

FCC, Congress Clash Over Ownership

by Alex Zavistovich

WASHINGTON Although the FCC approved an increase of the national station ownership limit by 150 percent and relaxed its duopoly rules by a 4-0 vote, key congressional leaders have vowed to reinstate the limits.

Under the new FCC ruling, a single licensee may now own up to 30 AM and 30 FM stations nationally, as long as those stations represent fewer than half the stations in a market. Locally, the Commission adopted a tiered system in which ownership is keyed to market size and audience share.

The March 12 FCC decision, which also restricted time brokerage agreements—otherwise known as local marketing agreements, or LMAs—has reportedly angered those who believe that programming diversity and minority ownership will suffer.

In a patronizing letter sent to FCC Chairman Al Sikes, an irritated Rep. John Dingell (D-Mich.), chairman of the House Committee on Energy and Commerce, said: "Although I have not had the benefit of reviewing the text of the Commission's decision, I am certain that the Commission would not have made such a sweeping change without extensive analysis."

House Telecommunications and Finance Subcommittee Chairman Edward Markey (D-Mass.) called the FCC's action "yet another ill-advised policy that will have

devastating effects on consumers and broadcasters alike."

Markey plans to introduce legislation reinstating ownership rules.

The FCC was not without its own opposition to the new rules. Abstaining from the March 12 vote was Commissioner Andrew Barrett, who submitted a six-page statement explaining his reasons. He added he would "probably dissent" when the plan is formalized.

The FCC's new rule more than doubles the old 12 FM-12 AM national ownership limit and would implement a local market ownership increase based on a variable scale:

- For markets under 15 stations, a licensee can own up to three stations, with two being FM's, as long as that number doesn't exceed 50 percent of the total stations in the market.
- For markets with 15 to 29 stations, a licensee can own two AM's and two FM's.
- For markets with 30 to 39 stations, a licensee can own up to three AM's and two FM's.
- For markets with 40 or more stations, a licensee can own up to three AM's and three FM's.

Built into this new ownership structure is what FCC Chairman Al Sikes called a "firewall against undue concentration" of ownership—for the latter three market sizes, combined audience share must not exceed 25 percent. Same-service simulcast-

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Showdown on the Hill:

FCC Chairman Al Sikes (left) and Rep. Edward Markey are at odds over the Commission's new ownership rules.

Senate Reviews AM Stereo

by John Gatski

WASHINGTON Legislation that would require the FCC to approve an AM stereo standard in the U.S. received mixed reaction during a recent senate hearing.

While groups such as the NAB, the American Hispanic Owned Radio Association and the Electronic Industries Association (EIA) were supportive of the bill (SB 1101), FCC Chairman Al Sikes said AM stereo will not cure AM's current ills.

Testimony on the bill, sponsored by Sen. Larry Pressler (R-S.D.), was part of a larger discussion of radio issues, including multiple ownership, before the Senate Communications Subcommittee March 11.

The bill would require the FCC to begin the standard selection process within 60 days after legislation is approved. Although the bill does not mention a particular system, Pressler had hinted that C-QUAM would be the odds-on favorite by virtue that it is the most widely used system in the U.S. The other system that could be considered is the Kahn ISB system.

Pressler and bill proponents believe that an AM stereo standard is long overdue and would enhance the quality and status of AM—especially in rural areas where AM stations are still important because of their range.

Conditional support

NAB Radio Board Chairman Dick Novik said the association supports the legislation, but that receiver companies must be compelled—also by legislation—to install AM stereo in receivers that have FM stereo.

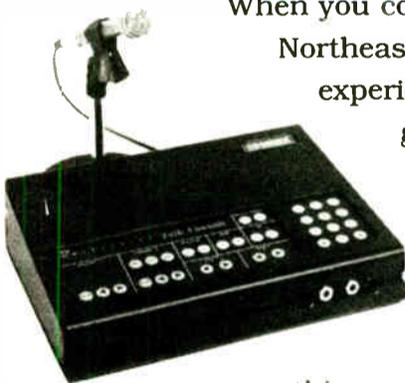
During the hearing, Amanico Suarez Jr., a member of the board of directors for the American Hispanic Owned Radio Association, said the Pressler bill would help Hispanic stations because most of them are AM.

Peter Tannwald, a partner in the communications law firm Arent, Fox, Kintner, Plotkin & Kahn, said many AM stations

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FCC Reviews Comparative Policy

WASHINGTON In recent action, the FCC said it will reexamine its 1965 Policy Statement on comparative broadcast hearings.

The FCC noted that the criteria used to select a licensee from competing applicants for broadcast stations has not been comprehensively reviewed for nearly 27 years.

Currently, the 1965 policy requires five primary criteria to be evaluated in a comparative hearing process: diversification of control, integration of ownership, proposed program service, past broadcast record, efficient use of frequency and auxiliary power equipment.

Other factors include local residence and civic participation, minority ownership, female ownership, daytimer status and past broad-

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cast experience.

In its reexamination of the policy, the FCC said it would consider whether to retain, eliminate or modify the integration, proposed program service, past broadcast record and auxiliary power.

Two new factors being considered include service continuity and a finder's preference. The FCC also may implement a point system in its evaluation process.

WARC Victory Declared

WASHINGTON Despite a lack of consensus on digital audio broadcasting (DAB)

spectrum, the recently-concluded World Administrative Radio Conference (WARC) in Torremolinos, Spain, was a step forward for U.S. interests, according to the head of the American delegation.

In a debriefing at the State Department, Ambassador Jan Baran said the U.S. got several "lucky breaks" from the "dynamics of the new world order," noting that there were no east-west or north-south differences, as had marked previous WARC's.

Also unlike past conferences, however, Baran said there was no real support from Europe for U.S. positions. "I wouldn't go so far as to say they were obstructionist or antagonistic," Baran said, "but they were

unenthusiastic."

Surprisingly, according to Baran, the real support for the U.S. came from emerging countries, particularly in the Americas.

In the area of shortwave international broadcasting, 790 kHz of additional spectrum was allocated, of which 200 kHz was below 10 MHz—considered the most congested part of the band. Baran said that the U.S. noted in protocols that additional frequencies needed to be allocated, and until that time, "future meetings wouldn't be productive."

As regards DAB, Baran said the U.S. delegation "was more successful than I had predicted." Despite the fact that spectrum in the range of 1452-1492 MHz was allocated for DAB on a primary global basis, Baran said the U.S. has a footnote in the decision for service at 2.3 GHz.

Baran said the decision was a "major

step forward" for DAB, but that it is now incumbent on the industry to indicate that DAB is a "viable service" with a sufficient number of supporters.

The U.S. delegation was glad that it did not have to take formal exception to any WARC decision on DAB, according to Baran. He said it was "important psychologically to demonstrate that we could look at issues with flexibility."

Apparently, not all nations showed the same degree of flexibility. Baran said Canada was "perhaps the most strident country we ran into." The Canadians had made a domestic commitment to a terrestrial 1.5 GHz DAB system at a time they thought the U.S. would support such an action, he explained.

Baran suggested that the U.S. and Canada should meet on a bilateral basis to discuss implementation of DAB. "We (the U.S.) may be the only country in this hemisphere that will be outside 1.5 GHz," he added.

Industry speculation is that Canada and Mexico—which also supports L-band DAB—might put pressure on the U.S. to move its military telemetry allocation from 1.5 GHz, to accommodate its neighbors' DAB plans.

Asked whether such an option might be likely, Baran offered his personal opinion that "if the technology develops in this hemisphere, no spectrum allocation is forever."

There may need to be a reassessment of existing services to see if they might find suitable spectrum elsewhere, he said.

NRB Sets 1993 Schedule

PARSIPPANY, N.J. The National Religious Broadcasters has officially set its 1993 national convention schedule to be held Feb. 13-16 in Los Angeles at the Convention Center.

Although the show has been held in Washington, D.C. for many years, the NRB decided to begin moving the show around the country starting in 1993.

NRB Executive Director E. Brandt Gustavson said the show's broadcaster and exhibitor base got stronger in Washington during its 12 years there, and he expects that trend to continue in LA and future locations.

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Congress Irked by Ownership Rule Change

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ing was also restricted to less than 25 percent of the broadcast hours of either station involved, for stations overlapping each other by more than 50 percent. The rules will be reviewed one year after their implementation.

The Commission also used the relaxation of local ownership rules as the basis for its restriction of LMAs.

Widespread time brokerage among stations in the same market could undermine diversity and competition, according to the FCC. The Commission ruled,

therefore, that a station cannot enter into an LMA with another local station that it could not also own under the local ownership rules.

In comments during the meeting, Commissioner James Quello supported the rule change. He said he would have supported even greater relaxation on the national level, but was concerned about the effect of the local limit increase.

Commissioner Sherrie Marshall voiced her belief that the new rules are "only so restrictive as to prevent one voice from being dominant." She said the benefits derived from the new rules will include decreased operational expenses, investment in new stations and format diversity by providing "more shelf space."

In explaining his abstention, Commissioner Andrew Barrett said he was concerned about the rules, which he said "are not based on real-world factors."

The Commission action should have been based on market considerations, Barrett said. Instead, under the "grossly altered ownership structure," the "losers are small groups, women, new entries and the public as a whole."

Barrett expressed his belief that, under the new rules, "smaller players" would be outbid for stations by larger multiple owners. He also was concerned that one of the earlier proposed increases—25 stations plus a five-station minority set-aside—was

not considered more closely.

The Commissioner also suggested that the FCC, "in a rush for the broad stroke, has missed the whole picture."

Commissioner Ervin Duggan, however, supported the action, saying he was "happy to see (the FCC) come out near the center of this debate." He said the action was a victory for "faithful adherence to the record," "modest and prudent deregulation," "the collegial decision-making process" and the public interest.

Duggan also referred to the built-in review period for the rules, which he said was put in place in deference to Commissioner Barrett's misgivings. If the review indicates that Barrett was correct about the effect of the new rules, Duggan said he would push for corrective action.

Chairman Sikes remarked that the new rules were an appropriate response to radio's declining share of the communications industry. Continued restrictions on radio would promote undue concentration in the television, cable and newspaper industries, Sikes maintained. He added his belief that the Commission will be attentive to minority interests.

Despite intense opposition, the FCC ruling had its backers. Sen. Larry Pressler (R-S.D.) commended Sikes' leadership. "This action should help revive radio's competitiveness," he said.

NAB President and CEO Eddie Fritts, in a prepared statement following the Commission's decision, said he was pleased with the FCC decision.

NEWSWATCH

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RF Gets Fair Hearing

WASHINGTON A bill now pending before Congress would authorize a ten year study focusing on health effects of electromagnetic radiation including RF radiation.

The bill, known as the National Electromagnetic Field Research and Public Information Dissemination Act (HR 3953), would fund a program to be directed by the Department of Energy's Office of Health. It would solicit expertise from the National Academy of Science and researchers in electromagnetic energy.

FCC Encourages Investment

WASHINGTON The FCC has launched a proceeding that would look for

ways to "reduce the burden of government regulation on investment in the broadcast industry."

Specifically targeted for comment in the proceeding are three topics:

- Whether the FCC should allow former licensees and third parties to hold "security and reversionary interests" in broadcast licenses, and if so, under what conditions;
- Whether ownership attribution rules should be changed to increase the basic attribution benchmark from five to 10 percent, increase the benchmark for passive investors from 10 to 20 percent, and extend eligibility for passive investors to include small business and minority enterprise small business investment companies;
- Whether other FCC actions could make financing more readily available in broadcasting.



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Game-Playing at the FCC

by Alex Zavistovich

WASHINGTON How mad do you have to be to spout off at your boss and not care how many people are around to hear you doing it?

That's what I asked myself at the FCC's open meeting on the new ownership limits. Usually those meetings are a good place



to catch up on your sleep, but this time Commissioner Andrew Barrett had an exchange with Chairman Al Sikes that raised some eyebrows.

Barrett maintained that the new rules weren't in the best interest of minorities, or anyone else for that matter. Abstaining from the vote, Barrett said he wasn't given enough time to examine all the facts on the issue, and that he didn't know the gist of the plan until it had already been leaked to the press.

Then things got pretty wild. Sikes said that he'd have Mass Media Bureau Chief Roy Stewart find the dates the Commissioners were provided with industry data regarding ownership. Barrett blew up.

He told Sikes, "Don't play those games with me," and, "Don't mislead people about what I'm suggesting." The flap was over pretty quickly, but Barrett was quietly fuming for a good part of the rest of the meeting, and left the scene really quickly.

Barrett was suggesting that he was left out of the decision-making process at a crucial time. That charge has been raised before since Sikes took over the FCC. Commissioner Ervin Duggan has been an outspoken critic of the rubber-stamp way in which FCC actions have been made in the past.

This time, though, the Commissioners felt like they had process coming out of their ears—everyone but Barrett. Maybe he was left out at a critical time. Like I said, how mad do you have to be to have a reaction like his?

Still, I have to wonder about a statement made by Commissioner Quello. He said, "There undoubtedly will be spirited disagreements about the final choices we have made, just as there were among all the Commissioners who chose to participate in the extensive internal debates in this proceeding" (my emphasis).

Hey, read between the lines: If some Commissioners chose to participate, that means some also chose *not* to. Quello's spokesman wouldn't elaborate on the statement, but it seems like Barrett's alone on this one. It goes to show, however, that things aren't all that rosy in the Sikes administration.

When it comes to digital audio storage, it seems like everyone's getting into the act. And for good reason: Those digital hard-

It goes to show, however, that things aren't all that rosy in the Sikes administration.

disk based on-air record and replay devices are among the hottest things going on in the industry. It's bound to be the main growth area of the '90s for broadcasters.

Anyway, I just got wind that Continental Electronics has entered into an agreement with Register Data Systems (RDS) for worldwide distribution rights of RDS's digital products.

RDS makes a variety of digital products, like hard disk systems that tie together control rooms and production rooms, as well as automation control systems. The company's newest product, the Digi-Corder, was introduced at the NAB's Radio '91

show in San Francisco.

On the surface, this seems like an unusual pairing of companies. I mean, Continental has built its reputation on one thing only—transmitters. But then again, BE makes the CORE 2000 and the AudioVAULT as well as transmission products. And Harris-Allied is distributing the Arrakis Digilink and selling its own line of transmitters.

It's kind of a one-stop shopping sales concept: Outfitting a new automated station? Great, you can pick up everything you need right here—transmission gear, automation equipment, and a CD-quality replacement for carts. Continental seems to be gearing up for a focused assault on some of its more diversified competitors.

★★★

The joint NAB/Denon super radio has achieved a mythic status in the broadcast industry since its prototype introduction four years ago. Well, RW's News Editor John Gatski recently learned that the tuner, which is to be displayed at the NAB show next week, almost died before it ever got out of the gate, thanks to a problem with the semiconductor manufacturer supplying chips for the radios.

Apparently, Allegro Semiconductors, formerly Sprague Semiconductors, and the only producer of a very effective AM noise blank-

ing technology, had promised the NAB in late 1991 that it would make chips for the initial 2,000 unit order of the super tuner.

Allegro later said it could not produce the noise blanking chips (and a high-quality FM stereo decoder chip it also had promised to deliver) in such a limited run. Without those chips, there just wouldn't be anything all that super about the super radio.

So the NAB started putting out fires. According to the association's John Marino, the NAB told Allegro that positive feedback from people at the Vegas NAB show could create more demand for the noise blanking chips, increasing future sales. That seemed to satisfy Allegro for the time being, and the super radio plans are now back on track.

Let's see if it turns up at the NAB show next week.

★★★

With the frequent changes taking place in broadcasting today, it's sometimes hard to keep it all straight in your head. That's why I got a laugh from a comment made by Ambassador Jan Baran, who led the U.S. delegation at the World Administrative Radio Conference (WARC).

A self-confessed novice in spectrum allocation issues when he was appointed to the WARC leadership, Baran had to become an instant expert—or at least pretend to be—to represent America's interests at the conference.

At a briefing following the delegation's return, Bradley Holmes introduced Baran. Holmes remarked on the fact that WARC was held in Spain, 500 years after Columbus set sail from that country to find a passage to India. He suggested there were similarities between Columbus' expedition in 1492 and Baran's trip in the other direction.

Without missing a beat, Baran said, "Yes: We were both lost."

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

Alex

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Keep Out Big Brother

Dear RW.

I get calls from the NAB and they wonder why I don't want to join. Dear God, save us from these people.

No freeze. Granted, there are a lot of radio stations. We've got five on the air and two CPs in Globe/Miami with only 20,000 people—plus we get Phoenix and Tucson signals. Somebody ain't gonna make it, and it could be me. But let's have the marketplace decide and keep "Big Brother" out of it.

When the marketplace decides who survives, then the real radio people will win. The people who invested in this business because they thought it had better returns than a pizza franchise will self-destruct. They never had a "heart" for this business, and they won't be with us in the long run.

These non-broadcast-investors are the same ilk as the multi-nationals who care not what country or economy they destroy; they only care about their bottom line. We know the type, the big shots who get the big bonuses while the companies post record losses and lay off thousands of workers. It's this mentality that is more than willing to trade someone else's freedom for the bottom line.

These wheeler-dealers are not going to stay in our business. They are only looking for a way to cut their losses so they can unload their properties, get their money out,

and then go foul somebody else's water.

When the government starts *protecting* us, God help us. They will start *controlling* us. Politicians, in return for the *favor*, will demand *free time*. The various do-gooders who have this, "the airwaves belong to the people" concept (none of them have ever worried about making payroll) will demand this program and that program—and we'll wind up back with those horrible program quotas and composite logs.

We've got a mess of snot-nosed kids at the NAB who don't remember when you couldn't find music on the radio on a Sunday night because we were all dumping our *promised* (required) public affairs programming that night.

The people who never belonged in this business are going to sell the rest of us down the river, and once they get their money out, they'll leave us with a Commission with even more bureaucrats living off our "user fees." Once they get their 40 pieces of silver, they'll skip town leaving the rest of us twisting on a cross of regulation.

Grant me the right to fail as a free man in an open marketplace rather than being secure as a protected slave on a broadcast plantation.

Bill Taylor, KQSS(FM)
Globe/Miami, Ariz.

Ownership Rules May Spur Growth

The FCC has made a good faith effort to reform the multiple ownership and duopoly policy governing the radio industry. Unfortunately, for its trouble, the Commission is getting it with both barrels from Capitol Hill.

The FCC's decision to allow higher national and in-market limits of ownership of AM and FM stations gives broadcasters the benefit of a more accommodating market in which to operate. Congress should stay out of this one.

Capitol Hill reacted with outrage to the Commission ruling, threatening to introduce legislation to invalidate the FCC's action. Once again, Congress has trotted out the diversity issue as a shield behind which to hide. The industry does not need a dose of posturing from legislators, but genuine help from its regulators.

Allowing broadcasters to own more properties (particularly in the same market) will allow them to benefit from the economies of scale, and the inherent strength of a broader base of stations. It can only enhance the broadcast business, and as such, should take precedence over the minimal public policy concerns involved.

Congress needs to be reminded that there are more than 10,000 radio stations operating in the U.S., and that there is little danger of a loss of diversity or of the creation of radio monopolies. There are only five groups at or near the current ownership limits, and two of those are controlled by minorities (Bishop Willis and Ragan Henry).

Additionally, Congress needs to be reminded that radio is a local medium. Even the largest and wealthiest group operators make programming, public affairs and sales decisions based on *local* market conditions—and the decisions are taken by their local managers. Diversity in programming is dictated by local audiences.

As a nod to Commissioner Barrett's concerns about minorities and small operators losing out to bigger broadcasters with deeper pockets, the FCC took the precautionary measure of building a one-year review period into its ownership rule. Corrective action to amend the recent regulation can be taken by the Commission at that time if it is necessary.

Write your Congressman and fill him in with the facts. The new rule is good policy.

—RW

GUEST EDITORIAL

DAT Legislation Will Restrict Taping Options

by Frank Beacham

NEW YORK A complex new piece of consumer legislation now moving through Congress may tax and restrict the editing capability of new digital tape technology designed for radio broadcasters.

The bill is called the Audio Home Recording Act (S.1623/H.R.3204) and reflects the well-publicized "DAT Pact" compromise between record companies, music publishers and consumer electronics manufacturers, which is supposed to break the logjam holding back consumer digital recording technology.

But, the legislation has a broad sweep which may cause broadcasters to: 1) pay a consumer "royalty" tax on equipment and blank tape, and 2) deal with copy protection circuitry that limits editing capability in news gathering and production applications.

In a nutshell, the audio legislation prohibits the music industry from suing electronics manufacturers over copyright information in exchange for two key concessions.

First, a system of royalty payments will be levied on the importers and domestic manufacturers of digital recording devices and blank recording media. These payments, which go to music creators and the copyright owners of recordings, would result in higher equipment and tape costs to the consumer. (The tax is two percent of the wholesale price for digital recorders with an \$8 ceiling, and three percent for blank media.)

Second, the Serial Copy Management System (SCMS) will be required in all consumer digital recorders. SCMS will pro-

hibit recordists from making second generation digital tape copies. Direct digital-to-digital copies can be made only from the original recording. SCMS effectively restricts the digital editing of tapes.

So-called "professional" equipment is supposedly exempt from the provisions of the legislation. A problem for broadcasters, business and educational recordists lies in the distinction made in the bill between "professional" and "consumer" equipment. Equipment considered professional will be marked with the letter "P" or have the word "Professional" on the outside packaging.

In order to determine whether or not a machine is really designed for professional or consumers, the bill lists several factors including the type of error detection system, input/output interfaces, sales literature, distribution channels and, curiously, the occupation of the user and the application to which the recorder is put.

But certainly the "pro" features mentioned in the bill, such as read-after-write code functions and professional connectors are already appearing on some high-end consumer model DAT decks. And many of these criteria become meaningless when one looks ahead to a new generation of sub-miniature tape recorders which are not much bigger than a "professional" XLR connector.

A new Sony digital recording technology, released on the Japanese market in February and scheduled for release later this year in the U.S., is a clear illustration of how the "sweep" of this legislation will damage broadcasters and other professional recordists.

Sony's new "Scoopman," an ultra-

miniature seven-ounce broadcast-quality stereo digital tape recorder (with postage stamp-sized cassette) is designed for use by radio news reporters, business and education users. Sony's U.S. publicists said the device is not intended for or being marketed to the consumer market. However, "Scoopman" is equipped with SCMS copy protection circuitry. Why? I'm told that the reason is the company wants to keep within the spirit of the pending legislation.

This raises some interesting questions. Are the news broadcasters and businesses who will use "Scoopman" tape recorders "consumers" or "professionals" under this bill? How will a radio broadcaster digitally edit a tape restricted by SCMS circuitry? If a radio broadcaster is considered a "professional," does Sony have the right to arbitrarily employ SCMS in a product designed for professionals?

Since Sony is both an equipment manufacturer and record company, is it not a conflict of interest to allow Sony alone to decide which equipment will or will not be subject to the provisions of the bill?

Broadcasters should start asking some hard questions about this proposed legislation before it is too late. The legislation, sponsored in the Senate by Dennis DeConcini (D-Ariz.) and in the House by Jack Brooks (D-Tex.) and William Hughes (D-N.J.), is on the fast track to passage. If this industry "compromise" is made into law, radio stations could slip through the legislative cracks and start paying a tax to the music industry.

□ □ □

Frank Beacham is an independent writer, producer, director and frequent RW contributor.

Correction: This information supplements RW's NAB '92 Exhibitor Directory of March 25:

RE America Inc. will be at the NAB RBDS Technology booth in the Convention Center Grand Lobby. The company will display the RE533 RDS encoder; RE531 RDS encoder; RE331 RDS decoder; RE530 RDS generator; d940 digital audio headphone interface; RE8800 sound interface unit, and the RE8720 tie-line audio codec. Contact: John Casey, sales engineer/broadcast products, 31029 Center Ridge Rd., Westlake, Ohio 44145; phone: 216-871-7617.

Also:

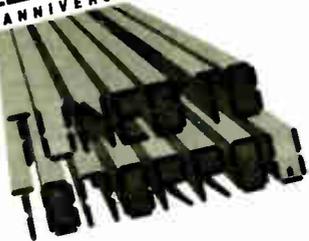
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Vol 16, No 7 April 8, 1992

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News Editor: John Gatski
Contributors: Frank Beacham/N.Y.,
Bruce Ingram, Pamela Watkins, Nancy Reist
Technical Editor: John Bisset
Technical Advisor: Tom McGinley

Radio World (ISSN: 0274-8541) is published semimonthly by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone: 703-998-7600, Fax: 703-998-2966.

Second-class postage rates are paid at Falls Church VA 22046 and additional mailing offices. POSTMASTER: Send 3579 forms and address changes to Radio World, P.O. Box 1214, Falls Church VA 22041. Copyright 1992 by Industrial Marketing Advisory Services, Inc. All rights reserved.



RAVE REVIEWS

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"It was a pleasure to get new equipment that, when first removed from the box, works as it should the first time. All in all we are very happy with our new CD 10s and will be adding more in the near future."

Bruce Harlan, Engineer, WDJQ/WPDN Alliance, OH

"Our AudioMetrics CD 10 is in our production room. Everyone has had good comments about it. Operation of the unit has been easy for people to learn. I like the speed of cuing up different tracks. It's very handy in production work. The search dial is fun to use, too. Overall, I have found the CD 10 to be a very well-built product."

John Graham, Chief Engineer, WFCJ-FM Dayton-Miamisburg, OH

"The jocks love 'em, they are easy to operate, and have worked flawlessly. From a technical standpoint, I like the features included in this unit. The selectable audio cue level is a nice change, being able to select your digital information down to the frame is very nice, sonically, they sound great! I wish this much thought would go into all broadcast equipment. Keep up the good work!"

Kevin Jenkins, Chief Engineer, KHEY El Paso, TX

"We have just installed our AudioMetrics CD 10 cart players in the studios, and I would like to commend you on creating a very well designed device. The ergonomics of the machine are well thought out and the jocks find the players intuitive and easy to use. It's nice to see an intelligently-designed product that meets the needs of the broadcast industry."

Tohru Ohnuki, Engineer, KROQ Burbank, CA

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DJ: No, nothing.

ENGR: (Long Pause) ... Are you SURE?

DJ: Yes!

(Same conversation follows with two more jocks)

ENGR to MGR: The new CD player has obviously done the trick, we haven't had a glitch yet.

MGR: Well, that's great!

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MGR: Are you sure?

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Senate Examines AM Stereo Standard Bill

► continued from page 1

may not financially be able to invest in AM stereo, but "it wouldn't hurt to pick a standard and see if anyone does anything different."

In Sikes' testimony and subsequent responses to questioning by Pressler, he said that he would have supported such legislation 10 years ago when the FCC initiated a standards procedure then

declined to move forward with the process.

Too late for a standard?

Sikes said choosing a standard now would have no effect on the AM band that has suffered through numerous stations "going dark," realizing little or no profit, and experiencing declining audience share.

Technically, AM stereo would not solve

numerous technical problems such as inherent electrical interference susceptibility and bandcrowding. Sikes said some have described AM stereo as "static on two channels."

The FCC chairman did acknowledge efforts are underway to curb inherent AM technical problems, including the recently approved AM improvements docket. Other voluntary efforts have been carried out by the NAB and EIA to get manufacturers to build higher quality receivers known as AMAX.

Pressler asked Sikes if choosing a AM stereo standard would hurt the industry. "In my view, it would not hurt things, but I don't think it will help, either," he said.

Sikes added, that C-QUAM already is the "de facto standard," with nearly 600 stations using it and 26 manufacturers producing C-QUAM radios. However, industry analysts have noted that stations broadcasting AM stereo are far short of the percentage of the AM stations total and that there are far fewer receivers with AM stereo than FM stereo.

Sikes said Motorola's competitor, the Kahn ISB system, is not widely utilized.

Chicken or the egg?

Pressler brought up a dilemma that AM stereo has faced without a national standard: whether stations choosing stereo would prompt an increase in receiver manufacturers or vice versa.

Pressler and other supporters have speculated that setting the standard would eliminate that dilemma because manufacturers and stations would have a standard to follow. It has been called the radio industry's version of the "chicken or the egg" theory.

Pressler also suggested to Sikes that Japan's recent adoption of C-QUAM AM stereo may renew interest in producing AM stereo radios because of Japan's consumer audio production capacity.

ISB Inventor Leonard Kahn, an opponent of the AM stereo bill, also testified on the bill. He remains in litigation with General

Motors regarding an alleged patent infringement. GM uses Motorola C-QUAM circuitry in its receivers.

Kahn filed suit in 1988 claiming that GM's use of Motorola C-QUAM AM stereo violated patents on AM stereo technology that his company had invented. On behalf of GM, Motorola filed a counter suit and asked for "summary judgment" that the case be dismissed because Kahn's claims were untrue.

According to Kahn, the courts have dismissed the summary judgment request and the suit will go to a jury trial.

In his testimony, Kahn said Motorola and GM's AM stereo marketing efforts had failed because the C-QUAM system is "poor technology."

Kahn warned that if his suit is successful, the court "can be expected to issue an injunction halting the manufacture of GM AM stereo radios."

RDS Standard Must Include AM as Well as FM, NAB Says

by John Gatski

WASHINGTON The NAB said it will oppose any action to approve a national Radio Data Systems (RDS) standard unless the standard includes AM broadcasting.

According to NAB spokesman John Marino, the broadcasters association wants RDS AM or some other AM data stream service to be added to the nearly finished standard before the April 12-16 NAB show. The standard is scheduled to be voted on by the full National Radio Systems Committee (NRSC).

If AM cannot be accommodated in an RDS standard, "the standards process would just fall apart and come to a stop," Marino said, noting that a large number of NAB members make up the NRSC.

The surprise announcement came in early March via a press release from the NAB RDS Task Force, which said the NAB supports an RDS technical standard "only if all broadcasting stations (AM and FM) simultaneously and from the outset can participate in the format scanning (PTY) and alphanumeric display features."

The members were disturbed, according to Marino, when they realized that the News/Talks format code was to be included

in the standard. Without AM RDS, the code would be underutilized since much of the programming on such formats occurs on AM.

NRSC RDS Subcommittee Co-Chairman Almon Clegg declined to directly comment on the NAB's action, but said, "I don't know of any AM technology that allows the PTY category search."

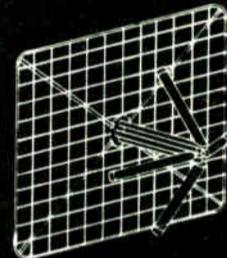
Despite the NAB announcement, Electronics Industries Association spokesman Gary Shapiro said the FM standard would likely be approved because of the support of NRSC members representing FMs.

RDS is a technology that was developed in Europe and allows an equipped tuner to receive various data stream functions via a digital subcarrier broadcast from an FM station.

The NRSC's RDS subcommittee has worked on an RDS standard for more than a year, patterning it mostly after the European FM specification. But as the U.S. standard developed, according to industry members involved in writing it, it was believed that research for AM RDS is further behind, and its capabilities are not as advanced as the FM version. Thus, the standards-developing subcommittee decided to place a heavy emphasis on FM—hoping to incorporate AM in the future.

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Noise Free Radio Has Broadcast Potential

by Paul Rebmann

LAKELAND, Fla. Since over-the-air tests have demonstrated the potential for narrowband FM systems, Noise free Radio (NfR) developer George Yazell hopes to petition the FCC for a rulemaking to allow implementation of the new technology by AM broadcasters.

In 1990, WQYK in Seffner (Tampa), simultaneously broadcast regular AM and narrowband FM signals, under a temporary experimental authorization granted by the FCC. Noise free Radio (NfR) was described in a Feb. 7, 1990 *RW* article and has been demonstrated at the NAB and SBE national conventions.

Some industry analysts, however, are skeptical about whether the technology can work for broadcast. Even if NfR is workable, it may be too late to benefit AM, because digital audio broadcasting technology may provide better audio quality for both AM and FM stations in the near future.

Los Angeles Is Interested

NfR proponents are undeterred in their confidence. "The experimental tests proved that it is possible to transmit a full 15 kHz audio bandwidth within the confines of a 10 kHz AM channel without exceeding the NRSC-2 mask," said Frank Berry, director of technical opera-

tions for WQYK AM-FM, who conducted the on-air tests.

The Los Angeles Society of Broadcast Engineers (SBE) chapter is considering conducting its own NfR tests. Chairman Sandra Woodruff said the chapter's AM improvement committee is interested in the system "to find out the pluses and minuses."

Yazell said it is time for NfR to advance beyond the efforts of an individual experimenter, and that ideally an organization such as the NAB would help plan and guide the implementation of NfR. But, he said, the NAB so far has expressed very little interest in the system.

John Marino, manager of technical regulatory affairs for the NAB, said "the concept was brought before the (NAB's) AM improvement committee," but "due to the fact that there was no test data at that time, they could not go further on it."

He said that he would like to see the results of any tests of NfR and that "the AM improvement committee was open to anything advantageous to AM." Marino added that it was his "understanding that the proposal was for AM stations to discontinue amplitude modulation and use NfR instead."

Planning for the future

Towards that end, Yazell plans to organize a committee to define technical standards for the narrowband FM system. He said he has tentative commitments from a number of broadcast engineers and representatives of equipment manufacturers

to serve on such a committee.

Yazell currently is appealing to AM stations to contribute monetarily to NfR to cover the attorney fees for the filing and other expenses including continued research and development.

Yazell said his next step in laboratory work is testing the addition of a stereo sub-

It is time for NfR to advance beyond the efforts of an individual experimenter.

—George Yazell,
NfR Developer

carrier to the NfR signal. Measurements from the WQYK tests indicate sufficient bandwidth availability in the narrowband FM signal to allow a method similar to that used for FM stereo, according to Yazell. The main difference, he explained, would be that only the lower sideband of the stereo subcarrier would be used.

Tests are also planned to see if the technique can be used for adding digital information to an AM station—either audio or data, Yazell added.

When questioned on his impressions of the WQYK tests, Berry said that it was shown that "narrowband frequency modulation allowed more information to be broadcast in the same channel than with AM," adding that this could result in better audio fidelity.

Less Interference susceptibility

Berry also said that the tests proved that the same capture effect works with NfR as

continued on page 12 ►



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KUSC Suffers Mexican FM Co-Channel Interference

by Nancy Reist

LOS ANGELES On Jan. 27, 1992, Lyle Henry, director of engineering for KUSC(FM) in Los Angeles, was faced with a radio engineer's nightmare—another station interfering with his station's 91.5 MHz signal.

"I walked into my office and what had been KUSC the night before was them coming out of the speakers," Henry recalled.

"Them" refers to XHTIM, a Tijuana, Mexico station which had been broadcasting without authorization on 103.3 MHz from August 1990 until the preceding weekend.

The irony of KUSC's problem is that it was the result of the Mexican government and the FCC trying to reduce interference to another San Diego station. That station, KJQY-FM, had earlier complained of second adjacent channel interference, claiming that XHTIM's previous 103.3 MHz signal violated the short spacing provisions of the 1972 U.S./Mexican FM Broadcasting Agreement.

On behalf of XHTIM, the Mexican government proposed several alternative channels to reduce the interference. After rejecting some of those proposals, the FCC accepted a Mexican notification for a Class B 91.5 MHz facility with a transmitter outside Tijuana, less than 1 kilometer beyond the minimum distance for two Class B stations, mandated by the 1972 treaty.

Not notified by the FCC

According to KUSC's attorney, Lawrence Bernstein, the FCC did not inform KUSC about the new Mexican allocation, despite the fact that in July 1990, KUSC had filed an application to upgrade and move its transmitter.

Unfortunately, XHTIM's recent move to 91.5 MHz led to co-channel interference with KUSC, particularly during warm inversion weather. Robert Gossett, president of Communications General Corporation and technical consultant for KUSC said,

"As a general rule, the interference has devastated KUSC's fringe listenership in San Diego and has certainly impaired it in parts of the greater Los Angeles area."

KUSC station manager Wallace Smith said listener response began immediately after XHTIM switched frequencies. "We began to get complaints before most of our staff got in that day."

KUSC is a Class B classical station, and according to Smith, 60 percent of its budget comes from listener contributions. He said

**The FCC did not
inform KUSC about
the new Mexican
allocation.**

some subscribers already have said they will not renew their support because they can't hear the station.

Henry pointed out that the interference also is bad for XHTIM, which has filed its own complaint against KUSC. Henry drove to Tijuana and visited the Mexican station the day it began broadcasting on 91.5 MHz.

For a stretch of about 80 miles from the border north he considered neither station listenable. "I think the owners of the station are innocent victims of the allocation process. They seemed genuinely startled and nonplussed to discover all this interference on what was supposed to be a better channel for them," Henry said.

From a different site

Although Henry did not see the station's equipment, by using a field strength meter he determined that XHTIM was not broadcasting according to the specifications that had been proposed to the FCC. The station was operating at lower power from a site in the Agua Caliente district of Tijuana. He said the approved transmitter site was "totally useless," because the station would need a 1500 to 2000 foot tower just to clear a hill between the site and Tijuana.

Oscar Rivera heads Tijuana's office of the Ministry of Communications and Transportation. He acknowledged a discrepancy between the location of XHTIM's transmitter and the FCC approved site. "The geographical coordinates sent to the FCC are apparently not accurate," he said. Nevertheless, Rivera said the agreement with the FCC gives XHTIM the right to broadcast on the channel. He hopes to solve the conflict amicably by reducing the power rather than moving the transmitter.

KUSC is proposing a different solution. The station hopes to persuade XHTIM to

continued on page 12 ►



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KUSC Suffers Mexican FM Interference

► continued from page 10

shift its signal to 91.7 MHz where they should experience less interference from KUSC and from other Mexican stations. Although he expected that KUSC would still experience some adjacent channel interference from XHTIM, "it's certainly a lot better than having them on top of us," Henry said.

KUSC also is filing a petition for rulemaking with the FCC, complaining that the station should have been notified about an impending allocation that could impact it so significantly.

"We really feel that we were sandbagged in this procedure. We should not be put in a situation where we have to go back after

the fact and try to correct a problem that we might have helped them resolve if they'd come to us before they made the decision and allowed Mexico to make the allocation," Smith said.

Rule change requested

The petition for rule making calls upon the FCC to "provide protection for acceptable applications filed with the FCC from subsequent notifications or proposals by foreign governments" which "adversely affect the grantability of the previously filed applications." It also asks the FCC to "mandate public notice and comment procedures for affected American licensees, permittees or applicants before ac-

ceptance by the FCC of any notification or proposal by a foreign government."

Attorney Bernstein said the proposed rules could help other border stations avoid similar problems by bringing the negotiations into the public.

Roderick Porter, deputy chief of the FCC's Mass Media Bureau, said that

since allocation negotiations across the Mexican border are governed by treaty, the notification procedures differ from those involving only domestic stations.

Porter said the FCC is investigating the extent of the interference that KUSC is experiencing and will take appropriate actions after it makes the determination. "Obviously, we're dealing with a sovereign nation, so we don't have the power to force them to comply with anything," he said.

Noise Free Radio Has Potential

► continued from page 8

with FM broadcast, resulting in much less skywave interference as well as less adjacent and co-channel interference.

NfR adds FM to the carrier, simultaneously transmitting both AM and FM. Existing AM radios do not detect the FM and continue to perform as usual with the AM signal, according to Yazell.

The narrowband frequency modulation used by NfR deviates the transmitter carrier by a maximum of 1 kHz. This signal can be created by using a standard FM exciter modulated by 50 Hz to 15 kHz audio to a deviation of ± 100 kHz.

Dividing the resulting frequency modulated RF by 100 not only reduces the frequency of the carrier, but the frequency deviation also is reduced by a factor of 100. The resulting frequency modulated signal with up to 1 kHz deviation is injected into the transmitter the same way an AM stereo carrier is.

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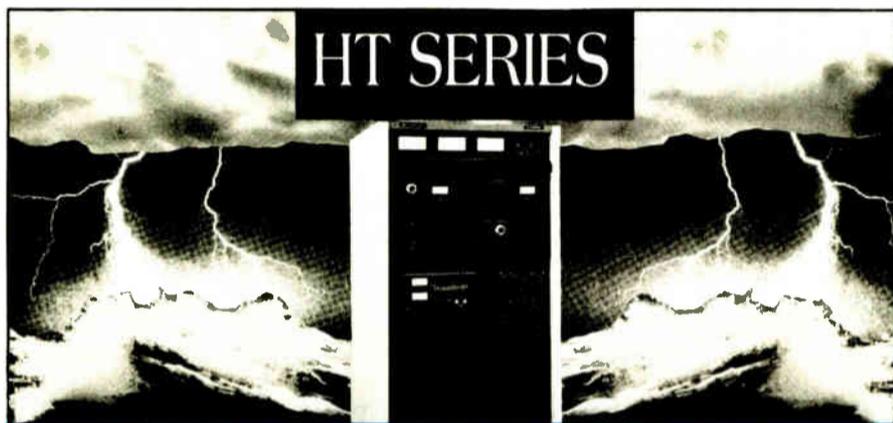
clipped to remove the AM component and multiplies 75 times, restoring the frequency modulated signal to 75 kHz deviation as well as increasing the signal in frequency. This is mixed with a local oscillator to create an IF signal of 10.7 MHz. The rest of the circuit is a standard FM receiver demodulator.

Some radio engineers remain skeptical and quote modulation theory to argue that a narrowband frequency modulation will not work at AM frequencies or will not improve AM broadcasting. One engineer who did not wish to be named added that AM was one of the simplest and best methods of broadcasting, and that "just because it's FM, it's not magic."

One problem that Berry pointed out in the test results was that negative amplitude modulation must be limited to some point below 100 percent to maintain a carrier for the FM receiver to lock onto, although accurate FM demodulation was obtained with as much as 98 percent negative peaks with a strong signal exceeding 20 mV/m.

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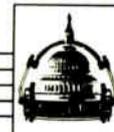
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ECLECTIC ENGINEER

Protect Your Radio Station's Recorded Assets

by Barry Mishkind

TUCSON, Ariz. It was about 1 a.m. when the disc jockey paid a final visit to the empty station. His resignation letter was written. His car was packed.

The DJ emptied his desk drawer and headed out the door. But, just before leaving, he went into the air studio. Waving the bulk eraser up and down, the soon to be ex-DJ destroyed every spot he had cut, plus a few others. "The station won't have the use of my voice anymore."

In this case, the DJ was right. The staff had recorded all the spots directly onto carts, with no backup. Worse yet, all the agency masters were gone too, used by the staff for audition tapes.

Archives or garbage?

It's not just the spot library at risk. Many stations have jingles and other production tapes that are irreplaceable. Loss of these materials could present a real problem in recovering from an incident such as the one I described.

Add to that the recently discovered deterioration of some Ampex 406 and other tapes that threaten the archives of many stations.

Me? I've always been the nervous sort. Protecting air material is second nature. In the production room, I've always kept master tapes, stored tails out, to reduce the effects of magnetic bleeding. Agency tapes are labelled and stored carefully.

Since even the best maintained cart machines can end up eating a cart, I like to duplicate all critical control room carts, so a replacement is instantly available. This might be an ID or a spot that is difficult to make good.

Then, too, I also worry about DJs stacking carts upside down, on top of speakers, or using them as frisbees when they mess up a segue. It's amazing how carelessly such important parts of our livelihood are handled in many places.

For that reason, many stations are taking steps to educate their staff on how best to handle carts and tapes, as well as the proper way to care for older materials. Of course, we don't want to forget the vinyl and CDs that make up a large part of the broadcast day.

For years, program directors and engineers have tried to keep the air staff from using records as plates for sandwiches and pizza. And nearly everyone who spent time on-the-

air in the '70s can tell at least one story of how they got stung with an encrusted record skipping or jumping during PM drive.

Hands-off approach

Today, some of the most popular CD players in the industry have literally taken the CD right out of the DJ's hands. Both Denon and Audiometrics CD players use plastic holders to ensure that the DJ never touches the CD.

Yet, the studio is littered with one of the biggest engineering problems in the modern station: tape cartridges. Looking at the tape path, and the efforts made to try to stabilize it for stereo, one might begin to wonder how tape carts ever work in the first place.

Most manufacturers will tell you that the single biggest contributor to early cart failure is stacking them upside down. This causes the tape pack to shift and/or slip on itself.

Often, DJs tend to flip carts upside-down to identify those played on the air, or when pulling the next group of spots to air (they stack them upside-down and then turn them over). This gives the tape the opportunity to slip and eventually jam the cart.

At one station, teaching the DJs to pull upcoming carts in reverse order (last first) reduced cart failures to almost zero. This has proved true with all the various cart bodies you are likely to have in the station.

Oh, yes: For those truly frustrating moments, we offered the staff some sponge flying discs and whiffle balls. That kept the rest of the cart stock from damage!

Production room practices

Often production directors maintain the spot library. Protecting the agency masters as well as the production room masters is as essential a part of their job as the program director protecting the music library.

Nevertheless, after 20 or 30 years, some of the tapes that contain rare music, vintage air checks, jingle libraries or other station goodies have deteriorated.

As mentioned above, Ampex 406 tape has been known to break down, destroying the emulsion and clogging tape heads. On the other hand, many of you have aged acetate masters, using that the old standby, III. In many cases, this tape has become so brittle that reproducers with excessive tension can break III into thousands of pieces.

The manufacturers' advice is to periodically

check the integrity of your tape archives. For problems with 406 and similar tapes with binder problems, a process of careful "baking" can restore the tape long enough to transfer. For others, like III, careful dubbing can preserve your station's history.

While it may take some work to keep your libraries in good shape, you have it easy: The record companies have thousands of miles of tape to transfer!

□□□

Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant in Tucson. He can be reached at 602-296-3797, MCI Mail #325-9883, or "barry@coyote.datalog.com" on Internet.

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Q-TIPS

Hard Times Can Make You a Hero

by John "Q" Shepler

ROCKFORD, ILL. Times are tough. You already know that. But, do you realize that this is the perfect time to rise above the crowd, solidify your position, and be the station hero?

How can that be? Easy. No competition. Everyone else is depressed into worrying, complaining, and general inaction.

No, I don't have any quick fixes. I have discovered that there is opportunity in every recession. It's hiding just under the surface.

These opportunities are not available to everyone. The people who benefit from troubled situations are those who refuse to be paralyzed by fear. Most importantly, they take positive action *before* disaster strikes them, too.

Protect yourself

The ideas that I'm going to present in this column require some savvy and some effort on your part. Even so, the rewards can be considerable.

Everyone is worried about losing his job. Yes, jobs will continue to be lost. The idea is to make sure it isn't you or your job that goes. The way you do this is by becoming so valuable that they'll find someone or something else to cut instead.

True, there's often a surplus of so-so performers in any field. You need to be seen as someone who's above average—even superior. That way, when the ship starts to sink you'll be way up in the crew's nest.

Is that safe? You bet. Seldom does any operation sink completely. Chances are that if you're valuable enough, you'll survive nearly all employment crises. You may even find yourself rising in the corporation.

Beyond the call of duty

Now, how do you perform this transformation from good solid performer to super performer? Here are some methods that might do the trick:

- **Cut costs.** I've yet to see a business that didn't love to cut costs. Today, cash flow is so critical that it's either cut the costs or lose the business.

The easiest way to cut costs is to cut expenditures. Stop spending money, or at least slow down. Review each and every item you're getting ready to buy. Is that item critical for staying on the air, performing a sponsor-paid activity, or necessary for general up-

keep of the plant and welfare of the staff?

To be recognized as a cost cutting hero, you need some way to be measured. Work to a budget. Your references are what was spent last month, last year, and over the last five years. Keep track of what you are spending and make a report every month. If you can draw a chart with the trend headed downward, so much the better.

- **Cut waste.** As part of bird-dogging those expenditures, check up on how each item is used. Are batteries being used capriciously when line power is available? Are cables and flashlights getting lost at remotes? Is the equipment being damaged through neglect or misunderstanding?

Every dollar of waste prevented is a dollar not spent. What's more, it's free. Nobody has to do without, they just need to take more care with what they have.

- **Fix instead of buy.** The easy thing to do is buy a dozen new cart machines. The tough thing to do is refurbish the old ones in the shop.

The hero makes a plan showing how much it costs to completely upgrade an existing machine versus buying a new one. It's possible that new heads and pinch rollers plus a thorough cleaning and alignment could get you by another year. By then, you'll be out of the crisis and ready to buy those new machines.

- **Make instead of buy.** I worked at a little FM station that had zero funds for new equipment. I mean zero. What we did have was a hotdog staff that wanted to sound great. So, we made a reverb from a junked organ, built a mic processor in a cake pan, added various jacks and switches to expand the board, tinkered with the time constants of the processing, and built furniture from doors and shelves. Oh, I almost forgot to mention ducting the transmitter heat into the front

office to cut the gas bill.

Cleverness and sweat equity can often be substituted for hard cash. It takes a do-it-yourself attitude and some petty cash for materials. Smarts can get you safely through the dangerous times.

- **Get better deals.** Sometimes the make/buy analysis says buy. Start dealing. Don't just go for the catalog price. Try to cut a deal where you get both a discount and some service thrown in.

You may be able to spread a major purchase over several years. Lock in a big discount now and pay as the units trickle in. Equipment manufacturers and distributors are also having tough times and are open to creative ideas to move that stock.

How about used gear? Check with your distributor for recent trade-ins that are ready to use. Also check the ads in the back of **RW** for station-to-station deals.

- **Generate more income.** Come up with a new program that helps sponsors move merchandise and everybody collects. Sometimes it's just a matter of being observant and suggesting a special remote broadcast or clever production. Other times you may have to upgrade the facilities to do the show.

Hint: Spending money to make more money is a way to get that new equipment for "free."

Ideas everywhere

Are you starting to get ideas, too? Once you start looking for available opportunities instead of lamenting the sorry state of the status quo, bright ideas seem to come from everywhere.

Right now would be an excellent time to find one or two measures you can implement quickly. Don't forget to let people know what you're up to so they can appreciate the results.

Next month, I'll pass on some more of my favorites. I'd also be interested in sharing what nuggets you've discovered. Please send them to me via **RW**. Let's all find ways to be heroes in these tough times.

□□□

John Shepler is an engineering manager and longtime RW columnist. Write him care of RW.

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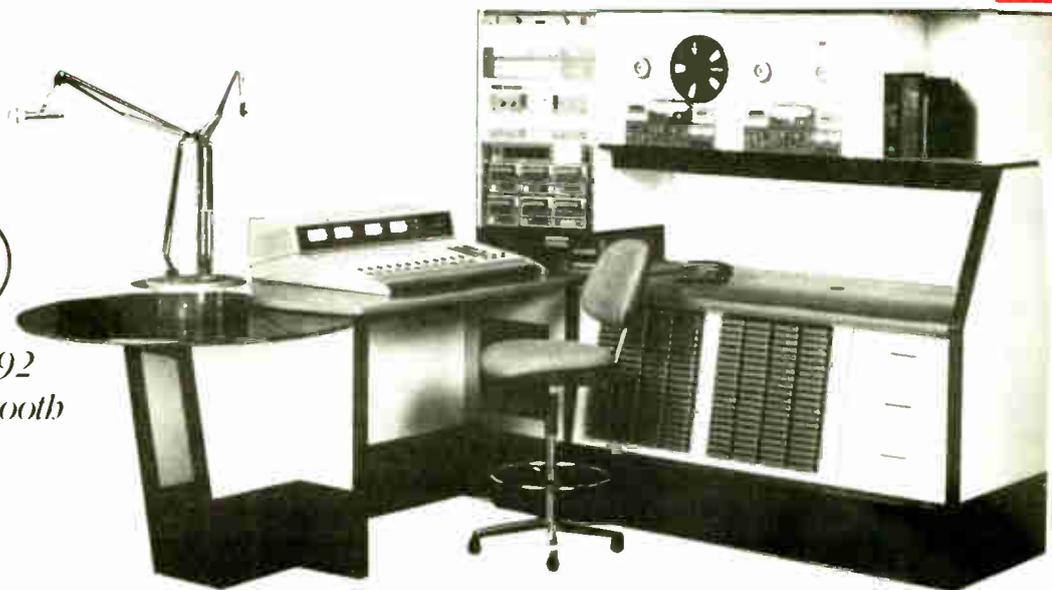


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World Radio History

FEED LINE

Unearthing Transmission Line Problems

by W.C. Alexander

DALLAS Over the last few weeks, I have had a number of engineers call me with transmission line troubles, wanting advice on fixing their problems. The subject seems to be hot right now and it struck me that maybe a brief refresher is in order.

Before we go on, let me point out that all these problem transmission lines were in AM stations, and in only one case was the trouble with a power-carrying cable; the remainder were with sampling lines.

The phone rings. It is the transmitter operator at the station, and he/she says that the tower readings are "funny." Describe the problem, you say. He does, and you determine that the phases aren't really off, but one of the ratios sure is.

Ratio problems

When you get to the transmitter site, you find that the one ratio is indeed whacko. You switch the sampling line inputs to the antenna monitor to be sure that there isn't a problem with the one tower's input board in the monitor itself. No dice—moving the tower with the faulty reading to the reference tower channel verifies that the sample itself is low in amplitude. What now?

The first thing to do is to take a look at the common point impedance and current. If you have a built-in common point bridge, great. Just read the resistance and reactance dials and compare the readings with the licensed values.

If they—along with the common point current—are normal, then the trouble is probably in the sampling system and not in the DA itself. If you don't have a CPB built-in, get out the operating impedance bridge or use the reflectometer in the transmitter.

As a rule, a substantial change in the directional antenna parameters will cause a substantial change in the driving point impedances and thus the common point impedance. This may not be true in every single case, particularly in cases where an antenna element's driving point impedance is very low. As a rule of thumb, however, it works pretty well.

Now that we suspect the sampling system, the next step is obvious. You put on your waders and march through the soggy ground to the tower (after turning off the transmitter, of course, so as not to become exposed to excessive E- or H-fields).

Where to pick up

The logical place to start is with the pick-up device itself, whether it's a sampling loop mounted on the tower or a toroidal pickup in the antenna tuning unit. Unscrew the sampling line connection and check for corrosion, water, or other foreign matter. If the connection is clean, reattach the line and check all the other connections, such as ground straps and hardware. If nothing is found wrong, what else is there to do?

The next step most engineers would take is to make some DC resistance measurements on the sample line. With one end of the line open, your super-duper microprocessor-controlled 248-function

multimeter at the other end shows . . . an open.

With the other end of the line shorted, it shows a few ohms. You compare this to the DC resistance measurements on one of the other sample lines and you find the results much the same. What could be wrong with this line?

If at this point, you've run out of ideas, don't call up the equipment rental yard and order up a trencher. Don't replace the whole line just yet—although that would certainly fix the problem if the trouble is, in fact, with the sample line.

It's true that all the facts point in this direction, but how can we know for certain? Get on the horn and beg, borrow, or rent a time domain reflectometer (TDR).

Time domain reflectometer

A TDR is a device which is used to hunt for cable faults by sending a pulse of energy down a line and detecting its reflected return with a tunnel diode. If the velocity factor of the line is known, the location of the fault also can be determined. With the TDR in hand, follow

the manufacturer's instructions and check the line.

You find an anomaly 366 feet down the line. Up to that point, the return is a straight line, but at that point, the line shows a low impedance. You have, no doubt, found the problem, but don't go measuring off 366 feet in the mud looking for a place to dig. First find out if the line with the problem has any excess that is coiled and buried.

Sample lines normally all have to be the same length to give accurate phase continued on page 16 ▶

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A Refresher Course in Transmission Line Fixes

► continued from page 15
indications. For that reason, the sample lines to the closer towers are cut to the same length as those to the farthest tower and the excess is usually coiled up and buried to keep it in the same environmental conditions as the rest of the line.

The excess can be buried in a variety of places. Ask the consulting engineer that oversaw the construction of the site,

or the chief engineer that was at the station then.

Usually the excess will be on one end or the other, and it is more common to have all the excess lengths in one spot, near the transmitter building. If this is the case, take the TDR to the tower and get the distance from the tower end of the sampling line to the anomaly.

Now get out the tape measure—if the excess is at the tower end, measure from the antenna monitor end. If the line is the one from the farthest tower, then all other things being equal, it is probably best to measure from the tower end.

Hacksaw the line

Now comes the hard part. You dig and dig and are covered with mud. You are angry, cold, and although you have unearthed the line in question, you can't see anything wrong with it. What now?

Cut it. That's right, take a hacksaw and cut it. With the line now open, take the TDR back to the tower or antenna monitor end and check the line again. If you see the open you just created on the TDR but no anomaly, go to the other end and check the line again. Find the distance between the cut you made and the anomaly, go back to your hole, and measure off that distance along the line toward the anomaly.

Add another foot or so and make another cut. Check the TDR again, and you should see an open from each end with no anomaly. That is now the piece of cable you hold in your hand.

The rest is easy. Call up a distributor and order a length of the exact same type of line, along with two splice kits. Splice in the same length of line that you took out and carefully waterproof the splices. Allow all the dope to dry, and run another TDR and open/short circuit test before burying the whole mess.

The line is fixed and you hook everything back up. Everything is back to normal; you can go home and clean up.

There is still that piece of sample line lying over on the workbench. What is wrong with it? Find out: Skin the jacket off and look for a break, crack, or pinhole in the outer conductor. You'll find it. Then, cut the outer conductor away with some aviation snips. I'll bet the dielectric is saturated.

Of course, there are other things besides water that cause trouble in underground cables. I have seen rocks that were pushed up from below by water or seismic activity press kinks into lines. Strange things happen, to coin a phrase.

This little instance could just as easily have been a transmission line feeding one of the towers. The troubleshooting and fix would have been about the same, but the initial indications would probably have been different.

The result is that, unless the whole line was soaked because of a jacket break at a high point along its length, the total repair cost will be the TDR rental, repair parts, and (of course) your time—a fraction of the cost of replacing the whole line.

□ □ □

Cris Alexander is director of engineering for Crawford Broadcasting. He can be reached at Box 561307, Dallas, Texas 75356.

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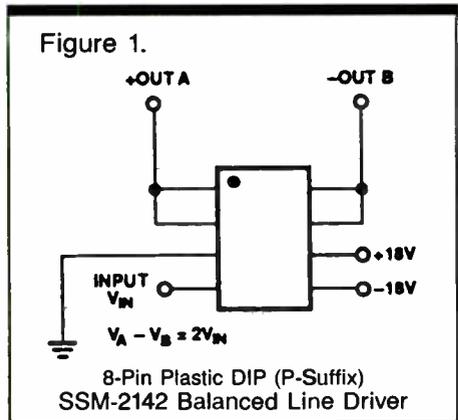
Interfacing Consumer and Broadcast Gear

by Jim Somich

BROADVIEW, Ohio To expand on the idea of interfacing consumer gear to broadcast systems, this month's column will tackle opamp building blocks, they are inexpensive, easy to design with and commonly available.

It is also possible to purchase "packaged circuits" that can make interfacing even easier. A packaged circuit contains one or more opamps and the resistors necessary to realize the circuit topology. This integration makes for tighter tolerances and higher performance.

Figure 1 is an application of the

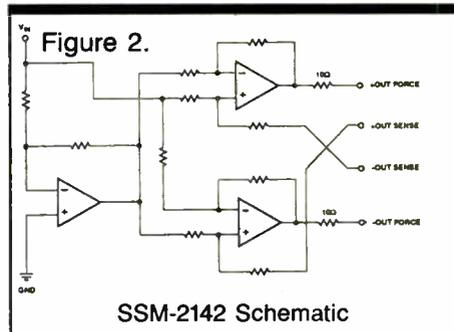


PMI SSM-2142 balanced line driver package. The schematic is shown in Figure 2. The 2142 is an economical, high-performance choice to balance the out-

puts of prosumer devices.

It is capable of driving 10 V RMS into a 600 ohm load. The outputs are short circuit protected and the chip has a low gain error and very high slew rate of 15 V/us. It operates on a bipolar 18 volts. The 2142 is a packaged alternative to the line driver described last month.

The primary purpose for building a piece of gear with a balanced input is to reduce



noise. A good balanced input has a common-mode rejection of at least 80 dB, and sometimes as high as 100 dB, depending on the device used and component tolerances.

Balancing act

A consumer cassette machine will have unbalanced inputs and outputs, and even if you can keep the input leads very short and well-shielded, the unbalanced input will ground one side of any balanced circuit to which it is connected.

This can result in all kinds of nastiness, es-

pecially hum and buzzes. For this reason, it is important to balance the input as well as the output of any consumer equipment you integrate into your station.

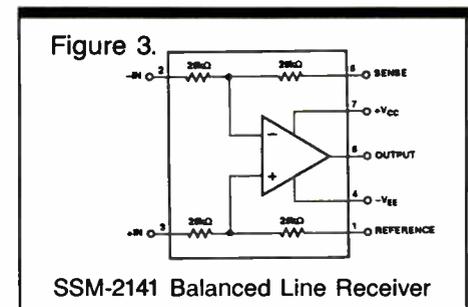
An opamp, by its very nature, is a balanced input device. There is a plus and minus input terminal and the output is the difference between these two inputs.

While this simple approach will work as a balanced input, it has one major drawback. The input impedance is different for the positive and negative inputs to the opamp. Nevertheless, when this approach is used in a packaged chip, with a high performance opamp and ultra-precision resistors, the performance can be quite good.

Figure 3 is the schematic of the PMI SSM-2141 single opamp balanced line receiver.

The diagram reveals why the single opamp approach to input balancing is not truly symmetrical. In the circuit shown the negative input has about a 25K ohm input impedance, and the positive about 50K ohm.

Because of the asymmetrical nature of this



topology, common mode rejection will be on the low side at high frequencies—probably about 65-70 dB at 20 kHz. The SSM-2141 uses precise resistor matching and an opamp with continued on page 24 ▶

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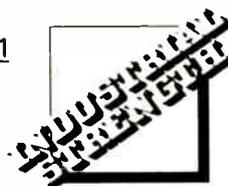
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LINE OUT

The Finer Points of Concert Broadcasts

by Bruce Bartlett
with Jenny Bartlett

ELKHART, Ind. Broadcasting a live concert is an exciting challenge. You must handle two tasks. First, you must mic, mix and amplify the sound of the musicians playing to listeners in an auditorium. Second, you must broadcast that sound clearly to your station's listeners.

Non-commercial WVPE(FM) in Elkhart, Indiana, routinely broadcasts its live

jazz concert series. CE Chuck Pitts described how it's done (see Figure 1).

The station hires an outside sound company, Audio Services, to mic and mix the musicians. (I'll refer to the mixer they use as "the remote mixer.") Monitoring is done in a control room isolated from the auditorium. The stereo program feed from the remote mixer goes to the studio's master control console, where it is switched on the air at the proper time.

The station's program signal returns

to the remote mixer's audition channels. From there it goes to the house sound-reinforcement system. The audience in the auditorium hears the broadcast mix through the house speakers.

Before the concert, the audience members hear announcements and music played by the station. During the concert, they hear the reinforced jazz group. The audience members feel they

ing the two mixers, the shield is disconnected from pin 1—ground—at one end of the cable (the input end). This breaks any ground loops. The shield still drains hum fields to ground through its single ground connection at the mixer output connector.

Fortunately for WVPE(FM), the auditorium and station are in the same building, so the engineer can use audio

Thus, a good house mix does not guarantee a good broadcast mix. Sometimes it's better to create an independent broadcast mix by using a separate mixer.

are taking part in a live broadcast, not just an isolated concert.

The auditorium announcer listens to the station's signal over the P.A. speakers. When the station announcer says, "Let's go to our concert," the studio engineer brings up the remote feed, and the auditorium announcer says "Welcome to our live concert series." After a few comments, the music begins.

And it sounds great on the air. There's no hum, in spite of the connections between two separately grounded mixers. That's because in each cable connect-

cables to connect the two mixers. If the remote were in a separate building, you'd use a telephone line for the audio link, with an audio coupler on each end.

The system described so far uses one mixer at the remote site to handle both the P.A. and broadcast mixes. The two mixes are the same.

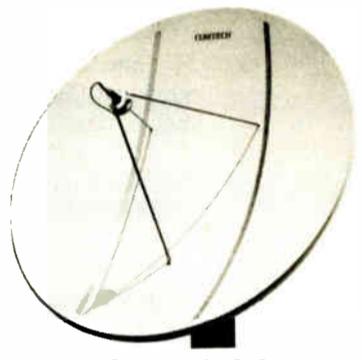
Another way to broadcast a concert is to set up two different mixes—one for the P.A. and one for the broadcast. In what instance might you need two

continued on page 23 ▶

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for a COMPLETE 6 hour stereo system



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- supports digital networks

SPECIFICATIONS

all tests performed at 1:1 compression

Digital Signal Processing System (DSP)

Sampling System- 16 bit linear PCM, 2 channels
Sampling Rates- 44.1,32,22kHz, fixed filter on routing switcher
Compression- 0,2,4...adaptive differential PCM

Controller -

Floppy Disk- 3 1/2" 1.44M capacity, System Hard Disk- 40MB
Printer Support- IBM compatible, parallel port

Audio Performance- Digital Record playback

THD- .008%, Dynamic Range >85dB,
Freq Response- (+)(-).5dB 10Hz-15kHz

Physical Specifications

Dimensions- 19" Rack mounted- 19"W x 5 1/4" (3RU)H x 16"D
Weight- 60lb's , Power- 110/220VAC, 50/60Hz, 100W

Audio Performance- Routing Switcher

THD- .005% typ, S/N < 100dB below +4dBm
Dynamic Range- >120dB,
Freq. Response- (+)(-).1dB 20Hz-20kHz

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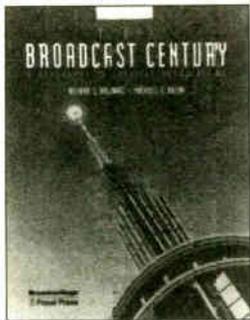
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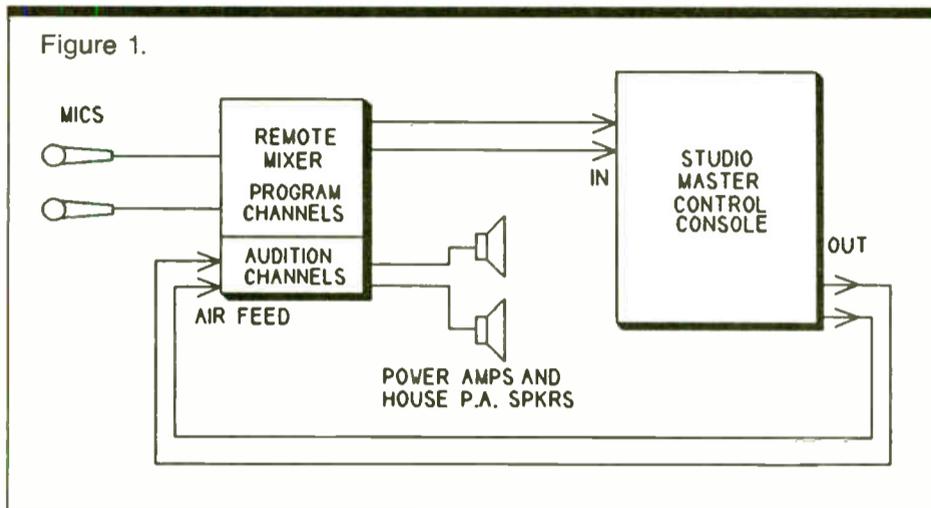


The Finer Points of Live Concert Radio Broadcasts

► continued from page 18
different mixes?

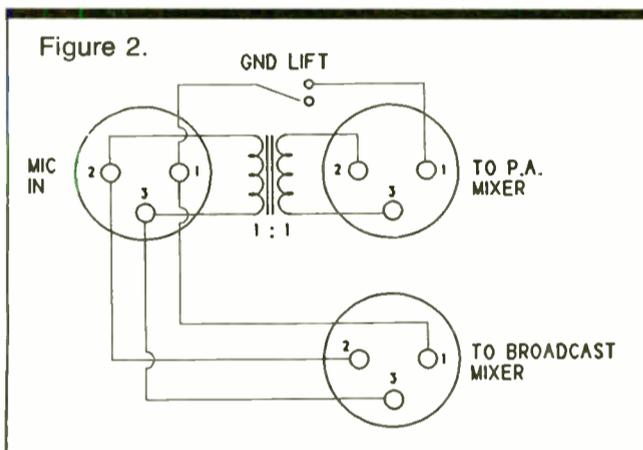
Suppose that a P.A. mixer operator is seated in the auditorium. The audience

ring between the two mixers. If you're using phantom power, supply it directly to the mic through the non-isolated output. The ground-lift switch is set so that



hears a "combination" of the live sound of the band and the reinforced sound

only one mixer (the one providing phantom) grounds the mics.



through the house loudspeakers. The mixer operator tries to get a good blend of both these elements.

Better than live

The house speaker sound is mixed to *augment* the live sound, not to sound good by itself. A broadcast mix taken off the house mixer might have an improper balance—often too strong in the vocals and too weak in the bass.

Thus, a good house mix does not guarantee a good broadcast mix. Sometimes it's better to create an independent broadcast mix by using a separate mixer.

Engineer this arrangement by having two mixer operators work at the concert site. One sits in the audience and mixes the show for them. The other sits in an isolated room, with near-field monitors, and mixes the show for the broadcast listeners. The off-the-air signal returns to the house mixer only for cueing before the concert.

Use a splitter

Each mic is needed on the stage to feed both mixers. This is done with a mic splitter (Figure 2), which provides two or three transformer-isolated outputs for each microphone. You could use a simple Y-adaptor, which parallels two male XLR outputs from a single female XLR input.

The transformer-isolated splitter prevents any chance of ground loops occur-

If the splitter has three feeds per mic, the third could go to a recording console and a multitrack recorder. Broadcast, P.A., and recording all can be going on simultaneously.

□□□
Bruce Bartlett is a microphone engineer and technical writer for Crown International, and the author of Stereo Microphone Techniques, published by Fo-

cal Press. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.

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Tap into New Rock's Revenue Potential

by Bruce Ingram

CHICAGO No one seems to know exactly what to call it these days—new rock, alternative rock, progressive rock, adult alternative, adult progressive, eclectic rock, contemporary rock 'n' roll, even adult rock 'n' roll are just a handful of the names being bandied about by practitioners.

Yet, regardless of the label, there seems to be little doubt that the old AOR alternative, the progressive rock format, is considered a serious option by stations encouraged by the success and stability of long-running operations like KBCO-FM Denver, WHFS(FM) Washington, KGB-FM San Diego and WXRT(FM) Chicago.

"I've heard some rumblings," said Jim Duncan of Duncan's American Radio, when asked if he was aware of many stations contemplating a switch to progressive rock. He was much less enigmatic when it came to providing hard facts about the money-making potential of the format.

Denver's KBCO-FM, for example, was the third largest biller in the market last year,

"It doesn't have to be wall-to-wall alternative music that nobody else is playing . . . It has to be a well-crafted mix."

with a total of \$7.4 million, according to Duncan's figures. San Diego's KGB-FM was fourth with \$7.3 million and Chicago's WXRT was tenth (up from 18th half a dozen years ago) with \$9 million.

Washington's WHFS was less successful in 1991, coming in 17th with \$3.6 million, but Duncan attributes that partially to signal problems suffered by the station.

Money to prove it

The financial success enjoyed by this format in recent years has everything to do with the confusion surrounding its name. Heritage stations like the ones mentioned above are clearly tapping into a broad-based and lucrative audience, not the sort of niche market implied by terms such as progressive and alternative.

David Rahn was marketing and promotions director at KBCO-FM for 10 years before joining with longtime KBCO-FM general manager, Ray Sibitsky and program director, John Bradley to form SBR Radio and spread the gospel of their format to stations looking for a new identity in their markets. The company has already signed up seven converts since it opened for business in July.

What's in a name?

Rahn says likely candidates for the switch-over to progressive/alternative/eclectic/contemporary/adult rock include number two AOR stations having a tough battle against a heritage AOR or the third or fourth AC sta-

tion finding its market sliced too thinly.

In practice, SBR (using the term "true album radio" to describe its approach) shies away from even mentioning the word "alternative" to advertisers. In fact, Rahn says, the so-called alternative rock format is actually a mainstream format with very broad appeal.

He pointed out that Chicago's WXRT, for instance, definitely leans toward modern, alternative programming, but the audience it reaches is a big segment of the population largely unserved by conventional, tightly programmed formats. As a result, WXRT, like the other heritage progressive rock sta-

tions, have gradually evolved a very stable, very salable audience base.

In the language of Arbitron, the format has proven appeal for 25- to 34-year-olds, with a broader demographic range of 18-45. It has also been known to perform well in the key 25-54 demo.

Properly positioned, Rahn explained, a format like WXRT's can pull listeners from standard AOR, AC, classic rock, even country formats in addition to

continued on page 26 ▶



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Bird Songs: Switching Over to Satellite

by Patrick Delaney

LA CRESCENT, Minn. "We're going satellite." These are three words that strike terror into the heart of any aspiring jock. The same three words, however, offer many a general manager the hope of a bottom line *not* in the red.

If you're planning or thinking about a 24-hour satellite format for your station, you're not alone. If you do it correctly and for the right reasons, you can succeed with satellite-delivered programming. But, if some critical elements are not in place, it can start your station on a downward spiral.

Unfortunately, financial distress is what causes many stations to go "on the bird." Too many times it's done in a panic situation with then-unemployed announcers, confused salespeople, and puzzled engineers scrambling to get the system up and running.

Half empty or half full?

It can all add up to create a hostile environment at your station. Keeping things together during this type of transition can become the ultimate test of a general manager's skills. A key attitude is viewing the change as an improvement to your operation and not just scaling back costs.

"It's not live" and "It's not local" are words you'll hear frequently at first. The truth is you *are* live. Your satellite jock is a living, breathing human being and perhaps more talented than the "local" person he/she is replacing. The fact that they are not in your studios is more of a problem for the station staff than it is for the listeners—95 percent of whom won't realize or care that you've gone on the bird.

If management is whole-heartedly behind the change, believes that it can work, and is ready and willing to deal with all of the short-term problems that it can create, then the switch will probably work.

If the feeling exists that you're only doing this because of financial pressure and it is a step down for your station, then it probably will be. In that case, try to cut your overhead someplace else.

In their hands

The underpinning of success rests squarely with two individuals at the station—the engineer and the operations manager.

The engineer's attitude and motivation will determine how tight your air sound is and how well your local breaks blend with the satellite programming. Small details like cart deck alignment, cue tone detectors, levels and clean, tight connections become much more important if there is no operator to correct minor discrepancies or glitches.

You'll find that as a rule, maintenance needs on most equipment will be reduced with a satellite format because there is much less physical wear and tear on switches, buttons and pots. Your initial investment in new equipment and/or maintenance will last for a long time.

If you are considering equipment purchases to coincide with going satellite, look hard at one of the PC-based hard drive audio systems to run your ads and liners. I have worked with

them for several months now, and cart machines, carousels and conventional automation systems already seem like dinosaurs.

Your engineer also needs to be creative at designing and building ways to make things happen with no operator present. You can put remotes on the air, record weather or news feeds, switch jock liners and almost anything else with some imagination, inexpensive relays, timers or many items you may have lying around.

In many instances, the operations manager of the satellite-fed station is the former program director of the locally-

originated station. You'll need to examine this individual's attitude in his or her new role carefully. This person most likely got into radio because he enjoyed being on the air, and may not be as committed to the success of the satellite programming as you need him to be.

Ask yourself if you can see this person keeping satellite jock liners fresh and changed on time. Will he make sure the automation system is always properly programmed for a tight sound? Will he train other board operators to do things the right way? Will he communicate frequently with network operations personnel and, in general, maintain a positive

attitude about the whole thing?

If you can't answer these questions in the affirmative, then let this person go be a star someplace else. You need someone that recognizes your station as a business. Be aware, though, that people like this are rather difficult to find.

A varied music menu

There are a few players in the field of satellite-delivered formats. Of the many formats offered by each, most are well done and easily localized. As a prospective affiliate, you should talk to and get to know one or more of the affiliates of the format

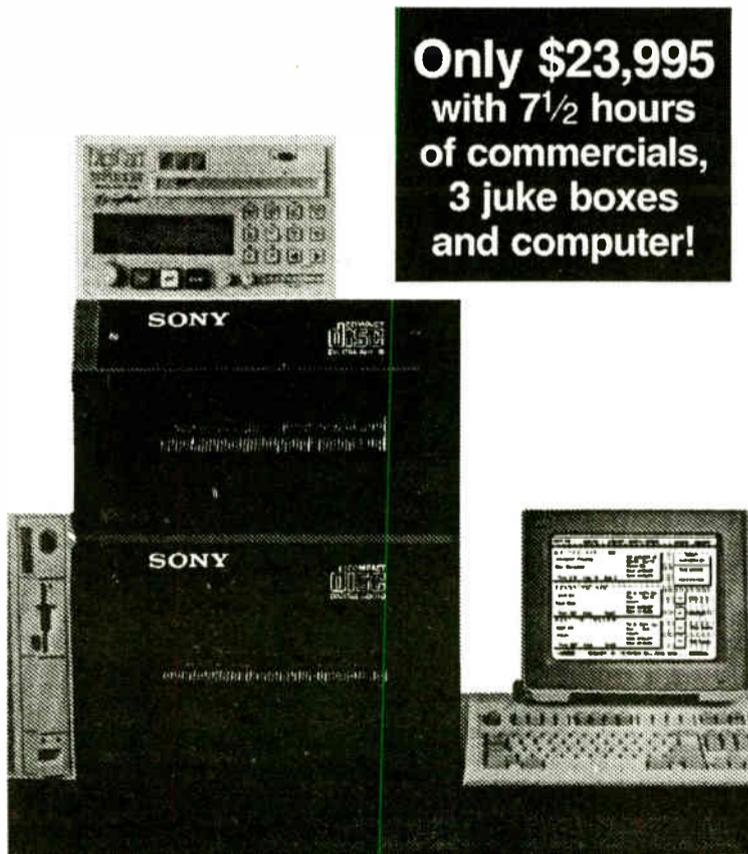
continued on page 28 ►

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• 23 GHz

Stations across the country are avoiding 950 MHz problems by using 23 GHz with CAT-LINK. They've stopped worrying about frequency congestion and interference, repeater-induced signal degradation, and fresnel zone clearance fading. 23 GHz dish sizes also reduce wind loading and tower space requirements.

• DS1 (T1) Data Line

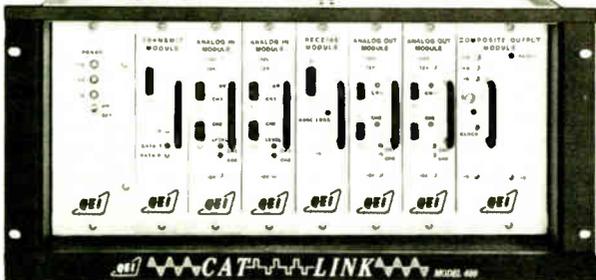
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Circle (59) On Reader Service Card

Are You Getting the Most From Power Companies?

by Barry Magrill, PE

FAIRFIELD, Fla. You may be spending thousands of dollars more than you should on your electric bill. Most people would like to reduce their bill and negotiate the best service, but never know how to do it.

Do you have a power problem so difficult that you do not have the resources or manpower to solve it? There are ways to enlist the help of the power company. You can control costs in initial construction, renovation, long-term operation and even during times of trouble.

During the planning stage of an initial construction or during a renovation, you should contact both the energy services department and the distribution engineering department. The engineering department will tell you which services are available in your area. The energy services department can tell you about the different rate structures that may apply to you.

Tell them what you need

You need to provide the power company engineering department with some details so that they can provide you with adequate power. A utility will want to see a site plan and a sheet detailing your anticipated equipment loading.

Initially, the plans can be preliminary (subject to change) so you and the utility can work out the best type of service. Be sure to tell them you are planning a broadcast facility. Sometimes they can provide an alternate feed. Often they can prioritize your feed so that you are one of the last customers dropped during brown-outs.

Eventually you must supply the utility company with a set of final drawings. Your chief engineer may submit the drawings in most states if he is your fulltime employee. A registered engineer or your contractor may also submit the plans.

You should check on the availability of three-phase power *before* you buy your station equipment. A few years ago it was difficult—if not impossible—to buy a high-powered, single-phase transmitter. Today they are increasingly common. The cost of

installing three-phase may far outweigh any advantages.

Each power company has its own rules regarding construction costs. Sometimes the first pole and span of wire (up to 400 feet) is free. Power companies usually require businesses to contribute "costs in aid of construction" for longer runs. The cost per pole is about \$1,500.

The maximum distance between poles is about 600 feet under good conditions. Much shorter spans are necessary in mountainous terrains and areas with high winds or severe icing. The costs of construction are negotiable and some power companies will deduct the expected revenue during the first year or two of operation from the construction costs.

Ease in numbers

If several users propose to operate from the same location, then the combined revenues may be enough to offset the construction costs. Under those conditions, the power company will normally install the power for free. The power company may require you to post a bond or deposit if there is any question that adequate revenue will be generated.

You should ask which voltages will be available at your site during your initial contact with the power company. Common three-phase values are 120/240 volt delta, 120/208 volt wye and 277/480 volt wye service. Single-phase service is usually 120/240 volts. All values are RMS.

There are two configurations on three-phase service that are useful to broadcasters. They are closed delta and wye. Closed delta is generally the best in terms of noise and voltage stability—although the closed wye configuration is generally adequate.

If you request a delta configuration, the utility company will often provide an open delta because it uses fewer transformers and is cheaper to install. Open delta service should never be used since its voltage levels and phase relationships tend to wander with varying loads. This can lead to failure in the power supply of your transmitting equipment.

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Switching Over to Satellites

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you are considering.

Ask how cooperative the network is at providing them with special liners in a timely manner. This is critical in your localization efforts. With many of the services, you can fax out your copy in the morning and get your liners fed in the dead breaks that same day.

It's best not to overuse this service though, because it causes extra work for the network personnel and they have hundreds of affiliates to serve. Also, most of the network announcers are willing to record your client's ads for a flat fee (usually around \$25 for a 30-second spot). You should consider using this service for a few of your ads because with reduced air staffing, your production voices will be limited. The major-market voice will also improve your sound.

National satellite formats are adding af-

filates every day—mainly because of economic downturns. As a prospective affiliate, maintaining a positive attitude throughout a transition is absolutely necessary for success.

There will be some moments of doubt to deal with during this period. These doubts usually disappear when listeners start commenting about the "professional" announcers you've hired and how they're hearing many more of their "favorite" songs on your station.

Switching to satellite programming is a big step. If you do decide to affiliate your station with a satellite-delivered network, be prepared to stand behind it all the way, just as you would the local air staff.

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Patrick Delaney is a broadcast engineer and is involved in the ownership of several stations. He can be reached at Quality Audio Broadcast Services, RR 2, Box 106A, La Crescent, MN 55947.

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 You will generally have a choice of delta or wye if you are using overhead service. Many power companies will not provide delta service for underground installations due to a phenomenon known as ferroresonance. It has caused transformers to explode (much to the chagrin of surprised power company crews).

The underground cables have a large capacitance and pad-mounted transformers have a significant inductance. These elements may form a 60 Hz resonant circuit, causing huge currents to circulate in the transformer. Although there are inexpensive ways to avoid the problem, most power companies are either unaware of them or reluctant to try them.

Know all the angles

There are three factors that may effect your bill enormously. The three are: demand, demand ratchet and power factor. Residential and small commercial facilities pay for the amount of energy (in kilowatt hours) they use. Larger commercial users pay for the amount of energy and how fast it is delivered. The rate of delivery is measured in kilowatts of demand.

It is important to keep your electrical demand as constant as possible. Large peaks—even for intervals as short as 15 minutes—must be avoided. These situations may increase your electric bill by thousands of dollars.

Suppose you have two 20 kW transmitters, a main and a standby. Each transmitter consumes 35 kW. For the sake of illustration, assume that the power company has a \$5/kW demand charge. The demand charge for the first transmitter will be \$175.

If you turn the other transmitter on to test it for 30 minutes, you will double your demand charge. It will now be \$350.

Suppose you do not operate the standby transmitter for the rest of the year. The power company charges 70 percent of your peak demand for the next twelve months. This is called the demand ratchet and in the example above will cost an extra \$1,470. The total cost for running the standby transmitter for 30 minutes will be \$1,645.

One way to avoid this charge is to shut down the air conditioning for a few minutes. Warm up the standby. Turn on the standby and immediately shut off the main transmitter. Another possibility would be to operate the standby while the main is off-line for maintenance.

Know the rules, too

If you have already incurred a demand ratchet you may be able to have it lowered or removed. Tell the utility that you have taken steps to prevent a recurrence of the peak demand.

Each utility company has its own rules governing demand rates and ratchets. The utility does not charge for demand or ratchet below a certain point—usually 25 or 50 kW. You can learn about the different rates by talking to someone in the

energy services department.

Large commercial users are assessed an additional charge for power factors that vary too much from perfect. The usual cutoff is 90 percent. This charge is used to encourage customers to compensate for inductive loads.

This type of load often lowers the service voltage without producing revenue. Compensation is achieved by installing capacitor banks that cancel the effects of the inductive loads. If the electric company charges you for the power factor, you should seek the advice of a registered engineer.

Fortunately, few broadcasters are charged for the power factor. If, however, you are running large in-

ductors like electric motors or rotary phase converters, you may be affected.

Some utility companies have special rates if you will allow them to control your air conditioning. These can lead to greater savings. Most agreements allow you to override the utility company control with a corresponding loss in savings.

Call Big Brother

What happens if you have service problems? Contact the utility and ask for help. Most utilities are extremely helpful. If yours is not, remember that virtually all utility companies are regulated by some form of governmental body.

Many are controlled by the state public service commission. Municipal utilities are generally controlled by the city or county council. These agencies have strict regulations concerning the quality of service that is provided to the customer.

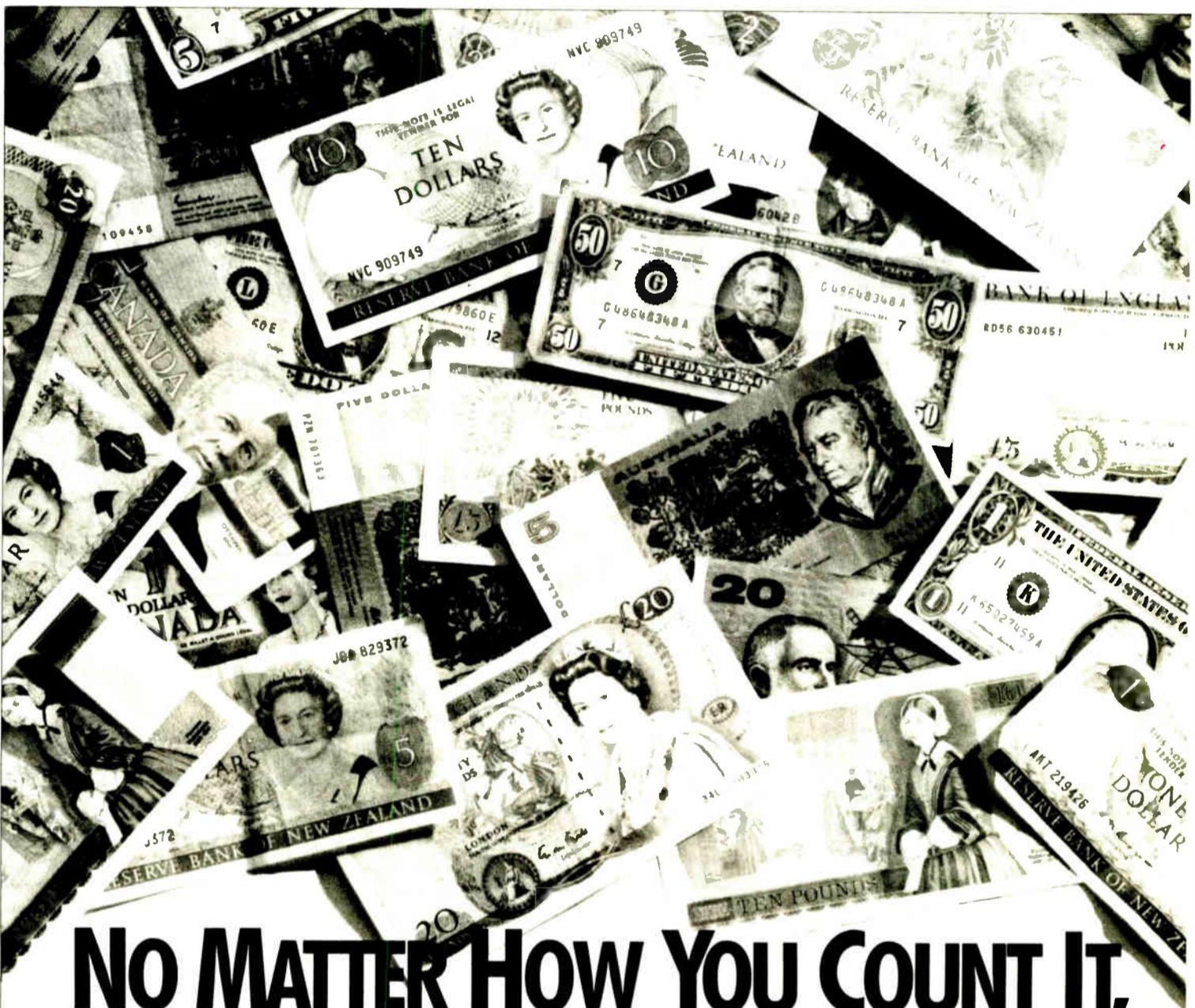
One of the most common regulations concerns voltage standards. Although the standards vary slightly from state to state, most states require utilities to regulate their voltages within five percent of the nominal value. Whatever your local standard, it must be adhered to even if the customer is at the end of the line.

Blackouts, surges caused by lightning and other types of distur-

bances over which the power company has no control are exempted. If you routinely experience voltages above or below the limits, then the power company is required to correct the problem.

You should be aware that these rules apply only at the point where the power company wires connect to your wiring. The power company is not responsible for problems in your wiring or equipment. If you suspect that your service voltage is out of tolerance, contact the power company engineering department.

The contact should be in the form of a phone call followed by a letter. Usually the continued on page 30 ►



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On-Line Promotional Ideas

WASHINGTON Capitol Media debuted an on-line computer service that focuses on compiling promotional ideas. IDEA!BANC is accessible by computer modem through Radio Online, a computer service that provides continuous information for the radio industry.

IDEA!BANC went on-line with more than 3,000 ideas stations can use for sales, programming, promotions and public service.

Subscribers of the service can also share in the revenue generated, based on the percentage of total ideas submitted

by each individual.

For information, call Jeannie Mantell at Capitol Media at 1-800-222-5080, or circle **Reader Service 155**.

Griffin Research Expands

WICHITA, Kan. Former Birch/Scarborough Research Senior VP Craig Harper has joined Griffin Research founder Ben Griffin in a new venture, Griffin Radio Research.

The new company will specialize in local market qualitative profiles, including analysis of local radio audiences with an emphasis on

income levels, education, occupation and buying habits, as well as lifestyles and media usage.

For information, contact Craig Harper at 201-445-9657, Ben Griffin at 316-682-0088, or circle **Reader Service 93**.

New Consulting Firm

DAYTON, Ohio Clark W. Davis, the former president of the broadcast division of Shamrock Broadcasting, Los Angeles, and former vice president of operations of Reeves Telecom, New York, has formed Clark W. Davis Broadcast Consulting.

For more information, call Davis at 513-293-8731, or circle **Reader Service 176**.

Ice Hockey Bartered

BOSTON The National Hockey League (NHL) and Star Communications have entered into an agreement for exclusive radio broadcast rights for the NHL Stanley Cup Final Playoffs in May. The programming is offered on a barter basis, with current NHL affiliates having the right of first refusal.

For information contact Mark Ryan at 1-800-800-5543, or circle **Reader Service 185**.

AM Map Book Available

BETHESDA, Md. Dataworld has introduced a map book depicting each AM station's predicted groundwave coverage (.5 mV/m or .1 mV/m) and interference (0.025 mVm) contours. The map book will be on display at the Dataworld booth (number 1626) during the NAB convention.

Each page of the book highlights a particular frequency and plots all the stations in the U.S. on that frequency and their .5 and 0.25 mV/m daytime and nighttime contours. The book covers 540 kHz to 1600 kHz.

For information, contact Bob Richards at Dataworld at 1-800-368-5754, or circle **Reader Service 37**.

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company can install a chart recorder to monitor the voltage over a period of time. You should ask for a copy of the chart during the initial contact. Normally, if high or low voltages are recorded, the utility will take steps to correct the problem.

What to expect

These corrective measures may take the form of resetting regulator taps or installing new transformers. Sometimes a customer finds that he is at the end of a very long line and the utility is unwilling to correct the situation due to the expense. That is the time to talk to the top brass and be ready to contact your public service commission.

If the power company serves you at all, it must provide the proper voltages. Failure to do so may get them in hot water with the local regulatory agency and cost them in claims for damaged equipment.

Before calling the power company, however, be sure your own wiring is not at fault.

Low voltages may be caused by loose connections on the customer's premises. Erratic high or low voltages can be caused by a loose neutral connection. Often power companies are called to investigate voltage problems only to discover that the customer's defective wiring is at fault.

It is a good idea to have all of the electrical connections tightened about six months after the initial construction. This reduces the possibility of arcing, fires, erratic voltages and equipment damage.

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Barry Magrill is president of Magrill Engineering and can be reached at P.O. Box 1010, Fairfield, FL 32634.



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AMPLIFIERS

Want to Sell

Audiotronics AUD-1000DAGLC (20) in 2 Audiotronics AUD-100-MF 10 input mainframes w/external pwr supply, \$1200+s/h. B Lord, Lord Bldg, 13313 SE 28th St, Kent WA 98042. 206-631-2374.

SAE 31B amp, 30 preamp, 3200 tuner, 50 w/h widig readout analog tuner & preamp, \$285; Hafier DH110 preamp & DH330 rack mount dig tuner, all gd cond w/manuals. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

Dynaco ST70 (2), \$100 ea. J Parsons, 904-532-0192.

Panasonic AGDA-100 audio dist, \$500. Roman, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Crown Microtech 1000 (4), excel cond, \$590 ea. G Fern, Best Audio, POB 2366, Van Nuys CA 91404. 818-763-2378.

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).

Want to Buy

Any decent low/med W, single rack unit audio amp, \$100 max. P Wells, KJCY, 625 Broadway #1200, San Diego CA 92101. 619-238-1037.

Gates M5144 AM RF. S Todd, 612-483-9163.

ANTENNAS & TOWERS

Want to Sell

Andrew 87G-83799 (2) 1 5/8" heliack, EIA flanges, gas blocking, new, \$200 ea. B Brewer, KOKL, 410 W 6, Okmulgee OK 74447. 918-756-5400.

Andrew HJ8-50B 800' of 3" Heliack, \$15,000. T Sittner, KSTX, 8401 Data Point Dr, San Antonio TX 78229. 512-271-9600.

Scala HDCA10 (4) 10-element Yagis tuned to 102.3, gd cond, \$150 ea/4 section Rohn 25, \$50/section; Andrew 4 lengths of 1/2" foam Heliack, \$250 all. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-753-2537.

Cortana folded unipole, upper skirt; 27 1/2" x 26 1/4" square shaped tower bracket for Rohn 25; 30 1/2" x 89 1/2" L shaped tower bracket; 74' 5/8" Heliack; 141' 5/8" Heliack; various 27 pair multi-cable shielded, under 30'; punch blocks & jack panels. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

Rohn 55-G 310' w/lightning pkg & guy wire, 5 yrs old, \$9000. B Williams, WBLG, 948 Fairview Ave, Bowling Green KY 42101. 502-843-0107.

Monopole, 120', free to good home, avail 3/1, you take down. B Engblade, WKLA, Ludington MI. 616-843-3438.

Shively 2-bay w/radomes, used only 7 wks. tuned to 96.1, \$6500. D Magnum, 608-372-9600.

Bdct Feedline 400' guyed, 20' x 12' bldg & 17 acres. D Schroeder, KOSU, 302 Paul Miller Bldg, Stillwater OK 74078. 405-744-6352.

ERI 2-bay Rototiller tuned to 101.7, 6 yrs old, 360' 1 5/8 Andrew line, \$2500. C Maley, KSIB, Box 426, Creston IA 50801. 515-782-2155.

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, POB 159, Fayetteville GA 30214. 404-460-6159.

UTC type 480/340 100-meter; 370' 1 5/8 air dielectric coax, BO. B Leggett, KRVE, POB 68, Denham Springs LA 70727. 504-665-5154.

Rohn 5-20' 65g sections, \$400 ea; HJ7-50A Heliack, 180', \$41/'; Type N conn, \$100 set. Robert, 817-566-5036.

ERI FMH-10C 10-bay tuned to 94.7, excel cond, \$10000. R Stratton, WXID, POB 679, Mayfield KY 42066. 502-247-5122.

DB OCX7/8 CP broad band FM, 1-9 bay, 2.5 kW per bay, \$650/bay. Allen, 404-325-7847.

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RCA BFC (12) gd cond, \$1500. R Dees, 806-355-4554.

ERI/Harris FML-3E 3-bay FM C-P for 95.3 MHz, \$3000. P Jellison, WLW, 1111 St Gregory, Cincinnati OH 45202. 513-241-9597.

Moseley Isocoupler, (1) 940-960 MHz, (1) 450-470 MHz, \$150 ea. D Tabor, WLCK, Box 158, Scottsville KY 42164.

Dielectric 200K-73 strobe light parts. E Kain, WWL, 1450 Poydras St, N Orleans LA 70112. 304-593-2105.

UHF TV w/Scala parapanel & SC-8, Bognner B Series or LPS Thomas UHF panels, tuneable to chnl 31/40/48; Rohn #80 tower sections; GE UHF TV for parts, 100 W driver & 30/55/110 kW amps. J Powley, WJIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

AUDIO PRODUCTION

Want to Sell

Comrex TLX, low freq ext, \$750; PLX, port low freq ext, \$500; Telex 3+1 tape duplicator, \$300. R Meadows, Durham Bulls, POB 507, Durham NC 27702. 919-688-8211.

Burwen 1000 Dynamic Noise Filter, gd cond, \$350. D David, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

Orban 111B stereo reverb, clean, \$400. P Wolf, 813-574-5548.

Radio Systems CP-15 (12) couplers, excel cond, wired w/6' 3 phase cable & 3 phase disc plug, \$90 ea. R Rossman, 814-865-9568.

Numark CD-5020 dual CD, rack mountable, new, \$995; Symetrix TI-101 telephone interface, new, \$349. Steve, 401-783-0737.

dbx 142 bdct noise red system, new, \$300. J Guber, Auburn ETV, Auburn Univ, Auburn AL 36849. 205-887-9198.

UREI 527-A (2) mono 27 band graphic EQs, \$200 ea. B Heffley, WBMJ, POB 36-7000, San Juan PR 00936-7000. 809-724-1190.

Orban 787A/SL mic proc & slave unit w/mic amps, new, \$1300. J Salov, WHGR, 3431 W Houghton Lk Dr, Houghton Lk MI 48629. 517-740-1165.

Valley Intl 400 proc, new, \$500. J Powers, KTQB, POB 831508, Nacogdoches TX 75953. 409-560-6677.

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dbx 150 (5) noise eliminator reduc system, \$140 ea. Roman, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Sansui PC-X11 PCM encoder/decoder w/box & manual, excel cond, \$195. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

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Audio Digital TC-2 digital delay unit w/manual, \$950. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Want to Buy

Ampex 350 & 351 electronics. Wayne Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728 or FAX 619-320-2454.

Orban 222 stereo enhancer. M Friend, WTJV, Box 711 Newcomb Hall Sta, Centreville VA 22904. 703-924-0885.

AMCO 10 or 20 position stereo audio/video switch boxes. TKV, 301-445-5450.

Impulse noise reduc units: SAE 5000A, Burwen TNE 7000A & DNF 1201 A, all need svc info. R Zorn, WMHR, 4044 Makyses Rd, Syracuse NY 13215.

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Hughes & Phillips TI-2035 isolation xfmr, 3.5 Kva, \$1200; Kintronics Labs FM 7.5 Isocoupler, \$300. W Craig, WGOH, POB 311, Grayson KY 41143. 606-474-5144.

Line hangers (50); Phelps-Dodge CFM LP2, 2-bay circ polar w/radomes, in use tuned to 105.5. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-789-1055.

Hughes Phillips 32" flasher beacon, \$600. H McDonald, BIG M Bcst Srs, POB 607, Verdale WA 99037. 406-456-0768.

Want to Buy

450' w/36-48" face, lights, guys, pref located in SW. R Simmons, Austin Bldg, POB 50124, Austin TX 78763. 512-476-5200.

400-500'; 8-bay FM or near 99.9 MHz. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

LAPP 9861 AM base insulator, gd castings. D Mance, WTOU, 199 Wealtha Ave, Watertown NY 13601. 315-782-1240.

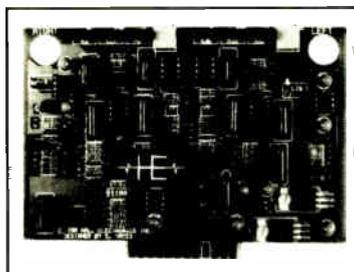
Heliack, 78", 50-100'; 1 5/8", 300'; 3"/larger, 400-500'. J Powley, WJIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

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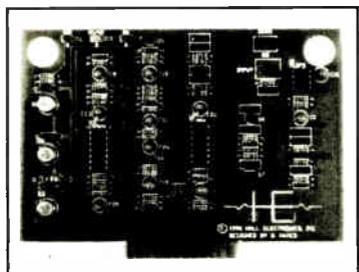
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Insta-Cart (2) 48-cart 1.6M, excel cond, \$3500/BO. R Carr, 509-925-1488.

MW Persons Programmer 3A live assist tape controller w/auto sequence option, excel cond, \$700. M Persons, KLOH, Hwy 30 W, Pipestone MN 56164. 218-829-1326.

SMC 452 stereo Carousels (2) plus MEI Satmaster 1000 event programmer, cables, manuals, \$1700+s/h. R Kerbyway, WTNI, 609 Main St, Mt Hope WV 25880. 304-877-5592.

Jones Sat Audio net commander, \$650. A Neri, WGTG, Box 590, Middlebury VT 05753. 802-388-4101.

Harris SC-90 (2) auto controllers, one removed from svc, one for parts w/books, cables & 733 ARS system, \$995. R Redmond, WWSC, 217 Dix Ave, Glens Falls NY 12801. 518-798-1031.

350RS Carousel, \$400. Kelly, 503-933-2217.

SMC 350RS Carousels, \$250 ea; Ampro CT4500, \$250; Infont Encode computer, \$100; SMC racks, \$75; Schafer 903 parts/boards; SMC DP2 Instacart interface, \$200; Scully 270s (4) for parts, \$400; SMC 250 Carousel & extra boards, \$150. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-753-2537.

Otari ARS 1000 (5) w/manuals, clean & well maint, \$800 ea; IGM 48 tray stereo Instacarts (2), 1 needs capstan motor, \$2500, other \$3000; IGM Go-Cart 24 w/manuals, 1 yr old, \$2000. T Teagarden, KELI, Box 3834, San Angelo TX 76902. 915-655-5483.

MW Persons programmer easy oper, set up w/manuals & cables, compatible w/all reel decks, \$650. P Wolf, 813-574-5548.

SMC Stereo-24 (2) Carousel in indiv racks w/control & ABC decoder, I pay s/h. J Salov, WHGR, 3431 W Houghton Lk Dr, Houghton Lk MI 48629. 517-740-1165.

IGM Go-cart (2) 24-tray, gd cond, BO. B Wynne, 503-882-4656.

IGM Instacart (4) 48-tray stereo, excel cond, \$3500 ea. D Albanese, WEEI, 529 Main St #220, Boston MA 02129. 617-242-5900.

IGM, excel cond, (5) Go-cart (24) stereo, (4) Otari ARS 1000DC P/B, (3) Fidelipac stereo cart P/B, auto rew w/racks, \$19500. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

SMC RP-1000 prog, POC3 clock & pwr supply w/manuals & DS20 switcher, \$500; Schafer 800 tube mdl in rack, 10 source, 20 position sequencer w/25 Hz detector, spare parts, working, \$500. E Stanley, KBTO, Box 12, Bottineau ND 58318. 701-228-2483.

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ITC 3D triple-deck mono; Harris 90-3 triple-deck stereo; IGM 92A stereo; Contel CT-101P-B mono; ITC PDII mono; (2) Gates CPR mono w/rec amp. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

LTC WP (2), \$350 ea. Kelly, 503-933-2217.

ITC 3D (2) motors w/new bearings, works gd, \$100 ea; mono, \$550; SMC stereo deck, \$150; Tepecaster 700-P mono, \$100, rbt audio & cue cards in all; Gates Critereon 80 compact, \$75; LEL splice linder, \$30; BE winder w/counter, \$75; Spotmaster winder w/case, \$40. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

BE 2100 R/P mono w/tones, \$550. R Redmond, WWSC, 217 Dix Ave, Glens Falls NY 12801. 518-798-1031.

BE Spotmaster 2000 (3) mono P/B, \$300/3. B Walters, WASE, POB 2087, Elizabethtown KY 42722. 502-769-1055.

Sparta cart-delay, \$500. R Meyers, Benchmark Comm Corp, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

ITC RP stereo, 3 cue tones, gd cond, \$900. J Gober, Auburn ETV, Auburn Univ, Auburn AL 36849. 205-887-9198.

ITC Delta 1 (2), \$800 ea; Delta IV editor, \$500, all work gd. Roman, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Spotmaster 2000 RP Mono, in gd cond w/manual, \$450. G Gibbs, KMNS, POB 177, Sioux City IA 51102. 712-258-0628.

Tepecaster 700 (2) P/B, lever-release type. J Eck, KSAJ, POB 69, Abilene KS 67410. 913-283-1560.

ITC stereo premium R/P: Beaucart stereo R/P; (5) Beaucart stereo P/B, reasonable prices. 214-349-7070.

Want to Buy

Fidelipac Dynamax CTR123 R/P, gd cond. J Torsitano, KNIS, 6363 Hwy 50 E, Carson City NV 89701. 702-883-5647.

Cartritepe II/Criterion 80 stereo R/P head-rest. S Todd, 612-483-9163.

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Want to Sell

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Tascam 48 8-trk, new, excel work cond w/dlx & remote, \$2200. Ken, 419-243-1000.

MCI 110 A&B 2-trk w/spare elect drawers, transport cards, head stacks, pwr supplies, working. M Shea, Precision Recording, POB 723, NY NY 10276. 212-989-2684.

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Otari ARS-1000 stereo, used only as back-up, \$900; Tascam 32, 10 1/2" reels, little use, \$950. P Wolf, 813-574-5548.

Tascam 112, \$311; 32 (2), \$837 ea, all need work. J Blodgett, WGTf, 308 Westgate Pkwy, Dothan AL 36303. 205-794-4770.

Ampex AG-440 stereo, gd cond, \$300. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

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Ampex AG-440B-8 1", gd cond, in console w/remote & manuals, STL alignment tape, take-up reel, \$3000. G Falk, Falk Rcdg Studio, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Otari MX5050BQII-4 4-trk, rack mount, gd cond, \$900; Revox A77 1/4" stereo, factory Dolby, fair cond w/manual, \$175. P Thompson, Moonlight Sound, 4763 Weld County Rd #32, Longmont CO 80504. 303-535-4748.

Scully 270 (5) some work, \$550/BO. M Kestler, KAWZ, 241 Main Ave, Twin Falls ID 83303. 208-733-3133.

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3M M79 24-trk, excel cond, \$9950. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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Magnecord PT-6 & others, recorders/transport/amps/tube equip. BO. L Dupree, KSYL, 1115 Texas Ave, Alexandria LA 71301. 318-487-0347.

Tascam 35-2B, \$500; 32-2B, \$300, both 1/2-trk 1/4" open reel. D Gaydos, NYU, 721 Broadway 11th Fl, NY NY 10003. 212-998-1665.

Marantz/Superscope PMD-220 \$80+s/h. R Zimmer, 602-236-2080.

Revox A77 (2), \$350 ea; PR-99 (1), \$750; Ampex ATR-700, \$750, all in gd shape. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Tascam 38 (2) 8-trk, mint cond, \$1750/\$1250. R Messick, 407-686-9505 x318.

Technics RS-686DS stereo port cass w/case, AC adaptor, manual & built in mon speakers, \$175. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

Akai GX77, \$300; Ampex ATR 700, \$800; TEAC A3300 SX, \$350; TEAC A3340, \$800; Tel-ex 235, \$250; Akai D1800, 8-trk & R-R, \$80, all in gd cond. J Parsons, 904-532-0192.

Revox PR-99 (4) MK II 1/2-trk stereo play units w/25 Hz sensor, \$1100 ea. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Tascam DA-50 DAT, gd cond w/remote control unit, \$1000+s/h. Henry Engrg, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

Ampex MM1000 16-trk, 2" multitrack, runs, sounds great, 4 yrs old, \$6500. J Jacobsen, 213-962-9614.

Tascam 44 4-trk, \$1400; Otari MX5050 BQII, \$2200; Otari MX5050 BII 2-trk, \$1500, all in excel cond w/manuals, I pay s/h. J Salov, WHGR, 3431 W Houghton Lk Dr, Houghton Lk MI 48629. 517-740-1165.

Revox B77, \$300/BO. J Powers, KTBO, POB 831508, Nacogdoches TX 75953. 409-560-6677.

MCI JH-110B w/BX elect, 14" reels in roll around cab, \$1200. P Wells, KJOY, 625 Broadway #1200, San Diego CA 92101. 619-238-1037.

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Technics RS1500 2-trk, \$985; Sony/MCI JH110C on roll around metal cabinet, \$2500+s/h, both excel cond. J Gelo, 813-642-6899.

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Akai 280-D, \$200. D Morris, WKUN, 204 W Spring St, Monroe GA 30655. 404-267-6558.

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Tascam 112/112B rack mount cass rec/reprod. J Laprad, Sunspots, Box 403, Worcester MA 01602. 508-755-0732.

Sony TC-D5M portable for parts. J O'Leary, 202-332-8377.

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MCI/Sony capstan & reel motors, any cond., recdg heads, most mfgs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-826-0601, in FL 305-659-4805.

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Wang CPU VP-2 Micro 3-port print, 4-port RS232, MW-0300 cards, Magna disk drive backup, 40 meg hd, 3 terminals, modems, BO. C Mellon, WILI, Box 496, Willimantic CT 06226.

Wang w/Control Data printer, BO. M Martindale, KYON, 1124 Foster Rd, Napa CA 94558-9611. 707-252-1440.

CONSOLES

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Yamaha M916 16x4, \$1500. D Gaydos, NYU, 721 Broadway 11th Fl, NY NY 10003. 212-998-1665.

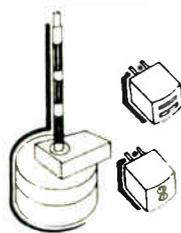
Collins/Autogram IC-10 10-chnl, refurbished, excel cond, \$3500. B Elliott, WRFK, 915 E 4th St, Charlotte NC 28205. 704-338-9970.

Sparta A-20B 22 in/2 out, mono w/pwr supply, gd cond for news/prod, BO. J Violanti, WSJR, 5600 City Ave, Philadelphia PA 19131. 215-660-1082.

Tascam MZ24 24x4x2 mixer sound reinforcement/studio use, \$1500. R Messick, 407-686-9505 x318.

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Sparten Centurion II 12-pot stereo, \$1000. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Harris Stereo-5. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

BE 4M50 4-chnl mono, gd cond, \$500; Howe Tech 10-k 16-chnl 24 mainframe, extras, BO; Ramko DC-12 11-chnl mono, needs control cables, BO. M Martindale, KVON, 1124 Foster Rd, Napa CA 94558-9611. 707-252-1440.

Shure M67, gd cond, \$50. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Sound Workshop Logex 8 16-chnl prod board w/EQ controls, BO. D Coffman, WSOR, 940 Tarpon St, Ft Myers FL 33916. 813-334-1393.

Yamaha M-916 w/16 input x4 output mixer, \$1500. D Gaydos, NYU, 721 Broadway, NY NY 10016. 212-998-1665.

Harris Mono 5, excel cond, \$500. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

Harris Stereo 80, very gd cond w/sep pwr supply, manual & spare parts, you pay s/h, \$800. G Gibbs, KMNS, POB 177, Sioux City IA 51102. 712-258-0628.

Sound Workshop 1208 B w/12 input, parametric eq, mon & mix down system, mint, \$1500. C Volpe, Volpe Prods, 540 Stemmers Rd, Essex MD 21221. 301-391-6927.

Sony MX16 gd shape, \$250; Pyramid PR8800 Echo, 8 in, 2 out, new, \$400. J Parsons, 904-532-0192.

Autogram IC-10 10-chnl, 28 inputs, mint cond, \$6000/BO. J Powers, KTBQ, POB 831508, Nacogdoches TX 75953. 409-560-6677.

Ramko PC8MS 8-chnl, 8 input, excel cond w/manuals. \$2500. R Trumbo, KNLF, POB 117, Quincy CA 95971. 800-397-4146.

Trident 65 32 in-16 out, new w/console base & wiring harness, \$10,000. J Diamond, Blue Diamond, Box 102C Chubbick Rd, Canonsburg PA 15317. 412-746-3455.

BE BM 150 8-chnl mono, 12 yrs old, 1 owner w/manual, \$400; McMartin B-802 stereo w/new 10 W mon amp, 8-pot board w/3 buttons over each pot, fair cond w/manual, \$350; Gates Yard mono 8-chnl w/manual & spare tubes, \$200. T Nichols, KWXL, POB 5, Glenwood AR 71943. 501-356-2151.

Yamaha PM-2000 24-chnl, pwr supply, 2nd pwr supply avail w/manuals; 1516 & 916, all w/cases in excel cond. G Fern, Best Audio, POB 2366, Van Nuys CA 91404. 818-763-2378.

MCI J11-618 bdct w/pat bay, 16 input non-auto, \$7250. B Petruzzi, A-Z Music, 5050 Tamarus #269, Las Vegas NV 89119. 702-736-2303.

Allen & Heath System 8, 16 channel console, 16x8x16, with stand and talkback mic, \$2500. Ted Hermanson, 717-843-6916.

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24-16-8 outs, will repair. J Price, 214-321-6576.

Gatesway, S Todd, 612-483-9163.

Svc manuals for Howe Audio 9000 w/parts list. K Austin, Austin Bdct, 1101 Hwy 81 N, Marion OK 73055. 405-658-9292.

Langevin AM4A w/documents. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

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Want to Sell

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Dolby 361 (4) noise reduction units, \$550 ea. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

JBL D-130 (4) 15" speaker reconed w/E-series cone & coil, \$350; Peavey MFZ-X (2) mid/high freq horns w/22A drivers in cabs, gd cond, \$200, you pay s/h. M Anderson, Jerge Studio, 1469 3rd Ave, New Brighton PA 15066. 412-847-0111.

CAD CGM-2 2-chnl w/noise gate & dynamic expander, new, \$450. M Anderson, Jerge Studio, 1469 3rd Ave, New Brighton PA 15066. 412-847-0111.

JBL D16R2405 replacement diaphragm for 2405 tweeter, new, BO/trade. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

EAW PM2/SX coaxial stage mon w/speaker & tweeter, mint cond, \$450/pr. B Petruzzi, A-Z Music, 5050 Tamarus #269, Las Vegas NV 89119. 702-736-2303.

Fostex 3180 stereo reverb w/24 msec pre-delay, BO/trade for UREI Cooptime cube. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

AKG BX-5 stereo spring reverb, \$150. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

Want to Buy

Alltec 604E JBL horns & drivers, 15" bass crossover. J Price, 214-321-6576.

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LIMITERS

Want to Sell

Optimod 9100A excel cond w/NRSC, factory refurbished, \$4200. T Crockett, Hot Tracks Rcrdg Svcs, POB 10501, Blacksburg VA 24062. 703-953-0222.

Inovonics MAP II AM proc, working when removed, \$300. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Harris MSD10 (2) tri-band AGC processors, \$250/both. K Smith, WNGC, 510 N Main St, Clyde OH 43410. 419-547-8792.

We buy Optimod 8000A's and 8100A's 414-482-2638

Volumax 4000A for parts, \$300; Orban 245E stereo synthesizer, \$200; Harris MSP90 AM peak limiter, \$300. Kelly, 503-933-2217.

DAP 310 w/CRL NRSC unit, \$400; Gates Solid Statesman AGC & limiter units, \$50; dbx 224 & 224x units (4), \$200 ea; dbx 140A unit, \$200. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

CBS Audimax R112 tube type level control w/spare memory module, BO/trade for LA-3A, any cond. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

Marti CLA 40H mono, \$250 both/BO. J Powers, KTBQ, POB 831508, Nacogdoches TX 75953. 409-560-6677.

Ashley SC-50, excel cond, \$170; Marti CLA-40, gd cond, \$75. J Gober, Auburn ETV, Auburn Univ, Auburn AL 36849. 205-887-9198.

CRL SGC-800; SG-800A; SMP 850; SEC 800. D Tabor, WLCK, Box 158, Scottsville KY 42164.

Want to Buy

Optimod FM 8100/8000 gd cond, NE preferred. P Galasso, WJLK, 605 Mattison Ave, Asbury Park NJ 07712. 908-774-7700.

ApheX Compellor 103A aural exciter. Kelly, 503-933-2217.

MICROPHONES

Want to Sell

Beyer M-500 cardioid ribbon, \$250. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Beyer M160 (3) dual ribbon hyper-cardioid, \$120 ea; AKG D200E (2) dynamic cardioid, \$45 ea. P Thompson, Moonlight Sound, 4763 Weld County Rd #32, Longmont CO 80504. 303-535-4748.

Sennheiser MD-211U (3) dynamic, omnidirectional, mint cond, \$840. R Grotke, Cornell Univ, 159 Sapsucker Woods, Ithaca NY 14850. 607-254-2409.

EEV RE-20 w/Luxo pro-bracket boom, excel cond, \$400. D Morris, WKUN, 204 W Spring St, Monroe GA 30655. 404-267-6558.

Sure SM7 (3) dynamic cardioid, 2 yrs old, mint cond, \$450 ea/BO. J Powers, KTBQ, POB 831508, Nacogdoches TX 75953. 409-560-6677.

CAD Equitek II (5) multi-pattern condenser w/windscreen kt & stand mount, new, \$650 ea; CAD-88 & 89 unidirectional PA, new. M Anderson, Jerge Studio, 1469 3rd Ave, New Brighton PA 15066. 412-847-0111.

Ceibaless MB MBC-520 pair of condenser w/PS, German made, similar to AKG, \$350/BO; EV-666, mint, \$150; Fostex M55 RP, new ribbon type, \$300/BO. J Diamond, Blue Diamond, Box 102C Chubbick Rd, Canonsburg PA 15317. 412-746-3455.

EV 644 shotgun, new, \$60/BO. B Petruzzi, A-Z Music, 5050 Tamarus #269, Las Vegas NV 89119. 702-736-2303.

Beyer M-500 cardioid ribbon, \$200. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

AKG C414EB mint cond w/phantom pwr supply. J Green, Audio Brochures, 1078 Barbara Ct, N Bellmore NY 11710. 516-221-1344.

Sony ECM-21, \$100; C-22, \$150; ECM-22, \$150; ECM-65F, \$200; ECM-56, \$275; ECM-377, \$300; ECM-33P, \$200; AC-148A pwr supply, \$125, all mint cond. J Diamond, Blue Diamond, Box 102C Chubbick Rd, Canonsburg PA 15317. 412-746-3455.

Mics; desk mics (hi2), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books #8 & #6; RCA tube manual; Sony head demagnetizer (new); jack femal connectors; EV 502 transformer print/sec. Mr. Oliver, 212-874-7660.

Telefunken U-47, Neumann U-67, KM-54 mint; RCA ribbon mics (2) KU3A's 10,0001, (3) 77-DX, (1) 44-BX, (2) BK-5; Altec tube mics M-11, M-20, M-30; 639 film version mic ect. Trade or sale. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

Want to Buy

RCA, Neumann, WE & all other vintage mics, parts, flags & stands. R Van Dyke, Calfrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9835.

MISCELLANEOUS

Want to Sell

Harris 994-8524-001 30 amp RF contactor, \$150. G Jablonski, WHMI, POB 935, Howell MI 48844. 517-546-0860.

WE patch panels (6), no cords, tip, ring, sleeve type, \$35 ea+s/h. R Kerbyway, WTNL, 609 Main St, Mt Hope WV 25880. 304-877-5592.

Star printers; Gerni 10X; NX-1000; NP-10, \$50 ea; phone system w/20 phones, 8 lines, rotary dial, BO. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Extel 1AF11R printer w/stand & book; Smith & Corona 101 Universal Tractor feed. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

GR 1931-B mod radio monitor on 1379 kHz, BO; Ampex 601 deck w/tube elect, parts; Karr Conalnet II, BO. W Craig, WGOH, POB 311, Grayson KY 41143. 606-474-5144.

Kohler S340 auto xfer switch, 3 phase, 240 V, 225 A, \$1500. J Salov, WHGR, 3431 W Houghton Lk Dr, Houghton Lk MI 48629. 517-740-1165.

Kenwood TK 801-S land 2-way radio, UHF 450-470 MHz w/5 W DC conv & manual, gd cond, \$250; 400 gospel & C/W albums from 50s & 60s, \$1 ea; ET 700 elect 7-day time switch, new, \$200. D Morris, WKUN, 204 W Spring St, Monroe GA 30655. 404-267-6558.

EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers, write Radio World, PO Box 1214, Falls Church, VA 22041, Attn: _____

POSITIONS WANTED

Announcer on top C/W combo overnight show w/CHR/AC/prod/remote exper seeks better hrs. Tony, 616-696-1631.

Mgmt consultant w/20 yrs exper avail for new station build-outs/existing turn-arounds, hiring/training sales & on air staff, excel credentials. 512-490-7489.

AC bdcter searching for PM/overnight pos. dependable, stable, excel refs, 18 yrs in radio, other shifts considered. Mike, 904-255-6950.

Seasoned engr seeks challenge & oppor w/bdcter, dependable, hardworking, dedicated, prefer midwest, IL-CO. Gerry, 712-258-0628.

High energy, hard working personality seeks new challenge in CHR, AOR, M/C, C&W or news/talk, prefer FL, will consider all. D Allan, 904-237-5816.

Energetic informative Golden Era show w/trivia & facts seeks AT opening in E/SE, avail on tape. E Pell, 201-791-4610.

Secretary/Traffic/Prod/AM Anchor seeks FT pos, will relocate, call collect. Beth, 814-288-3402.

#1 rated programmers w/unique format, engr/audio guru, sales/mktg wizard & staff, temp/perm. B Elliott, B Bryar, 813-849-3477.

Young Christian man w/Bus Admin & Masters Degree in Christian Educ seeks radio bdct/mgmt pos. K Bolt, 417 S Story St, Boone IA 50036. 515-432-1741.

Former GM & 20 yr veteran bdcter (PD/OM) seeks pos w/bdct facility in Balt/DC/PA mks. B White, 401-931-1176.

Experienced at seeking new challenge, S/SE, small/med mkt. J Reynolds, 919-671-1162.

HELP WANTED

Chief Engineer for six station group in SE Alaska. Salary DOE. Resume to KJNO, 3161 Channel Drive, Juneau, Alaska 99801. c/o Steve Rhyner, GM, 907-586-3630 or FAX 907-463-3685.

Keymarket Communications is looking for all levels of radio engineering talent for future positions. Send your resume in confidence to Lynn Deppen, DOE, Keymarket Communications, 2743 Perimeter Pkwy., Bldg. 100, Ste 250, Augusta GA 30909, EOE.

Engineer, 3 stations, 1 market, \$25,000 minimum plus perks. West Texas. EOE. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box #RW04-08-1.

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Up timers, new 2" readouts, counts to 9:59 then resets, \$57.50. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Multisync MDA1B controller, BO. J Socolof, KJUL, 3500 Maple Ave Ste 1470, Dallas TX 75219, 214-526-2580.

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Audio/RF tech manuals for Sparta Elec Corp equip. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Want to Buy

Realistic SA-200A right chnl vol control, slide type for SA-2000 (31-1985); stereo amp Radio Shack part #P-1632, mfg part #28200025 (250K/Bx2). R Kerbway, WTNH, 609 Main St, Mt Hope WV 25880. 304-877-5592.

Older journals audio/bdct engrg, on disc from 40s-60s. K Gutzke, Custom Recording, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

NP1 battery charger in gd cond at reasonable price. M Glaser, 516-447-1041.

Manuals: HP 400D VTVM & pre-1972 Gates equip. S Todd, 612-483-9163.

Radio Shack TRS-80 software for TRS-80 I/III, E Stanley, KBTC, Box 12, Bottineau ND 58318. 701-228-2483.

Turntables, disc recorders, tube amps, limiters, audio journals, 45/78 records, related material. K Gutzke, Custom Recording, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

Audio input, interstage, output xformers, repeat coils. V Vogt, 330 SW 43rd St #247, Renton WA 98055. 206-251-5420 x247.

TEAC/Tascam CS606 roll-around stands for 32/34. J Parsons, 904-532-0192.

Jazz record collections, 10" LP/12" LP bebop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, Nyny 10003. 212-674-3060.

MONITORS

Want to Sell

McMartin TBM-2000B SCA; BFM-1531R SCA gener, both 67 kHz, \$250 ea; TBM-3700 FM mono mod, \$300. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

TFT EBS rbit, gd cond, decode unit, set up for 94.1 MHz, \$400. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

TFT 760 EBS gen card, \$150. Gates MO2639 AM mod, \$100. Kelly, 503-933-2217.

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Gates M5693. S Todd, 612-483-9163.

Belar AMM2/3 AM mod. George, WWCR, 1300 WWCR Ave, Nashville TN 37218. 615-255-1300.

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

RECEIVERS & TRANSCEIVERS

Want to Sell

Maxon CP-0510 VHF port, 5 W, 4-chnl, 144-174 MHz, new batt, chgr & manual, leather swivel case, mint cond, \$150/BO. C Stahuke, 1951 N Meridian Rd #84, Tallahassee FL 32303. 904-385-0718.

Spilsbury IMTS mobile phone, new, \$1000; IMTS/cellular mobile phone, gd cond, \$1500. B Williams, WBLG, 948 Fairview Ave, Bowling Green KY 42101. 502-843-0107.

Sony SRF-A1 & A100 AM/FM stereo Walkmans, port radios, new, \$100/A-1, \$120/A-100. C Fox, WOLF, 4853 Manor Hill Dr, Syracuse NY 13215.

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Regency Cary-Com 5 5-chnl handi-talkie, FM w/chgr, needs batt pack, 2 W out, \$50. W Craig, WGOH, POB 311, Grayson KY 41143. 606-474-5144.

Collins R390A (2) military HF tube, one works well, other for parts w/manual, you pick up, \$500 both. D Rickmers, D.R. Media, 1117 Peden, Houston TX 77006. 713-529-0233.

Moseley PCL-505 mono, \$800/BO. T Ray, 203-522-1080.

REMOTE & MICROWAVE EQUIP

Want to Sell

TFT 7610-C studio & xmitr, 7 yrs old, gd cond, \$1495. C Mellon, WILI, Box 496, Willimantic CT 06226.

Gates RCD-10 (2) remote control units, need some work, \$50 both. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Schafer TC300/SC300 wireline remote control unit, needs minor repair w/manual, \$75; Moseley TRC-15AR remote control unit, 26 kHz, control subcarrier, subaudible metering return, gd cond, \$450. D Davis, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

TFT 761-C digital, \$1200. Kelly, 503-933-2217.

Macom 4' dish, 23 GHz, will trade for 2' dish. D Solinske, WSUN, 877 Excir Ct Dr, St Pete FL 33702. 813-576-1073.

Marti 406-512 MHz single section cavity, resonator 450 band, never used, \$100; Motorola UHF Maxar 450, 0-10 W, mobile, air traf- fic w/mic, single freq, \$350; Moseley MRC-1600, clean, spare parts, STL-TSL set up, \$1300; Marti RPT-30 (2), UHF, CR-10, wants. 1 w/code identifier, \$1350 ea; Regency Transcom, dual freq w/mic, 0-15 W, mobile, traf- fic, 450 MHz, \$150/BO; Burk TC-8, set up for STL, SCA w/SCA rcvr, \$1200; TFT 7700B, 16 W STL, new, \$4500. P Wolf, 813-574-5548.

Microdyne 1100 rcvr, demod, gd cond, freq agile, SCPC, \$1500. P Wolf, 813-574-5548.

Wegener 1600 mainframe rcvr for Unistar country, excel cond, \$200+s/h. R Kerbway, WTNH, 609 Main St, Mt Hope WV 25880. 304-877-5592.

Satcus 400, \$175. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

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Micro Controls DLC-9 (2), 1 set up, 1 telco, \$600 ea. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Comrex Box model PTLX, asking \$2000/BO. Call Lisa at 714-495-2471.

Micro Control DLC-9/DLT-9 9-chnl remote w/single pair line, \$1000. C Maley, KSIB, Box 426, Creston IA 50801. 515-782-2155.

TFT 7700 dual composite STL, 2 TX & RX, gd cond, \$2500/BO; TFT 8600 STL dual mo- no systems (2), never used, BO. T Tucker, Desert West, POB 36717, Tucson AZ 85740. 602-797-1008.

Marti SCG-10/SCD-10 (2) pr on 39kHz, (2) pr on 92kHz, (1) pr on 67K, \$900/pr. T Ray, 203-522-1080.

Moseley MRC-1600 telco remote, gd cond, \$1200. S Youngberg, WLLO, 540 N Emerson, Cambridge MN 55008. 612-689-1055.

DB DCV FM band xlator. Allen, 404-325-7847.

Marti STL-8 stereo discrete STL system, FCC Type rated w/xmit combiner, gd cond, \$3300. L Burke, 602-234-6355.

Remote control 9-chnl w/relay interface, \$200. D Tabor, WLCK, Box 158, Scottsville KY 42164.

Moseley PCL-505 STL for parts, BO. T Ray, 203-522-1080.

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Comtech Unistar AC format rcvr, avail new w/inet controller, \$1500; Wegener Unistar ol- dies chnl rcvr, avail 5/1. B Williams, WBLG, 948 Fairview Ave, Bowling Green KY 42101. 502-843-0107.

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Microdyne 1100-TDC Ku band tracking down cov, Aus \$1800; 1000-SCM (2) 7.5 kHz SCPC modulators, Aus \$2000 ea; 1100-PCDR (4) SCPC demodulators, Aus \$800 ea; 1100-DS (RT) SCPC modem xmit/rcvr, Aus \$2000; Miteq U-9256 freq agile up conv, Aus \$10000; MCL 15260 Ku band, 300 W, TWT amp & pwr supply, Aus \$20000; all 5 yrs old, you pay s/h. E Tedesco, First Radio Ltd, 201 Tynte St, N Adelaide S.A., 5006, Australia. FAX 011-618-264-2031.

Wegener 1601 w/1606, (2) 1610, 1645, 1646, 1605, \$1200/BO; Fairchild 156 kHz chnl card for DART 384 rcvr, \$500/BO. R Morrison, WBZW, POB 932, Wooster OH 44681. 216-262-0503.

Prodelin 3-meter dish w/Harris 6550 rcvr, \$500. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

Wegener Format 41 rcvr/decoder, excel cond, \$4500/BO, s/h incl. T Smith, WQLS, 331 Ross Clark Cir, Dothan AL 36303. 205-671-1234.

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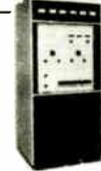
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Kurzweil 250, loaded, new, \$7500. Roman, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Want to Buy

Sony RM 580. Also AMCO 10 or 20 position stereo audio/video switch boxes. TKV, 301-445-5450.

VIDEO TAPE RECORDERS

Want to Sell

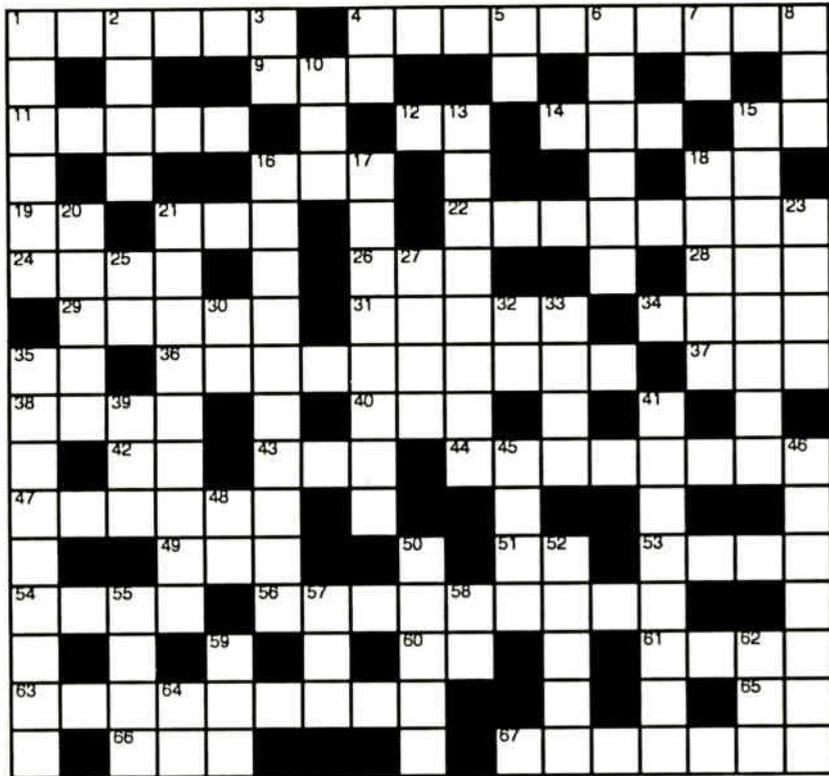
Sony 5850 U-Matic 3/4", edit, new, \$4500. B Bridges, KCAM, 827 Meridian St, Nashville TN 37207. 615-226-1122.

Sony BVH500 1" port w/color stabilizing unit & external pulse gener, gd shape, \$3800. Roman, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Sony AC-2400/3400 pwr supplies for 2400, 3400 video tape decks, BO/trade for audio gear. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

This Month's Crossword

by Steve Walker



ACROSS

1. DAB Contender
4. The one who buys the time
9. Standby transmitter
11. Type of memory chip
12. Prosecutor, abbr.
14. "America's Full-Time Broadcast Supplier"
15. Concerning, abbr.
16. Male of many species
18. Symbol for iron
19. Exclamation
21. Missing soldier
22. Audio _____ Series 99 retrofit cards
24. By oneself
26. A typewriter type size specifier
28. 50-year old govt. radio service
29. Mother in Spain
31. Equipment holders
34. Bird
35. Ord is a city in _____
36. 38 virtual audio tracks on an AT
37. Makes Digi-Corder
38. Standards committee
40. Ampex tape deck designation
42. Not
43. Add
44. 360 Systems' digital cart deck
47. Buy now, pay later
49. Night before
51. Room of a house, abbr.
53. Pronoun
54. Rip
56. How to "Add \$472,000 gross profit this year"
60. Size of shot
61. Effigy
63. Bubbly beverage
65. Head tech
66. Network
67. Barn cats, usually

DOWN

1. RF Diagnostic
2. Hard to find
3. Battery type
4. Cutting tool
5. Latin "and"
6. Creator of portastudio
7. ITC cart deck designation
8. Cereal grain
10. Something unexplained in the sky
13. "Best kept secret" cart decks
15. Studer's D740 is a CD _____
16. 900 series cart machines
17. ATI's small headphone amplifier
18. Half of a sawbuck
20. Adult females
21. Keeps you loud but legal.
23. Without
25. City in California
27. Gone before, ago
30. Newport is in _____
32. Satellite band
33. Catch; obstacle
35. Many pain relievers are _____
39. What lawyers do
41. Thermoplastics
45. Type of missile
46. Mutant Ninjas
48. Feeding method, abbr.
50. Vitreous cable
52. Consoles for less than "an arm and a leg"
55. Quickly
57. Austrian headphones
58. Prefix meaning "before"
59. Often used interchangeably with BAUD
62. Method of scanning text
64. 1,024,000 bytes

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