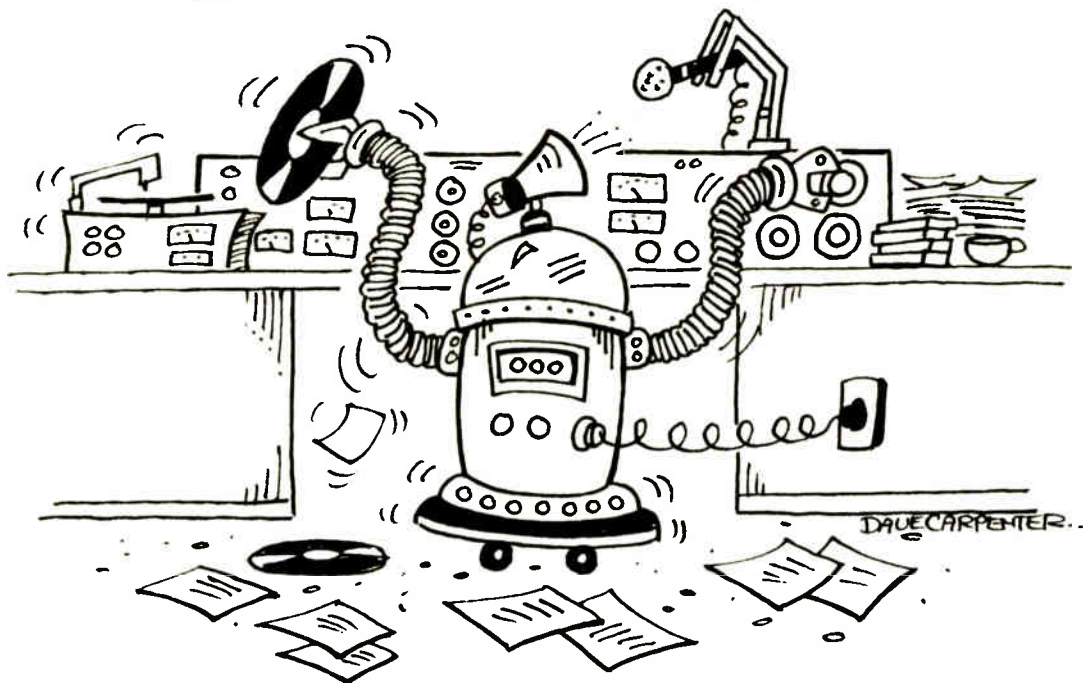
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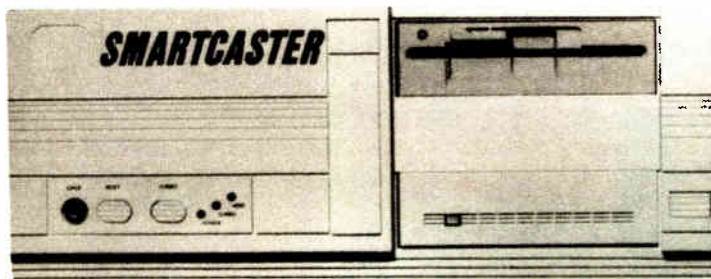
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World Radio History

Learning to Be a Leader

► continued from page 15
that it improves their positioning for further responsibilities, rewards and possibly promotion.

But will they follow?

Be sure to help them understand that you are not sloughing off your own duties onto them. Teach them that a manager's job is different from theirs, and that your time is best spent planning, scheduling, evaluating and otherwise looking at the big picture.

Stagnation is another subordinate obstacle to effective delegation. People get into ruts in their jobs, and even though you are trying to help them grow as professionals, they can disdain your efforts. If they can't see the value of broadening their scope, but are otherwise good employees, leave them alone. Good workers are hard enough to find.

Peer pressure is one of the strongest demotivators for subordinates to accept delegation. They fear either being heckled by their co-workers as a *teacher's pet* or they fear failing in front of their peers.

Believe it or not, subordinate *eagerness* can be a problem in effective delegating. "Eager Beavers" tend to want to say yes to every delegation opportunity. Your job as a manager is to nurture their enthusiasm, while bringing them along at an appropriate pace.

Finally there is the "Power Player." This is the subordinate who tries to use delegated tasks as an opportunity to get leverage on co-workers or you. The Power Player may even be making a move for your position.

Things to remember

If you are going to give subordinates responsibility for tasks, you should give them as much authority as possible to carrying out that job. Whether it's authority to order parts or to make specific adjustments, tell them they have your approval to do what is necessary.

If you have specific reservations in terms of what they can do without checking with you, make those exceptions clear. You'll get much better performance from them that way.

If you can't give them the authority to control a task, then you cannot justifiably hold them accountable for the outcome. Accountability is only fair when it follows authority *and* responsibility. If you only give subordinates a portion of that equation, then you share responsibility with them for any shortcomings in the results.

The bottom line is that, when you accepted the position of manager, you signed on for this challenge. Just remember that you are now being judged by a different set of rules, and how effectively you delegate will go a long way towards proving that you are successful as a manager.

□ □ □

John Cummuta is an independent marketing and management consultant. He can be reached at 708-960-5999.

COLE'S LAW

LMA's: Waiting for the FCC to Decide

by Harry Cole

WASHINGTON Faithful readers (that is, anybody who read my last column) will recall that we addressed the question of local management agreements ("LMAs") and the controversy surrounding them. Well, enough new information has surfaced to justify a reprise of the LMA theme. Unfortunately, you shouldn't expect any final resolution of anything this time around.

When last we looked at LMAs, a couple of congressmen had introduced a bill that, if enacted, would largely gut the utility of LMAs. Bad news for all you LMA fans. But as many expected, FCC Chairman Sikes stood firm in his support of LMAs. At a December press conference, Sikes maintained, "I would not urge that that law be passed, and I look forward to testifying against it." He also suggested that an undesirable effect of the law would be that stations would have to go dark.

That's all well and good, and pretty much the type of support that LMA supporters might have hoped for. Although such direct Commission resistance to Congressional pressure might encourage quicker action on the anti-LMA bill, at least the Chairman's response indicated that the FCC was not going to roll over on the question just because a bill happened to be introduced. Further, the FCC still has the option of initiating a formal inquiry or rule making, which would likely result in the deferral of any legislation for years, if not indefinitely.

Good news, bad news

Chairman Sikes' official pronouncements were the good news. The bad news is that the Mass Media Bureau apparently hasn't heard the good news. Officials of the Bureau were reported to have placed a hold on any decisions relating to LMAs for the foreseeable future, perhaps pending further action by Congress with respect to the LMA bill.

Anyone who sought a declaratory ruling blessing a particular LMA, and anyone who is the subject of complaints, petitions, FCC inquiries and the like concerning LMAs, need not be checking their mailbox on a daily basis nowadays—reportedly, nothing will be issued until further direction on the matter is provided by Congress.

The Bureau's position seems at odds with the stated position of the Chairman. If the Commission believes LMAs to be consistent with the public interest—and the Chairman's statements certainly seem to say that—then the Bureau should have no problem in reviewing and analyzing existing LMAs consistently with that approach.

If Congress at some point redefines the notion of "public interest" to expressly exclude LMAs, the Commission and the Bureau may then reassess their position. And yet, it just doesn't seem to make sense that LMAs would receive a ringing endorsement from the FCC's Chairman, but be left in a peculiar state of suspended animation by the Bureau.

Oh, and then there was the "raid" by the Field Operations Bureau. Although the FCC has issued no formal announcement, reports indicate that, during the week of Dec. 9, 1991 members of the FCC's various field offices were instructed to inspect stations, looking for evidence of improper LMAs. At least one observer has suggested that the stations targeted for inspection included a number of those with pending requests for declaratory rulings concerning their LMAs.

The results of the inspections have not been

made public. Nevertheless, it is clear from the "raid" that the Field Operations Bureau, and presumably the Mass Media Bureau, may believe that LMAs are suspect arrangements which, by their nature, raise questions about potential unauthorized transfers of control. It is, of course, hard to interpret with any certainty this type of situation, but it is clear that, at a minimum, serious questions concerning the validity of LMAs exist somewhere in the Commission.

What is the law, anyway?

What does all this mean? It's hard to say. It would be nice if the Commission were inclined to act and speak consistently. After all, most broadcasters are inclined to follow the letter of the law, as long as they can figure out what the law is. But with the mixed signals now being sent on LMAs, it is extremely difficult to figure what the law is.

That difficulty is aggravated by the fact that it was the Commission itself, in a number of declaratory rulings issued over the last 15 months, which clearly indicated that LMAs would be acceptable. If they are no longer acceptable, or if new limits are to be imposed on them, broadcasters would seem entitled to be placed on formal notice of such changes in policy.

While it is no doubt true that the proposed legislation may be giving some at the FCC pause, that is hardly a justification for the Commission to turn mute on the subject. And yet, that appears to be what is happen-

ing: We have been informally advised that no further declaratory orders, opinions or other statements will be made about LMAs until some further word issues from on high (our informal contacts have not indicated exactly where that further word will come from, what it will say, or when it can be expected).

If you are not involved in an LMA, you have nothing to worry about. But if you are already in the middle of one, or are contemplating entering into one, you are faced with a lot of questions for which there are simply no concrete answers available.

Whatever the Commission decides to do with LMAs, it should do it sooner rather than later, and with clear notice to all. Perhaps more importantly, any enforcement actions (including any which might flow from the recent FOB "raid") involving LMAs entered into and implemented during the current black-out on LMA-related statements should be tempered in light of that black-out. It would be the height of unfairness for the Commission to attempt to penalize broadcasters for violation of policies the Commission failed to clarify in any meaningful sense.

In any event, the question of LMAs is murky and getting murkier. If you are involved in one, or if you are thinking about getting involved in one, you should be sure to discuss it with your communications counsel.

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

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World Radio History

STUDER

RUNNING RADIO

January 22, 1992

A Resource for Business, Programming & Sales

RAB Conference Comes to Nashville

by Lucia Cobo

NASHVILLE, Tenn. Radio industry sales executives and managers will converge on Music City, U.S.A. for the Radio Advertising Bureau's (RAB) Managing Sales Conference (MSC), Jan 30-Feb. 2. This year, the MSC will be held at the Opryland Hotel and Convention Center in Nashville.

In addition to providing sales training seminars, workshops and keynote speakers, this year's conference will serve as an introductory forum for the association's newly-hired president and CEO, Gary Fries.

Fries will be introducing the management team he has put together for the association, and will present a mission statement for the RAB. The theme for this year's conference is "We cannot change unless we survive . . . we will not survive unless we change."

Three keynote speakers will be headlining the MSC events. Radio creative expert Dick Orkin will preside over a working luncheon, titled, "The Dick Orkin School of Radio Creativity."

Orkin will focus on the how to differentiate between a great commercial, one that moves product and enhances a station's image, and a bad commercial, which does neither. The session will focus on the elements vital to a good commercial, how to recognize a bad commercial, and how to improve it.

EFM Media Management's Rush Limbaugh will deliver the talent keynote address during Saturday's working luncheon. Limbaugh's program is syndicated nationally and reaches over 7.5 million listeners a week.

Attendees will receive a lesson in economics from keynoter Dr. Gene Stanaland. Stanaland, president of an economics and management consultancy, also is a 20-year veteran of the Economics Department at Auburn University in Alabama. He will share his insights on the current economic climate and where he believes the economy is headed.

As part of its support program for local marketing efforts, the RAB will hold an industry-wide forum on local radio marketing associations. The forum will seek to address the needs, problems and opportunities unique to these local groups.

The first half of the three-hour meeting will feature presentations from the heads of successfully established local radio associations. Among the speakers: Bill Burton of the Detroit Radio Advertising Group (DRAG); Don Seidholz of the Radio Association of Metropolitan Phoenix (RAMP), and Jack Rattigan of the Hampton Roads, Virginia Radio Broadcasters Association.

The second half of the meeting is designed to be a brainstorming session. Panelists will answer questions from attendees during the second half as well.

The RAB will once again offer a special, limited-capacity Certified Radio Marketing Consultant (CRMC) examination for MSC attendees on Thursday, Jan. 30. The exam is designed to test sales executives' knowledge of radio marketing.

CRMC accreditation is the advertising industry's only professional recognition program. RAB members and non-members meeting certain professional experience re-

quirements can take the three-hour examination.

Attendees will have a series of "survival" topics to select from when choosing sessions and workshops. This year's sessions run the gamut—from LMAs to sexual harassment. Sessions led by popular sales trainers

will be repeated to allow for maximum attendance. Many sessions are forums designed to give step-by-step sales strategies that can be implemented by sales managers immediately.

Chris Lytle will share "The Ten Terrible Truths About Sales Managers," in a ses-

sion designed to evaluate radio sales today and how they can be improved.

Norm Goldsmith will examine the changing dynamics of the industry and particular radio markets. Goldsmith will explain how these changes affect an operator's way of doing business and how that operator needs to develop sales people and dollars. The emphasis will be on *acting* rather than *reacting* to the marketplace.

continued on page 26 ►

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Nashville to Host RAB Conference

► continued from page 25

Irwin Pollack will share 92 proven revenue-producing ideas. The sales executive looking for good promotion ideas should not miss this session.

Dave Gifford will show sales managers how to train their sales staff to sell at all times. Gifford believes this kind of training ensures that a station will be prepared for anything at any time.

Pam Lontos will give attendees ten strategies for eliminating common radio objections. Lontos will teach the science of asking the pertinent questions and finding a prospective client's hot buttons.

Value-added

The NAB will help attendees understand what is and what is not allowed in political advertising. The panelists will attempt to answer questions such as, "What political ads must you accept?" "What can you turn down?" "When does 'lowest unit rate' apply?"

California-based Honda-Stice, an advertising consultancy, will disclose the inside story on why and how auto dealers make ad decisions. Honda-Stice executives will show attendees how to take that information and train their sales staff to

communicate effectively with auto dealers. The sales conference will also feature a

Database marketing is becoming an essential part of many radio operations.



session on LMAs. Panelists will discuss the short- and long-term prospects for LMAs.

Panelists will discuss different ways to generate revenue with a database.

Steve Marx and Pierre Bouvard will explain Optimum Effective Scheduling (OES), a system they developed to sell, market and schedule radio. To date, the system has caused a sensation in some markets; in others, stations won't go near it.

Is there room at a radio station for direct response marketing? Some stations are already reaping rewards from using direct response marketing. Panelists will tell attendees what they should know about its role in the coming years.

A subject at the forefront of the nation's awareness in 1991 was sexual harassment in the workplace. Managers will have a chance to learn what procedures to follow to ensure a comfortable working environment. They will also learn what files to keep, when to call an attorney and what liability they bear for the actions of their staff.

Helping sales managers forecast sales with precision is the topic of a session designed to take attendees through a step by step procedure to minimize guesswork and make precise sales projections.

New business development will be the topic of a four-session series. Finding and procuring new dollars for a radio station will be examined in detail. The first session will focus on retail-driven vendor programs. The second session will discuss manufacturer-driven vendor programs. Session three details cross-promotion partnerships, and the final session will be a "how-to" on event marketing, shows and fairs.

Another four-part session will be partly taught by sales consultant Ken Greenwood. Greenwood will outline the four most vital elements necessary to being an effective sales manager. The four are recruiting, training, compensation and account list management.

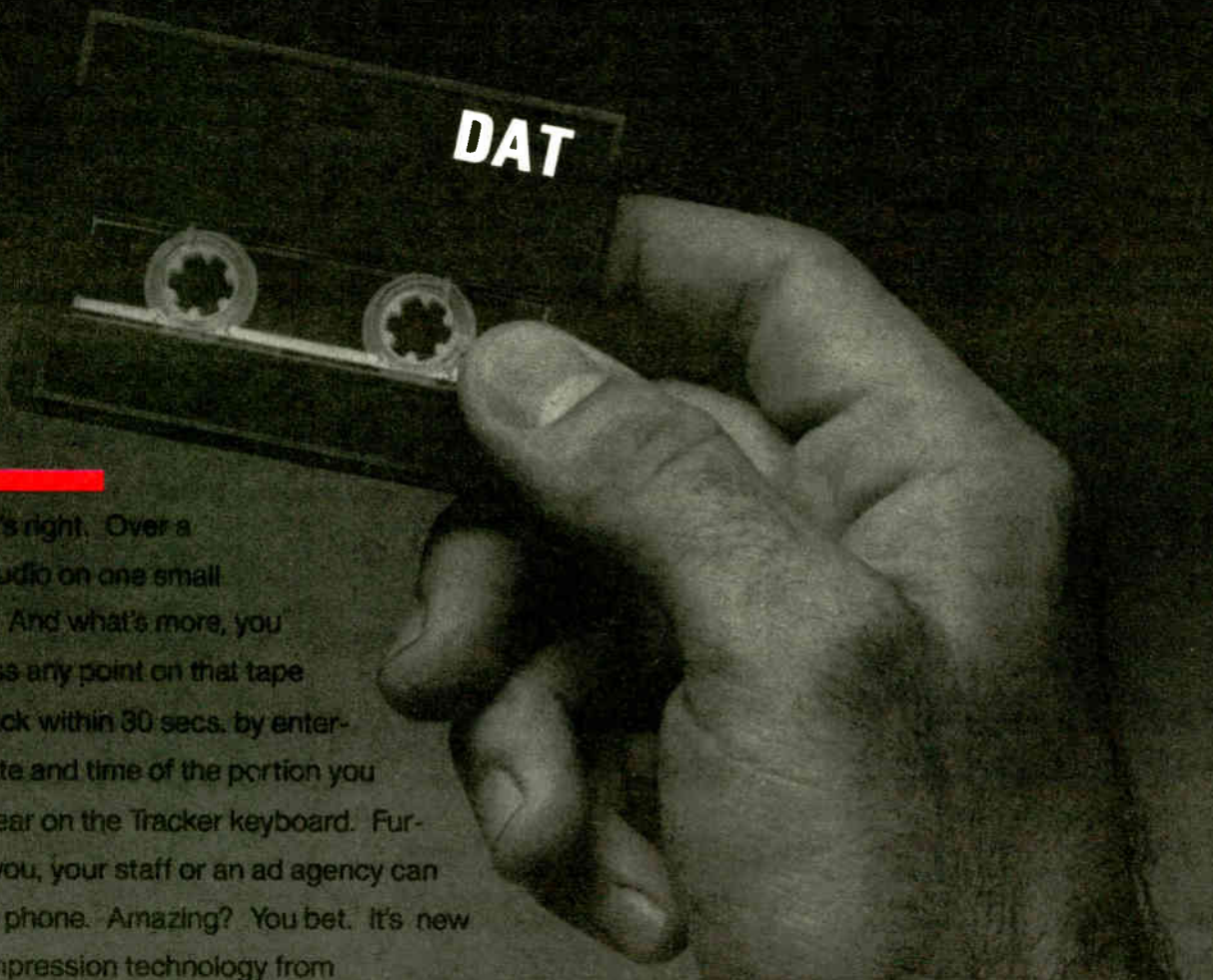
The advertiser's side

National sales managers can learn a few new techniques at the national spot sales tracking session. Topics discussed will include evaluating a rep firm; selling local ideas on a national level, communicating better with a rep, getting national business with no numbers, and making a lasting impression at an advertising agency.

Lenny Stein, vice president, radio, Young & Rubicam, New York, will give attendees the rundown on what agency buyers can and cannot do. Stein will explain the role of planners and some of the do's and don't's for communicating effectively with them.

Successful small market stations will get a chance to share their strategies at a session designed for them. Small-market radio station sales managers will discuss some of the different things they are doing to remain profitable.

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World Radio History

Staying Profitable in a Lean Economy

by Dr. Sammy J. Parker

Part I of II

MURRAY, Ky. It was Winston Churchill who said "Never have so many owed so much to so few." This phrase could be applied today to radio station owners, managers, and engineers. Never in the recent history of modern radio have emerging technological advances and increased competitive pressures placed radio stations in a more perilous position.

However, despite the bleak financial figures recently released about the health of the industry, some small-to-medium market radio stations continue to gross over one million dollars a year and earn substantial profits. How do these select "few" defy the odds and continue to profit in these perilous times?

There isn't one answer that works equally well for every radio station. But there does seem to be a series of common factors shared by highly successful, high gross small-to-medium market radio stations. These same elements are usually missing from the "typical" radio station operation for a variety of reasons.

It starts at the top

One of the most important factors shared by successful stations is strong management with vision. Radio station owners and managers *must* have a clear sense of mission and purpose for their station. This mission and purpose must be pursued without distractions and peripheral, energy-draining activities.

A lack of clear sales, programming, and community service goals and objectives greatly hampers the day-to-day decision making and leadership needed for a highly successful business. The high gross radio stations seem to share the same type of visionary leadership, with their goals and objectives clearly in view. The need for ownership and management to provide clear and consistent leadership needed to keep the "ship on course" cannot be stressed enough.

Another essential factor common to these stations is strong financial support for technical improvements. Management has a willingness to make engineering an equal partner with programming or sales. High gross radio stations have continued to invest in the best equipment and the latest technology to keep their sound competitive with enhancements like CD, DAT, and stereo.

Management of a radio station in the 1990s demands technical knowledge well beyond the transmitter and studio. The employment of a fulltime engineer is common, and recommended, for stations operating with remote equipment and selling/broadcasting on a regional basis. High gross radio stations share the same technical commitment for providing the best quality signal to their listeners.

Many successful stations have restructured the organizational framework—with new approaches to job descriptions and job responsibilities. Job specialization in small market stations is ineffective in the current economic/competitive environment. Your radio station should have detailed descriptions of daily, even hourly duties for the staff.

An operator can strengthen his station operation by rotating staff members among news, production, control room and sports responsibilities. The giant car maker Toyota

has thousands of employees successfully rotating jobs within their plant in Georgetown, Ky.

Staff of all trades

Radio operators need to rethink their traditional approaches and develop less specialization among their staff—especially in small-to-medium markets. The old attitude of "that's not my job" should be immediately replaced with a quality customer service-oriented view.

Successful radio stations have rethought and changed their programming philosophies from those of the last 20 years. Small-to-medium market stations

have, in far too many instances, become small carbon copies of large market, niche programming strategies.

These concepts are not working well and need to be rethought by management. My suggestion is to develop defensive programming designed to offend as few people as possible. This type of musical programming is well suited to small and medium markets where there are fewer local radio choices.

In general, high gross radio stations program to adult audiences and to the business community. Program on AM what adults and older citizens want to hear. Specifically, the program list for a station

should include frequent weather forecasts, community events, recipe programs, real estate shows, and strong local news broadcasts. The news program is a must programming item.

In short, high gross stations are giving people what other radio stations find inconvenient, distasteful, or "out of format." Operators that want listeners, and lots of loyal listeners, have to earn their loyalty by broadcasting soccer games, high school graduations, 4-H club award dinners, and sports banquets.

Demand an unfair share

It is essential for owners/managers to develop a positive radio attitude. It is time for managers to expand their thinking and believe strongly in their mission/vision and their station's ability to generate impressive

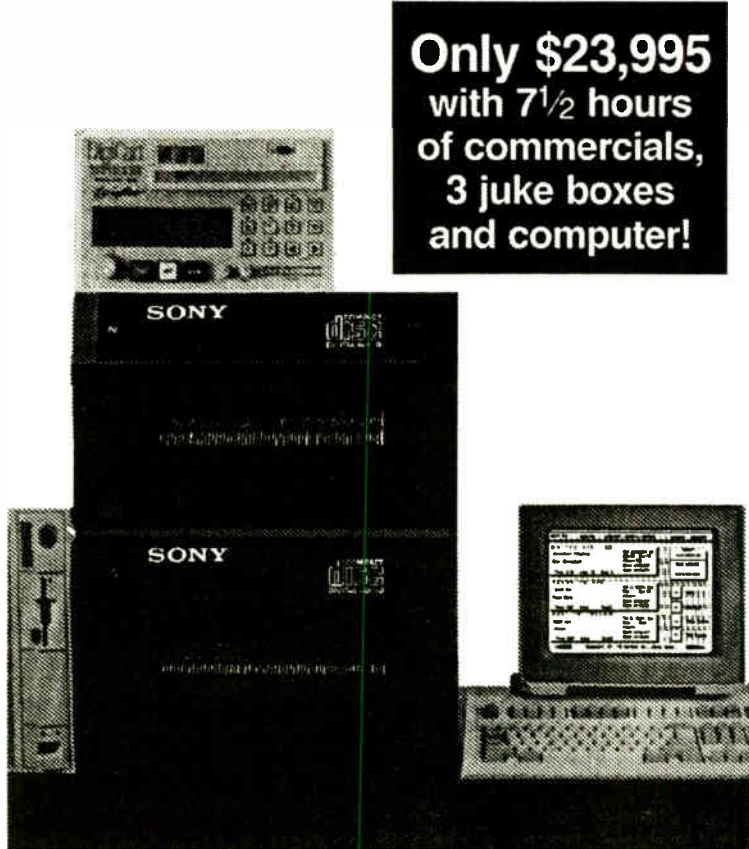
continued on page 29 ►

Improve the Sound of Your Station!

...Control Commercials from Hard Disc
...Control Music from Compact Discs
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"Ultimate Digital Studio" Controls Compact Disc Juke Boxes & "DigiCart" Hard Disc Digital Audio Recorders

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and computer!



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having a *great* sounding radio station, where songs, commercials, talk, promos, and jingles come together perfectly. You'll have a station where where *creativity* thrives, yet announcers couldn't "forget" commercials or tags if they tried. Your studio'll be a clean, clutter-free showplace.

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Perfection Can Be Yours

with the *ultimate* in mistake-free, clutter-free, paper-free creative programming. It's affordable, with computer, three Sony CDK-006 industrial juke boxes, DigiCart™ HD-400 storing *7½ hours of mono (or 3¾ hours of stereo) spots, jingles and songs for only \$23,995! A DigiCart for your production room adds only \$3,995. Call "(800) TM Century" for details. (Storage at 44.1 kHz *with Dolby AC-2 6:1 data compression.)

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14444 Beltwood Parkway, Dallas, Texas 75244
Phone: (800) TM Century - FAX: (800) 749-2121

Yes! I want to know how TM Century's "Ultimate Digital Studio" can help my station sound better! Mail to: TM Century, Inc., 14444 Beltwood Parkway, Dallas, TX 75244-3228, or FAX toll-free to (800) 749-2121.

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Circle (55) On Reader Service Card

RAB's President Gary Fries Contemplates the Road Ahead

Editor's note: The last two years were ones of great change for the Radio Advertising Bureau (RAB). The staff was reduced by roughly half (from 70 to 39), without any decrease in services to member stations. The organization enhanced its On-Line Express system and took the project in-house. The installation of tighter accounting practices also meant that the RAB lost roughly one-fourth of its member stations.

Gary Fries assumed his role as president and CEO of the RAB Oct. 1, 1991, replacing Warren Potash. Fries' charter is to shake up the industry and bring it and the RAB to the forefront of the media marketplace.

Fries comes to the RAB with years of experience in all facets of the radio business, including stints with Transtar, then Unistar, after the merger of Transtar and United Stations.

RW: With the appointments of Wayne Cornils, Ron Ruth, and Judith Carlough, you now have a management team in place at the RAB. Will you be making any more additions?

Fries: No, The team is basically in place at this point.

RW: You've said before that once you had your management team in place, you would formulate a specific mission statement for the RAB. Is it still too early for that or do you have a mission statement ready?

Fries: Actually, we are having strategic meetings on just that. But I can tell you—and this is not a full statement—that the mission of the RAB is to train people to sell radio and to help people sell radio better. It is that simple. It gets into trouble if you try to get more complex than that. That is what it boils down to.

RW: Are there any other specific programs or efforts that you consider key in promoting the continued growth of the radio industry, and the RAB?

Fries: Yes, I think we are going to simultaneously approach the buying of radio with programs such as the Optimum Effective Scheduling (OES) program. That program deals with the cost-per-point philosophy—so that people buying radio can buy easier, they can understand it better.

The bottom line, in my opinion, after meeting with members of the Association of National Advertisers (ANA) and several agency people, is that everybody is looking for one thing and one thing only—they want to get results. Hopefully, that is neither a mystery nor a new revelation to anyone.

And if you start looking at what gets results, what gets results is proper scheduling, which is not effective unless you have the proper creative. And we are going to be doing more in the research area to assist people in getting better results and in knowing how to buy radio.

RW: Why did the RAB choose to get involved with the Radio Creative Fund?

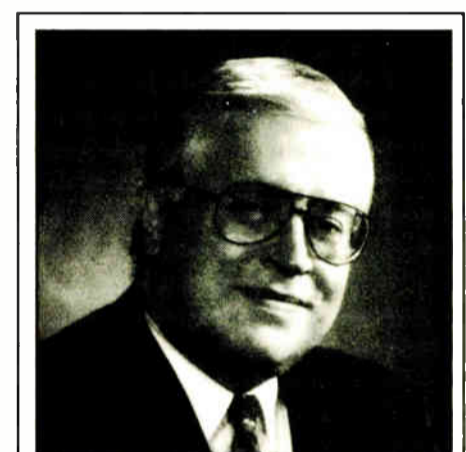
Fries: I agree 100 percent with Jim Thompson and all the reasons why he felt that the Radio Creative Fund needed to be established. One of the major elements in attracting more money into radio is for radio to be exciting from an advertiser stand-

point. And one of the areas where excitement can be injected is the creative area.

But because of a recent lack of glamour of radio creative at various agencies, the focus has been on television creative and other media creative.

Radio has not been able to come to the forefront, as far as receiving the energy, the stimulus that is necessary in order to get its day in court. It has not been able to come to the forefront as far as having the agencies invest in it.

The research that was done by Group W was pretty conclusive. It showed that this type of effort will have a major impact on stimulating the creative people at agencies to create and get excited about creating bet-



"The mission of the RAB is to train people to sell radio ... and to help people sell radio better."

— Gary Fries, RAB

ter radio commercials. That will, in my opinion, result in more money being placed in radio.

RW: The buzz surrounding the Managing Sales Conference is the unveiling of the "Fries RAB." Can you tell us how it will be different from the RABs of the past?

Fries: I think that the difference is going to be a more tightly focused set of responsibilities—utilizing people on a focused mission to accomplish certain delineated objectives—rather than just a broad-based "all things" to the radio industry.

We see a definite desire and a definite need both coming together at the same time. A desire and a need to see radio joined together and becoming itself, rather than being competitive amongst itself for the various advertising dollars.

We are working aggressively with other groups that have the same interest that we do, to gain their support and participate with them in the advertising and marketing of the radio industry. So there is a unified effort of all of these groups in advertising and marketing of the radio industry.

RW: Will this newly focused RAB retain the flexibility to change with the industry?

Fries: That is definitely part of the plan. Everything is being built with a two-fold understanding. The first is to ensure that the tentacles be out there to enable us to anticipate and meet the marketplace changes. Secondly is to not carve anything in stone, but rather be able to "bob and weave" with the needs. And that, by the way, is the type of person that we have been looking for and hiring here at the RAB.

STATION SERVICES

News and Services for Business, Programming and Sales

VNU, Arbitron Market New Tracking Services

VNU/Business Information Services, the parent company of Birch Radio, has signed a five-year license contract with Arbitron Ratings Co. The contract makes Arbitron the exclusive marketer of VNU's Scarborough report to radio and television stations.

The companies have also reached an agreement to jointly market their respective advertising expenditure tracking services. Arbitron currently markets Broadcast Advertiser Reports (BAR) and Radio-TV Reports, while VNU markets the Leading National Advertiser (LNA) reports and the Radio Expenditure Reports (RER).

Birch Radio discontinued its ratings product line on Dec. 31, after delivery of the fall survey. Although the service had won support in the advertiser and agency community, financial pressures in the radio station marketplace led to a decline in station subscriptions.

For information call 212-887-1314, or circle **Reader Service 23**.

AP Strengthens West Virginia Presence

The Associated Press has promoted Terry D. Wallace, newsman in the Charleston, W.Va., bureau to broadcast editor for the AP in West Virginia. Wallace worked in the newspaper business prior to joining AP in March 1991, and has also taught at the University of Florida.

For information on AP services, call Evelyn Cassidy at 202-955-7243, or circle **Reader Service 95**.

Radio Et cetera Joint Venture

In another exclusive marketing agreement signed recently, Radio Et cetera has agreed to be the marketing agent for The Lund Consultants to Broadcast Management, throughout the U.S.

The Lund Consultants work in all mar-

kets sizes in both programming and sales consulting. The company also has a research division that provides market research projects.

Radio Et cetera is a broadcast marketing and promotions company headed by Rick Lemmo. For information, call Rick Lemmo at 800-767-1267, or circle **Reader Service 84**.

CBS Grows Hispanic Network

CBS Radio continues to strengthen its Hispanic Radio Network with the appointment of Nick Kiernan, operations man-

ager, to the post of vice president and general manager.

The CBS Hispanic Radio Network was launched in 1990, and now reaches 80 percent of the total U.S. Hispanic population. Programming on the network includes Major League Baseball, post-season NFL coverage, including the Super Bowl, and a variety of feature programs.

For information on the CBS Hispanic Radio Network, call Marilyn Rachap at 212-975-3773, or circle **Reader Service 44**.

Paragon Research Provides Full Range of Broadcast Services

Denver, Colo.-based Paragon Research celebrates its tenth anniversary with a full plate of offerings to broadcasters. The research firm supplies radio stations with services such as: auditorium music testing; format analyses; format searches; perceptual studies; perceptual tracking; music call-out; one-on-one interviews; focus groups, and national format lists.

For more information on Paragon services, call the company at 303-922-5600 or circle **Reader Service 150**.

Maintaining Profitability

► continued from page 27 results.

Managers of high gross radio stations are not afraid to ask for larger shares of the advertising dollar. High gross radio stations are using consultation selling and other techniques to ask for much larger shares of advertising dollars—and they are getting them in many instances. Don't be afraid to get your fair share and more.

Next time we'll look at expanding your sales market, stopping all sales promotions and selling radio as the basic advertising medium, creating significant new revenue through special events selling, and the importance of developing higher rates.

□ □ □

Dr. Sammy J. Parker is director of basic courses at Murray State University in Murray, Ky. He is the author of a 55-minute audio cassette, "High Profits from Small Market Radio," available to any radio station requesting the tape. Parker also operated a stand-alone AM for over 12 years and a Class C FM before both stations were sold in June of 1990. He can be reached at 502-762-4460.

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in the heart of today's 35-44s, in the new Broadcast Programming format by Bill Conway. Call it Rock AC, Adult Rock, Mellow Classic Rock...whatever. It took the expert programming company to get it right.

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Not too soft, never too hard, this is The Heart of Rock. Your target listeners will take it to their hearts, to stay.

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NO COMPANY OFFERS YOU MORE WAYS TO WIN.

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We stay on top of the music.
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Already Gone, Eagles...
I Wish It Would Rain Down,
Phil Collins...*

*Fly Like an Eagle, Steve Miller...
Tiny Dancer, Elton John...
Walk of Life, Dire Straits...*

*White Bird, It's a Beautiful Day...
Under My Thumb, Stones...
Long Train Runnin', Doobies...*

*These Eyes, Guess Who...
You May Be Right, Billy Joel...
Dancing in the Dark,
Bruce Springsteen...*

*Peg, Steely Dan...
Free Fallin', Tom Petty...
Take the Long Way Home,
Supertramp...*

*"Ob-La-Di, Ob-La-Da,
life goes on..."*

BUYERS GUIDE

January 22, 1992

Test & Monitoring Equipment

USER REPORT

TFT Part of the KJLS One-Two Punch

by Michael Rogers
GM, KJLS

HAYS, Kansas Working in a small market radio station where the general manager does 95 percent of the engineering can make broadcasting very interesting.

You see, the only time we call for an engineer is when we see a mushroom cloud rising from the transmitter site. So most of our equipment must be simple and straightforward.

Competition in small market radio is getting tougher as we enter the 1990s. Our DJs want and our audience demands that we must be loud and clean—a lot of limiting and compression—with a 90 dB dynamic range.

Absolute necessity

Our owners want us to cover a 60-mile radius with a 450-foot tower at 100,000 W ERP. To even try to accomplish all of this, good equipment is a must; monitoring equipment is an absolute necessity.

Truthfully, almost all manufacturers

make comparable equipment. Some had different strengths and, for the most part, very few weaknesses. The trick was finding the right combination for KJLS.

We immediately determined the main monitor must be located at the studio site. We could monitor peak modulation at a glance, multipath, stereo pilot, etc., and sneak a peek to see what the competition is doing. So we chose the TFT 844A.

It's true, most monitors would accomplish the above. I, however, like the ability to change the rise time of the monitor when setting peak modulation. You see, we use a slight amount of composite clipping at the studio location, plus we use an extremely gentle clipper at the transmitter site to minimize any overshoot.

If any spikes blow through our clipper circuits, we are able to slow the rise time of the 844A up to .9 milliseconds, which ignores the spikes. The ability to change the peak duration enables us to achieve maximum loudness and reduce the compression and limiting circuits, permitting

us to achieve an outstanding dynamic range.

The added benefit is knowing that I can achieve loudness and still modulate within FCC regulations.

Oh yeah, that

KJLS plays all of its music from compact disc through a modified 20-channel production console. The music then enters world class processing, from there moves into a recently calibrated and tested STL into a new transmitter. What could possibly go wrong? AM noise.

If the transmitter is not tuned properly, AM noise will affect the sound of the programming. To solve this problem, we acquired the Radio Designer Labs ACM-1 and installed it at the transmitter site. Yes, we could have moved the 844A to the transmitter site, however, it is tough for me to read AM noise by watching for a meter to dip when I am looking at four other meters peaking and dipping simultaneously.

The ACM-1, with its LED display, is

very easy to read while tuning the transmitter. The ACM-1 was installed one inch above the meters in the center section of our Continental 27.5K transmitter. Tuning is a piece of cake.

Our on-air staff watched me leave for the transmitter site with the ACM-1. I thought nothing of it. Installation is so simple I won't bore you with the details.

After tuning the transmitter, one of my DJs said to me, "Buck, tell me exactly what the ACM-1 does to the audio ... We



The TFT 844A offers an edge on the market for KJLS.

sound great. I think we need to get one for the production studio, too."

I laughed and said, "Maybe next year."

Ultimate goal

Tuning our Continental for the lowest possible AM noise is not our ultimate goal. The major transmitter companies have definite procedures on the tuning of their transmitters. We follow Continental's instructions to the letter, then use the ACM-

continued on page 36 ▶

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Circle (50) On Reader Service Card

TECHNOLOGY UPDATE

Audio Precision's FASTtest: When Speed Is What You Need

by Tom Mintner
Marketing Director
Audio Precision

BEAVERTON, Ore. Speed always has been an important factor in audio testing. Broadcasters use our Audio Precision FM and TV-BTSC audio proof packages to reduce testing time for broadcast audio proofs from hours to minutes.

But periodic and frequent on-air or live-link testing of extremely short time intervals has been a continuing goal of many users.

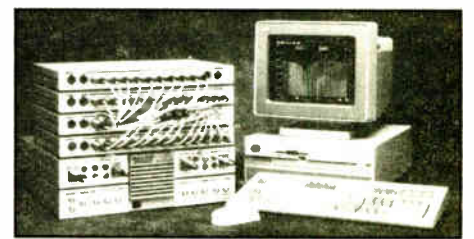
A European Broadcasting Union (EBU) recommended standard testing protocol, often called "short interval testing," utilizes an FSK-encoded preamble to define test instrument setups and predetermined tone "sequences" for testing various parameters of a broadcast audio channel. However, some sequences take more than 20 seconds (hardly a "short interval" by U.S. broadcast standards). The shortest of which we are aware still require five seconds of on-air test time.

Although Audio Precision also can supply hardware for running EBU 0.33 audio testing sequences on our System One, we prefer and have recently introduced a newer approach, which we call FASTtest.

FASTtest is Audio Precision's rapid channel testing system for use with any DSP-equipped System One audio test set. Since the FASTtest system consists of software,

FASTtest may be retrofitted or added to any DSP System One without the special cost (often in excess of \$25,000) associated with other dedicated "short interval" test systems.

FASTtest also has many other general audio testing applications beyond 0.33 broadcast testing, including tape recorder and



Don't be confused! FASTtest speeds up channel testing and more.

general audio testing, generation of calibration waveforms and others.

The system is not an EBU 0.33 technique, but a new method utilizing digital signal processing to generate a multifrequency test signal, which may then be inserted as a "burst" as short as one second into the on-air channel. Compete startup, acquisition and analysis of results may typically be made in three seconds or less, depending on such factors as PC speed and how many parameters are to be measured. FASTtest can measure frequency response, distortion and noise,

continued on page 32 ▶

TECHNOLOGY UPDATE

Amber 7000 Mixes High-Tech Features with Ease of Use

by Vincent Desouza
Director of Sales
Amber Electro Design

ST. LAURENT, PQ, Canada The Amber 7000 system is a universal audio frequency generation and measurement system that combines a sophisticated user interface with high performance analog and digital hardware.

It integrates state-of-the-art analog measurement capabilities with the digital processing and measurement functions required by modern mixed-signal systems.

The complete system is contained within a single enclosure that is rack-mountable and transportable. It requires no additional equipment to form a complete automated measurement system.

Configuration flexibility

The 7000 system offers a high degree of configuration flexibility. The basic platform can support a variety of generation and measurement functions to allow the specific requirements of particular users to be satisfied in an efficient and easy-to-use form. A "soft" front panel based on Microsoft Windows offers a standard user-friendly interface.

The user interface functions are implemented by a 40 MHz 80386 system with 4 Mbytes of RAM running MS-DOS and Windows. The system includes a 1.44 Mbyte 3.5-inch floppy disk and an internal 40 Mbyte hard drive.

Communications with other systems is provided by a GPIB port, an RS-232 port and a parallel printer port. The front panel display is a VGA resolution (640x480) electroluminescent flat panel providing 16 gray-level graphics mode displays.

The 7000 system incorporates a generator subsystem with both analog and digital sources and outputs. The system generates a variety of analog output signals up to 30 dBm, including: low distortion sine wave (analog generation 10

Hz to 100 kHz); miscellaneous signals—pink noise and square wave; and arbitrary waveform—digital signal generation.

Up to four independent analog signal sources can be summed in integer ratios to feed a single output.

Digital arbitrary waveform generation can act as a source for the analog system and also provides direct digital outputs. Waveform creation is simplified by a standard waveform library and powerful editor. Digital outputs will be available in parallel AES/EBU, SPDIF and fiber-optic formats with resolution to 24 bits and sampling rates to 200 kSpS.

Complete measurement channels

The 7000 system has one, or optionally two, complete measurement channels. It will allow a variety of measurement modules to be installed to enhance the basic measurement functions. Optionally, two independent simultaneous measurement channels, each with some specific measurement capability, can be provided.

All normal audio measurements, including level, frequency, distortion, etc., are provided with true RMS, average and quasi peak detection.

Digital signal processing capabilities provide waveform capture and analysis functions, including optional real-time processing. The digital system has two channels to allow simultaneous analysis, such as spectrum analysis (FFT), waveform display, serial bitstream analysis and level and distortion measurements.

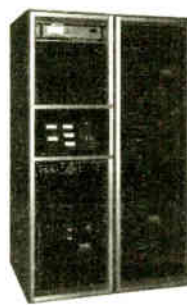

The DSP system can acquire data either from various points in the analog measurement system (through a 16-bit A/D converter) or directly from parallel, AES/EBU, SPDIF or fiber-optic digital inputs.

For more information on Amber products, contact Vincent Desouza at Amber Electro Design: 514-333-8748; fax: 514-333-1388; or circle Reader Service 72.

WHY QEI?

<p>24 Hours.</p>  <p>Our 24 hour service hotline number is 609-728-2020.</p> <p>Call us toll free at 800-334-9154 for all the facts on QEI "New Reliabes" FM transmitters from 1kw to 30 kw.</p>	<p>Power Up.</p>  <p>With our FMQ 3.5/5/10 kW or 20/30 kW FM transmitters, you can upgrade power in the field.</p> <p>Call us toll free at 800-334-9154 for all the facts on QEI "New Reliabes" FM transmitters from 1kw to 30 kw.</p>
<p>No Extras.</p>  <p>We never charge you extra for single phase power. Not on our FMQ 10000 or our FMQ 20000B—not even on our 30 k FMQ 30000B.</p> <p>Call us toll free at 800-334-9154 for all the facts on QEI "New Reliabes" FM transmitters from 1kw to 30 kw.</p>	<p>Less is More.</p>  <p>All of QEI's FM transmitters have no plate blockers or sliding contacts.</p> <p>Call us toll free at 800-334-9154 for all the facts on QEI "New Reliabes" FM transmitters from 1kw to 30 kw.</p>
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<p>Single Phase 30 kW.</p>  <p>Our new FMQ 30000B is the only 30 kW transmitter available with a single phase power supply.</p> <p>Call us toll free at 800-334-9154 for all the facts on QEI "New Reliabes" FM transmitters from 1kw to 30 kw.</p>	<p>Built-in Backup.</p>  <p>QEI's constant 50 Ohm interstage impedance lets you bypass the IPA or PA in the unlikely event of a problem.</p> <p>Call us toll free at 800-334-9154 for all the facts on QEI "New Reliabes" FM transmitters from 1kw to 30 kw.</p>
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Circle (12) On Reader Service Card

TECHNOLOGY UPDATE

QEI's Model 691 at Home in Any Environment

by Jeff Detweiler
Domestic Sales Manager
QEI Corp.

WILLIAMSTOWN, N.J. The QEI 691 is an FCC type approved modulation monitor which incorporates a wide variety of important test functions into a stand-alone modulation monitor.

The entire instrument, including power supply, is contained in a 10½"×12"×19" rack-mountable package. Large switchable autoranging meters, adjustable peak flashers, test outputs, clearly labeled color coded controls, a built-in signal sampler and many more unique features allow a

wide variety of tests to be made in a minimum amount of time.

Highly accurate quadrature detector input circuitry assures no overshoot in the measurement of any complex modulation waveform and level.

Additionally, the 691 monitors and tests off-air or in high RF environments normally found in common transmitter sites with equal precision and accuracy.

Assure accuracy

To assure accuracy, the QEI Model 691 features a built-in calibrator and field calibration function by a Bessel null. Because the 691 has all necessary circuitry

to convert any X-Y input oscilloscope into a spectrum analyzer, the engineer can be certain of the calibration of his test equipment without relying on the unknown of the built-in calibration circuitry.

The baseband portion of the QEI 691 contains a Total Modulation Meter, which is switchable to display either positive or negative modulation peaks. The Peak Mod thumbwheel peak flasher, and peaks-per-minute numeric LED display provide accurate peak modulation indications from the operator setting of one percent to 199 percent in one percent increments.

The addition of the QEI exclusive Variable Peak Duration Test Option (VPDTO) allows the 691 peak flasher to display peaks that are weighted by either time of duration of the peak, or the total number of peaks within a five millisecond length of time (adjustable 100 to 1000 microseconds) will be displayed on the total peak flasher.

The VPDTO also counts individual peaks of modulation and will display peaks exceeding a preset number within a five millisecond period. The settings all are DIP switch-selectable and the VPDTO also can be switched in and out of the circuit from the front panel.

This portion also contains the Carrier Frequency thumbwheel, RF level indications, power switch, mute switch and baseband test outputs. The outputs include the BNC connections to drive the oscilloscope as either a spectrum analyzer or a vectorscope.

The spectrum analyzer center frequency is the frequency set on the Carrier Frequency thumbwheel and can be push button-switched to either 240 kHz or 700 kHz bandwidth. This allows viewing of the modulation envelope or that of the competition for analysis or comparison. The vectorscope display can provide a quick check of mono balance.

A signal sampler

The 691 also contains a signal sampler, which can handle up to 50 W of RF. Simply attach a suitable load to the rear panel BNC and connect your "sick" exciter directly to the 691 test set to utilize all of its features for troubleshooting.

The stereo and SCA portion contains all the necessary controls, meters and outputs for these measurements and tests. The two large meters are grouped vertically for quickest eye scan and are switched together for ease in making the most common stereo measurements.

These meters also may be switched to VU ballistics and de-emphasized for visual review of loudness as heard by the listener. Switching to auto-range operation permits a very rapid check of separation, crosstalk or noise. Simply push the correct button, let the meters range and note the reading.

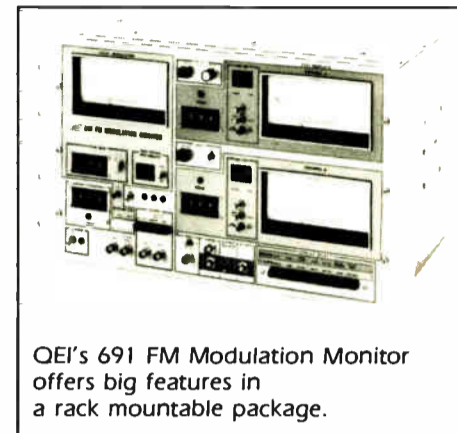
Each meter has a separate peak flasher and thumbwheel peak level set switch with a range of one percent to 199 percent in one percent increments for indicating instantaneous modulation level. The component part of the stereo signal being displayed also is available the front panel BNC-labeled Scope and is switched by the Output Select switch. This permits rapid comparison of the two metered signals on your oscilloscope.

An example of a separation measurement would go as follows: First, press the Left/Right push button and apply a 100 per-

cent left-channel audio signal. Next, switch both meters to Auto. Your separation is expected to be 65 dB, but the meters indicate 31 dB.

Comparing audio channels

Finally, connect your scope to the front panel Scope Output and switch between channel A and channel B. The 31 dB down signal will be amplified by the auto-range and is easily compared to the audio on the



QEI's 691 FM Modulation Monitor offers big features in a rack mountable package.

other channel. You can easily and quickly see if the problem is harmonically related or noise or something else.

FM noise, AM noise, 38 kHz suppression, stereo generator 19 kHz to 38 kHz phase alignment and many other test functions also are performed with similar ease and accuracy.

This section also performs the SCA Monitoring functions if the optional SCA monitor card is installed. One or two SCA channels may be monitored by this option, which can be installed by the customer if the card is purchased after the test set is in service. The card is plugged into the existing socket in the 691 and the SCA-related buttons on the front panel become active.

For many years the QEI Model 691 FM Modulation Monitor/Test Set has been providing accurate modulation and test information to conscientious broadcasters.

□ □ □

For information from QEI, contact Jeff Detweiler or Bill Hoelzel at 800-334-9154; fax: 609-629-1751; or circle Reader Service 115.

When Speed Is What You Need

► continued from page 30

all from the same stimulus signal.


The stimulus signal may be chosen from a standard waveform supplied with FASTtest or an easily generated custom signal where the user may specify number, frequency, amplitude and phase of the signal components. Analysis of the acquired signal also is done by DSPs via special Fast Fourier Transform programs.

Since FASTtest signals are generated digitally, they may be recorded to RDAT or other high-quality storage medium. This transfer may be done digitally, without intervening analog conversions, if the System One used is a Dual Domain model. So a portable RDAT becomes a portable signal source of standard or custom FASTtest stimulus signals.

FASTtest works with System One DSP-equipped audio test systems and DSP capability may be retrofitted to any existing System One unit.

□ □ □


For information from Audio Precision, contact Tom Mintner at 503-627-0832; fax: 503-641-8906; or circle Reader Service 63.



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USER REPORT

WTIC AM Upgrades to Potomac 1901

by Thomas R. Ray III
CE, WTIC-AM/FM

HARTFORD, Conn. As part of our 1991 capital projects at WTIC, we replaced our old, troublesome remote control. The new remote control would give our operators all of the readings in real time on one screen and print a summary as often as we wanted.

While going over the readings we wished to print on the log, we found a minor problem—our antenna monitor.

WTIC-1080 operates with a two-tower directional antenna at night, and was using a Potomac AM-19 antenna monitor at the time. There were three problems with the monitor: You had to issue a command through the remote control to read a parameter; once that parameter was read, it was gone from the remote control display; and the monitor was susceptible to carrier shift, and the loop current readings would bounce with modulation, making them inaccurate because they were taken at different times with different levels of modulation.

I came up with two solutions to the problem. One was to design a timed sample and hold circuit that would access the antenna monitor and update the operating parameters at, say, one minute intervals. The other was to call Dave Harry at Potomac to see if they had a way out of this predicament.

Why not try it?

Dave confirmed my suspicions that it would not be possible to modify the old AM-19 to do what we wanted. He suggested that we purchase the new model 1901 monitor.

The 1901 has many advantages over the old AM-19 series, I have found. First, it fits neatly into 5.25 inches of rack space. The 1901 also weighs considerably less than its older brother, removing the need to have the GM question the weight training program you put into your department budget.

Unlike the older generation of antenna monitors, the power supply, antenna sampling modules, microprocessor control and display

all are modular units. If you keep a spare module on the shelf and have a failure, there is no need to take the monitor out of service for several days for trouble-shooting, or to send it back to the factory.

All modules pop out and in, and, after a few minor adjustments, the monitor is back in service. The sampling modules have resettable jumpers to identify a tower as a reference tower for a particular pattern.

My second favorite characteristic of the 1901 is that it reads directly in the current ratio. No more setting the reference loop cur-

The 1901 weighs considerably less than its older brother, the AM-19.

rent to 50 (our ratio is 1.06—not really readable on the old AM-19's analog meter if the reference were set to 100), reading the tower 2 loop current and breaking out the calculator to see if you're within licensed limits.

Slightly cross-eyed

Before removing our old AM-19, the ratio was read as 53/50, or 1.06. The 1901 read a ratio of 1.061, which was deemed close enough, as I could have been looking at the old analog meter slightly cross-eyed. There is no need to set a reference reading, the 1901 does this automatically.

Just for fun, we cranked on the phasor a bit after the 1901 was installed, just to see how quickly it would react to phasor adjustments. No need to worry. The response is instantaneous. What a joy not to have to go back and set a loop current reference after every adjustment. And, as an added bonus, the ratio reading seems immune to carrier shift.

Calibrating the 1901 is a simple procedure. With the touch of a front panel button, the 1901 is placed into test mode. Here, all towers

(the 1901 is configurable for 12 towers and three patterns) read 1.000 at 180.0 degrees. If a tower does not read properly in test, simply open the front panel of the 1901 and tweak the phase and/or ratio pots with a greenie.

Calibrating the remote control to the 1901 has never been simpler. With the old AM-19, we would have to go to directional mode against management's better wishes during the day, and calibrate the remote control to the readings on the AM-19.

With the 1901, we stay non-directional and place the 1901 into test mode. With all towers reading 1.000 at 180.0 degrees, we simply calibrate the remote control telemetry to these figures. Our ratio of 1.060 reads right on the money every time. Our phase angle of 45 degrees sometimes reads 0.1 degree high on the remote control, but over a range of 135 degrees from calibration to operation, I can't complain about the accuracy of the remote meter driver.

The 1901 also has another nice feature. It reads the sample line voltages as actual voltages in its amplitude mode. This feature was nice when we installed the 1901. WTIC has half-wave towers. During non-directional operation, the night reference tower is grounded, with the full 50 kW feeding the west tower.

Since we only use the 1901 on night pattern, we did not connect the day/night switching of the 1901 into our system. The ratio obviously is off scale during day pattern. My concern was that the voltage coming back on the sample line would be too much for the 1901. To my surprise, it was just above mid range.

Checking and recording

The amplitude mode also comes in handy for checking out the sampling system. By checking and recording the sample line voltages, you can spot changes in the sampling or antenna system by detecting current distribution changes around the sample loops.

continued on page 39 ►

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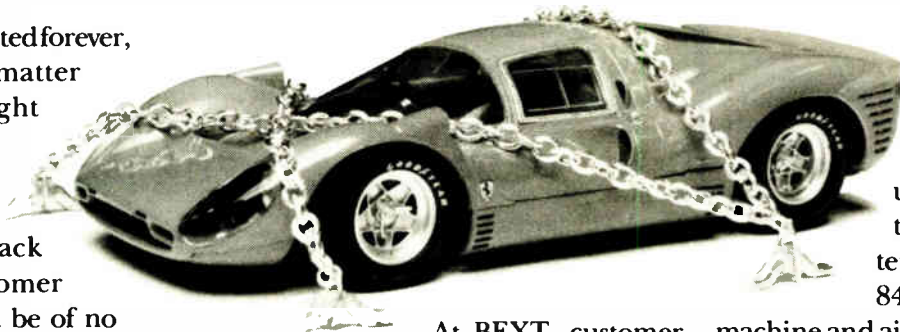
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If electronics lasted forever, it wouldn't matter where you bought your next exciter, amplifier, STL, translator or transmitter. Track records of customer frustration would be of no concern as you simply chose the box which suited you.

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TECHNOLOGY UPDATE

AVCOM PSA-65A Versatile, Economical

by Andy Hatfield
President
AVCOM of Virginia, Inc.

RICHMOND, Va. With a frequency range of less than 2 MHz to greater than 1000 MHz and sensitivity of -95 dBm, the PSA-65A has proven itself to be a versatile, powerful and cost-effective portable spectrum analyzer.

The analyzer weighs only 18 pounds and comes standard with a built-in rechargeable battery pack.

The PSA-65A is an effective instrument for field testing of RF systems, classroom instruc-

tion, satellite system alignment, electronic countermeasures, cellular and production use. In fact, the applications of the PSA-65A are limited only by the user's imagination.

PSA-65A expanded

AVCOM has expanded the capability of the PSA-65A by designing and producing a line of accessories such as an FM demod, 10 kHz resolution bandwidth, oscilloscope interface, AM detector, frequency extenders, log periodic antenna and preamplifier.

The FM demod allows the operator to listen to FM signals that are displayed on the PSA-65A CRT via the internal speaker or Au-

dio Out jack. This jack can be used to drive external speakers or headphones, which is particularly useful when identifying FM station signals or those from TV stations, various two-way radio systems and satellite and microwave downlinks. It also is ideal for listening for the "noise source," as well as other signals in a security countermeasures application.

The installation of the 10 kHz resolution bandwidth filter increases the frequency coverage by reducing the low end of the unit from 2 MHz to 200 kHz.

The oscilloscope interface option was designed to give the operator the ability to output the CRT display of the PSA-65A to an oscilloscope. The advantage of this capability is realized when the PSA-

65A is interfaced with a digital oscilloscope. This way the information of the PSA-65A can be digitized and stored to be recalled at a later date or output to a computer via the RS-232, HP-IB or other computer interface port of the digital oscilloscope.

The AM detector option enables the operator to "hear" the vertical deflection of the CRT trace of the PSA-65A. It originally was designed for utility companies to detect RF leaks and interference. When a signal pops up on the screen, it will either create a tone or change the frequency of the existing tones.

Greater versatility

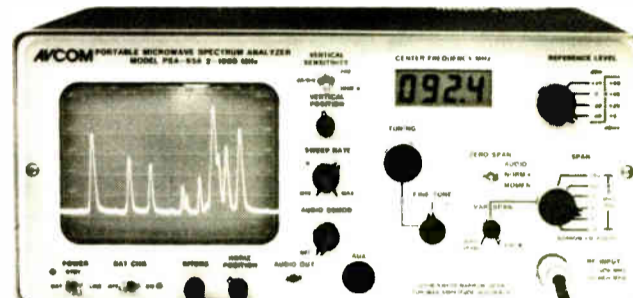
AVCOM developed frequency extenders to allow the PSA-65A greater versatility by increasing the frequency coverage. Standard frequency extenders include 1 to 2 GHz, 2 to 3 GHz, 9450 to 1450 MHz and 3.7 to 4.2 GHz. Other frequency bands may be customer specified.

Frequency extenders consist of a mixer and oscillator tuned to downconvert a signal so that the output falls between 2 and 1000 MHz, which is the input range of the PSA-65A. The sensitivity and accuracy of the PSA-65A are not affected during this operation; however, there is a 10 dBm conversion loss.

This loss may be accounted for mathematically by subtracting 10 dBm from actual readings or eliminated by the use of a pre-amplifier.

Frequency extenders are particularly useful for cable operators who need the capability to align satellite antennas, check signals on cables and monitor off-air signals. They also are necessary for the official who employs the PSA-65A to locate RF transmitters (bugs) that operate higher than 1 GHz. AVCOM has manufactured the 1 to 2 GHz and 2 to 3 GHz frequency extenders in one package for this application.

AVCOM's LPA-1000 is a high-performance precision-machined log periodic antenna for the PSA-65A, as well as for use with other equipment. The LPA-1000 covers a frequency range from 140 MHz through 1200 MHz.



The Avcom PSA-65A Portable Microwave Spectrum Analyzer

The LPA-1000 is only 49 inches (125 cm) in length and weighs four pounds (1.8 kg). A BNC connector is standard.

Enhance performance

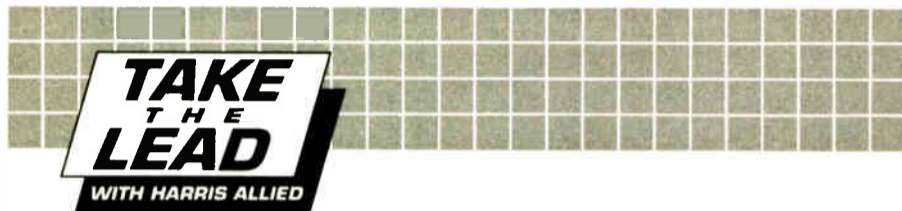
AVCOM's high-performance RF preamplifier, the RFP-24, was designed to enhance the performance of the LPA-1000 log periodic antenna, and for other applications where low noise signal amplification is required. The RFP-24 dramatically improves the sensitivity of any spectrum analyzer or frequency extender to frequencies in excess of 2 GHz. Used with AVCOM's PSA-65A portable spectrum analyzer, signals weaker than one microvolt can be detected.

Technical specifications for model RFP-24 include 22 dB gain through 2 GHz, a noise figure of 2.2 dB at 1.2 GHz, a VSWR of 2.5:1, and 50 ohms input and output impedance. Power may be supplied by the PSA-65A front panel Aux jack or any source of 12 VDC.

The PSA-65A portable spectrum analyzer, we believe, is a real value. The operator can tailor the instrument to meet his specific requirements by adding the proper options and accessories.

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For information on the PSA-65A, contact Charlie Odom at AVCOM of Virginia, Inc.: 804-794-2500; fax: 804-794-8284; or circle Reader Service 97.

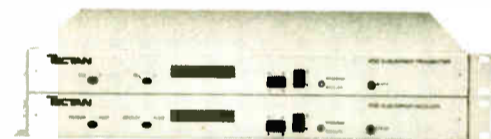


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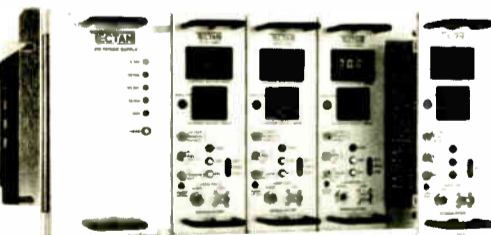
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Model 450 Dual FM Subcarrier



Tectan's Model 450 is a frequency agile, synthesized FM subcarrier unit designed specifically for narrow band multi-channel applications. Each unit contains two completely independent transmitters or receivers for stereo applications over terrestrial microwave, satellite or analog fiberoptic facilities.

Model 412 Frequency Agile SCPC FM Terminal



Tectan's Model 412 is a frequency agile, single-channel-per-carrier (SCPC) wideband FM receiver for satellite transmission and reception of high quality audio, voice or data.

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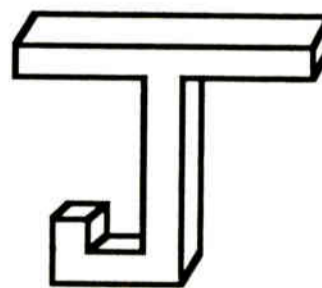
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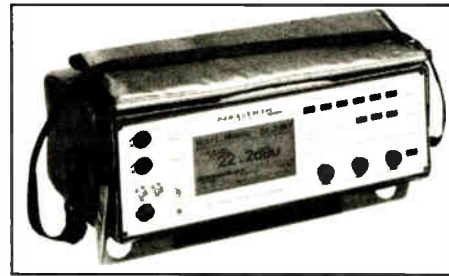


DEVON, Pa. Belar's new frequency-agile FM RF amplifier, the RFA-4, brings frequency agility and accuracy to off-air measurements. With 10 programmable presets, one can check competitors with just the press of a button. The 12-character alphanumeric display shows station call letters. Direct-

dial and up/down functions also are provided. The RFA-4's engineering brings a high standard of accuracy to off-air measurements—it will allow monitoring with an accuracy to within two percent. The RFA-4 will operate with the Belar

FMM-2 FM Modulation Monitor as well as the older Belar FMM-1 Frequency and Modulation Monitor. When used with The Wizard (as shown in the photograph), the RFA-4 can be operated with The Wizard software, displaying the station frequency and call letters on your PC screen or on hard copy.

For information, contact Arno Meyer, president of Belar: 215-687-5550; fax: 215-687-2686; or circle **Reader Service 139**.



LAKEWOOD, N.J. Neutrik's AI audio test and service system contains a sweepable generator, analyzer and oscilloscope. Measurements of level, W&F, drift, crosstalk, frequency, phase and THD+N allows the unit to replace seven conventional measurement instruments.

A large backlit LCD shows single measurements numerically or as sweeps in graphical form. Screen hard copies are available on most popular printers through the AI's parallel port. The unit is auto-ranging, -tuning, -nulling, -scaling and -calibrating—enabling true one-button, one-function operation.

For information, contact James Cowan, general manager of Neutrik USA, at 908-901-9488; fax: 908-901-9608; or circle **Reader Service 108**.

TFT's One-Two Punch

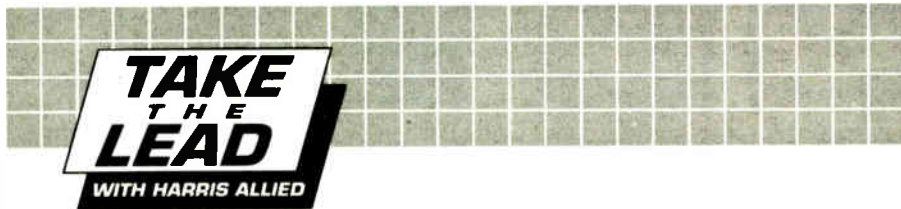
► continued from page 30
I to find center tune. All of this is accomplished in a matter of minutes while we're modulating our normal daily programming.

There's no need to tune with a spectrum analyzer and noise generator through the subcarriers. Not that this is wrong, but I just don't have time for it.

Before the installation of the ACM-1, our AM noise was 43 dB. After retuning our Continental, our AM noise dropped to 58 dB. Seriously, we noticed better stereo separation and frequency response, but most important, we noticed a dramatic increase in dynamic range. We achieved what I call "look-through audio." The stereo images are now precise and distinctive. Our Continental transmitter now exceeds most all of its published specifications.

I am sure other monitors can do the job, but if you have a radio station where warning signs are posted, "Danger—General Manager on Engineering Duty," the 844A and ACM-1 might be the right combination for you.

□ □ □
For information on TFT, contact Joe Wu at 408-727-7272; fax: 408-727-5942; or circle **Reader Service 35**.

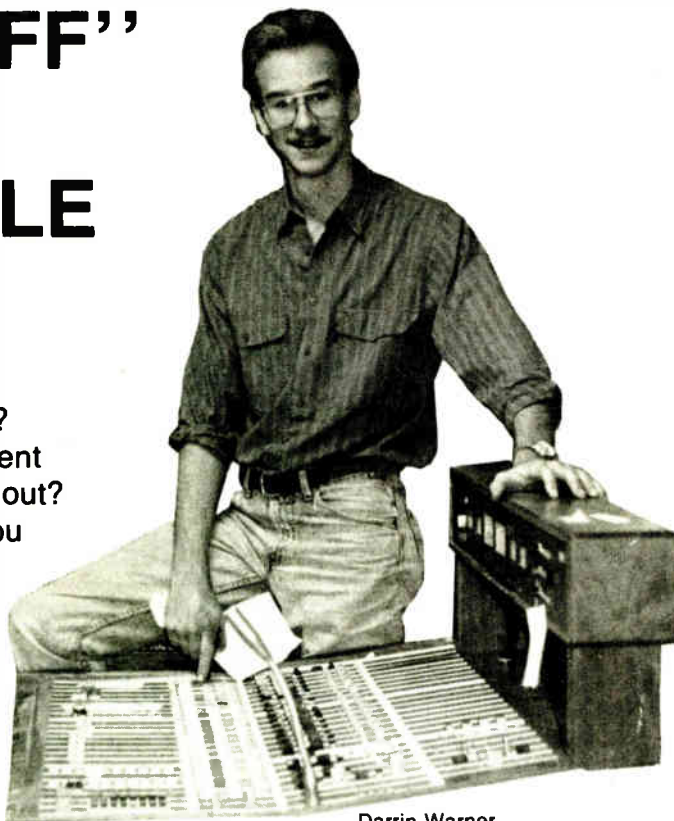


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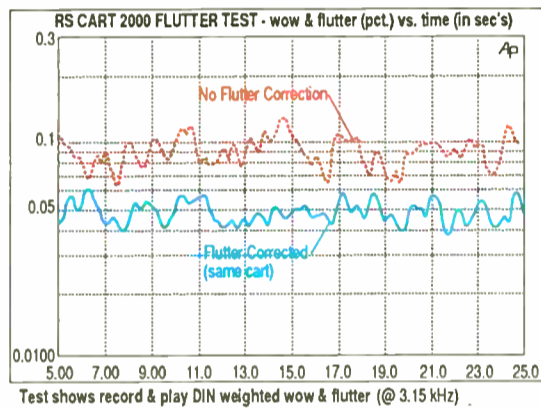
RS-CART 2000

The RS-CART 2000 is the Finest Cart Machine ever designed and manufactured. From major new features like flutter correction, to important details like improved cart hold downs, nothing has been overlooked.

The World's First Flutter Correction.

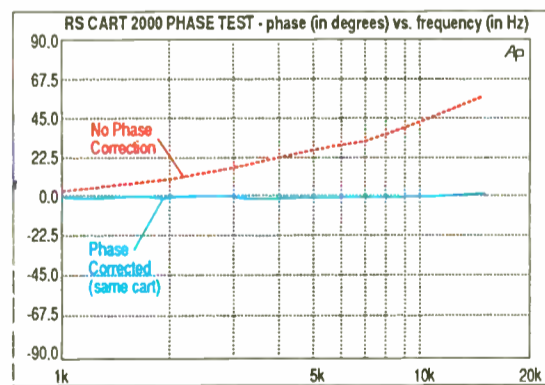
The RS-CART 2000 is the only cart machine to incorporate active flutter correction. This encode-decode system records a pilot tone on the cue track. On playback, the pilot is FM demodulated to drive two dedicated all-pass filter time delay networks to achieve up to a 50% wow and flutter reduction.

For the first time, cart wow and flutter is reduced to levels rivaled only by the finest reel-to-reel recorders.



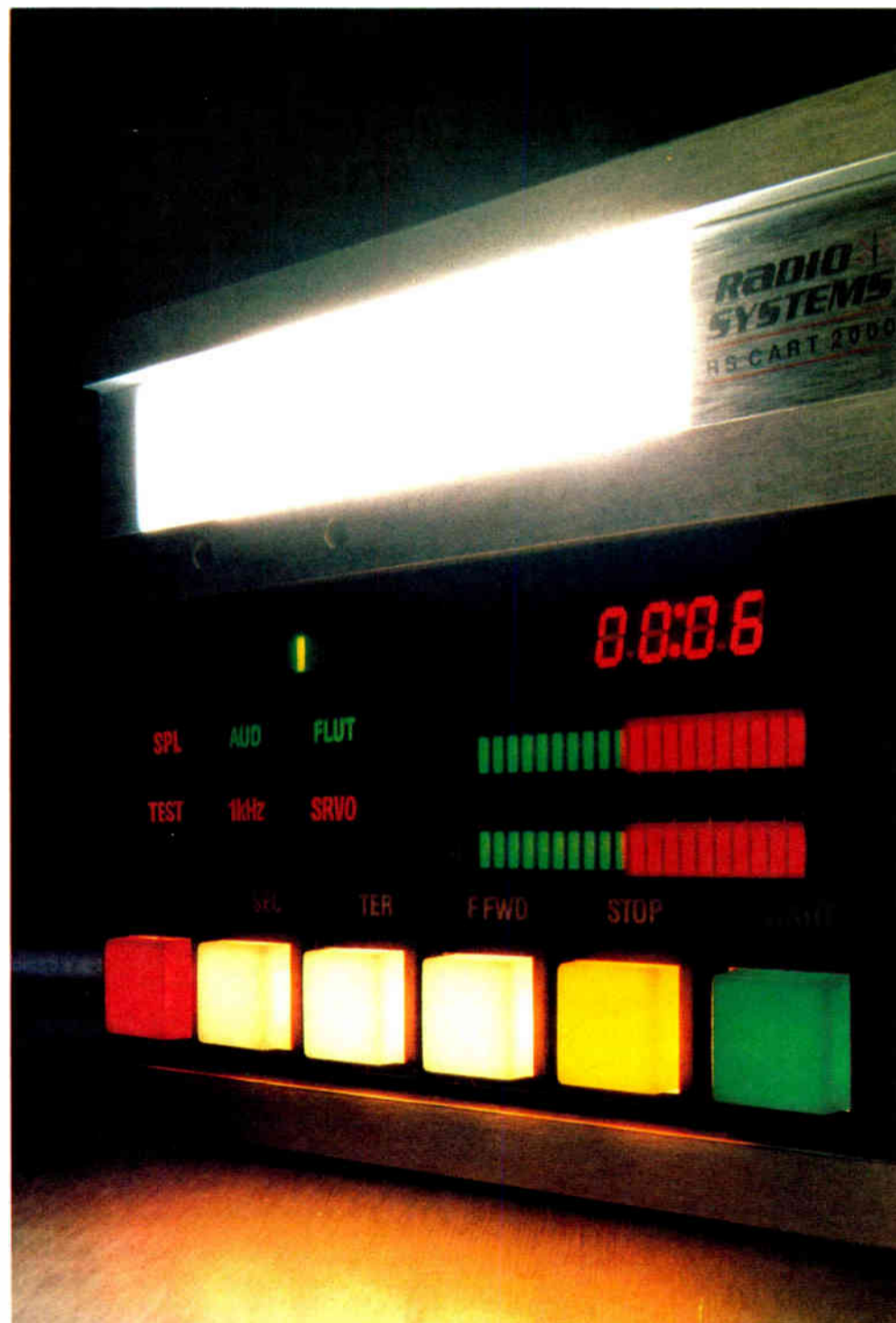
Active Phase Error Correction.

This non-encoding circuitry detects out-of-phase audio by tracking the common left/right audio components of any pre-recorded cart. The RS-CART 2000 is the only cart machine made that uses distortion-free and noise-free, all-pass filter time delay networks to correct phase error. Up to 90° of phase error at 5 kHz is corrected in real time, as the cart plays.



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Circle (69) On Reader Service Card

World Radio History

TECHNOLOGY UPDATE

J.N.S. Provides Monitoring for Australian FM

by **Rodney N. Thompson**
Director of Engineering
J.N.S. Electronics Inc.

SAN JOSE, Calif. Initial testing for FM radio broadcasting in Australia was conducted back in the mid 1960s, but it was not until 1976 that the first full-time broadcasting services were initiated in The Land Down Under.

Today, more than 300 transmitters are in service in Australia. There are two national services produced by the Australian Broadcasting Corp.: one from Adelaide, South Australia, the other from Sydney, New South Wales.

Sole provider

Until recently, Telecom Australia was the sole carrier available and allowed for the distribution of programming around the country. Delivery from the Adelaide studio to transmitter stations was accomplished via microwave link and coaxial trunk telecommunications systems.

With the launch of the AUSSAT satellite system about 10 years ago, some of the remote sites were provided programming via that link system. Telecom Australia has historically had responsibility for broadcast transmitter facilities.

When the national FM network was established, ABC and Telecom Australia agreed to provide a system that would allow continuous checking of programming at various locations within the network.

The system was to automatically check for

the correct program, the correct level, and the correct phase relationship between the stereo signal's left and right channels. This was to be achieved by development of the Continuity Tone System. The equipment specified was to monitor the continuity of the program channel from the point at which it leaves the studio to the transmitter output.

The monitoring would be accomplished by the insertion of a very low level 15 kHz tone in each channel at the studio output. A 90-degree phase difference between the tones on the two channels would provide a mechanism for continuous phase checking.

At the detection point, levels are sampled to detect a fault condition when the level decreases by 6 dB or more, and the relative phase of the two channels are compared to indicate any transposition.

An initial batch of equipment was built by Telecom Australia. J.N.S. Electronics was then approached by Telecom Australia to build additional equipment as the network expanded.

Initially, this was provided specifically as a system to check the transmission network between the studio and transmitter station, but over time its use has been extended to check the program through the total program distribution system, dispersed throughout the country.

Five items

The system comprises a number of items. First is a tone generator that produces two signals at 15 kHz, phase locked 90 degrees

apart, from a single digital oscillator. The outputs feed through high Q tuned circuits that include transformers to couple the signals in series with the program line at a level 65 dB down on program level.

The second component is a tone detector, which consists of a tuned amplifier with a center frequency of 15 kHz and 40 kHz bandwidth. These are followed by tone decoders based on phase locked loops. Comparators provide a change of output when the incoming signal level drops by 6 dB or more. A phase detector generates an output when the phase relationship between the signals changes.

Open collector transistor drives and floating relay contacts are provided as outputs for each channel, along with the phase comparator to be utilized by the user. While customer-dependent on the systems used, generally these are used for the switching of program sources.

A circuit alarm card is used at transmitter sites and takes the logic inputs from two tone detector modules, one of which is used to monitor the program line, while a second monitors the demodulated output from a transmitter.

The module provides floating relay contact outputs, which may be used to provide both transmitter changeover or program line changeover. The status is indicated on the front panel.

A tone stripper is used to remove the 15 kHz tone from the program. This is particularly prevalent at studios where the program

passes for local material insertion. In these instances, the tone is re-inserted locally at that particular studio output.

Line drivers

Using a multistage active filter, a high Q band reject circuit is provided to remove the 15 kHz tone. Line drivers provide a low source impedance output at standard program level.

Finally, a low pass filter system is used as an alternative to the tone stripper. The circuit used provides a sharper rolloff, and as such has less impact on the program channel. This has been used in specific applications where multiple filters are used in the program chain.

Each of these products is supplied as a module, designed as a part of the J.N.S. Electronics 8000 Series modular rack frame system. Each is self-contained and plugs into the rack frame, which provides the power supplies required.

A unique Rear Terminal Panel (RTP) for each module is fitted to the rear of the rack frame and provides the cable interface to the module. The format provides the customer with the advantage of configuring the equipment to specifically suit each particular requirement.

These products often are used with others in the J.N.S. line, especially the audio fail alarm, used to monitor audio signals in the program channel. The frame can also house other modules of the product line, which may be used, for example, for program distribution and monitoring.

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For information on J.N.S. Electronics products, contact John Leonard at 408-729-3838; fax: 408-926-1003; or circle Reader Service 24.

AUTOMATION

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PRODUCTION

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Audio Prophet is truly the unlimited digital broadcast system. Just comparing our features and our price with the rest will convince you that Audio Prophet is the price/performance leader in digital audio systems

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SATELLITE

TECHNOLOGY UPDATE

RE Introduces RDS Gear to U.S. Market

by John Casey
Sales Engineer
RE Instruments Corp.

WESTLAKE, Ohio For several years, European car stereo manufacturers have offered receivers utilizing the Radio Broadcast Data System (RBDS).

Digital information is broadcast on a 57 kHz subcarrier, and offers several new features to the listener, such as selective search based on music format. The capability for a receiver to display station call letters and real-time text offers several commercial advantages for the broadcaster using RDS, as well.

A U.S. standard for RBDS is expected by mid 1992. Also, General Motors has developed an RBDS receiver for the U.S.

WTIC OKs Potomac 1901

► continued from page 33

Recently, I helped a friend tweak in a four-tower directional. I manned the phasor because I was more experienced with directional. I cursed his antenna monitor up one side and down the other. Adjust phasor, set reference loop current, read all tower parameters, adjust phasor, set reference loop current, read all tower parameters; loop until monitor points are at their licensed values.

With the 1901, we could have been done in half the time. We could have cut the time even more.

Consider this. The current ratio and phase readings for all towers, whether two or 12, are always available on the back of each sampling module. In the case of this four-tower directional, you could rack-mount eight separate digital voltmeters, four for ratio, four for phase.

Imagine the ease with which you could make the adjustments when you can see the effect of one control on *all* parameters at once. This is possible with the 1901. Even with our two tower, I just leave the unit in the tower two position and make my adjustments. In the past seven months I've been spoiled.

If there's any down side to the 1901, it's this: When you open the front access door to tweak the ratio and phase readings in calibrate mode, it is a little hard to keep the door open, work the screwdriver and read the front panel digital meters all at the same time.

My suggestion would be to somehow make the adjustments available with the front panel closed. This would save some slight aggravation when calibrating. But I rarely, if ever, have to adjust the calibration pots. What am I complaining about?

From the beginning I've been having a love affair with this monitor. And I've gotten to know Dave Harry well. There was a one-month delay with delivery of our monitor, as Potomac's engineering department was cleaning up the bugs from the first production run.

Dave kept me informed all along the way, and has always been there to answer any questions or take any criticisms I might have.

If it's time to replace your current antenna monitor, I'd highly recommend you investigate the Potomac 1901.

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For information, contact Dave Harry at Potomac Instruments at 301-589-2662; fax: 301-589-2665; or circle Reader Service 86.

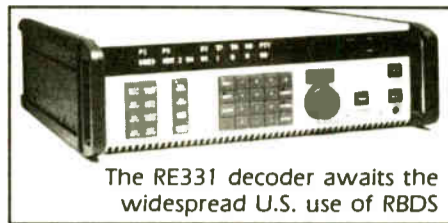
market.

RE Technology, a major supplier of RDS test equipment in Europe, is marketing a complete line of coders and decoders to the U.S. One of our latest product releases is the RE331 decoder. This decoder provides all the necessary functions required to verify the integrity of the RDS signal being generated.

The RE331 is a modular RBDS Decoder utilized to display and monitor information transmitted using the RBDS. The RE331 RBDS decoder also monitors phase, level and frequency of all signals involved in the transmission of RBDS information. Thus,

the range of applications is broad.

The basic function of the RE331 decoder is to display received RBDS information,



The RE331 decoder awaits the widespread U.S. use of RBDS

such as station call letters and real-time text. However, it surpasses what an actual receiver will display by providing the user

with several menus that display all data from the RBDS broadcast.

The decoder will help a broadcaster ensure that the RBDS information he is broadcasting is actually being transmitted properly. Through predefined reference records, the user may compare between received and stored RBDS data.

The optional measuring unit enables the RE331 RBDS decoder to measure and monitor the phase between the 19 kHz pilot signal and the suppressed RBDS carrier. Also, the level of the RBDS signal is constantly measured and the measured values are compared to the preset limits. If problems occur, the unit can enable alarms via internal relays.

□ □ □

For information from RE Technology, contact John Casey at 216-871-7617; fax: 216-871-4303; or circle Reader Service 43.



Model 9200/9205 Monaural 140 MHz-1.7 GHz STL System Spectrum efficient, frequency synthesized and cost effective.



Model 844A Stereo Modulation Monitor/Analyzer Maximize modulation. Use for proof of performance.



Model 8910 Reciter Better audio quality by combining STL Rx and FM exciter plus building block for synchronous booster.

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Model 9100/9107 Composite STL System 5-year warranty, field-programmable Tx and Rx, low distortion and spectrum efficient.



Model 8888 RPU Transmitter Dip switch frequency programmable, excellent audio quality and DTMF control.



Models 886 AM or 887 FM EBS System Meet present and proposed FCC requirements. Frequency-synthesized receiver. Elapsed time alarms.

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ation by using random, non-recursive filter techniques.

The simulated stereo is created via two incoherent signals from one source, simulating stereo perception at the ears of the listener.

Features include transformer-less electronically balanced input and output circuitry; LED metering; adjustable stereo intensity controls; music and voice mode for simulation without losing center image of voice signals; and tamper-proof controls.

For information, contact Studio Technologies at 708-676-9177; fax: 708-982-0747; or circle Reader Service 107.



Multi-Source Meter Panels

The MSM Series audio level meters from Wohler Technologies provide accurate monitoring of levels for up to 20 mono or 10 stereo audio sources in a single rackspace unit.

The array of 10-segment LED bar graph meters, each with green/amber/red signal level indication, offer at-a-glance recognition of potential problems with signals missing, mismatched levels or input overloads. "Zero" calibration level and VU or PPM ballistics are individually selectable on each meter. Wohler Technologies' proprietary IPI-1 phase/polarity indicators may be specified instead of level meters.

Each MSM unit can accommodate up to 20 bar graph level meters, 10 IPI-1 indicators or combinations of the two.

For information, contact Wohler Technologies at 415-285-5462; fax: 415-821-6414; or circle Reader Service 135.

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Dennis R. Ciapura, Senior Vice President
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A U D I O
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Circle (125) On Reader Service Card

World Radio History



Comrex Talk Console

The Comrex Talk Console offers users everything they need for talk programs, in a single package. Designed for use by a wide range of both air talents and experts, the portable Talk Console is simple to set up and use by anyone, wherever there is access to phone lines.

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When a telephone line is in the "Cue" mode, the host can talk with the caller off-air. "Hold" places the callers on hold while feeding program back to them. Mix-minus circuitry is built in so the callers will not hear themselves echoed back down the line while they are on the air.

Two mic inputs are provided on the rear panel with the second channel also available for line level sources such as CD players and tape decks. There are two adjustable headphone outputs, as well as remote contact closures to permit starting tape recorder and delay systems.

For information, contact Comrex at 508-263-1800; fax: 508-635-0401; or circle Reader Service 46.

With Modulation Assurance, you'll never pay a fine for overmodulation.

We've said all along that ModMinder's digital technology produces the most accurate, stable and reliable measurements of peak modulation. Now we're putting it writing: **If you faithfully follow the Modulation Assurance program and still run afoul of an overzealous FCC Field Inspector, we assume full responsibility for your defense and, if necessary, pay any penalties.**

This unique program lets you cross overmodulation off your list of things to worry about—forever. And it costs you nothing when you register your purchase of a ModMinder™ with the internal DeMod Board or have your existing unit retro-fitted at the factory.

Now, you do have certain obligations: to install your ModMinder at the transmitter site, to connect it to your transmitter room telephone with an inexpensive modem, and to adjust your air chain so that peak modulation does not exceed legal limits. (The modem lets you check modulation levels from any modem-equipped PC using ModMinder Remote software.)

Of course nothing can release you from the responsibilities that come with your FCC License. But we do promise you that with Modulation Assurance, you'll never pay a fine for overmodulation.

OVERMOD FINE?

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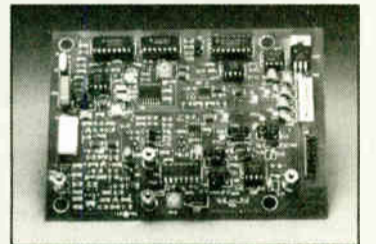
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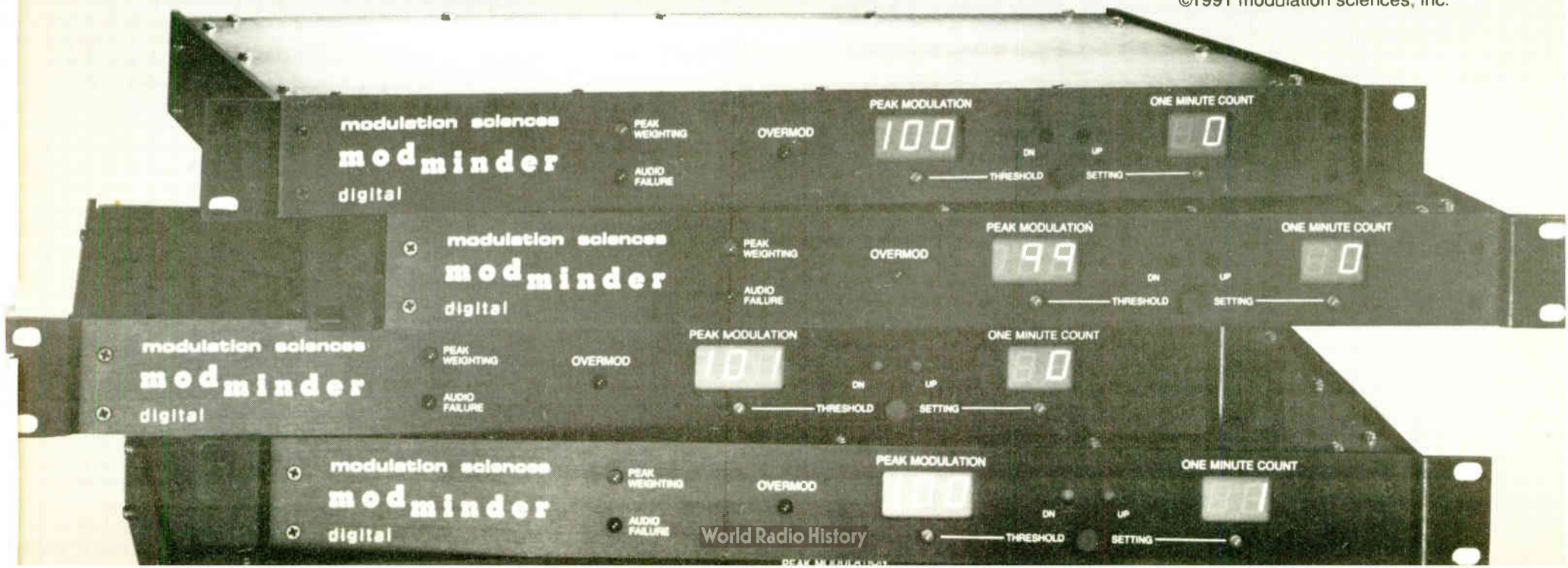
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Want to Sell

RCA BTE-15A w/2 SCA generators, extender board & book. Nationwide Talk Radio, PO Box 68088. 503-774-0459.

Auditronics 1100DAGLC dist amp (20), in (2) Auditronics 1100MF 10-input mainframes, w/Auditronics PS60 RM external pwr supply, used 6 mnths, \$1290/all. B Lord, Lord Brcdstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Altec 1607A (4) & mixer, \$100/ J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Crown Micro-Tech 1200 320 W/ch 8 ohms, 495 W/ch 4 ohms, 700 w/ch 2 ohms, 1315 W 4 ohm bridge mono, as new w/balance or 3 yr xferable warranty. B Fisher, KPOK, 122 S Main St, Bowman N58623. 701-523-3883.

Yamaha C3 preamp mint cond, \$200. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Dynaco PAS3 path preamps, \$150/booth. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Carvin FET 900 200 W/ch 8 ohms, 450 W/ch 4 ohms, 900 W bridge mono, 3 rack space, 35 lbs, fan cooled, sub-sonic filter, ultrasonic filter, variable pwr compressor, clip indicator LED's, handles, \$400. B Fisher, KPOK, 122 S Main St, Bowman N58623. 701-523-3883.

Fisher master control, 50 W, \$25. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

McCurdy DA 504 audio dist, \$100. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Dynaco 705 (2), \$100/ea. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

RCA, Altec tube mic pre's & tube amps & mixers; Langevin AM-16's, sale or trade. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

ANTENNAS & TOWERS

Want to Sell

Scala 8' STL dish, \$800; 6' STL dish, \$500. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

American 20' free standing sections (2), triangular, 24" per side, \$800. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

CSP phasor built for 5 kW day/1 kW night; DA-2 5 twr array on 1410 kHz; Potomac Instruments AM-19D phase monitor for 5 twr array, BO. L Fuss, WDTL, PO Box 159, Fayetteville GA 30214. 404-460-6259.

Locke/Lapp 78463 & 91349H (3) AM twr base insulators, BO. R Habegger, WAWZ, Weston Canal Rd, Zarephath NJ 08890.

Hughey & Phillips TI-2035 isolation 3.5 KVA, \$1200; Kintronics Labs FM 75 Isocoupler, \$300. W Craig, WGOH, PO Box 487, Grayson KY 41143. 606-474-5144.

LeBlanc & Dick 1249' w/7' face, will support multiple FM, crows nest at 1000' for 2 ways w/strobes & red lighting & extra hardware, BO. M Gumb, Surrey Bdcgt, 165 S Union, Denver CO 80910. 303-989-9980.

Gates FMC-4A 4 bay Class A CP w/radomes tuned to 100.9 MHz, \$1200. Paul, KPCR, PO Box 1, Bowling Green MO 63334. 314-324-2283

Want to Buy

Bogner UHF bdct/xlator. B-series, chnls 25-40, 41-52, 53-83, any cond. J Powley, WJIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Andrew 16 bay tuned to 36 UHF, donation/price negotiable. R St. John, Robert St. John Productions, 7123 I-30 #31, Little Rock AR 72209. 501-562-7829.

180-200' guyed for light duty FM/West Coast. P Plank, PO Box 1401, LaQuinta CA 92255. 619-564-4065.

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Want to Sell

Mod Sciences SCA-186 Sidekick clean, like new, \$2000; Johnson SCA ST-449 rcrv, \$100. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Orban 622B parametric EQ, \$600/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Orban 672A (2) trade towards Harris SP-90 FM Imtr/BO. E Mitchell, KCDU, 5956 Sherry Ln #2000, Dallas TX 75238. 214-343-1760.

Orban 111B Parasound dual reverb, gd cond, \$225 + s/h. Ken, Rainbow Music, 614-877-0585.

Russco DA4228 4 x4 dist amp, \$400/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Eventide H949 Harmonizer w/de-gitch card, \$1250. R Hagggar, Hagggar Audio Prod, 4902 Hammersley Rd, Madison WI 53711. 608-274-4000.

Delta DL-4 acoustic computer, gd cond, \$175 + s/h. Ken, Rainbow Music, 614-877-0585.

Orban 424A gated compressor/limiter de-esser, \$475. R Hagggar, Hagggar Audio Prod, 4902 Hammersley Rd, Madison WI 53711. 608-274-4000.

Orban 245E (4) stereo synthesizers, unused w/manuals, \$200/ea. J Cunningham Jr, KNOC, 720 Front St, Natchitoches LA 71457. 318-352-9596.

dbx 163X single chnl limit, \$50. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Radio Systems RSTM-2R timer to 9:59:59, front panel or remote controls, 1/2" digital readout, mint, \$95. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

ADC SS-300 stereo equalizer & spectrum analyzer, \$100. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

HPX headphone for critical monitoring, processing set-up, Q-C & maint checks, stereo balanced instrumentation inputs, rack mountable. J Somich, WJOIO, 800-334-3925.

Want to Buy

Fairchild tube reverbs gd cond. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Gentner CRM combo remote mixer. A Kenyon, WLW, 1111 St. Gregory, Cincinnati OH 45202. 513-241-9597.

Orban 111B-1 spring reverb, gd cond. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Ham radio operators looking for surplus audio processors, mixers & mics, as well as other inexpensive gear that could help bdct engns play radio at home among enthusiasts for vintage AM. Please write w/offerings. WA3VJB, Box 73, West Friendship MD 21794-0073.

AUTOMATION EQUIP

Want to Sell

MW Persons Prgrmr like new w/manuals & cables, sets up w/any reel decks, \$700. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Conex CG-25 25 Hz encoder. P Wolf, WKZY, 329 S Main St, Labelle FL 33907. 813-574-5548.

Otari ARS-1000 (2) w/tone sensors mounted in McCurdy 2077 equip rack, excel cond, \$2000 w/manuals. J Cunningham Jr, KNOC, 720 Front St, Natchitoches LA 71457. 318-352-9596.

SMC w/3060 60-event programmer, AS-10 switcher, programmable digital clock, RSC-100 random selector for Carousel, (1) 350 Series Carousel, LA-246 AGC amp, 2 ARS-1000 half trk stereo R-R reproducers, inside 2 rolling racks, \$4000/BO, you pick up. R Miller, WRVI, 815 West Dean, Virden IL 62690. 217-965-3388.

MW Persons 25 Hz stereo decoder, like new, \$250. P Wolf, WKZY, 329 S Main St, Labelle FL 33907. 813-574-5548.

Conex 25 Hz tone generator, \$200/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

BA 25 25 Hz tone sensor, rack mount, \$200/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

SMC-24 (2) Carousel auto system w/controls, switcher, each w/metal cabinet, w/ABC decoder, \$2500. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

SMC 350RS Carousels (3) in gd cond, \$650. C Springer, KSEC, PO Box 890, Lamar CO 81052. 719-336-2206.

Instacart (2) 48-hole w/Sentry firing systems & IBM PC software. Nationwide Talk Radio, PO Box 68088. 503-774-0459.

Harris SR-90 stereo audio programmer w/cables, manuals & extras. T Cauthers, KSOR, 1250 Siskiyou Blvd, Ashland OR 97520. 503-552-6301.

SMC system w/3060 60-event programmer, AS-10 switcher, programmable digital clock, RSC-100 random selector for Carousel, 350 series Carousel, LA-246 AGC amplifier, (2) ARS-1000 1/2-trk stereo R-R reproducers inside 2 rolling racks, you pick up, \$4000/BO. R Miller, WRVI, 815 W Dean, Virden IL 62690. 217-965-3388.

Want to Buy

CD Juke Box, multiple CD players. J Stromquist, WNCB, 2828 Piedmont Ave, Duluth MN 55811.

CAMERAS (VIDEO)

Want to Sell

CEI 287 studio (2), new 1" plumbicons, all cables, CCU, (2) lrg VF outfits, (2) Verregon lens 10/1, \$750 both. C Potorti, Potorti Video, 10005 Lacy, Morrisville PA 19067. 215-945-3990.

CART MACHINES

Want to Sell

Pacific Recorders Micromax (2) stereo (NAB) w/all options w/rack mount kit, \$2000. Henry Engrg, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

ITC mono record/PB deck, \$350. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

SMC 721 dual PB rack mount, \$350. C Springer, KSEC, PO Box 890, Lamar CO 81052. 719-336-2206.

Audi-Cord A31SR mono cart PB (2), excel cond, \$150/ea. J Cunningham, KNOC, 720 Front St, Natchitoches LA 71457. 318-352-9596.

SMC 510 mono (3), very gd cond w/manuals, \$150/ea. J Cunningham, KNOC, 720 Front St, Natchitoches LA 71457. 318-352-9596.

ITC RP stereo w/3 tones, new hds, perfect cond w/rack mount, \$1200. Henry Engrg, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

ITC premium triple deck (mono), one w/mono record amp, excel cond. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

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BE Series 3000 R/P stereo, \$500. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Gates Criteria's R/P, mono, book, \$300. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

ITC 3 3-tone w/new heads & book, \$1500. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Spotmaster 2000 R/P stereo, \$350. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Want to Buy

Good working stereo PB decks, prefer triple, w/all tones, consider trade for advertised surplus equip. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Tascam 32 remote control, like new, controls 22 & 32 reel decks, \$50. P Wolf, WSEB, 241 NE 10th Ave, Cape Coral FL 33904. 813-574-5548.

Telex 235 cassette duplicator, \$500. S Russell, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Magnequad 1021 (2), mono, \$75/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

TEAC 3340 gd cond, 4-trk, 10 1/2" reels, recently srvcd, \$450. S Hahn, Precipice Prod, 103 E 2nd St, Tucson AZ 85705. 602-882-7154.

Studer Revox PR99 MK 2 like new, few hrs, w/roll-around pedestal & stereo cue amp-speakers built-in, \$1995/BO. D Bisbee, 685 S Roys Ave, Columbus OH 43204. 614-279-6163.

750 PB only, reel deck & 1 new Otari ARS-1000, \$500. C Springer, KSEC, PO Box 890, Lamar CO 81052. 719-336-2206.

Tascam 122 (8) 2-spnd rackmount cassette decks, all need some tweaking, \$125 ea or \$800 for all, FOB Austin. J Block, Prod Block, 906 E 5th, Austin TX 78702. 512-472-8975.

Ampex AG-440B 8-trk in roll around console, gd cond, BO. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Scully 284B-8 8 trk 1" deck, 3 3/4 to 30 ips, console mdl w/V5-76 variable spd module, manuals. T Sherry, Recording Consultants, 1412 Clarita Ave, San Jose CA 95130, \$4000. 408-244-3848.

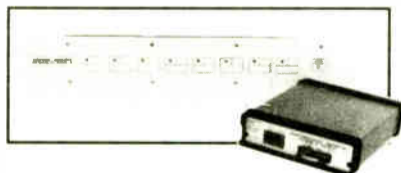
Scully 280B 1/4" 4 trk w/Ruslang cabinet & remote, needs minor transport elec repair. \$300 + s/h. Ken, Rainbow Music, 614-877-0585.

Scully 250 1/4" 2 trk w/Ruslang cabinet & remote, excel cond, \$450 + s/h. Ken, Rainbow Music. 614-877-0585.

Otari 5050 MX stereo R-R, excel cond, new heads, tilt back brackets, \$1200. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

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Otari ARS-1000 deck, stereo, \$1000. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Viking 88 working, gd cond, \$200. B Lee, WEEI, 25 Mystic St, Boston MA 02129. 617-242-4184.

Pioneer RT-909 4-trk stereo, 10 1/2" reels, mint cond, low hrs, \$450. S Hahn, Precipice Prod, 103 E 2nd St, Tucson AZ 85705. 602-882-7154.

Ampex 3000/Protracs 1/4" duplicating system, mint cond, \$5900/BO. J Quinn, The Mix Place, 663 5th Ave, NY NY 10022. 212-759-8311.

Tascam 122 factory refurbished, excel cond, \$385 & Pioneer CT-F1000 rack mount cassette, \$199. P Willey, WBTV, Rte 7, Bennington VT 05201. 413-663-3419.

Ampex ATR-800 1/2" 4 trk w/remote & pedestal 7 1/2, 15, 30 ips, mint cond, \$3000. B Yaeger, UCA Recording, Box 243, Cassville NY 13318. 315-839-5841.

TEAC A7030GSL mastering deck, mint cond, \$400. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

TEAC 6010 (NMR) w/remote (1/4 trk stereo), \$75+s/h. M Muderick, 215-449-6970.

Otari MX70-16 1" 16 trk w/remote, as new 15, 30 ips, \$12000. B Yaeger, UCA Recording, Box 243, Cassville NY 13318. 315-839-5841.

Ampex speakers from 622 portable speaker/amps, no rear bolt, excel cond, \$25/ea. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

Alignment tapes used twice, MRL # 20J205 & 21J105, \$20/ea. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

Telex 235 (2) RP110 electronics & (1) 235 deck, \$250. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Scully 280 4 trk in roll around cabinet, new heads, \$1100. P Willey, WBTV, Rt 7, Bennington VT 05201. 413-663-3419.

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American Concertone 605-4R (NMR) w/remote (1/4 trk stereo), \$75+s/h. M Muderick, 215-449-8970.

Ampex AG-440B-8 1" in console, gd cond w/remote & manuals, STL alignment tape, take up reel, \$3500. G Falk, Falk Recording Svc, 502-239-1010.

Revox PR-99 (5) MK-II 1/2 trk stereo play units, \$1200. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

TEAC A3300SX (2) 10 1/2, like new, \$350/ J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Ampex knobs original unchipped from 350/351 electronics, 11 LG, 2 MED, 4 SML, 3 tiny, \$15. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

TEAC A1500U like new, \$275. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

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Want to Buy

Craig 2405 schematics to make repairs, will pay postage. J Benjamin, 3923 E Thunder Bird Rd, Box 139 Ste 26, Phoenix AZ 85032.

Tapesonic for parts. J Garvey, Radio Yesterday, Box C, Sandy Hook CT 06482. 203-744-2476.

Old multi-chnl R-R decks, mixing consoles, mics, pwr amps. S LeRoy Sailors. 308-882-4696.

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Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

Wang CPU, 2 terminals, modem, BO. A McCarty, KUIC, 600 E Main, Vacaville CA 95688. 707-446-0200.

Commodore computer equip: 128 (NMR), (2) 1541 drives (NMR), (2) C2N datasets, (2) 801 printers, (3) mdl 128 pwr supplies, 1520 printer, \$350/BO. M Muderick, 215-449-6970.

Tandy 1000SX w/5.25" floppy, 640K RAM, 32 Meg HD, mouse, mono graphics mon, excel cond, PC compatible, \$600/BO. Voss, Box 123, Farmersburg IA 52047. 319-536-2227.

CATV-MATV EQUIPMENT

Want to Sell

Pioneer PD-M6 multi-disk, \$100. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

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Denon 950FA working when removed from svc. \$700/BO. R Rogers, KSKG, 1217 S Santa Fe, Salina KS 67401. 913-825-4631.

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Tandy 1000SX w/5.25" floppy, 640K RAM, 32 Meg HD, mouse, mono graphics mon, excel cond, PC compatible, \$600/BO. Voss, Box 123, Farmersburg IA 52047. 319-536-2227.

Ward Beck M2484A 8-track, looks good, pots & switches need cleaning, 16 in/8 out/2 out st, \$7000. P Vandegrift, KING, 333 Dexter Ave N, Seattle WA 98019. 206-448-3435.

Tascam M-520 20x8x2, w/pedestal, pwr supply & on air light/speaker muting system, low hrs, \$3200 + s/h. Ken, Rainbow Music, 614-877-0585.

Roland CompuEditor automated fader pkg, SMPTE based w/15 long throw ALPS faders & 15 chnls of voltage controlled gain elements, (2) avail, 30 chnls, \$900. R Seifried, Eclair Engrg Svcs, 101 Prospect St, Northampton MA 01060. 413-584-6767.

Altec 10 chnl mixing board, \$300. S Russell, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Howe Series 9000 10 chnl, light use, 2 yrs old, \$5000. P Wolf, WKCT, 4048 Evans, Fort Myers FL 33907. 813-574-5548.

Gately 18 chnl mixer/stereo, 18 in, 2 out, \$800. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Harris Stereo 5 w/book & spares, \$1000. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Pods to make up 2 control boards, modular design, new, \$10000. Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Arrakis 500 SC-85 less than 200 hrs, 8 chnls, 25 inputs, \$1850+s/h. F Spinetta, KCEA, PO Box 2385, Atherton CO 94026. 415-321-6049.

Gates Ambassador mono, working w/manual, BO. Paul, KPCR, PO Box 1, Bowling Green MO 63334. 314-324-2283.

Pyramid 8800 8 in, 2 out, new, \$400. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

McMartin B-502 stereo 5 chnl in excel cond. Goodrich Enterprises, 11435 Manderson St, Omaha NE 68164. 402-493-1886 FAX 402-493-6821.

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Want to Buy

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Sparta Centurion II not working OK & manual. B Rathman, KRWM, 1574 Coburg Rd Ste 237, Eugene OR 97401. 503-687-3370.

Good working stereo w/current parts avail & support, consider trade for advertised surplus equip. T Wetzel, KEXQ, Box 2450, Grand Junction CO 81502. 303-243-1230.

Sunn Colliseum 8 chnl. S Russell, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Howe 10000 any & all parts, not for 10K series. A McCarthy, KUIC, 600 E Main, Vacaville CA 95688. 707-446-0200.

Langevin AM4A w/documents. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

DISCO & SOUND EQUIPMENT

Want to Sell

Altec 100A 92S9 dual TT port DJ setup, can run tape thru to amp, excel cond, \$800. A Walker, KBAK, 40 1312 S.W. Croix, Topeka KS 66611. 913-266-5273.

Klipsch La Scala spkrs, horns in road cases, will run 300 Wchnl, BO. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Bozak speakers 199A woofer, \$50; 209B midrange \$40; 200X dual tweeter, \$30; 10102 ntwk, \$50. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

Blamp Legend prod w/20 input chnls, 16 output chnls, 3 chnl sweepable EQ, many spares, excel cond, \$4000. G Falk, Falk Recording Svc, 502-239-1010.

Ramsa WS-A200 & WS-A240 compact, port high pwr PA loudspeaker system, pair 2-way 12" WS-A200 full range cabinets & PR WS-A240 12" subwoofers w/WS-SP2A crossover/sub woofer processor, speakers 35 lbs ea. B Fisher, KPOK, 122 S Main St, Bowman NE 58623. 701-523-3883.

Want to Buy

Eventide H969 Harmonizer. S Russell, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

dbx 500 owner's and/or svc manual. J Butler, Motorola, 2 Phillippi Creek Dr, Elgin IL 60120. 708-576-5962.

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Aphex Dominator II stereo multiband peak, new w/manual, \$750/BO. D Kronquist, D&D Prods, 7028 W 70th Ave, Arada CO 80003. 303-425-6851.

Optimod 8000A
\$1495 & UP
414-482-2638

Collins 26U-1 peak and Gates SA-39B peak, BO. W Craig, WGOH, PO Box 487, Grayson KY 41143. 606-474-5144.

Gates Sta-Level tube type, \$50. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Want to Buy

UREI/Teletronics LA-2As/LA-3As compressor/mtrns. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Optimod 8100A will pay top dollar for gd cond. M Osborne, WKSQ, PO Box 9494, Ellsworth ME 04605. 207-667-7573.

Composite clipper/filter, prefer Chris Hood's Sta-Max/Mod Science CP603, Hnat Hinder or Cutting Edge. J Hoge, WTLN, PO Box 607000, Orlando FL 32660. 407-682-9494.

Optimod 8100 prefer mdl w/Card 0 & late mdl Texar Audio Prizms w/Card 5 mod card. J Hoge, WTLN, PO Box 607000, Orlando FL 32660. 407-682-9494.

Optimod 8000A, will pay cash, leave message at 703-276-0125.

MICROPHONES

Want to Sell

RCA 77 vintage ribbon mic in gd cond, BO. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

WE 633A (2) in gd cond, 1 in fair cond, \$200/both. R Habegger, WAWZ, Weston Canal Rd, Zarephath NJ 08890.

Sennheiser MKE-2002 stereo/binaural mdl w/dummy head, \$200. Henry Enggr, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

Sennheiser 405 (2) cardioid condensers, XLR-ended cables, no supply, \$400. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

Sony C-38-B large diaphragm condenser, phantom/battery, cardioid/omni, grill corner slightly damaged, \$300. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

Mics; desk mics (hi2), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books *NO8 & *NO6; RCA tube manual; Sony head demagnetizer (new); jack femal connectors; EV 502 transformer prim/sec. Mr. Oliver, 212-874-7660.

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Want to Buy

RCA 77DXs/44BXs ribbon mics, chrome/TV grey, R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

MISCELLANEOUS

Want to Sell

Orban ACC11 1-3/4" security cover (6), \$15 ea. B Lord, Lord Brdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Equip racks 6' (3) very gd cond, \$100/ea. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Remote studio Marti xmtr, ant, stand-by generator, 5 chnl mixing board, wireless mic, FM/AM rcvr, large tinted window in back to see jock, custom flashing lights, intercom, ready to bdct, \$5000. R Dees, KARX, 3507-A Van Tassel, Amarillo TX 79121. 806-355-4554.

Rolling 19" cabinets (2), \$300. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Gentner FBTRB prewire bay (8), \$195 ea; Gentner GEC-FB-100 Flexiblock (50), SIE-MF2250, \$8 ea; Gentner GEC-50DR pre-wired patch bay, 52DR w/TRS jacks #8 & approx 15' wire, \$90. B Lord, Lord Brdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Up timers (5) w/2" LED readouts, new, counts to 9:59 & resets, momentary closure resets unit to 0:00, \$57.50. Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Audio/RF tech manuals for Sparta Elec Corp, call/write for list. Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

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Han-D-Mag THIN-P 2-sided probe demagnetizer, rarely used, \$35. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

Trade magazines: audio/AV/video dated back to mid '60s/BO. M Muderick, 215-449-6970.

Triad HS-29 audio xformer. A Grundy, IAR, 64 Univ Pl, NY NY 10003. 212-677-7560.

Peerless Altec 15095 line xformers (5) 150/600 ohms to 15K ohms, \$20/ea. J Newman, Box 1211, Newport RI 02840. 401-847-0455.

Office equip: Sony cassette xcribing machines w/footpedal, no mic, for full-size cassettes, \$125. M Muderick, 215-449-6970.

Assorted 1A2 telephone equip 2564's, 2565's, 501 & 551 KSU's, ITT 601 KSU, 3A & 4A sprkphones, 5 GLX phones, 15 WE 52 headsets (double plug) w/ & w/o mic switches, 66-type blocks, will sell separate, \$400/BO. M Muderick, 215-449-6970.

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CE/FCC const, maint, component lvl xmtr, audio & automation, AM/FM, relocate any market. L Thompson, Mid-Continent Tech Svcs, 331 Pineview Dr B-18, Kernersville NC 27284. 919-993-0205.

College grad w/major in audio prod/mass comm, 4 yrs internship/college radio exper. Tina, 508-745-1120.

Engineer w/20 yrs AM/FM/TV exper & personal commitment to AM, seeks CE pos. J Pearce, PO Box 17502, Colo Sprgs CO 80935. 719-495-9253.

Board Op 12 yrs exp, some on air, great voice, no training, loyal staff member for training, AM/FM/any market/shift, NH/ME/MA. B Cory, Blue Moon Music Svc, 5 Kennedy Ave, Gonic NH 03839. 603-332-2346.

Announcer w/3 yrs college radio & prod exper, anywhere in US, any market/format/shift. J Thomas, WMCC, 15 North Ave, Rochester NY 14626. 716-227-3867.

Morning team avail professional, local, good phones, listener involvement, call Barker & Reynolds. Ask for Jack. 919-671-1162.

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Gates GTM88S stereo mod, \$150. Paul, KPCR, PO Box 1, Bowling Green MO 63334. 314-324-2283.

Gates M02639 AM mod, tube type w/manual, BO. Paul, KPCR, PO Box 1, Bowling Green MO 63334. 314-324-2283.

Gen radio GR 1931-B AM mod mon on 1370 kHz, McMartin TBM-3500 FM mod mon on 102.3 MHz, needs pwr xformer; Ampex 601 deck w/tube electronics, good for parts; Karr Conalant II, BO. W Craig, WGOH, PO Box 487, Grayson KY 41143. 606-474-5144.

TFT 760 AM EBS system new caps book, \$550. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

FM mod monitor package for mono, stereo * SCA, used, tuned & calibrated to your freq & guaranteed, all or part. Goodrich Enterprises, 11435 Manderson St, Omaha NE 68164. 402-493-1886 FAX 402-493-6821.

Want to Buy

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Fisher 800-C tuner, working & gd cond, \$300. B Lee, WEEI, 25 Mystic St, Boston MA 02129. 617-242-4184.

SCA decoder, high quality micro-miniature 6792 kHz, prewired & ready to install, \$15. D Jackway, Backgrnd Music Eng, 5742 Fair Oak, Springfield MO 65810. 417-881-1846.

Regency Carry-Com H5 w/charger, needs batt pack, \$50. W Craig, WGOH, PO Box 487, Grayson KY 41143. 606-474-5144.

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McIntosh MR77 FM stereo tuner, excel cond, \$550. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23570. 804-622-6771.

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Regency Transcom 0-15 W, mobile, traffic rpts, etc, 450 MHz band w/mic, dual freq, \$200. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

TFT 7700B composite 2 wks use, works good, \$5000. P Wolf, WCKT, 4048 Evans, Ft Myers FL 33907. 813-574-5548.

Moseley PCL 303 2 sets; (2) ACL303 xmtr and rcvr sets on 947.5/946.5 MHz, \$2850. D Dodd, KKTJ, 107 W 9th St, Mtn Home AR 72653. 501-425-5100.

Burk TC-8 new 8-chnl R/C set-up for telephone line, \$1300. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

Scientific Atlantic 7300/7325 wideband BPSK rcvr; digital proc unit; 15/75 kHz dual audio decoders; ABC/CBS/NBC/Transtar w/dish & some cable, \$6500. R Williamson, KWEI, PO Box 791, Weiser ID 83672. 208-549-2241.

Marti 406-512 MHz single section cavity, never used, \$100. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Burk TC 8 new, in orig boxes w/all manuals, \$1200/BO. D Durden, WWSF, 38 Miracle Stop Pkwy, Ft Walton FL 32548. 904-664-2400.

Micro Controls RCR-9 & RCT-9 9 chnl remote control, gd cond, \$1500/BO. C Conwell, KOMA, PO Box 6000, Oklahoma City OK 73153. 405-794-4000.

Moseley MRC 1620 never used w/Task Master 2.0 SW, set-up for WIRE LINE, \$4000. Paul/Gordon, KZST, PO Box 100, Santa Rosa CA 95402. 707-528-4434.

Micro Controls DLC 9 remote control system book, \$100. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Micro Controls RCR-9 & RCT-9 9 chnl remote, gd cond, \$1500/BO. C Conwell, KOMA, PO Box 6000, Oklahoma City OK 73153. 405-794-4000.

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Marti SCG-10 & SCD-10 67 kHz, sub-carrier gen & demodulator unit. B Rathman, KRVM, 1574 Coburg Rd Ste 237, Eugene OR 97401. 503-687-3370.

Comrex 2-line send extender. E Faskowitz, 212-777-7900.

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Want to Sell

Wegener 1601 Unistar format 41 satellite rcvr, avail 1/92, BO. P Vessy, WDLA, Box 58, Walton NY 13856. 607-865-4321.

Scientific Atlanta 7300/7325 wideband rcvr/digital processing unit w/(2) 15 kHz dual audio cards, 20 kHz 2 chnl decoder, data decoder & voice cue, used for selectable, \$5500. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Wegener SMN country rcvr, like new, \$1500. P Wolf WKZY, 329 S Main St, Labelle FL 33907. 813-574-5548.

Scientific Atlanta DAT-32 complete w/2.8m disk & mounting hardware kit, coax & connectors, 7300 rcvr & 7325 DPU w/15 kHz dual audio, voice/cue and ABC data decoder cards installed. J Barnes, KBSY, 3108 Jenny Lind, Ft Smith AR 72901. 501-782-1992.

Adcom 7010 FM demod card used 3 mos, \$900. C Conwell, KOMA, PO Box 6000, Oklahoma City OK 73153. 405-794-4000.

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Moseley SCG-6 & SCD-2 135 kHz sub-carrier gen & rcvr for 950 MHz STL, \$250/pair. R Habegger, WAWZ, Weston Canal Rd, Zarephath NJ 08890.

BE FC-30 generator 67 kHz SCA, book w/data, \$650. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

CCA SG1-gd cond, \$250. Paul, KPCR, PO Box 1, Bowling Green MO 63334. 314-324-2283.

Moseley SCG-8 subcarrier generator 67 kHz, \$650. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Want to Buy

786V-1 schematics/manual for old stereo card, make unknown, stock #783-6648-001 Rev. P. D Slentz, WAKR, 955 S Hess Mill #3, Bolivar OH 44612. 216-869-9800.

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Potomac FIM-71 field strength meter, \$3700. G Gilbreath, 4289 Rowridge Ave, Las Vegas NV 84120. 702-454-2085.

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McMartin 25 kW, mdl BF-25K in excel cond, tuned & tested on your freq, by original designer, guaranteed. Goodrich Enterprises, 11435 Manderson St, Omaha NE 68164. 402-493-1886 FAX 402-493-6821.

Continental 802A FM Exciter. 1989 model, like new! 816-635-5959.

Want to Buy

Harris 25 kW FM late mdl. M Gority, WYUU, 9421 Exec Center Dr • 200, St Pete FL 33702. 813-579-1925.

Jones/Tepeco single/dual 10 W translator. J Stromquist, WNCB, 2828 Piedmont Ave, Duluth MN 55811.

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MOSELEY PCL-303, 505, & 606's
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55 kW solid state FM w/exciter, late mdl, gd cond. Atwood, WBRV, 7606 State St, Lowville NY 13367.

Late mdl FM 5-10 kW w/ or w/o exciter, Harris or Continental, 3 phase pref. J Hoge, WTLN, PO Box 607000, Orlando FL 32860. 407-882-9494.

Plate & modulation xformer & reactor for Gates/Harris BC series 5 or 10 kW or similar that works w/3CX2500F3 mods & finals, wet or dry, must be PCB clean. J Hoge, WTLN, PO Box 607000, Orlando FL 32860. 407-882-9494.

1-2 kW FM working or not. P Plank, PO Box 1401, LaQuinta CA 92255. 619-564-4065.

late model 5 kW AM, prefer Harris SX-5A, Nautel AMPFET 5 or ND5. J Hoge, WTLN, PO Box 607000, Orlando FL 32860. 407-882-9494.

Low pwr shortwave G McClinton, WWCR, 1300 WWCR Ave, Nashville TN 37218. 615-255-1300.

Audio driver deck from Gates BC-10P in gd shape. J Hoge, WTLN, PO Box 607000, Orlando FL 32860. 407-882-9494.

Solid state driver deck from Harris BC-5HA or similar (drive 3CX-2500F# mods for 10 kW). J Hoge, WTLN, PO Box 607000, Orlando FL 32860. 407-882-9494.

Late mdl 10 kW AM, prefer Harris DX-10, Nautel AMPFET 10, Nautel ND10, or Continental 316C. J Hoge, WTLN, PO Box 607000, Orlando FL 32860. 407-882-9494.

Harmonic FM filter 20 kW rated at 20 kW or better, to work at 100.5 MHz, state condition/price. B Earle, KZZQ, 7146 Webbwood Way, San Antonio TX 78250. 512-521-5035.

McMartin AM/FM xmtr, any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

Acrodyne 25 W, donation/small price. R St. John, Robert St. John Productions, 7123 I-30 #31, Little Rock AR 72209. 501-562-7829.

GE UHF TV TT-57, 58, 59, 62, any cond for parts; also new/used parts for GE UHF TV xmtrs, will handle removal. J Powley, WIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

CCA FM-10DS exciter manual. P Anderson. 208-234-1290.

TUBES

Want to Sell

FOR SALE: R.F. tubes & transistors. Eimac, RCA, Amperex, Motorola, Texas Instruments. 4CX15000A, 4CX3000A, 8877, 4CX1000A, 4CX5000A. Call: 201-839-3360, FAX: 201-839-5926.

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Stereo turntables preamp/qualizer (2), \$300. D Evans, 818-905-9388.

Technics SL1200 MKII (2) like new, excel cond, \$250/ea. P Wolf, WSEB, 241 NE 10th Ave, Cape Coral FL 33904. 813-574-5548.

Technics SP-15 (2) gd cond w/arms, \$350/ea. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myer FL 33931. 813-574-5548.

GRK (2) w/Micro-Trak tone arms, \$300/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Technics SL1100A (2) in good cond, \$200 ea. P Vandegriff, KING, 333 Dexter Ave N, Seattle WA 98019. 206-448-3435.

Presto 6N (2) lathes, \$50. J Parsons, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

BE 12-C 3 spd, less than 50 hrs, \$225+s/h. F Spinetta, KCEA, PO Box 2385, Atherton CO 94026. 415-321-6049.

Technics SL 1200 MK 2, \$350. Wayne, Woollard Labs, PO Box 1097, Castroville CA 95012. 408-663-5512.

Technics SP15 w/Microtrak arm. Excellent. \$500. 615-781-2416.

Want to Buy

Old disk recording equip & tube proc gear, Fairchild, Neumann, Westrex, Presto, Rek-O-Kut, Pultec, especially Fairchild 670 limiter, 641 recording system, 605 stereo preamp, 740 lathe, 741 drive system, manuals, literature, blanks, 45/78 records. K Gutzke, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

Old disk recording equip & tube processing gear (Fairchild, Neumann, Westrex, Presto, Rek-O-Kut, Pultec), 45/78 records. K Gutzke, Custom Recording, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

Fairchild parts especially 202/500/501 tone arms, 603/XP4/F-7/232/SM-1/SM-2 stereo cartridges, 215/220/225/230 mono cartridges; electronics & TT's. Bisbee, 685 S Roys Ave, Columbus OH 43204.

TV FILM EQUIP

Want to Sell

B&H Autoload 545 green, works good, can use 1K watt lamp, \$150 plus S&H. M Kantor, New Age Data, 50 Knickerbocker Rd, Plainview NY 11803.

CBS EVR Player 2 EVR films, like new w/color flying spot scanner, \$200 ea plus S&H. M Kantor, New Age Data, 50 Knickerbocker Rd, Plainview NY 11803.

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SP-44/4-Track