

Debate Intensifies Over EBS

by Alex Zavistovich

WASHINGTON Although comments filed with the FCC agreed that the present Emergency Broadcasting System (EBS) should be revamped, opinions varied as to whether a successor system should be simply an extension of the present EBS or a separate technology altogether.

The FCC's Notice of Inquiry (NOI), Docket 91-171, sought comment on whether the present tone alerting EBS system should be replaced or supplemented with an existing system that would provide more information to the public, such as the nature and area of the emergency. The Commission divided the options into the categories of in-band audio or non-audio band (such as FM subcarrier) transmission.

Four systems were put forward for comment: the National Weather Service's

(NWS) Weather Radio Specific Area Message Encoder (WRSAME); the Improved Colorado EBS (ICEBS); California's Emergency Digital Information Service (EDIS); and Sage Alerting's SAGE I, based on the radio data system (RDS) technology.

Each system drew some measure of support, but the WRSAME and SAGE I systems generated the most comment.

RBS for EBS

The SAGE I system was the most hotly debated. Sage Alerting's RDS-based technology, which operates on a 57 kHz FM subcarrier, was supported by some emergency planning agencies, which believed it to be the most advanced system. AM broadcasters, however, opposed its comparatively higher cost for implementation and maintained that the technology put AMs at a technical and competitive dis-

advantage.

The Society of Broadcast Engineers (SBE) noted that the "SAGE RDS system places AM stations at a competitive disadvantage to FM stations." The SBE endorsed a combination of the ICEBS and the EDIS systems.

The New Hampshire Association of Broadcasters (NHAB), while conceding that the SAGE RDS system "does offer advantages," said that its disadvantage was that "the system involves out-of-band characteristics, therefore excluding AM and TV participation." NHAB said such exclusion was "not acceptable."

NHAB also stressed that the FCC must mandate a specific system. "The broadcasting industry cannot survive another debacle like AM stereo, which left system decisions up to a disinterested marketplace."

Michael Rice, president of Nutmeg Broadcasting, concurred that there is a "strong need for updating the automatic alerting system in the EBS." He added,

**DAT Bill
Proposes Levy**
Will it
affect you?
Find out
on p. 3



Fiber at Issue in Chicago

by Bruce Ingram

CHICAGO More than 10 Chicago radio station engineers recently met with Illinois Bell executives to protest telephone company plans to replace the stations' copper wire short-haul broadcast program circuits with a fiber optic carrier system.

William Florian, president of classical WNIB-FM, which has used 24-gauge copper wiring to transfer its audio signal from studio to transmitter for more than 30 years, is spearheading the protest.

"Illinois Bell's proposed carrier system would require our signal to be digitized and translated back to analog at the other end," Florian said. "That means we have to go through a lot of active components such as printed circuit cards in their central offices. Any time active components are used between two points rather than a dry metallic pair, it is obvious that the possibility of a failure is more likely."

Florian also emphasized that the quality of sound realized through a carrier system will be severely degraded as compared to the uninterrupted copper wire system.

By tariff, Illinois Bell is required to provide broadcasters a 15 kHz channel to their transmitters, the standard generally accepted in telephone systems.

Need for quality audio

More specifically, WLS-AM-FM Chief Engineer Warren Schultz said Illinois Bell must provide minimum broadcast transmission specifications of one percent harmonic distortion or less, frequency response of ± 1 dB and a signal-to-noise ratio of 60 dB.

In practice, however, Schultz pointed out that as transmission technology has im-

proved, stations have been able to achieve specs of much higher quality with dry twisted-pair copper wiring. Harmonic distortion of 0.1 percent, a signal-to-noise ratio of 70 dB and frequency response of ± 0.3 dB is not uncommon.

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USA Digital DAB Demo'd

LAS VEGAS At the NAB '92 convention, proponents of USA Digital Radio's in-band, on-channel (IBOC) DAB system said that an FM solution has been reached, and an AM answer may not be far behind.

During the convention held April 11-16, reaction to the system, dubbed Project Acorn, was enthusiastic—to the extent that the Radio Operator's Caucus has thrown its support behind the technology.

Tony Masiello of CBS, Glynn Walden of Group W and Paul Donahue of Gannett provided insight into the system at a DAB session during the convention. Their companies comprise the USA Digital Radio consortium.

The Project Acorn system employs 21 digital carriers, each 43 dB down from the analog FM signal. The DAB information is broadcast within the RF mask of the conventional FM signal. The system then relies on an "extractor" chip to demodulate the DAB signal at the receive end.

During the session, Masiello showed a videotaped laboratory demonstration of the Project Acorn "extractor" at work. Using a waveform monitor to record the

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RDS Impasse Resolved

LAS VEGAS The NAB and the Electronic Industries Association tentatively have agreed to a proposed radio data system (RDS) standard amendment that would incorporate ID Logic B for automatic format selection for AM.

The National Radio Systems Committee (NRSC) RDS subcommittee will evaluate whether ID Logic B can be added to receivers and work with the FM RDS function, which provides format selection for FM.

The two groups were at odds over the FM RDS standard, which had been scheduled to be voted on by the full NRSC at the NAB, but was postponed until an AM com-

promise was found for format scanning.

Relations between the NAB and EIA had cooled following an NAB press release issued in late February that said the NAB would not support an RDS standard unless it included AM.

Christian to Leave NAB

WASHINGTON Lynn Christian, NAB's senior vice president for radio, announced his intention to leave the association after the fall Radio Show. Christian has held the post since May, 1989, when he signed on for a three-to-five-year commitment. Christian will relocate to his home base of California.

RadioSat Wants Investigation

PASADENA, Calif. Radio Satellite Corp. (RadioSat) is trying to persuade the FCC and the U.S. Congress to investigate the American Mobile Satellite Corp (AMSC).

According to RadioSat, AMSC has tried to block development of the RadioSat system for three years. RadioSat has proposed a plan to provide interactive audio entertainment, personal communications and navigational services with the use of inexpensive satellite radio receivers.

RadioSat also recently filed a lawsuit against AMSC in the U.S. District Court here, charging that company violated communications and anti-trust laws.

According to RadioSat CEO Gary Noreen, who founded, but resigned from AMSC in 1991, the FCC granted AMSC

a "valuable monopoly" to launch and operate MSAT satellites. RadioSat applied for authority later that year, "but AMSC . . . has been unwilling to provide pricing and terms for the RadioSat systems," Noreen explained.

"Unfortunately, the AMSC prevented the RadioSat system from reaching the marketplace, depriving the public of its many benefits and thwarting FCC directives," Noreen said.

Dolby Goes "OnLine"

SAN FRANCISCO Dolby's Audio/Video Forum is now available on America OnLine, an on-line computer service popular with MS/DOS, Apple and Apple Macintosh users.

Using the service, subscribers can browse through a information on Dolby technology, retrieve files including Dolby stereo movie release date lists, and file questions with Dolby staff. Subjects pertinent to broadcasters include Dolby surround, Dolby S noise reduction and new cassette technologies.

The service also includes a "Manufacturers Corner" message board, where subscribers can communicate with consumer electronics manufacturers including those that are Dolby licensees.

For more information, contact America OnLine, at 800-827-6364.

New Customs, FCC Inspection Program Tried

WASHINGTON The FCC and the U.S. Customs service have announced they will implement a "paperless" inspection program for the importation of certain RF equipment into the country, including

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DAT Bills Could Affect Broadcasters

by John Gatski

WASHINGTON Despite assurance to the contrary, some professionals believe they will be affected by pending legislation that would require a royalty on blank digital tapes and limit digital copying on consumer recorders.

Following recent testimony on a third version of the digital audio recorder legislation, supporters of the bills admitted there may be some effect on professionals—especially with digital audio tape (DAT). However, they believe the “minor” effect on professionals will be negated by the new market created by the legislation—resulting in a new generation of digital products.

The three versions of the current legislation, HR 4567, HR 3204 and SB 1623 are very similar, and bill supporters are confident a final version will be approved by early summer.

The royalty legislation is based on an agreement between recording industry groups and audio equipment manufacturers. It would finally allow digital recording machines to be sold that could make digital copies of CDs, providing recording artists and publishers are compensated via a government-administered royalty fund.

Strictly interpreted, professional digital recording equipment is exempt under this agreement (conditions are spelled out in the legislation). Still, many brands of consumer DAT tapes that professionals now use would be subject to the royalty. Some consumer equipment that is modified for professional use also could be subject to the royalty.

Royalty on tapes, discs, etc.

Under the proposed law, a royalty of three percent must be paid on the transfer price of the blank media by the manufacturer or the distributor if the products are imported. The law also would assess an \$8 royalty per single deck digital recorder and \$12 per double deck.

The law defines assessable digital media as those that would be used by consumers, such as the current DAT tape, the upcoming Digital Compact Cassette and the Sony Mini-Disc. The problem with DAT, however, is there is no distinction between consumer or pro tapes out in the market.

Critics of the legislation said many radio stations use DAT tapes that are sold by consumer outlets and many professional DAT equipment suppliers buy their tapes from consumer outlets to sell to their professional customers.

Jeff Saracco, a salesman with the DAT Audio Gallery, in Santa Monica, Calif., said his store sells the same tapes to consumers and pros. Saracco said the companies that have introduced pro lines usually add a better shell and drive mechanism, but there are few such products.

DAT may be an exception

Proponents of the bills counter that tape manufacturers are likely to produce more separate tape lines for professionals, and if the manufacturers demonstrate to the government that consumer DAT tapes are primarily used by professionals, these tapes would likely be exempted as well. Opponents, however, said they doubt that would occur.

Another digital recorder legislation issue involves the manufacturers’ administration cost of the royalty. Although DAT manufacturers have promised they would absorb the costs of the royalties without passing them on to customers, some doubt that assertion.

Legislation critics argue that the tape and hardware manufacturers are likely to pass on the costs to the retailers, whether professional or consumer outlets. The retailers, the critics maintain, would then pass the costs along to the consumer.

A spokesman for Radio Systems Inc., a company that sells modified Sony consumer DAT decks for professional use as well as DAT tapes, said the firm would pass

on any additional tape costs to its customers if the manufacturers raise the price because of the royalty levy.

Pass it on down the line

Sales representative Garrett Conover said Radio Systems would not pass along to customers the \$8 per recorder royalty cost if Sony passed it on to his company. He said the two Sony decks that Radio Systems modifies are bought at such a good rate that the company can absorb those costs with no problem.

“We are much more competitive selling the tapes than we are the machines,” Conover said.

Currently, DAT tapes, which retail in the \$13-\$15 range, have a wholesale price of about \$8-\$9, according to DAT outlets.

Angela Jackson, a spokeswoman for the House Subcommittee on Competitiveness, said there is nothing in the legislation to stop manufacturers from passing on royalty costs to the retail outlets who could then pass it on to the customers.

But, she noted, there is a consensus among the bills’ supporters that these costs would be reduced when the success of the digital media and recorders result in lower prices through economies of scale.

Critics, however, contend that broadcasters should not have to pay any increased cost based on digital media or equipment royalty because they already pay royalties on the music they play.

Bill opponents also point out that the law requires the manufacturer or the distributor to provide bookkeeping records for submission to the Copyright Office. Thus, they claim, companies would incur additional administration costs for the bookkeeping and would likely pass those costs on to buyers as well.

Other costs

Bill supporters, however, including the Electronic Industries Association (EIA), said any increased administration costs tacked on to product prices would be offset by falling prices as a result of increased production through increased demand.

Besides the tape question, the digital recorder legislation also has come under fire from some professionals because of the provision that mandates the copy-limiting Serial Copy Management Systems (SCMS). This circuitry only allows one digital copy of an original source. The digital copy is prohibited from being copied.

Although SCMS only will be required in consumer digital recorders, numerous radio stations use these decks because they give the same quality sound as the more expensive pro decks.

With SCMS, critics argue, professionals will be limited since many work at small stations that cannot afford to purchase more expensive professional decks that do not have SCMS.

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Reliving AM Radio's Good Ol' Days

by Alex Zavistovlch

WASHINGTON Like a lot of you, my first experience with radio was AM. In fact, one of my strongest early memories is of sitting in the living room with my dad, listening to big band music on his console-style Grundig AM/FM radio and phonograph system.

Back then, a "home entertainment center" was more like fine furniture than a rack of 21st-century electronics. Elegant hardwoods hand-polished to a rich, dark lustrous shine . . . and solid as a house: You had to know where you wanted it before you bought it, because once it was in place it was there to stay. "String of Pearls" and "Take the A-Train" slinking out of the speakers—I mean it was a real swingin' scene, Daddy-O.

Later, when hand-held transistor radios came out, sure, you could take your music anywhere you wanted, but it definitely lacked the magic of those earlier days with the old Grundig.

Then I learned something about physics, and adjacent channel interference, and narrow bandwidth radios. I chalked up the big sound of my childhood to simple wistful memories of the "good ol' days" (I still get misty-eyed thinking about it).

A few weeks ago, though, I got hold of a tape compiled by Herb Squire, CE of WQXR-AM-FM in New York that brought it all back to me again. Herb has put together samples of AM radio programs from his high school and college days, acetate transcriptions from the '30s and '40s, and even some recent broadcasts.

The programming was taped right off the radio, it was not studio line recording. And it really points out what has happened to AM radio receivers.

The biggest eye-opener—or is that ear-opener?—was a comparison of a segment of Sheena Easton's "For Your Eyes Only." The first sample was recorded from a digitally tuning AM/FM headset portable radio from 1988. The second sample was the same song received at the same time over an RCA Radiola 3, circa 1923.

For all the advanced technology, digital this, high-end that, the 1923 RCA radio beat its 1988 grandson by a country mile. The frequency response, the dynamic range—there just was no real comparison. I mean, it wasn't

like listening to a CD, but it made me remember what listening to AM radio used to be like. It was warm. It was *real*.

I'm not the only person to have been bowled over by this tape. When the FCC adopted its sweeping review of AM technical criteria last fall, Chairman Al Sikes made a passing reference to "a tape that was made by an engineer in New York." His verdict was that "technology is dramatically better today overall and yet the AM radio service is measurably inferior to what it was a number of decades ago."



Boy, I'll say. But it's not fair to blame the whole AM situation on *service*; the radios are demonstrably not what they once were.

Sure, the stations are so densely packed in the larger markets that narrow bandwidth receivers seemed a convenient way to assure decent reception for the greatest number of AM stations. But there's a big difference between "decent" and the kind of sound AM radios are really capable of receiving with appropriate and generous design.

The National Radio Systems Committee's work to improve AM via pre-emphasis and de-emphasis standards and the RF mask was, of course, a step in the right direction. And the AMAX certification program for higher-quality receivers with a wider bandwidth will also help quite a bit, once the receiver manufacturers can be persuaded that better AM reception is worth pursuing. But right now, to say things are moving slowly in that direction is a major understatement.

I didn't get a chance to talk with Herb before this piece went to print (the NAB convention crush was on top of us here before we knew it), but if you give him a buzz at WQXR (212-633-7600) and ask him nicely, I think he'd get a copy to you. It's worth the price of postage and a blank tape to hear what AM could sound like if given a chance.

I got wind of this information a little late

to do a full-blown write-up of it, but Northeast Broadcast Lab, the South Glen Falls, N.Y., broadcast equipment sales company, has expanded its sales team. In fact, it's now *doubled* in size.

Company President Bill Bingham has welcomed aboard former Harris-Allied salesmen Pat Hurley and John Timm as regional sales managers for New York City, Pennsylvania, New Jersey and Ohio. Roger Brace will handle the New England region, and former Greater Media engineer Marty Sacks will take over the Baltimore, Washington, D.C. and Virginia areas.

With Rich Redmond working Connecticut and New York (not including the Big Apple and Long Island) and Doc Masoomian heading up the Southwest office, the company has really grown. For more information, call Gary Crowder, director of marketing, at 518-793-2181.

Before I go, I want to let you know that our associate editor Charles Taylor has added his byline to RW's new *Running Radio* section.

Chuck's *USAirplay* column—a programming feature—has provided insight into U.S. formats to readers of *RW International* for some time now. I'm glad to give him the opportunity to share his thoughts with the home team as well. This month, he looks at the phenomenon of Christian broadcasting, and how the format has stayed profitable even through the recession.

Congratulations, Chuck. As for me, I'm off to dig up some old Glen Miller records. Maybe I'll call my dad, too . . .

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

Alex

NEWSWATCH

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radios and computers.

The intent of the ruling is to allow quicker customer access to imported items such as radios. Instead of each item being inspected for an FCC Form 740 sticker, U.S. Customs officials will scan for Form 740 information via computer.

This will reduce the 40,000 forms per month forwarded to the FCC each month to 4,000, according to the Commission.

The first test of the new system was conducted at San Francisco International Airport in early April.

EIA Publishes New Catalog

IRVINE, Calif. The Electronic Industries Association (EIA) has published a new 108-page catalog of the association's standards, specifications, and publications. The catalog is free by calling 1-800-854-7179.

The catalog and all other EIA documents and publications are distributed by Global Engineering Documents.

FCC Releases Station Totals

WASHINGTON As of March 31, 1992, there were 11,229 licensed radio stations in the U.S. Subtotals were: AM, 4982; FM, 4625; and FM educational, 1,522.

Licensed FM translators totaled 1,887. There are 1,496 licensed television stations and 1,231 licensed low power TV stations.

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Microphone History Lesson

Dear RW,

Recent press releases and product reviews concerning Microtech Gefell microphones demand clarification. Factual errors have left the impression that these mics are somehow associated with, manufactured by, distributed and/or endorsed by, Georg Neumann GmbH. As a result, Neumann/USA has been asked frequently to respond to inquiries concerning the Microtech Gefell "Perestroika" mics.

A brief review of the history will put this relationship, such as it were, into proper perspective. In the late years of World War II, production of precision equipment became extremely difficult in Berlin, as it was one of the target cities for Allied bombings. Georg Neumann moved his manufacturing operations to a small farming town of Gefell, halfway between Berlin and Munich, where production was resumed.

In the aftermath of the war, the deteriorating political situation in post-war Germany prompted Neumann to return most variable manufacturing equipment and operations to Berlin. Soon thereafter, all business and technological ties with the Gefell plant were severed. The East German government expropriated the plant and renamed it Mikrofon Bau, Gefell, abbreviated as M/B Gefell.

Decades passed with virtually no contact or exchange of technological information between the two companies. With Germany's recent reunification, M/B Gefell mics became available in the West. With the coincident Neumann restructuring, the former U.S. representative picked up a replacement line in Microtech Gefell.

While it may evoke romantic images to suggest that the Microtech Gefell mics are produced by a "forgotten" or "lost" Neumann factory, emerging from communist isolation after the fall of the Berlin Wall; this notion is simply incorrect.

Examination of the construction, circuits, components and quality of the Gefell mics reveal that they bear very little resemblance to the Neumann line of mics. Georg Neumann GmbH was not involved in any way with the design and/or construction of these M/B

Gefell products, as might be inferred by the erroneous statements printed in some recent publications.

Specifically, we feel that the following statements in **RW** require clarification:

RW International, Feb. 19, 1992:

"... The mics are built with Neumann's M7 large diameter dual membrane capsule."

Fact: The capsules used in the UM70, (and the slightly less noisy UM70s) are a copy of a capsule originally developed by Georg Neumann in 1947. It is not produced by Neumann and any inference suggesting that these are Neumann capsules is erroneous.

RW, Jan. 22, 1992:

"Gotham has made arrangements with Microtech Gefell of East Germany, to distribute three microphones that were originally designed by Georg Neumann, but had been 'lost' behind the Iron Curtain."

Fact: As with the capsules referred to in the prior example, there was no Neumann involvement of any kind in the design of these three or any other Microtech Gefell mics. Furthermore, to most knowledgeable engineers, even in the West, these mics were never unknown or lost behind the Iron Curtain. The availability in the "Free World" of truly superior equipment never warranted their serious consideration.

The decision to purchase a high quality studio mic should be based on careful subjective listening tests as well as a thorough examination of technical specifications—self generated noise figures, immunity to RF interference, etc.—from a manufacturer with a proven track record of reliability and performance. Neumann/USA is proud to represent those microphones which serve as the reference in virtually all comparisons in this field for the past four decades.

Jeff Alexander, Product Manager
Neumann/USA
Old Lyme, Conn.

No FM Freeze

Dear RW,

Your editorial in the Feb. 19 issue, opposing the NAB's FM freeze proposal, was right on the money. After reading Mr. Fox's response from the NAB in your March 25 issue, I decided to write.

It would be one matter to limit new FM construction in truly congested areas, or to limit the practice of using a directional antenna to squeeze in a questionable allocation. I'd have no problem with either, provided the rules were applied fairly and with common sense.

What I'm opposed to is a blanket freeze, such as that proposed by the NAB, because not all parts of this country suffer from FM overcrowding.

A look at my area will demonstrate what I'm saying. In Fayetteville, N.C., there are two allocations—one commercial and one noncommercial. There are CPs and/or FM applications in progress for nearby Hope Mills and the more-distant city of St. Pauls. To that figure, add three other FMs which have moved in on the Fayetteville market.

You'll still end up with a number that's far below the "26.4 stations for the average listener" cited by Mr. Fox. Actually, on a typical car radio around here, you can receive no more than eight or ten audible FM signals. That's total.

Choose Help, Not Hindrance

Given a choice between helping or hindering the broadcast industry, lawmakers now seem poised to do the latter.

Capital Hill legislators presently are considering two bills that will have an impact on broadcasters. One is designed to promote the development of AM stereo; the second may impede the growth of DAT technology, or at least batter end-users with increased costs in the form of levies on blank media.

Ironically, the bill that may have a net negative effect on the industry has the best chance of being adopted.

The DAT legislation—perhaps rightly called *anti-DAT* legislation—would apply a levy to the sale of consumer DAT machines and blank media. While firms that upgrade consumer units for professional use may "absorb" the costs on the machines themselves, the added costs for the media will be passed along to users (including professionals).

Also, SCMS circuitry to be required in DAT machines may make it impossible to edit with DAT unless more costly professional recorders are used. That will directly affect broadcasters in many markets who use consumer units because they are within easier reach of their budgets.

The legislation may prevent some stations from taking full advantage of the benefits of digital audio. It also will continue to push DAT technology into a secondary role as an archiving and logging medium, rather than a true professional audio product.

This is clearly a case of the squeaky wheel getting the grease. The item before Congress was spearheaded by the recording industry, concerned about lost revenue from digital copying. The electronics industry seems to have bowed to this concern in order to get DAT off the ground, irrespective of how such legislation may hobble this and future digital recording technology.

The NAB is aware of the impact the DAT bill may have, but has offered no strong opinion to Congress. Neither has it thrown support of any consequence behind the AM stereo bill, which would serve to benefit many NAB members and the industry as a whole.

In the grand scheme of things, the NAB may consider these matters not worth getting involved with. But a little lobbying can go a long way. The NAB should take a more vocal role in influencing Congress to pass the AM stereo bill and defeat the DAT bill—for broadcasters' sake.

—RW

This is an example of the old adage that you can prove anything through the creative use of statistics. I think Mr. Fox failed to mention that his figure included AM stations.

More importantly, the FCC rules for station allocations aren't based on averages. They are based, or were originally at least, on engineering data and need.

Simply put, if I can prove that an allocation won't interfere with those existing, they'll make the allocation. If I can prove that it would provide needed service to a new area, it might receive special consideration.

Why is that such a bad idea, and why does the NAB feel the need for a change? Why doesn't the NAB instead propose, say, that the FCC tighten the overlap requirements or disallow the use of directional antennas?

Three other points in Mr. Fox's letter need to be addressed.

First, he states that the "free market system" did not create new FM allocations. That's ludicrous. The 80-90 allocations, in particular, weren't arbitrarily proposed by the FCC. They were the FCC's answer to specific and long-standing complaints from those who wanted FM licenses and couldn't get them. Simply put, the FCC supplied to meet a specific demand.

Second, I'm glad he thinks that I can just buy a radio station. In this market, there are none available (at a rational price) unless I want to buy an AM. Suppose I want a FM?

Third, while the NAB's new-found concern for the well-being of small-market radio is laudable (I speak with tongue firmly pressed in-cheek), they should allow me to decide whether building a new station would be economically feasible. The right to succeed or fail, and to make one's choices in the matter, is what a free-market economy is all about.

Your editorial was dead right, and the NAB is dead wrong. It cannot be stated categorically that the market is overcrowded. It may be in some areas, but that's not the case in every community nationwide.

Actually, it doesn't take a genius to figure out that this is a merely a thinly-veined at-

tempt to protect vested interests and eliminate potential competition. Let's hope the FCC recognizes it for what it is.

Stephen M. Poole
Raeford, N.C.

Just for the Fun

Dear RW,

I'm astounded at the amount of publicity you've given the KALW(FM) BBS system. It seems a natural thing for a noncommercial station, operated by a school district, to operate a public service, a free BBS such as theirs.

What is harder to figure out is why a commercial station would operate a free BBS. Across town from KALW is KJAZ(FM) on 92.7 MHz. KJAZ operates "Jazz Online" to record companies. "Jazz Online" is available at 415-771-3191.

Still more difficult to comprehend is why a commercial, dance-industrial-techno-pop station in Los Angeles would operate a free computer BBS. After all, a BBS requires many hundreds of dollars in equipment, and at least one telephone line.

If you get a 9600 baud modem, and at least 80 MB of storage, then the price tag gets above \$1000. What's in it for such a station? Why play host to an unwieldy gaggle of technonerd and children? I don't know. And the staff at KJAZ is deluding itself if it thinks that a wide audience will see the BBS ads.

We're nuts. Out to lunch. That is why we operate the MARS FM BBS. We've lost sight of legitimate profit-oriented reality, and operate the BBS as a lark. Sometimes the GM thinks the PD takes the same approach to on-air programming.

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Frank Martin, Chief Engineer
KSRF(FM) and KOCM(FM)
Santa Monica, Calif.

Radio World

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**Next Issue of
Radio World
May 20, 1992**

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Chicago Stations Say Fiber Not Best Choice

► continued from page 1

In a letter responding to Florian's original complaint, Illinois Bell Sales and Service Vice President James A. Eibel was conciliatory and eager to assure him that the telephone company wants to find a way to meet the needs of broadcasters.

Eibel wrote that Illinois Bell has other options available, such as "engineered broadcast grade channels," that can provide high quality transmission regardless of the transport medium used.

Florian rejected that claim in a response to Eibel's letter, writing back that "engineered broadcast grade channels" are just another term for a carrier system, which "in reality does not provide the necessary quality or reliability."

Fiber vulnerability

WLS's Schultz said Illinois Bell's fiber-glass system is vulnerable to breakdown if only because so much equipment is involved in making it work. On April 3, for example, he said WLS lost its connection with a traffic reporter because of a fault Illinois Bell identified as a failure in a fiber-optic link.

In terms of audio quality, if Illinois Bell goes through with its plan to replace all copper pairs with fiberglass, the company will still meet its tariff obligation to broadcasters—but no more than its minimum requirement, Schultz said.

Mike Egan, Illinois Bell's director of

service costs, was present at the meeting with Chicago broadcasters including representatives from WNIB, WLS, WMAQ(AM), WLIT(FM), WJJD(AM), WJMK(FM) and WGN(AM).

Egan said Illinois Bell is sensitive to the problem facing broadcasters and is eager to find some way to accommodate them, although "an appropriate and technically feasible" solution has not been identified.

In fairness to Illinois Bell, Egan noted that the company, with a carrier system, is still providing the same contractual specifications it has always provided. The only difference is that the old copper wire system allowed broadcasters, through their own efforts, to achieve transmission performance of higher quality without paying extra for it.

A low cost arrangement

On the subject of contractual obligation and price, Florian's WNIB is currently operating under a little-known codicil of the FCC No. 2 tariff, which requires Illinois Bell to maintain interoffice metallic facilities (wire pairs) within a limit of five miles per channel, where facilities are available.

Under this codicil, Florian not only has access—at least temporarily—to wire pairs, he is billed at \$41.73 per month for each non-equalized metallic circuit, compared to the standard cost of a

\$287.90 (\$575.80 for stereo) for a 15 kHz Illinois Bell equalized circuit.

Schultz pointed out, however, that Florian takes a risk by invoking this loophole because the price for Illinois Bell's

Illinois Bell is eager to find a way to meet the needs of broadcasters.

equalized circuit involves a service guarantee, one that Florian does not qualify for under his arrangement.

Schultz added that he does not necessarily blame Illinois Bell for the state of affairs in which Chicago broadcasters find themselves as the telephone company system changes.

In fact, there seems to be little overt antagonism on either side in this issue, with both concerned parties recognizing that the other has legitimate needs.

As an engineer, Schultz said he can appreciate the benefits of an all-fiber-glass carrier system to Illinois Bell and the company's desire to implement it universally. Once in place, the system will be far more efficient (requiring less maintenance and therefore fewer personnel) and capable of much greater data capacity.

The carrier system, he said, is good for data transmission, good for dial phone operations and even potentially good for broadcasters. To achieve the potential benefits, however, radio stations must be willing to lay out a considerable sum of money to take the coding/decoding process out of the hands of Illinois Bell.

With the resources of Capital Cities/ABC behind him, Schultz has set a plan in motion that will involve installing WLS's own in-house codec equipment: a TI terminal into the phone system that can transmit up to twelve 15 kHz audio paths into the Illinois Bell system in the form of digital data streams exceeding phone company specs.

USA Digital Demos IBOC DAB

► continued from page 1

results of engaging the extractor, he maintained that 30 to 35 dB of the analog signal is successfully removed, retaining the DAB signal.

Masiello also noted that multipath has no effect on cancellation or extraction in the Project Acorn system.

Glynn Walden said USA Digital is already working on a coding and interleaving system for AM DAB, which would offer 15 kHz stereo audio with a signal-to-

noise ratio of 96 dB, and would work with most AM antenna systems.

While alternative system proponents remained skeptical about whether Project Acorn could work outside the laboratory environment, Walden told RW that USA Digital could have had an on-air broadcast demonstration at the show, but the group decided it was not necessary. Masiello speculated that a mobile demo may come as early as September to coincide with the Radio '92 show in New Orleans.



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The drawback, however, is price. Schultz estimates that WLS's TI unit will cost in excess of \$100,000. This outlay is beyond the means of some stations, particularly independents like WNIB.

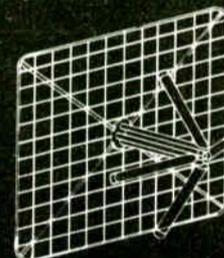
Will Illinois Bell come up with an option that enables radio stations to maintain their current high-quality audio transmissions without incurring great capital costs?

Schultz said that is hard to predict. He believes Illinois Bell has some good people working on the problem, but the company itself "is like working for the government."

"One problem is that broadcasters provide about 0.5 percent of their income," he pointed out. "We could go away and they'd be happy. The other side of the coin is that the phone company is a public utility and radio station signals must be protected in the public interest."

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Japan Embraces C-QUAM AM Stereo

by John Gatski

TOKYO With eight Japanese AM stations now broadcasting in Motorola's C-QUAM stereo system and more stations expected to follow, receiver manufacturers are planning to increase production of AM stereo receivers and tuners, according to the Electronic Industries Association of Japan (EIAJ).

"Potential demand for AM stereos seems to be huge, as listeners will be able to enjoy better quality radio broadcasting at a lower price," EIAJ Public Affairs Manager Tamotsu Harada said.

The Japanese government selected C-QUAM as the Japanese standard in 1991, and industry observers are paying close attention to whether the move jump-starts AM stereo here and abroad. Currently there are 47 licensed AM stations in Japan, not including their relay services. The partially government-supported Japan Broadcasting Corp. also owns two AM stations.

Since Japan selected a standard, reaction has been positive to the technology, according to the EIAJ. Sony and Aiwa already produce AM stereo radios for Japan; Panasonic and Kenwood plan to start marketing their products soon. "Other manufacturers are said to follow," Harada added.

Stereo programming needed

He cautioned, however, on predicting an immediate AM stereo boom for Japan until other considerations within the industry are resolved—such as getting broadcasters to transmit stereo programming and improve their facilities.

"Some of the manufacturers seem to be aggressive, but we think that, in order to create the demand for AM stereos, receiver manufacturers should supply many kinds of equipment," Harada said. "In addition, it is necessary for AM broadcasters to improve their programs (to be) suitable to stereo programming."

As in the U.S., a significant portion of Jap-

Potential demand for AM stereo receivers seems to be huge.

anese AMs broadcast talk and news formats on AM—programming that does not audibly benefit as much from stereo as music formats.

Delta Electronics, located in Alexandria, Va., is one of the major producers of C-QUAM stereo generators and transmission equipment, and has been doing business with Japanese stations.

Delta has sold several AM stereo generators to Japanese stations and is readying the sale of two more systems, according to marketing engineer Barth Pitchford.

Follow the leaders

Pitchford noted that key Japanese stations are now converting to AM stereo, and if they become successful, the other stations will follow suit.

"We are excited about the Japanese mar-

ket," Pitchford said.

According to C-QUAM developer Motorola, interest from Japanese radio manufacturers for its C-QUAM stereo chips "has been hot and heavy."

Motorola's Manager of AM Stereo Broadcast Systems Don Wilson said there has been a big push by the Japanese stations that have implemented AM stereo in Japan. "They had signs on buses, they had signs on trains. They had live concerts. They are doing a heavy promotion," he said.

An AM stereo boom in Japan also may energize AM stereo in the U.S. because more receivers are likely to become available, according to proponents of the technology.

Some in the industry have predicted that since the majority of receiver companies are in Japan, they will be prompted to produce more models for their own market, which also would make more models available for the U.S. More receivers would, in turn, prompt more broadcasters to add AM stereo.

U.S. to benefit

AM stereo has not fared well in the U.S., where fewer than 20 percent of AM stations broadcast in stereo—about 650. In the early 1980s, the U.S. decided not to select

a standard, opting for a marketplace approach instead.

The overwhelming majority of U.S. AMs did not upgrade to AM stereo for several reasons, including lack of a standard, lack of receivers, and the economic decline of many AMs.

Another impediment to development of the technology is ongoing litigation between Motorola and its AM stereo rival, Kahn Communications. Kahn is the manufacturer of the Independent Sideband (ISB) system of AM stereo broadcast, as opposed to the compressed quadrature approach used in Motorola's C-QUAM technology.

Gary Shapiro, VP of the EIA's Consumer Electronics Group in the U.S., said that an AM stereo boom in Japan "would probably help" the receiver market in the U.S., but to what degree he would not speculate.

Wilson said Motorola also would like to see a spin-off of interest here in the U.S. "We certainly hope so. I think it will be important."

Wilson also noted a "great interest" in Japan concerning the U.S.-developed, voluntary tuner standards AMAX and AMAX Stereo. The standards offer improved AM specifications and features such as wider frequency response, effective noise blanking, wide/narrow bandwidth, and external antenna connection for both mono and stereo AM.

Japanese manufacturers' interest in AMAX also may increase the number of those radios available in the U.S. as well, Wilson added.

DAT Bill May Have Impact

► continued from page 3

Mark Schubin, a professional audio and video engineer, has criticized SCMS from its inception. "SCMS is much more insidious than the (royalty) tax," he said. "The function of SCMS is to prohibit piracy, which it absolutely does not do. What it does do is prevent people from editing digital tape. That is an outrage."

SCMS unfair to the semi-pro

Schubin continued: "A broadcaster that wants to set up a little edit suite has to go with \$10,000 professional machines, instead of \$1,000-\$2,000 consumer machines. We

are going to end up with a situation where you think you can do something but you can't. Someone who is accustomed to editing in a professional editing suite may go into a semi-professional suite or a professional suite that has cheap equipment and suddenly find he can't do it (edit)."

Legislation proponents say that professionals, including broadcasters, still have professional equipment available to them that will not be subject to the royalty and is exempted from the SCMS requirement.

Although some critics have emerged at hearings on the legislation, few broadcasters have spoken out on the bills.

The NAB has taken no formal position on the legislation. NAB Science and Technology VP Michael Rau said the NAB is aware that the legislation could affect broadcasters when they purchase DAT tapes or edit on SCMS equipment. However, Rau said, "we're still analyzing it."

Society of Broadcast Engineers member Skip Pizzi said broadcasters either don't know that much about the issue or they don't care because they believe the additional cost added by the royalty would be minuscule.

Despite the few objections by critics so far, the agreement by the manufacturers and the artist groups—formerly enemies on digital recording and royalties—has impressed members of Congress; many have signed on as co-sponsors of the bills.

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Opinions Vary on EBS Proposed Alternatives

► continued from page 1

however, that the "RDS system should not be used because it discriminates against AM radio."

"We need a new system that is distributed by the NWS's weather radio system," Rice commented.

Frederick Baumgartner, engineering manager WTTV-TV and WTTK-TV, said that "RDS should be dismissed out of hand as technology looking for an application. Being data-based assures that it is inherently slow, relatively more expensive, incapable of dealing with automated stations and depends on human intervention and interpretation for implementation."

Baumgartner noted that ICEBS and WRSAME "come closest to meeting the simple and clear requirements of any public alerting system." He added that the two systems are "so similar that it would appear that melding the two systems is the obvious conclusion."

Pro SAGE

Not all the comments regarding an RDS-based emergency alerting system were negative, however, and Sage Alerting came to the rescue of its SAGE I technology in a filing that maintained that all broadcasters would be accommodated on the system.

Sage Alerting's filing stated that with the SAGE I system, "primary radio stations are FM." The company noted, however, that 73 percent of listeners are on the FM dial, "therefore emergency messages would be more readily received when transmitted on FM stations."

"Of course, SAGE I accommodates all other electronic mass media outlets such as AM, television, cable, closed caption, etc.," according to Sage.

Comments from General Motors (the parent company of receiver manufacturer Delco Electronics) noted that "the best approach for providing EBS over FM radio would be to utilize the capabilities of RDS. Use of this option will provide significant increase in capability over the existing system at very low marginal cost to either broadcasters or listeners."

The Louisiana Emergency Preparedness Association (LEPA) commented, "With the exception of the SAGE I system technology, LEPA feels that the other systems are labor intensive, would not significantly improve emergency broadcast capabilities at both the state and local level."

The City of New Orleans Department of Utilities (NODU) pointed out that a warning system should not only be responsive to

weather emergencies, but to mishaps in "rail, highway, intra-coastal and ocean vessels and aircraft, both civilian and military."

While acknowledging that the WRSAME system is "excellent for wide-area weather disturbances," NODU noted it "cannot be used for railcar or highway hazardous materials incidents that would affect a small population."

"It appears that the SAGE system is the best system to use. It has been thoroughly field tested," NODU wrote.

Other comments in favor of the SAGE I system came from the South Carolina Broadcasters Association and emergency management agencies including the Waco, Texas EBS Operational Area, the Middlesex County Emergency Management Agency, North Brunswick, N.J.; and Jefferson County Emergency Management, Beaumont Texas.

Talking about the weather

Another strong contender for EBS replacement was the NWS weather radio service.

The State of Ohio Adjutant General's Department, Emergency Management Agency recommended system interoperability between EBS and NOAA weather radio—the WRSAME system.

The Commission "should select a specific alerting system as part of its rulemaking and mandate its universal use. This would create a national framework for an improved EBS system," according to the agency.

Lawrence Titus, of Titus Technological Labs, said "the WRSAME system of in-band audio activation is the one system that I feel would be easily adapted by radio, television and weather stations. It is also the easiest of all of the systems with which to manufacture decoding and audio switching equipment."

"With the inclusion of the WRSAME data burst system within the current structure of the EBS attention tone message system, the public would be best served," Titus said.

The New York State Emergency Communications Committee (NYSECC) maintained that improvements or changes in the technical aspects EBS alerts "must be undertaken as a supplement to the present concept of audible in-band tone alerting."

Pushing for WRSAME

Stressing the need to have inter-operability with EBS and services such as the weather radio system, NYSECC indicated a "strong preference for a system conceptually parallel to WRSAME."

continued on page 10 ►

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A First for VSAT Network

by Lucia Cobo

AVON, Colo. Rocky Mountain Radio, the first digital VSAT audio radio network based on the MUSICAM digital compression algorithm has been activated, according to the National Supervisory Network (NSN). The Rocky Mountain Radio Network will serve as the programming and sales link among the Gardiner Broadcast Group's family of Colorado stations.

The new program distribution system will feed real-time CD-quality stereo programming from a central production facility in Vail, to sister stations in Breckenridge, Aspen, Steamboat Springs and Telluride. The VSAT system will use the ComStream ABR-200 digital audio network system.

The system will be used to distribute 24-hour programming, commercial inventory, news, sports and weather—all compiled from a central studio and sent to the individual stations. Each of the stations will be equipped with the AUDISK digital hard disk station automation system.

The Rocky Mountain Radio Network is the first fruit of an ongoing labor at NSN. Founded in 1988, NSN has specialized in providing "virtual" operators—off-premise, broadcast station control systems.

NSN developed and recently introduced the VSAT Intelligent Satellite Integrated Operations Networks (VISION) systems, that allow station groups to link together all broadcast operations. The benefits of the system include the economies of scale that can be gain-

ed by centralizing front-office, commercial production and station programming facilities.

The NSN facilities also lend themselves to serving stations involved in LMAs. According to company President Bill Sepmeier, NSN gets called for Local Marketing Agreement (LMA) situations because they can fulfill the requirement that a licensee retain control over its station.

"And we certainly look good," Sepmeier said. "Because for about 72 cents an hour, we provide them with a staff that is responsible to the licensee—not the brokering agent—you are not abdicating that control at any time."

It is a growing area of business for the company, he added, because NSN can provide a quality operations staff. "I think that especially in the LMA situation, where you need to be able to prove to the FCC that you have upheld the tenants and tenets of your LMA agreement," he said. "Basically we become the staff of the station operating under the LMA."

Stations in both LMA and regular operational modes can select as much or as little as they need from NSN's variety of services including the VISION systems, fully integrated and automated situations, and program distribution.

Said Sepmeier, "We started a small industry within the radio industry with NSN, and as with any new industry, there is a make or break point. We passed through that last year and have begun showing stockholders a return on their investment."

EBS Opinions Vary at FCC

► continued from page 9

The Primary Entry Point Advisory Committee (PEPAC) advocated a WRSAME-based system, as well. Field tests at two radio stations using WRSAME show the data system "has been completely reliable," according to PEPAC, with the only failures traceable to operator error on the sending end.

The group acknowledged the "tremendous capability of other systems which use data subcarriers," but commented that "implementation of any subcarrier system for AM broadcast has not to date shown enough reliability for us to recommend its use."

Capital Cities/ABC recommended that the Commission "mandate a carrier alarm on EBS receivers, and a change in monitoring assignment when the primary station is not on the air." Each station should also be required to have at least one other alert channel.

The company also recommended adoption of the WRSAME system, because "it is relatively inexpensive, and would also address most emergencies, since the majority of emergencies are weather related."

An engineering statement from Kenneth Brown, attached to the CapCities filing, noted that a system such as the SAGE I is "highly impractical." In addition to Brown's concerns about only FM stations acting as primary control points under the SAGE system, he noted that the plan calls for allocation of RPU channels, "which are essentially unavailable in many major markets."

Improved EBS

Still other filings endorsed an enhancement of the existing EBS system, rather than a completely separate technology.

TFT wrote that "improving the present system would certainly be more cost effective than instituting a new system or even having compatible dual systems, because it will min-

imize the investment in implementation both to the broadcaster and to the general public."

The company proposed an enhanced EBS system that it said "is compatible with the existing two-tone system, and any in-band EBS system being tested today, such as WRSAME, ICEBS, FM subcarrier and EDIS, as long as the audio signal is accessible."

A completely new system "would face stiff opposition from broadcasters because of expense and complexity, and would inhibit their participation on a local level," TFT wrote.

The Alaska chapter of SBE voted for modification of the existing EBS system, to keep it intact, but improve its efficiency.

Among the suggestions made by the chapter was to "take control out of operators' hands for a real emergency, utilizing a circuit which would put the CPCS-I directly on the air automatically." Such endorsement of an automatic seizure function for improved EBS was, in fact, generally supported in the filings, regardless of the actual system advocated.

In its comments, the NAB agreed that there is "a need for an updated, more automated EBS alerting system to provide public notification of emergency conditions." However, it stopped short of recommending a system, and noted it was "premature" for the Commission to select a system.

The association suggested that an improved daisy-chain system can be both reliable and cost effective and supported the idea of an automated activation feature so that an "external authority" would switch stations from normal programming to an alert mode in times of emergency.

The NAB recommended, however, that the FCC arrive at a list of requirements for an improved EBS system and issue a notice of proposed rulemaking at a later date.

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DIGITAL DOMAIN

Taking Inventory of an Arsenal Of Digital Interconnection Gear

by Mel Lambert

STUDIO CITY, Calif. This month's column will stay with the theme of digital interconnections, and techniques for carrying AES/EBU-format signals from one device or studio to another.

As we know, interfacing and synchronizing several digital subsystems can result in logistical problems.

Specifically, we might need to match unbalanced, S/P DIF and other consumer-grade I/Os with balanced, AES3-compatible professional inputs and outputs, and ensure that channel status information is corrected during the translation. And, in more and more situations, the need arises to lock a workstation or editing system to a non-synchronous digital source, or to convert between discrete sampling rates.

Fortunately, an arsenal of hardware now exists to handle these and other funnies, including digital interface compatibility, sample-rate conversion and system synchronization. In addition, several comprehensive test sets are now available that allow both electrical parameters and protocol schemes of a variety of digital I/Os to be analyzed and, in some cases, corrected.

In addition to providing high-quality translation between analog and digital worlds, the Apogee Electronics Model AD 500 portable stereo A-to-D converter will accept a variety

of sync references, including internal crystal, external word clock (32 to 54 kHz), AES3 sync, S/P DIF (consumer), and video sync (59.94/60 Hz North American NTSC or 50 Hz European PAL). The unit provides consumer-grade IEC 958-compatible ports, and an isolated word sync from the unit's internal low-jitter clock in addition to AES3 digital outputs.

Apogee's proprietary R1.001S circuitry provides switch-selectable conversion between 29.94 and 30 frames per second NTSC video rates. For information, call Apogee Electronics at 310-399-2991, fax 310-399-7665, or circle **Reader Service 192**.

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Audio Precision's System One comprehensive test unit connects to a companion IBM-compatible PC. System One measures and generates AES3-format test signals, including variable-frequency sine/square waves, impulses, and multiple sine waves. Channel status can also be displayed and altered.

The unit will lock to a studio word-clock reference for high-precision analysis of digital I/Os. For information, call Audio Precision at 503-627-0832, fax 503-641-8906, or circle **Reader Service 53**.

Digital Audio Research makes the DASS 100 digital audio synchronizing system. continued on page 25 ▶

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World Radio History

ECLECTIC ENGINEER

Careful Planning May Halt Budget Ax

by Barry Mishkind

TUCSON, Ariz. Times are tight. You don't need me to tell you that budgets are thin, and getting thinner. You probably get enough of that from your manager each and every day. In fact, one of the biggest topics of conversation when engineers gather is exactly how deep the budgetary knife will cut.

Last month, a chief engineer at a major market station told me that his request for less than \$1,000 to cover all travel expenses for a broadcast convention was completely deleted. "Not enough money," said the GM. Of course, not long after that, the GM and

the sales manager both went off to the RAB conference.

That's not the worst of it. The entire budget for publications was excised. "If it's not free, don't get it," was the new station policy. And then there was the station that decided to eliminate the engineering pager to save \$20 a month. They figured the engineer could just keep a radio turned on to find out if there was trouble.

Why is this happening in more and more stations? And is there something that you can do about it besides a lot of grumbling? Knowing what's happening may assist you in planning your future in a changing industry. Let's

look first at the debt service bomb.

Many stations were sold and resold in the late 1980s. As the decade ended, the prices for stations multiplied as more and more people bid for the best facilities.

For example, a sunbelt station that might have brought \$75,000 in the 1960s sold for \$1.6 million in the 1970s, and then quickly \$2.5 million, \$4 million, \$7.5 million and \$12 million.

And that's in medium markets. Prices in major markets soared to as much as \$100 million and more. Yet, today's selling prices have contracted dramatically.

This has really put pressure on managers.

Most station purchases were made by taking on debt. And even when the company paid cash, there still was pressure to get a return of 12-20 percent on investment.

Simple math shows that for a station financing roughly \$6 million, the yearly debt service alone will be between \$720,000 and \$1.2 million. To that must be added salaries, utilities, and other fixed expenses like rent and taxes.

It can take a medium market station \$4 million to \$5 million just to break even. And major market costs will take one's breath away. It'll take a full load of commercials just to pay the nut.

The result has been an abandoning of many formats, such as classical, deemed not capable of generating sufficient spot loads and cash flow. Some stations have even sold some real estate, often resulting in an inferior technical plant.

The recent changes in the FCC Rules will have an important effect. Companies will be allowed to own many more stations than previously. We may well see many mini "networks" and other cost-efficient linkups.

All of which leads to the question: "What about the engineering departments?" The conventional wisdom is fewer and fewer engineers are going to be doing more and more, as managers continue to view the technical budget as an easy place to cut overhead.

Interestingly, at about this same time the FCC has begun aggressively inspecting stations with a new fine schedule in hand. Some of these fines (for missing public files, non-operating EBS units or tower lighting issues, etc.) can easily wipe out the "savings" that stations thought they'd achieved.

If you haven't been inspected lately, ask around. The RIs are getting quite active, and the fines aren't cheap.

Whether we like it or not, the engineer's job more and more requires some public relations ability.

Indeed, you must develop communicative skills to inform station management what you are doing as well as what needs to be done in the near future. Try to set and meet two goals here: Show how you've kept the station operating efficiently, and as far as possible prevent surprises from hitting the station's checkbook.

Many successful engineers have mapped out the technical needs of their station ranging from one to three years down the line. While it's hard to plan for everything, showing such careful consideration to all aspects of operation will prevent one month without expenses being set as the benchmark to measure future needs.

Most managers will agree that a steady, modest budget will likely survive, while unexpected expenses will be resisted.

Of course, the largest item in the budget is usually the engineer's salary itself. Lately, even that's under attack as stations try to do with part-time technical help. Perhaps even you yourself have considered whether or not this might be the time to become a contract engineer.

Can you survive in today's business climate as a contract engineer? There's enough work, but at what price? More on this next time.

One last thought before we go—I've had a few requests to print some more odd instructions and muffs from manuals. If we get enough, we'll do it. Send your nomination for manual misprint or muff to me at 2033 S. Augusta Pl., Tucson, Ariz. 85710. We're also interested in your favorite bizarre memos . . . and great ones, too!

□□□

Barry Mishkind, aka RW's Eclectic Engineer is a consultant in Tucson. He can be reached at 602-296-3797, or 70631,116 on CompuServe, or 'barry@coyote.data-log.com' on Internet.

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BOTTOMLINE BROADCASTER

The AC/DCs of Broadcast Power Supplies

by Jim Somich

BROADVIEW, Ohio This month I'm going to tackle power supplies. Deceptively simple and often taken for granted, supplies that provide clean, regulated power are vital to good circuit design.

Just about every piece of equipment in a broadcast station contains some type of power supply: all electronic equipment re-

quires a source of clean direct current. This DC can be obtained from batteries, simple unregulated supplies, linear regulated supplies or higher efficiency switching power supplies.

put current capability, filtering and regulation. The main design consideration in broadcast audio power supplies is to provide clean DC power at the required voltage and current.

Any hum or ripple at the power supply output can be transferred to the device's output. Opamp circuits require a bi-polar power supply, a supply with a positive and negative voltage output with respect to ground.

A simple, unregulated full-wave power supply (such as the one shown in Fig. 1), will provide a relatively clean DC output that will vary somewhat in voltage with the

load placed on it. Where loads are relatively constant this is not normally a problem. Regulation is required when a constant output voltage—independent of load—is required.

Another purpose of regulation is to provide a precise voltage from a power supply. A simple diagram of a DC power supply utilizing zener diodes for regulation is shown in Fig. 2. The current-limiting resistor value is determined by the formula:

$$R = (V_S - V_{out}) / (I_L - I_z)$$

where V_S is the voltage at the input to the regulator and V_{out} is the output voltage

(zener rating). I_L is the required load current and I_z is the zener current, which should be about 10 percent of I_L .

The power rating of R is determined by the formula:

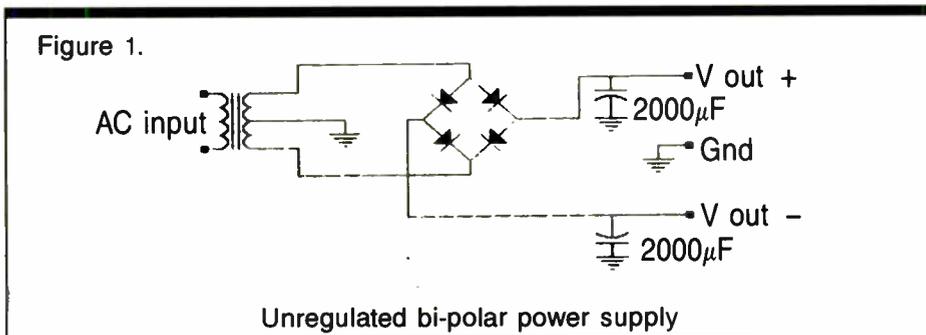
$$P_r = (I_L + I_z)R$$

The power rating of the zener is:

$$P_z = P_z = V_{out} \times I_z$$

This power rating will only hold true for a given load current. If the load is removed, the zener current will increase to the load current. If this is a possibility, the zener rating must be high enough to stand this

continued on page 20 ►



quires a source of clean direct current. This DC can be obtained from batteries, simple unregulated supplies, linear regulated supplies or higher efficiency switching power supplies.

Most of the projects I'll be writing about will require regulated DC. Linear supplies, while less efficient than switchers, are easier to construct, so we will concentrate on linears. As a bonus, we can ignore the RFI that is often produced by switchers.

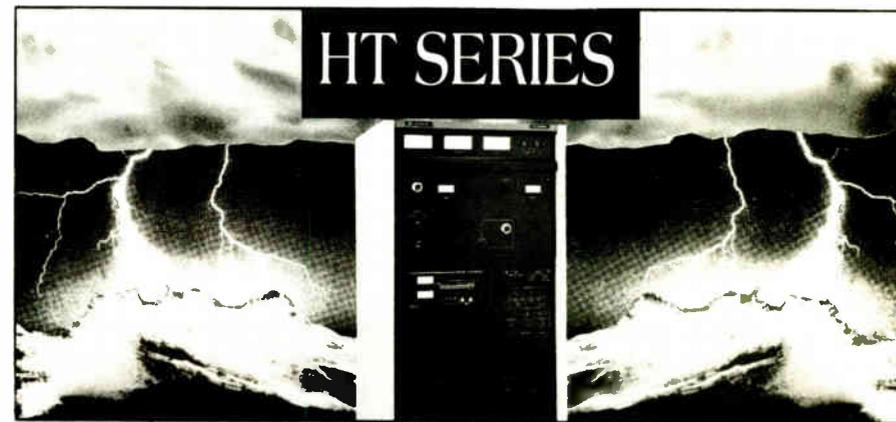
Start with linear

A linear DC power supply consists of a power transformer, which reduces line

put current capability, filtering and regulation. The main design consideration in broadcast audio power supplies is to provide clean DC power at the required voltage and current.

Any hum or ripple at the power supply output can be transferred to the device's output. Opamp circuits require a bi-polar power supply, a supply with a positive and negative voltage output with respect to ground.

A simple, unregulated full-wave power supply (such as the one shown in Fig. 1), will provide a relatively clean DC output that will vary somewhat in voltage with the



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World Radio History

INSIGHT ON RULES

Avoid EBS Fines Using Self-Inspection

by Harold Hallikainen

SAN LUIS OBISPO, Calif. In my last column, we left off our discussion of the FCC's proposed self-inspection form with the review of the public inspection file. This month we'll look at the EBS section of the self-inspection form and discuss various EBS concerns.

The next section of the FCC self-inspection form deals with the Emergency Broadcast System. The FCC takes EBS very seriously and can issue large fines for seemingly minor violations. In an emergency, however, these "minor" problems could result in the public not being informed of an emergency.

In a policy statement issued on July 11, 1991, the FCC set the forfeiture for "EBS equipment not installed or operational" at \$12,500. Several changes are being proposed or discussed regarding EBS. These include shortening the EBS tones, automating a portion of the emergency information rebroadcast and the use of digital data transmission.

Reconsideration of fines

In addition, the increased forfeiture schedule issued last year may be reconsidered. FCC field offices currently have delegated authority to issue forfeitures up to \$2,000. Forfeitures larger than this have to be issued by the FCC in Washington. This may also change.

The self-inspection form requests submission of the past two months of log entries showing EBS tests sent and received. Recall that 73.1820(a)(1)(iii) and 73.961 require transmitted or received EBS tests be logged in the station log. Furthermore, 73.961(c) requires an EBS test be transmitted once a week on a random basis between 8:30 a.m. and local sunset.

Finally, 73.932(c) requires the licensee to determine the cause of any missed reception of a weekly EBS test. The reasons for the failure must be logged. While making the repairs, a station may operate for up to 60 days without an operable EBS receiver, once the appropriate log entries are made (73.932(d)). If the EBS generator is removed for repairs, the remainder of the EBS test (script, etc.) must be run as usual.

I've read of several cases where a station claims the EBS receiver is operating properly. The station sending the EBS test is not transmitting the tones properly. My suggestion is to notify the station originating the faulty tests of the problem—ideally in writing. Ideally the station will be cooperative. Things to check at the originating station include tone duration, tone modulation level, tone level "twist" and tone distortion.

The tone duration is (currently) required to be 20 to 25 seconds (73.906(d)). It is proposed that this be changed to 8 to 25 seconds, limiting listener tune-out due to seemingly interminable EBS tones.

80 percent modulation

The tone modulation level is required to be at least 40 percent on each tone (73.906(c)). Both AM and FM stations generally transmit the EBS tones in monaural (equal levels and phase driving left and right channels), resulting in full modulation of the L+R channel (baseband of FM stations and the in-phase sidebands of AM stations).

The actual measurement technique

seems to be open to question, but it appears to me that if the peak flasher on an AM station indicates 80 percent or higher when the EBS tones are present, the station is probably in compliance. If a station is using subaudible subcarriers on the main (I as opposed to Q) carrier for telemetry, utility load management, stereo pilot, etc., then I'd suggest the peak modulation level of the EBS tones be 80 percent above the injection level of the subcarriers.

Again, the rules require the EBS tones to modulate the transmitter at least 40 percent on each tone. If you have a subcarrier running at five percent and the total peak

modulation with EBS tones is 80 percent, it doesn't look like the levels are compliant.

Similarly, for FM stations, I'd add the levels of all subcarriers to the 80 percent lower limit. Stations running a stereo pilot at nine percent injection and a subcarrier at nine percent injection should see a total peak modulation of at least 98 percent when EBS tones are present (stations running a subcarrier with nine percent injection are allowed a maximum of 104.5 percent, see 73.1570(b)(2)(i)).

I believe many stations are not complying with the EBS tone level requirements. These stations place the EBS equipment

ahead of audio processing equipment which reduces the EBS tone levels below that required. It may be desirable to place the EBS encoder at the transmitter site or immediately before the stereo generator for stations utilizing composite STLs.

Monitor modulation

Note that I've suggested using the modulation monitor peak flasher to determine the EBS tone levels. The previous rules for the type approval of modulation monitors required the meter to have "semi-peak" characteristics.

The meter would give an accurate indication of the peak modulation level when the modulation was a continuous sine wave; it would not accurately indicate the peak modulation level with any other waveform. Since the EBS attention signal consists of

continued on page 25 ▶

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WORKBENCH

Don't Overlook "Freebies"

by John Bisset

FALLS CHURCH, Va. In the spirit of the "freebie giveaway" found at trade shows like the NAB, this installment of *Workbench* will concentrate on some useful things that are either free or close to it.

From our "free" department comes a useful bookmark from Dataworld. Available in two sizes, the bookmark is imprinted with useful FCC telephone numbers as well

as contour values for AM, FM, TV, and LPTV. The English-to-Metric conversions round out what is a very useful tool for today's broadcast engineer. Copies of the Dataworld bookmark are free. Circle **Reader Service 72**, or call Dataworld at 1-800-368-5754.

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offering from Jensen Tools. Shown in Fig. 1, the HAKKO 605 Iron Cover is just the answer for the contract engineer on the run, who doesn't have time to wait for his soldering iron to cool before running to the next station.

The heatproof fabric sleeve is held in place with a band that fits around the handle of the soldering iron. Jensen sells this accessory for \$8.00 (catalog number 578B605). If you don't have a Jensen Catalog, circle **Reader Service 148**, or call 602-968-6241 to place an order.

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If you've been searching for inexpensive **DANGER-RF RADIATION** signs, Holaday Industries has ended your search. Rather than metal signs, Holaday's signs are adhesive-backed stickers. They discovered that the metal signs they used to offer got "hot" with RF, only contributing to the RFR problem.

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signs be used to relate specific instructions to the reader or personnel in the area.

A package of six vinyl, adhesive-backed signs is only \$15.00 and can be ordered by calling Michael Leighton at 612-034-4920. For information, or to have Michael contact

you, circle **Reader Service 130**.

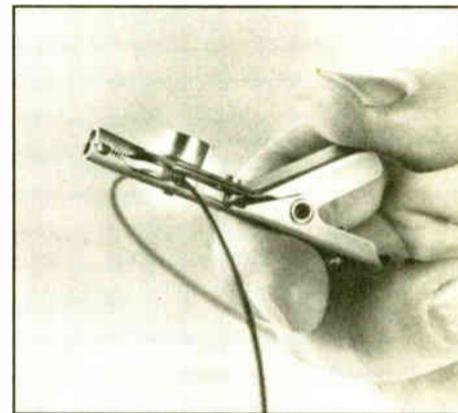
★★★

Keith Arnett of Broadcast Services wrote in to tell of a Field Support Kit that Marantz now offers for their PMD portable professional recorders.

The Field Support Kit (part number FSK221) includes replacement switches, belts, knobs, levers, screws, jacks, door, springs and retainers. It retails for \$60.00. If you use the Marantz PMD series of recorders, circle **Reader Service 45**, and Keith will send you more information. For more immediate needs, Keith Arnett can be called at 800-345-7112.

★★★

In the Feb. 19 issue of *RW*, I described a cheap circuit enclosure in the form of plastic or metal stud-mounted electrical switch boxes. N.E. Litsche from Air Navigation Industries faxed a supplement to that idea. He writes that electrical supply stores sell an item called a "pull box" which is ideal for larger enclosures. The pull boxes come in a variety of sizes—with and without the semi-



Thin needles pierce the insulation of a wire under test, and prevent the need to strip insulation to check a connection when the JP Test Tool is used.

punched knockout holes.

Covers are available, and the boxes can be mounted either flush with, or directly on a wall surface. One word of caution: If your project includes meters, which are to be mounted on the cover plate, make sure the meter is shielded for use in steel panels. Another solution would be to fabricate a cover from aluminum and mount the meter in the center of the cover, for minimal interaction by the steel box. Norman Litsche can be reached at 716-394-9099.

We'll wrap up this month's column with an interesting test clip. The JP-8783 (pictured in Fig. 2) permits "bridging" across a line without stripping the insulation. Wire of either 22 or 24 gauge is "vaccinated" by a group of tiny needles, which makes the connection for testing purposes.

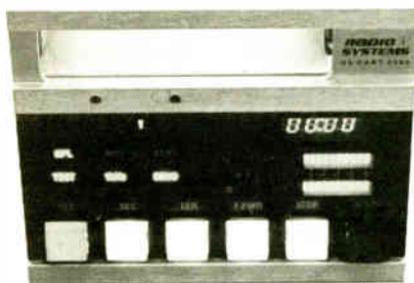
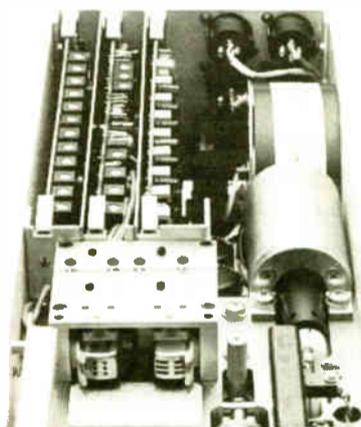
The tiny size of the piercing needles permits the wire insulation to "heal" after withdrawal. Of course, the insulation doesn't grow back, but the elastic properties of the plastic insulation causes the holes to "disappear."

The test tool can be purchased loose or factory-assembled to a 50-inch lead that terminates in a banana plug. For information on this new product, manufactured by J. S. Popper Inc., circle **Reader Service 115**.

□□□

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

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World Radio History

OFFBEAT RADIO

Pirate Radio Owner Shuns Regulation

by Dee McVicker

PHOENIX, Ariz. The federal government considers Bill Dougan a pirate riding the high seas of unauthorized broadcasting.

In March, Dougan was told by the FCC to shut down his one- and-a-half watt FM station operating from a remodeled tool shed in Phoenix. The station had been airing on 88.9 MHz since November without the benefit of FCC licensing.

"I am not a pirate," said Dougan, claiming that the FCC has no right to regulate his station.

Dougan's station, KAPW, covered less than four miles in the Phoenix area and played music, books on tape, and documentaries. KAPW aired from 6 p.m. to 10 p.m. during the weekdays, a regular schedule that made it easy for the Commission to monitor

low-powered FM station.

On July 4, 1991, Dougan wrote to the FCC requesting a new low-powered FM classification be established on "the non-commercial section of the FM spectrum (88-92 MHz) and limited to a maximum effective radiated power of 5 Watts with antenna height not to exceed 50 feet above average terrain." Dougan mentioned his intention to start such a station in the same letter.

On Nov. 1, 1991, Dougan again wrote a letter to the Commission, once more declaring his intention to commence broadcasting. His right to broadcast, he claimed in his letter, was protected under the Bill of Rights of the Constitution, Articles I, IV, and IX, and Section 301 of the Communications Act of 1934.

Those rights, he said, had been violated when the FCC told him to pull the plug on his FM station. On March 17, FCC representatives called from a mobile phone near Dougan's home during an evening broadcast and told him to cease broadcasting. Dougan complied, shutting down the station to pursue legal avenues for his radio station.

"I still have retained everything," he said, referring to his studio gear, transmitter and antenna. "And now I'm going to pursue it in whatever legal arena I can."

Dougan's argument is that since KAPW does not broadcast across state lines or engage in interstate commerce, the federal government has no

agency." Currently, Dougan is having case histories researched that could possibly set a precedent for his argument. If successful, Dougan himself could be setting a precedent for unlicensed radio "pirates" as well as licensed non-commercial stations nationwide. Why not just apply for an FCC license? Replied Dougan, "The minimum power they'd license for is 100 watts, and then you have to have a minimum number of hours you have to be on a day." For even serious radio hobbyists like Dougan, many of whom hold down full-time jobs, these requirements are too stringent. The cost is also beyond what he can afford.

"The license fee is \$2,000," said Dougan. "Then you have to have another \$50,000 to \$100,000 in FCC attorneys and engineers, and you have to have FCC approved equipment."

Recalling an adage, Dougan commented, "Freedom of speech belongs to people who can afford it. This has been proven by this station right here."

Nonetheless, Dougan has been able to air his views since his visit by the FCC, thanks to two licensed radio stations KSLX(FM)



Dougan remodeled a tool shed for the studio and used a 36 foot mast and mail-order antenna to broadcast the unlicensed FM station.

Bill Dougan, shown, was told by the FCC to cease operation of a 1-1/2 watt FM station in Phoenix, Ariz. KAPW had a coverage area of four miles and had been touted as "Arizona's Most Controversial Station."

the station.

But Dougan claims he had been anticipating a visit and had even sent letters to the Commission stating his intention to start a

right to regulate it.

Said Dougan, "It is a low power FM station engaging in no interstate commerce, no advertising, no sort of business transactions

and KOY(AM) in the Phoenix area, which picked up on the story and interviewed Dougan during morning broadcasts.

While being interviewed on KSLX, Dougan said he commented to morning show host John Giese that the "amazing thing is that I'm sitting here speaking to you and I bet people are listening, because every night while I was on the air (on KAPW), I got the feeling nobody was listening."

Giese assured Dougan that there were times in his broadcast career that he had had the same feeling.

□□□

Dee McVicker is a freelance writer and regular contributor to RW. She can be reached at 602-545-7363.

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TECHNOLOGY

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Power Supplies Important to Circuit

► continued from page 15
current.

Fig. 3 is a universal opamp power supply that you can build. You will find it a very useful supply for testing and project development. The circuit shown will produce a bi-polar, regulated 15 V DC at 150 mA. This small supply is suitable for most simple opamp projects. By using larger components, the output current capability can be increased.

Power supply construction

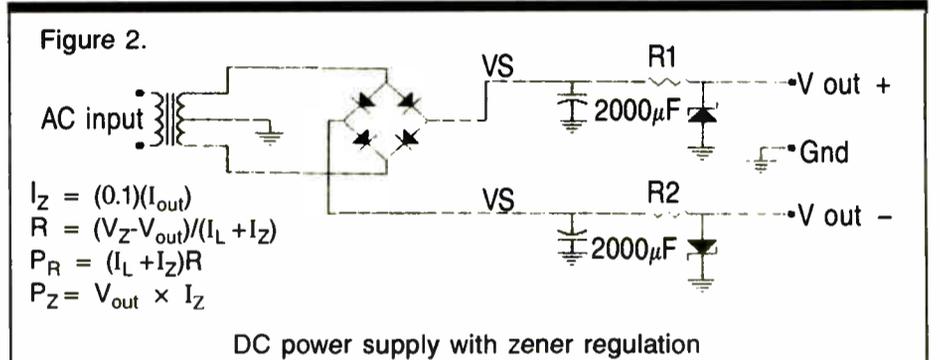
In this circuit, three-terminal voltage regulators are used, though you could

also use zener diodes. Follow good construction practice. Keep all leads short and direct and establish a solid ground.

Consider bypassing the input and output leads of the regulators to ground with

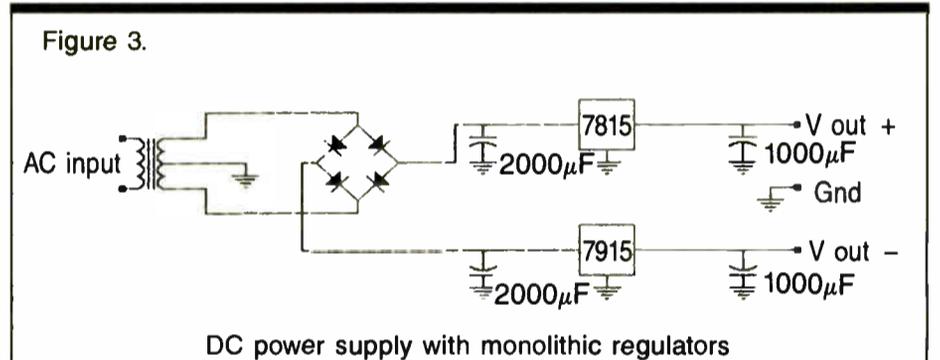
regulator or zener diode is then very handy to bring the voltage down to what the circuit requires. As a bonus, the voltage will stay constant with load.

If you are planning on rebuilding an old audio console with modern solid state



small ceramic capacitors. This bypassing can stabilize the regulators, especially when long leads are used at the output of the supply. Use a fuse to protect the primary of the power transformer and don't leave any hot AC leads exposed. Regulation is not vital to most opamp

electronics, look for the largest power transformer you can find. You can always mount it external to the console, which is a good idea anyway. High power bridge rectifiers are also available on the surplus market. Next month we will construct a universal line amplifier that can



audio circuits, but it is often the best way to get a specified voltage output from a surplus transformer. Remember that filtering the output of a full wave bridge rectifier will increase the voltage by 50 percent.

For example, suppose you find a heavy duty transformer that is rated at 24 V AC output at rated current, and you require 24 V DC at the output of your supply. After full wave rectification and filtering you will have about 36 V DC with a normal load. A three-terminal

be used wherever gain is required.

In the coming months, I will tackle a mic preamp, distribution and power amplifiers. Then I will show you how you can use all of these projects to completely rebuild an outdated audio console and bring it up to modern-day performance levels.

□□□

Jim Somich is president of Somich Engineering and chief engineer of WOIO(TV) Cleveland. He can be reached at 216-526-4561.

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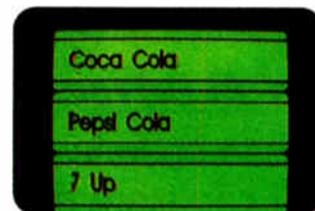


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Digilink is not simply a hardware package assembled from parts built by *other* computer manufacturers and run under our software. Arrakis is the *only* manufacturer to build nearly all parts of the digital system in-house. We build our own *Arrakis* DSP board, SCSI board, I-O board, switcher board, cabinet, and cabling. Because Arrakis builds the system and doesn't simply mark up someone else's hardware, Arrakis can offer you Digilink with broadcast features and performance unmatched by anyone *and* at a truly remarkable price !!!

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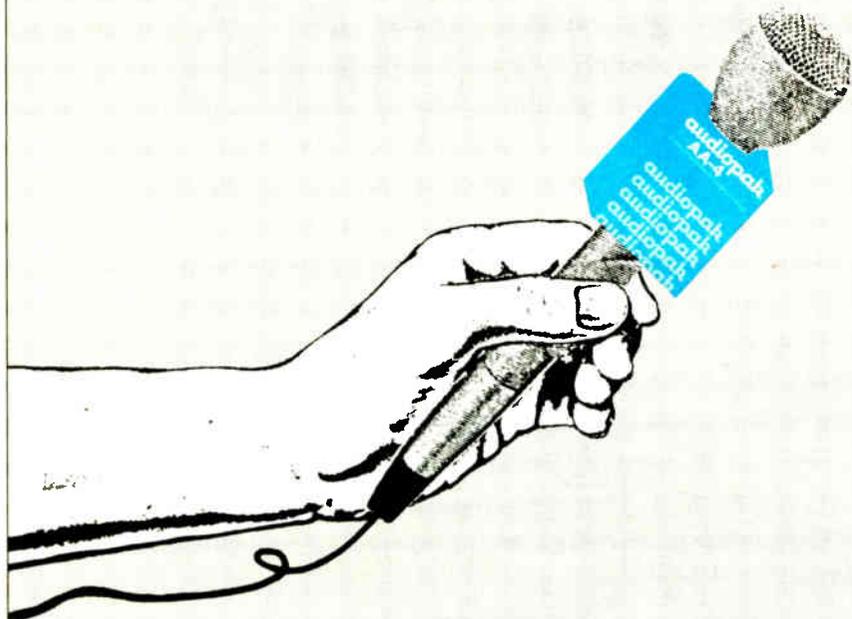
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Look to Your Local Library For Origins of Radio History

by George Riggins

LONG BEACH, Calif. Russ Butler of Providence, R.I. recently paid me a visit in Long Beach. Russ just happens to be a long-time broadcaster who, among other things, roomed with George Stephenson of WSM-AM-FM Nashville for a time when both were attending Northwestern University in Illinois.

Russ now spends most of his time with a consulting firm in Providence, R.I., but gets his real kicks from a Sunday night program he does on WOTB(FM) Middletown, R.I. The program features music from the big band era.

Russ sent me a sample tape of his program. Listening to it, how the time did go by. In addition to a relaxed style of presentation, Russ gives a history and background on many of the orchestras and leaders. I understand that the program is also carried on satellite and picked up by several cable companies.

Empire of the Air

Several people have called me and mentioned both the on-air presentation of "Empire of the Air" and the book by the same title. If you missed the TV presentation, contact your local PBS affiliate to ascertain whether there will be a re-run, or how to purchase a tape of the program. My copy of the book came from B. Dalton Booksellers.

To learn more about the early developments that led to the beginning of our present day AM and FM radio, I scoured the Long Beach Public Library and found that there were four books on Guglielmo Marconi in the local collection.

An interesting note about my search—one of the books I found useful is considered a children's book. The only reason I could find for putting that particular book into that particular section was the ease of reading and size of the print.

Guglielmo Marconi was born in Bologna, Italy in the year 1874, the product of an Irish mother and an Italian father. There were two older children in the family, a half brother and a full brother. Through his mother he was a member of the Jameson family, Irish distillers, and through his maternal grandmother, the Scotch Haig family. Both of these connections would come in handy later when setting up the Marconi Wireless Company of England.

While Marconi was growing up, there was no formal schooling as we know it today. Marconi never attended public schools. He was tutored privately and did a tremendous amount of study with the aid of his mother. Later, Marconi took advantage of the opportunity to attend lectures and study with several eminent scientists of the period.

Great minds at work

One such scientist was Professor Augusto Righi of the University of Bologna, in Italy. Marconi was 19 when he attended the lectures of Professor Righi on the subject of electro-physics. He never matriculated in the university.

Marconi demonstrated an early interest in electricity. He read the publications of the leading teachers and researchers of the 19th century. There were such teachers and researchers as Hertz, Lodge, Popoff, Dr. Mahlon Loomis, Edison, Lord Kelvin (Sir

William Thompson), Faraday, Fessenden, Tesla, Steinheil, H. D. Ruhmkorff, Maxwell, Helmholtz, Leyden, S. A. Varley and Branly (of coherer fame).

Perhaps the most interesting part of Marconi's learning process was a deal he made with a gentleman who was slowly going blind. Marconi read to him and in turn the man taught him Morse Code. Marconi became an expert telegrapher. He could both receive and send telegraphic messages at a respectable speed.



It appears that both Marconi and Major Armstrong shared many of the same qualities—particularly the ability to build on the theories and discoveries of others and make practical use of the knowledge. The two men complemented each other in many ways.

Credit where due

Marconi was not the first to describe the electric waves in space that are now known as radio waves. Dr. Mahlon Loomis demonstrated disturbances in the atmosphere and was granted a U.S. patent—number 129,971—on July 10, 1872.

In 1866, Dr. Loomis sent his signals, without wires, between Cohocton Mountain, Va. and Beorse Deer Mountain, Va., a distance of 14 miles. Later signals were sent between two ships in the Chesapeake Bay that were about two miles apart.

Edison reported on an electrical phenomenon in 1875 while observing spark activity in his lab. He deduced that the impulses were of an oscillatory nature. The black box of Edison contained two carbon points forming a small gap where sparks could be observed through a viewing window. Edison was of the opinion that the sparks were created through induction rather than radiation.

It was Hertz who proved mathematically that electric waves could exist in space. Edison's notes were dated Dec. 3, 1875. A patent application was filed on May 23, 1885, and U.S. patent number 465,971 was issued on Dec. 29, 1891. This patent was later sold to Marconi so there would be no duplication of resources. Edison gave Marconi full credit for developing the radio waves into a useful purpose.

On another subject, I was informed recently that the RCA Nipper pictured in the Feb. 5 issue of *RW* is not an original. According to the phone call, this is one of one hundred reproductions made about 25 or 30 years ago by the grandson of the original producer. As more information becomes available on the subject, I will pass it along.

□□□

George Riggins has experience in radio and electronics dating back to the 1930s. He also is a licensed ham radio operator and has had his own broadcast sales and service company, Riggins Electronic Sales, for more than 20 years. He can be reached at 213-598-7007.

More Options with Digital Signal Gear

► continued from page 12

The comprehensive DASS 100 is capable of handling a wide range of useful tasks, including sample-rate conversion, format conversion, sample-rate synchronization, gain adjustment, digital mixing, and sample-clock generation.

For conventional sample-rate conversion, the DASS 100 handles the fixed sampling frequencies of 32, 44.1 and 48 kHz, with up to two percent deviation. In addition, digital sources can be synchronized to a master internal or external clock reference (video, timecode, word-sync or AES3).

DASS 100 also handles conversion between AES3, S/P DIF, SDIF-2, ProDigital and Yamaha-format I/Os; generates variable-frequency sine, square and sawtooth digital test signals; and provides editing of channel status and other data bits. For information, contact Digital Audio Research's U.S. distributors, Sam Ash Professional, at 212-719-2640, and Audio Interservice Design, at 213-469-4773, or circle **Reader Service 166**.

The Digital Domain FCN-1 format converter accepts consumer-type or AES3-format digital inputs and produces four, transformer-isolated outputs. Front-panel controls enable various channel status flags to be set on the output data stream. For information contact Digital Domain at 212-369-2932, or circle **Reader Service 181**.

Sic transit Harmonia-Mundi

The Harmonia-Mundi bw 102 modular system offers various modules that provide sample-rate conversion (to/from 44.1 or 48 kHz); format conversion (from/to virtually any format of digital I/O); sample-rate synchronization; level control and digital mixing; signal processing (parametric EQ, dynamics, limiting and de-essing); external computer control; plus sample clock/word-sync output. For information, contact Harmonia Mundi's U.S. distributor, Gotham Audio Corporation, at 212-765-3410, or circle **Reader Service 21**.

Lexicon's new LFI-10 format interface provides digital I/O conversion (from/to AES3, S/P DIF or SDIF-2); front-panel display and modification of various auxiliary data, in-

cluding channel status, CRCC errors, validity and parity bits; display of input and output sampling rates, plus several other handy functions. For information contact Lexicon at 617-736-0300, fax 617-891-0340, or circle **Reader Service 79**.

NVision makes a variety of interface and transmission modules for generating a video-referenced AES3 Digital Audio Reference Signal (DARS); 18- and 20-bit A-to-D converters plus 20-bit DACs; multiplexer and demultiplexer cards for communicating between analog and digital I/O modules; plus AES3 digital distribution amplifiers.

The stand-alone Model NV4448 Digital Audio Sample Rate Converter handles AES3, S/P DIF and SDIF-2 format signals, at synchronous and asynchronous rates between 28 and 54 kHz. For information contact NVision at 916-265-1000, fax 916-265-1010, or circle **Reader Service 174**.

Prism Sound's DAS-90 AES/EBU-SPDIF channel status editor features a combination IBM-compatible card and software for displaying and editing channel status from both AES3 and consumer-format inputs. For more information contact Prism's U.S. distributor, Gotham Audio Corporation at 212-765-3410, or circle **Reader Service 92**.

The Pro-bel Model 6510 digital audio analyzer can be used to measure various electrical parameters of AES3, S/P DIF or SDIF-2 digital inputs (level, sample rate, EyeWidth, biphasic mark, jitter, etc.) plus channel status, CRCC and other data flags.

Other useful hardware includes the model 5241 digital audio distribution amplifier that allows a single AES3-format input to be split into 10 isolated outputs; and the HD Series digital audio router for switching up to 256x128 AES3-format signals. For information contact Pro-Bel's U.S. distributor, HEDCO/Leitch at 800-231-9673, or circle **Reader Service 87**.

The Sonic Solutions SS-612 SDIF converter provides simultaneous, bi-directional conversion between SDIF-2 and AES3/consumer formats, with switch-selectable channel status data (pro/consumer I/O from byte-0/bit-0) and empha-

sis. For SDIF-2 conversions, the timing relationship between word sync and the input or generated data can be adjusted in 1/8-bit increments.

The firm's universal clock module allows master sync reference to be derived from various digital inputs (SDIF-2 and AES3 via XLR/BNC and optical), word clock and/or video sync (composite video or 24, 25 or 29.97/60 fps timecode). The system will also generate word clock (128 times the sampling rate), as well as 29.97/30 fps timecode referenced to the video sync source. For information contact Sonic Solutions at 415-394-8100, fax 415-394-8099, or circle **Reader Service 161**.

The TC Electronics model TC8201

AES/EBU interface analyzer and test generator measures various electrical parameters of AES3 and EIAJ CP-340 (consumer) outputs, including sync lock, parity, clock stability, sync plus validity, and displays frame rate, channel status and user data. Designed to be operated from an IBM-compatible PC, the unit generates various digital waveforms, and converts from/to AES3, S/P DIF (BNC and optical connection) with or without reclocking. For information contact T.C. Electronics' U.S. distributor, Virtual Designs at 805-373-1828, fax 805/379-2648, or circle **Reader Service 10**.

Mel Lambert has been involved with the production and broadcast industries on both sides of the Atlantic for more than a dozen years. Now principal of Media & Marketing, a consulting service for the professional audio industry, he can be reached at 818-753-9510.

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Avoiding FCC Fines for EBS

► continued from page 17

two sine waves at different frequencies, the resultant waveform is not a sine wave. The peak flashers (and peak indicating meters on more recent monitors) will indicate the actual peak modulation level.

Now, let's continue the discussion of EBS requirements on the FCC self-inspection form. The FCC may not approve of many of the off premises control schemes stations are using because the operator is not *instantaneously* alerted by reception of the EBS attention signal and not able to *immediately* monitor the emergency programming (73.932(a)).

Further, in many such situations, the operator is not able to immediately run the required announcements, EBS tones and emergency programming as required by 73.933(b)(4). I'd suggest that before any non-traditional control points are put into operation—where the operator has neither an EBS receiver at the control point nor instantaneous control over the programming and transmitter—approval from the FCC in Washington be sought.

If you'd like a copy of the 20-page FCC self-inspection report, contact me at H&F, 141 Suburban Road, Building E4, San Luis

Obispo, CA 93401-7590, including an SASE (8.5x11 inches) envelope with \$0.98 postage and \$2 for copying.

I recently tried calling Master Control, the bulletin board system run by the National Supervisory Network at 303-949-3253. The full text of several FCC documents is available here (such as the proposed modification of the EBS rules), along with lots of other good stuff.

In addition, the Pike & Fischer on-line edition of the FCC Rules is on the system. Access to the on-line rules requires an ANSI color terminal and a modem speed of at least 2400 bps. In addition, you can get your own copy of the Pike & Fischer rules on disk by calling 301-654-6262.

□ □ □

Harold Hallikainen is president of Hallikainen and Friends, a manufacturer of transmitter control and telemetry systems. He also teaches electronics at Cuesta College, San Luis Obispo. He can be reached at 805-541-0200. He also can be reached on Internet at ap621@cleveland.freenet.edu or hhallika@pan.calpoly.edu or through CompuServe at INTERNET: ap621@cleveland.freenet.edu.

USAIRPLAY

Christian Radio Prospers in U.S.

by Charles Taylor

WASHINGTON Not more than 10 years ago, religious radio often conjured up images of a preacher in a pulpit whose message of the gospel usually was mightier than the scratchy AM signal over which he was heard.

Today, the Word is out.

Christian radio outlets have proliferated into a mini-empire of some 1,200 stations nationwide. No longer are sacred formats broadcast over struggling, low-power frequencies; instead, they're broadcast from some of the strongest FM allocations in many of America's top radio markets.

"There have been religious stations all along," says Michael Miller, station services manager for the Christian Broadcasting Network (CBN), "but the religious format as a whole—music, talk and preaching—is growing at one of the fastest rates of any format."

Industry analysts recognize as many as 18 religious hybrids, as numerous and fragmented as mainstream commercial radio. Among the concentrations: traditional,

southern, country or black gospel; all talk, all teaching, all preaching; adult contemporary, contemporary, inspirational music and Christian rock. There's even Spanish Christian.

Ads, but listeners?

But despite the format's increasing presence, the actual popularity of the format in measurable nationwide listenership has not changed greatly over the years. Its growth appears to be more a result of economic fortitude than audience share.

"Arbitron may be telling us that statistically, no one is listening. And yet a station could be billing \$100,000, \$200,000 or \$300,000 a month," says Christian media consultant Brad Burkhart, president of Brad Burkhart Christian Media and publisher of the "Christian Research Report."

Does this mean that prosperous group owners are spending millions to buy up prime frequencies that no one is listening to? Yes . . . and no.

In all, there are four recognized breeds of religious radio—those supported by spot advertising; those supported by donations;

those aired on non-commercial frequencies, often owned by churches and supported by advertising and donations; and those supported at least in part by time brokerage, in which programmers pay to air blocks of programming over a station.

Many major market Christian stations are thriving as a result of the latter option, where blocks of airtime are sold to various clients, from ministries to talk shows. Thus, the stations are not dependent upon audience ratings to prosper.

"When you stop thinking about the need to have an audience to be profitable, you redefine the laws of radio," Burkhart says.

Brokerage innovator

Salem Broadcasting, which owns more than a dozen AM and FM religious radio outlets across the U.S., is regarded as an innovator in airing brokered religious programming on its stations. The method serves a double purpose, according to Carl Miller, operations manager for the company's WMCA(AM) in New York, which obtains about 60 percent of its revenue from block programming.

For one, brokering ensures financial stability for a format that may never draw ratings high enough to support top ad dollars. "We know we're never going to crack the numbers game here in New York," Miller says. "There are so many stations competing for the same 20 million people."

Second, he says, airing blocks of brokered programming provides an outlet for Salem's fundamental mission—to spread the Word.

Other religious stations have jumped into the competitive arena, vying for spot advertising only. One variable in their favor is that Christian radio boasts an easily defined demographic audience, a plus for advertisers in an era where formats are often indistinguishable from one another.

According to Paul Martin, general manager of Salem Radio Representatives, a full-service national spot radio representative for Christian-formatted radio, advertisers

recognize that you must search out power groups in the economy rather than being a mass marketer.

Christian radio leader

The national Christian radio leader, KLTU(FM) in Dallas/Ft. Worth, is one of only a handful of all-music, 100 percent advertising-supported Christian outlets in the U.S. In recent ratings, the adult contemporary station was ranked Number 7 overall and as high as Number 2 with adult women, trouncing mainstream formats.

Its programming philosophy is much like that of any competitive commercial station: "Ours is very basic radio. We want to be on 24 hours a day, whether a listener is coming out of church Sunday morning or a movie Friday night," says Program Director Scott Wilder.

Advertising on KLTU includes clients that might be heard across the dial—American Airlines, 7-11 convenience stores, Dr. Pepper soft drink and North Texas Chevrolet automobile dealers.

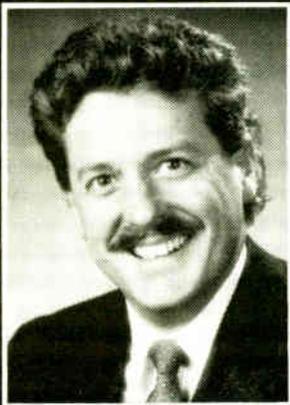
KLTU's success should signal other religious music stations that perhaps the time has come to follow the leader.

While time brokered stations may be successful—even ratings- and recession-proof—one has to consider how well a system of bartered programming serves the local community, the essence of American radio. Traditionally, revenues are tied in with a station's ability to snag a significant audience share. Time bartering makes an audience gratuitous.

Indeed, the ultimate challenge for religious radio is matching economic success with as bountiful an audience. This requires *innovative programming* and aggressive management and promotion.

Says Burkhart, "Stations will have to decide whether to continue finding revenue through ministries and other paid block programs that are listened to and supported by a statistically small if not insignificant number of listeners in the market"—or, like KLTU, whether to make the ambitious move toward competitive programming.

"I think the future for Christian music radio," says KLTU's Wilder, "is to look as we have to success stories in radio in general, not just in Christian radio, and learn how to apply that to what we do."



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Phone Bill Audits May Result in Savings

by John Bisset

WASHINGTON If your station has moved studios, offices, or transmitter sites within the last several years, some time spent with your local telephone company may reap you a rich reward, and lower your phone bill at the same time.

At some point after a site move, the old telephone circuits are disconnected. This is usually done by a simple phone call to the business office. The call is made, and the matter is forgotten.

More often than the telephone company would like to admit, the paperwork never makes it to the billing office. The result is that your monthly bill will continue to include costs for all or some of the phone lines or audio circuits that you are no longer using.

Since the monthly phone bills don't—as a rule—itemize each charge, your business manager continues to pay the monthly amount, never knowing that you may be overpaying. The solution? Request a complete audit of your telephone expenses.

Audit everything

Some stations may have several different telephone bills. One for studio phones, one for special remote broadcast circuits, and another for the transmitter site telephone. You'll want to have an audit done on each bill for the same month.

If you find the customer service representative hesitant to provide you with an itemization of your charges, ask to speak to a supervisor. Explain to the supervisor that this is not a "frivolous" request, that the station moved six months ago, and you want to make sure all circuits have been transferred to the proper account.

It may take two days to two weeks for you to get the results of the audit. Before the hieroglyphics that describe each circuit bring on a migraine, call in your engineer to help decipher the documentation. If even your engineer is baffled by the description of the charges, it's time to call back to the business office.

Ask for whomever you spoke with to get the audit. Explain that you and your engineer are having some difficulty understanding the printout, and that you'd like to invite this rep to explain the charges over

lunch. If the rep cannot explain all the circuit charges, also invite the supervisor.

Take the phone company to lunch? Precisely. Chances are that among that rep's hundreds of customers, no one has ever done this. Not only does the lunch serve as a nice way to thank this rep for the "extra" service in preparing your audit, you will be assured of first class service from that point on.

Try a little tenderness

A problem crops up? Call up the rep you treated to lunch, and see how quickly the problem is resolved. This simple gesture of thanks is often overlooked, and yet can be so powerful.

Giving your engineer some restaurant trade to take the supervisor of the air conditioning service company out to lunch can result in middle-of-the-night emergency service, at regular labor rates.

During your "power" lunch, have the rep explain the charges for each phone line, control circuit, or remote radio loop listed on the bill. During this explanation, you may find additional phone lines that you don't need—like the \$39 monthly charge for a private line coming into the jock's lounge, where an extension from the office PBX system would do.

With regard to remote lines or radio loops, make sure you understand the descriptive numbers and codes. This will be useful as you identify each charge once you're back at the station. In addition to deciding whether an existing line is necessary, make sure that each circuit or line is indeed still being used.

Even if no overcharges are found, you'll find the audit a real eye opener. In addition to removing the private line into the jock's lounge, ask your telephone customer service rep to suggest any ways to reduce your telephone line charges.

That was then, this is now

Some years ago, a religious-formatted station provided equalized lines or radio loops to a number of local programs that were broadcast live. When the lines were installed 15 years ago, the \$8 per month charge was easily absorbed by the station as a cost of doing business.

Today, with equalized radio loops no

longer subsidized, it's not uncommon for the same circuit to cost \$800 per month. In a number of cases, the station was actually losing money, since the monthly cost of the phone circuits exceeded what the broadcasters were paying in time charges.

Passing on the line charges encouraged the broadcasters to tape their program instead of airing the broadcast live. At the same time, the station charged a modest "recording studio fee." Not only did they reduce their telephone bill by several thousand dollars, they picked up additional revenue by renting out their studio.

If you find an overcharge, there are some steps you can take to have the credit issued promptly. First, if the error was due to a studio move or transmitter site move, gather copies of leases, permits, or other agreements that prove that you moved to the new location and vacated the old site on a certain date.

Second, list the circuit(s) or lines involved, in a letter to your business office—preferably to the rep or supervisor who prepared the audit for you. Include all applicable circuit numbers, order numbers, or other descriptors. This is why you want to review the audit with the rep in person, so you can understand where one circuit description ends and another begins.

Third, ask that the phone company calculate your refund. Check the math, and also make sure the company took into account any utility taxes that you paid on the total amount of the bill, as well as any rate increases. Finally, request that your refund be in the form of a check, payable to the station.

Gone but not forgotten

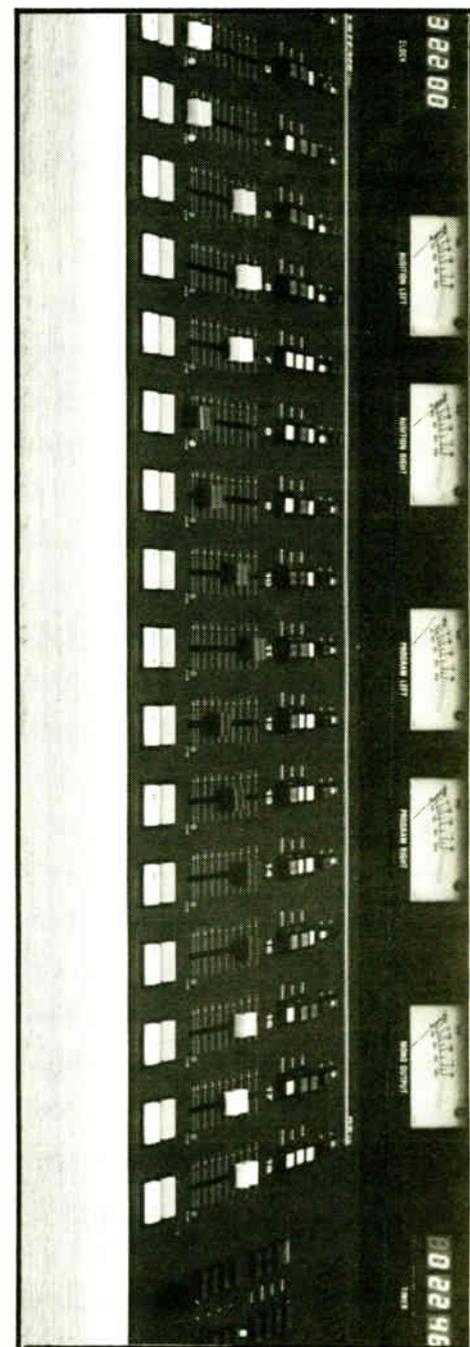
How can these overcharges happen? Consider this example. Your station moves its studio location. At location "A" you had a remote control line to the transmitter, and also a stereo audio pair feeding your programming to the transmitter site.

Once you moved, the lines were disconnected. You see the phone bill charge drop somewhat, and pay the balance, thinking the charges have been removed. The audit will show that although the stereo lines were indeed dropped from the bill, the phone company has erroneously continued to bill the station for the remote control circuit.

This fee, amounting to only \$15 per month, seems trivial when compared to the \$300 per month charge for the stereo lines, but it adds up quickly.

Another situation that will almost certainly result in overcharges is the station that uses radio loops (equalized circuits) to broadcast remotes. These temporary circuits are installed for one broadcast, and supposedly removed a day or two after the remote broadcast. If a station does many remotes, it's easy for a circuit to be dropped, but for the paperwork to never find its way to the billing department.

continued on page 31 ►



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Chief Engineers: Not Just Repairmen

by Jon Banks

WASHINGTON Finding a good chief engineer is difficult. It's not easy to evaluate an applicant's technical ability, and the traits that make people good with electronics may not help them get along with others.

You shouldn't have to settle for a chief engineer who's just a repairman. You need someone with good people skills, budget and purchasing experience, com-

puter literacy, environmental awareness, and broad radio experience. A chief engineer needs a certain combination of skills to be effective, and the job interview is your chance to find out whether your applicant has those skills.

Technical skill

The basic question that must be answered is, "Can this person keep us on the air?" Check any applicant's references carefully.

Make note of any special FCC licenses—even ham radio experience is a plus. Ask whether he or she is certified by the Society of Broadcast Engineers (SBE). Be aware that there are various levels of SBE certification: professional (highest); senior; broadcast, and technologist (lowest).

Questions that can yield informative answers include: "At your previous station, what would have made the greatest technical improvement for the

least cost?" Ask about remotes he's done—this will give him a chance to tell you how he works under pressure, in contact with the public and the client, and in unfamiliar facilities outside of the station.

These questions help a non-technical manager evaluate a candidate's technical skill. And ask specifically about his experience with studio equipment and with transmitters like yours.

You'll also want to know that

your engineer will be available for an emergency, and that he will respond quickly. Discuss your needs for emergency service with him, and determine whether he can give you the support you want. If he lives far away, is unavailable often, or takes care of other stations as well, you want to know that up front. If your station does lots of remotes, how will you handle the overtime required of him?

Is your applicant thoroughly familiar with FCC regulations? Can he keep your station out of trouble? Give him your transmitter logs from last week and ask him to review them on the spot and tell you what he's looking for. Listen for proper signatures, regular meter readings, correct power level and changes, tower lights, EBS tests sent and received, etc.

Ask him what he's done at other stations to prevent these problems. Talk with him about your commitment to running a clean operation. Make it clear that you want to be told about any potential FCC violations.

Environmental problems can be very expensive. Your potential engineer must know about PCBs, underground fuel tanks, and radiation levels at the tower site.

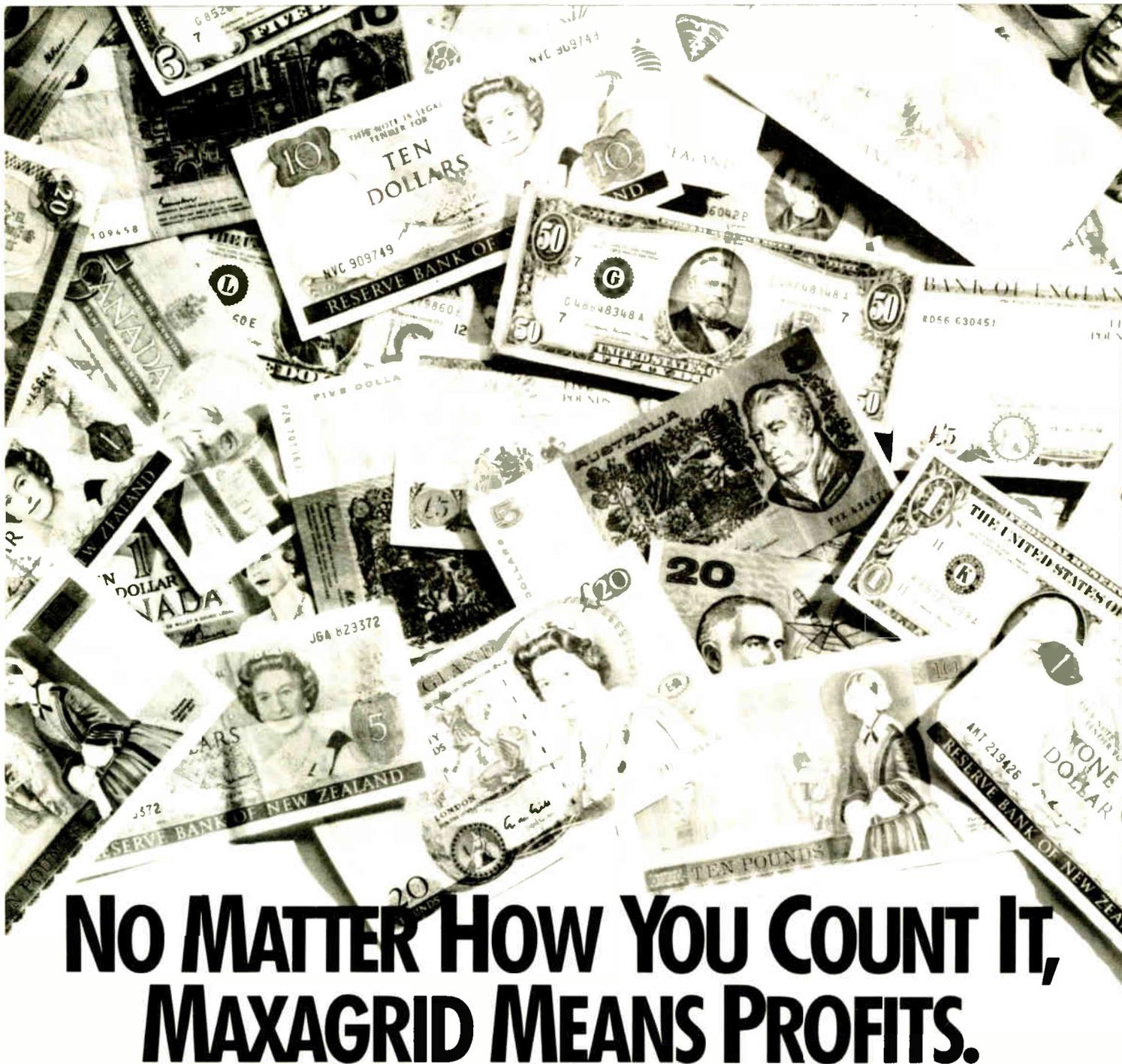
Some applicants may have worked with computers, PC networks, satellite services, or telephone systems. Find out whether your candidate has these skills, or others that can contribute to your station.

Business skills

More and more engineers are developing effective business skills. This is especially important at the larger stations. You should expect your engineer to be able to develop a budget for his department and to work within it. In fact, controlling his budget is the primary method you'll use to manage and direct your station's technical operation.

You'll want to discuss spending authority and the station's purchase order system. Find out if he's comfortable pushing vendors aggressively to get the best deal. He should understand how to use competitive bidding to make sure you get the best price on major purchases. Ask about his experience with budgets and bidding at other stations.

Your applicant may have owned his own contract engineering service. If that is the case, spend some time talking about his experiences as a small businessman. If he's had to deal with the realities of running a business, you know he'll understand the problems you face, too.



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Circle (77) On Reader Service Card

World Radio History

continued on next page ►

► continued from previous page

If your applicant has negotiating skills, he may be helpful with tower site, two-way, and SCA leases.

This is the what your kindergarten teacher called "works and plays well with others." It helps people get along at the office, and pull together as a team. Engineers seem to be stereotyped as having poor people skills.

People skills

But you do need an engineer who can deal effectively with the other staff members at your station. You'll have to decide whether an applicant is the kind of person who'll get along with the rest of your staff.

You, as a manager, can help foster good relations, too. If you have your engineer changing light bulbs, and if he's the person you call when the toilet's broken, he's not going to get any support or respect from the rest of your staff, either. Treating him as a valuable member of the team is the cheapest way to motivate him and get his best efforts.

You also want to find an engineer who presents a good image for the station—someone who'll make a good impression with clients when your crew goes out on remotes. Don't forget to bring up working hours. You'll probably want him to keep the same office hours as the rest of the staff, unless there was overnight transmitter work, or a long weekend remote.

Getting the big picture

A manager should expect his engineer to understand the entire operation of the radio station... what each department

does, how the departments interact, their varying needs and responsibilities.

You want to be sure your candidate understands why it would be a bad idea to start rewiring the production studio on the

A chief engineer needs a certain combination of skills to be effective, and the job interview is your chance to find out whether your applicant has those skills.

Friday before a four-day weekend. If your candidate has worked as an announcer, even in a small market, you know he can see things from that perspective.

You also want to know that you and your candidate can work from the same list of priorities. Any engineer would take pride in having the latest state of the art equipment, but that's an expense few stations can afford. You should discuss your plans for the station.

If you'd rather have a heavy schedule of remote broadcasts instead of perfectly maintained cart machines, say so. If you feel it's more important to build a studio for the new morning team than to upgrade the aging equipment in the production studio, share that with your applicant. Let him know your priorities, and the kind of technical support you want your station to have.

Your engineer should always provide you with choices. When you have a technical problem, a special project, or a new piece of equipment to buy, he should give you several options, in quality and price, to choose from. It's your decision—after all, you're running the sta-

tion; his role is to advise you on the pros and cons of each option and then implement the one you select.

An engineer is often a one-man department with no one else at the station with

A good engineer knows his limitations, and he'll tell you when a project is too large or difficult to do alone. You should also expect him to keep abreast of the technical operation of other stations in your market, and share that competitive information with you.

This should give you an idea of what to look for in an engineer, and how to tell when you've found a good one. Of course, better qualified people command better pay, and if you find someone who's outstanding in all these areas, he may be more expensive than you can afford. But there are good engineers out there; you don't have to settle for just a repairman.

Jon Banks is CE of WLTT(FM) Bethesda, Md. (Washington).

the background or qualifications to evaluate his work and check his performance. You'll need someone who is a self-starter, and he must be honest, so that you can trust his work without review. These are important traits you'll have to judge during the job interview.



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On-Air Commercials Began In the Golden Age of Radio

by James T. Wold

MINNEAPOLIS The history of commercial radio—and commercials on the radio—as we know it today dates back 70 years from this August.

On August 28, 1922, WEAF(AM) (now WFAN), New York, broadcast the first income-generating program. The format? A 10-minute message to the public from the Queensboro Corporation, a real estate firm, to promote the sale of apartments in

Jackson Heights, Long Island.

The broadcast resulted in the sale of two apartment buildings and many inquiries from other prospective buyers. With this, commercial radio was underway.

Good, but not great yet

The sponsors paid \$50 for the initial broadcast, and during the following weeks the Queensboro Corporation broadcast four additional talks at \$50 each and an evening talk at \$100. All of the broadcasts were an

indirect appeal for Hawthorne Court.

A copy of that initial talk covers two single-spaced type-written pages. It dwells in detail on the views of author Nathaniel Hawthorne.

In this stodgy, 10-minute talk, the announcer emphasized that the great writer had "analyzed with charming keenness the social spirit of those who had thus happily selected their homes," and added that Hawthorne Court would have met with the approval of the author of "The Scarlet Letter."

Nowhere in this discourse was there any direct appeal to the listener to visit Hawthorne Court in Jackson Heights and not once was price mentioned. The series of commercials continued until September 21. The Queensboro Company admitted that Blackwell's radio efforts resulted in sales of "several thousand dollars," but the com-

pany was not overly enthusiastic.

And neither was WEAF, which during two months succeeded in selling only three hours of time, bringing in a gross of \$550. Although WEAF was somewhat disappointed about its early results, the first sale of airtime was the impetus for a great new American enterprise.

The first purchase of time paved the way for making broadcasting a going financial proposition. Stations would have the wherewithal to bring the finest entertainment talent to the microphone. Concentration could be given to expanding the services of broadcasting in education, in civic affairs, and to provide public service in times of emergency.

Opportunists versus purists

Some early broadcasters were enthusiastic about the prospect of making radio an important factor in advertising circles, but there were others none too pleased over a young upstart cutting in on the advertising dollar. It was hoped by many that direct advertising would never be allowed on the air.

The opposition reacted swiftly and with decided hostility. Radio Broadcast Magazine decried the first few attempts and warned readers that "more of this sort of thing may be expected. And once the avalanche gets a good start, nothing short of an Act of Congress will suffice to stop it."

U.S. Secretary of Commerce Herbert Hoover spoke out boldly against it, claiming, "the quickest way to kill broadcasting would be to use it for direct advertising . . ." Hoover went on to say it was "inconceivable that we should allow so great a possibility for service . . . to be drowned in advertising chatter."

Advertising agencies, however, soon arrived on the scene and commercial broadcasting would experience phenomenal growth.

On Dec. 22, 1922, William H. Rankin was the first advertising agency to go on the air. It bought 15 minutes of time on WEAF to deliver a talk on "Advertising and Its Relation to the Public," for the purpose of testing the allure of broadcasting.

Reports on the talk's reception were so encouraging that Mineralva, an advertiser, decided to sponsor motion picture star Marion Davies on WEAF for 10-minute programs, twice a week.

It kept going, and going . . .

N. W. Ayer and Son, an established advertising agency in print media, claims to have been the first major agency to take radio seriously as an advertising medium. Ayer handled advertising for an optical company on WEAF in 1922, and in 1923 introduced one of the earliest sponsored network programs, the National Carbon Company Everready (battery) Hour.

Another pioneer agency in radio was Lord and Thomas, whose Albert Lasker was one of the legendary figures of media advertising history. By March 1923, WEAF boasted 25 sponsors, including the R.H. Macy department store, the Metropolitan Insurance Company and I. Miller Shoes.

These agencies and James M. Mathes, of J.M. Mathes Inc., another agency, had as profound an influence on radio programming as any other in this country.

Advertising had better results when straight talk gave way to advertising programs with music. The First Annual Radio Conference in 1922 recommended that only the sponsor's name be allowed, and many other individuals and groups shared this opinion.

With this action, a new sort of advertiser arrived on the scene. Instead of touting individual products, these sponsors were

continued on next page ▶

“

CBSI's InterAcct accounting system delivers everything we were promised. The installation process was well-planned and coordinated. Our financial history was all pre-loaded for us. Our CBSI training specialist was extremely competent. The changeover occurred without any problems or delays.

"The InterAcct system has exceptionally strong internal control features, the menus are logical and easy to understand. The overall system is extremely fast and very flexible.

"Using InterAcct, we reduced the time it takes to process payables by several hours per week. InterAcct is up and running successfully in all of our locations.

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Kansas City, Missouri
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STRAIGHT TALK FROM THE BIG NAME IN BROADCAST SOFTWARE - 1-800-547-3930

► continued from previous page
content to settle for brand-name publicity by attaching their names to specific programs. Browning King Inc. was among the first. It began by sponsoring the "Browning King Orchestra," a weekly musical program that made its debut on WEAJ in April 1923.

There was no sales message; in fact, the listener had no way of knowing that Browning King sold clothing. The link would rest solely in the name "Browning King Orchestra," and the financial arrangements behind it. The idea was that such programs created "good will" toward the sponsor, which would eventually show up as sales.

The venture led to a rash of similar creations. Soon there was the "Cliquot Club Eskimos" and the "Gold Dust Twins," the "Lucky Strike Orchestra" and many others. Hoover felt that the indirect, or *institutional*, approach was preferable to the hard sell, and the practice was dubbed "the Hoover method."

As late as 1929 the National Association of Broadcasters took a stand against commercial announcements during the evening hours.

By 1933 Lasker, president and owner of Lord and Thomas, (later to become the Foote, Cone & Belding Agency), affiliated the Pepsodent account with the "Amos 'n' Andy" program. Sponsors did not actually produce the shows, they only paid the bill.

Advertising agencies arranged for the programs, and advertising agency copywriters made up the musical slogans and other jingles that sold the products. In exchange, the agency received a 15 percent discount on air-time bought from the station.

The advertising agencies which, like Lord

& Thomas, had plunged early into broadcasting, were achieving extraordinary success. In spite of the Depression, they had brought the recently formed networks quick affluence and power. In 1934 approximately one-third of network time was sold for sponsored programming, which occupied the choicest hours. More than half the revenue came from the top 10 advertising agencies. The top two advertising agencies in terms of volume were Blackett, Sample & Hummert and Lord & Thomas.

As late as 1946 there were still complaints against radio advertising. Lee de Forest, a claimant to the title of "father of radio," expressed himself in a letter to that year's fall meeting of the NAB in Chicago.

He addressed the broadcasters in the opinion and editorial page of the Chicago Tribune, Oct. 28, 1946. He called radio his child and wrote, "You have cut time into tiny segments called spots (more rightly stains) wherewith the occasional fine program is periodically smeared with impudent insistence to buy and try."

So much for the historical development of a business whose gross time sales grew from a few thousand dollars in 1925 to one million in 1935 and more than \$4 million in 1945. For the most part, it has been a natural phenomenon, a case of a hidden spring producing a brook that became a stream and then a torrent, making its own bed as it swept along.

□ □ □
James T. Wold is a freelance writer based in Minnesota. His soon-to-be published book, "Minnesota Microphones" will be published by Northstar Press. Wold can be reached at 1106 South Seventh Street, Minneapolis, MN 55415.

Cash Back from Audits

► continued from page 27

The phone audit will tell you where the remote line originates, which can be a clue to how long ago it was used. We recommend to clients that do a large number of remotes to request quarterly audits, since with two or three remotes per weekend, the situation can quickly get out of hand.

Back billing record keeping requirements may vary among phone companies. That's where your documentation of when the circuit was installed is important. Don't be afraid to fight for charges you paid that extend past the recent records kept by the phone company. Check with your local State Corporation Commission or Utility

Regulation Agency to answer your questions.

We tell our clients to look upon these audits as a treasure hunt. You never know what you will find. Most recently, one of our clients received a refund of over \$2,000 for line charges that were discontinued two years earlier.

In another case, we obtained over \$10,000 for a station that had moved studio sites, but was billed for phone service at both the new and old site for nearly five years.

□ □ □

John Bisset is a principal with Multiphase Consulting, a contract and service engineering company based in Washington, D.C. He can be reached at 703-379-1665.



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Circle (187) On Reader Service Card

World Radio History



Gentner Capitalizes on Digital Product Strength

by Alex Zavistovich

SALT LAKE CITY When Gentner Communications Corp. recently completed its acquisition of MacroMedia, along with that company's Audisk automation system, it established itself as a bona fide leader in digital technology for broadcast.

With the mid-March acquisition, Gentner now manufactures a digital telco hybrid, a three-line digital frequency extender, the Lazer and Prizm digital audio processors, and the Audisk digital satellite automation system. The company's high-end Digital Audio Workstation Network (DAWN) is on a developmental hiatus, undergoing refinement.

According to Gentner's Broadcast Sales Manager Elaine Jones, Gentner's move into digital technology was a carefully orchestrated expansion from the company's original focus. The firm has "an aggressive plan to develop its digital expertise and apply it to product development in the future," Jones said.

Gentner Communications Corp.—formerly Gentner Electronics—literally got its start in the basement of its founder, Russell Gentner, in 1981. Gentner, who has an electrical engineering degree and MBA from the University of Utah, was the Assistant CE at KSL in Salt Lake City when he started designing prewired audio patch panels (which the company does to this day).

Starting with telcos

From there, the firm moved on to designing telco interfaces, based on experience Russell Gentner accrued while still in college. The company soon became one of the foremost telco manufacturers in the broadcast industry.

Growth for the company came quickly, and Gentner began to experiment with diversification in its product line. John Leonard, in his stay with the company, designed a transmitter remote control, the VRC-1000, which was released at the NAB convention in 1986. Later upgraded to the VRC-2000, the product is still a popular item in the Gentner line.

According to Jones, the four-year-old company went public in 1985, and joined the NASDAQ index in 1989.

It wasn't until the fall of 1988 that Gentner really began to show its intention to broaden the scope of the company. Glen Clark, the founder of Texar, sold Gentner the technology for two of his audio processors, the Phoenix and the Audio Prism. Gentner was now in the processing business.

The company was particularly pleased with its purchase of the analog Prism, which Jones called "a dynamite piece of equipment that has been a terrific seller for us."

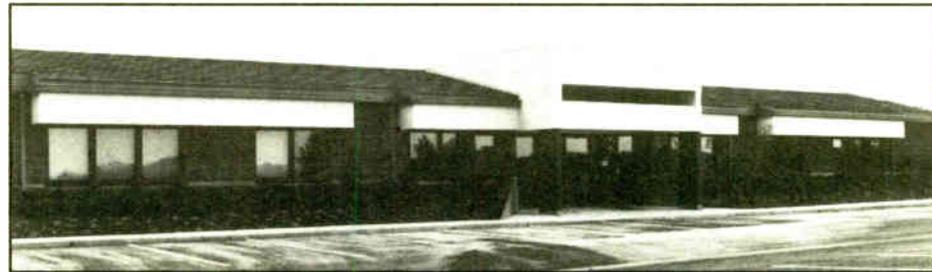
A digital focus

From there, Gentner developed the Lazer and the Prizm, a digital version of the Audio Prism, which uses fiber optic inputs and outputs to remain truly digital throughout the signal path. The company's efforts were rewarded in September 1991, when Gentner made a secondary public stock offering.

The acquisition of the MacroMedia Audisk system has now taken Gentner into the realm of hard disk-based on-air record and

replay devices, a strong growth area in broadcast technology of late. Several engineers specializing in digital products have been hired in recent years by Gentner, reaffirming the company's commitment to the technology.

Where does the future lie for Gentner Communications? Although Jones was enthusiastic about the company's growth in the teleconferencing market—a complete boardroom teleconferencing system is a new big seller for Gentner—she stressed,



Gentner Communication's Salt Lake City headquarters

"the company got its start in broadcasting, and we're not planning to move away from that area."

Instead, Gentner plans to continue its expansion into radio studio equipment. "We still lack a few key product areas," Jones said, noting that the company may either develop the products itself or purchase the technology as it did with Texar and Mac-

roMedia.

In particular, Gentner is eager to explore technology that will tie together all areas of station operation, possibly even supplanting some more time-tested equipment such as audio consoles.

"That's going to be the station of the future," Jones said. "And it's probably not all that far away."

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STATION SERVICES

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Sales Workshop Launched

PORTSMOUTH, N.H. Jeraf Marketing's John Fellows has developed a sales workshop and accompanying 120-page workbook titled: "Nuts 'n' Bolts: Time-tested Street-level Selling Tips that Work!" The workshop was presented at the NAB Spring Convention last month.

"Nuts 'n' Bolts" teaches a three-step method for achieving sales success. Selling insights, attitude-tuning thoughts and selling tips help walk participants through conceptualizing, understanding and applying real-world solutions to common selling situations.

For more information, contact John Fellows at 207-781-5756, or circle Reader Service 106.

Spanish Poster Released

NEW YORK The Arbitron Co. is distributing a newly produced ratings distortion poster to Hispanic radio and television stations throughout the U.S. The mailing is in response to concerns about ratings distortion expressed by the Arbitron Radio Advisory Council.

The poster is bilingual, and designed to inform Hispanic broadcasters about the special station activities guidelines—intended to prevent ratings distortion. For more information, contact Thom Mocarsky at Arbitron: 212-887-1314; fax: 212-887-1390; or circle Reader Service 134.

New Broadcast Service

COLORADO SPRINGS, Colo. The former director of major market affiliations for Unistar Radio Networks, Skip Joeckel, has formed Executive Broadcast Services (EBS). EBS markets a variety of radio programs and services to radio stations.

Available from EBS are: the Business Radio Network; American Forum Radio; Farwest Communications music services; The Goal Line Guide, a pro/college football ad magazine; Paragon Research; Broadcast Management services; Radio Placement Service; the M Street Journal and the Rad Report.

For more information, call Skip Joeckel at 719-630-8407, or circle Reader Service 38.

Weekly CD Service Debuts

ORCHARD LAKE, Mich. Radio Programming and Management Inc. has debuted a weekly CD service, "Top Hits U.S.A." "Top Hits U.S.A. contains AC, CHR, and country hits, plus a recurrent disc every eight weeks containing approximately 17 cuts from one format.

For information contact Tom Krikorian at 800-521-2537, or circle Reader Service 16.

U.S. and Overseas Consultation

ALBUQUERQUE, N.M. KBE Broadcast Services is offering two consultation packages in addition to a series of support services for radio stations in the U.S. and overseas.

The station and market assessment report KBE offers is prepared in-market, and is designed to determine a station's "health" as well as contributing factors to its overall performance. The report will suggest options on how to improve a station's performance based on existing market and station conditions.

KBE also offers a management consultation package that includes supervisory

services for turnaround situations and start-ups, as well as on-site management contracts, staff and operational restructuring and initiation of new systems.

For more information, contact Karl Baehr at 505-828-0488; fax: 505-828-0488, or circle Reader Service 120.

Aircheck Service Available

SYRACUSE, N.Y. Managers looking to improve their on-air sound can take advantage of the services of Air-Checks U.S.A., an on-air talent consultancy firm.

Air-Checks will monitor your station's sound to identify areas for improvement for your air talent. The service targets such problems as ineffective music mix, careless station positioning, negative rapport with the audience, questionable articulation and dead air.

For more information, contact William Tinsley at 315-788-0914, or circle Reader Service 26.

Marketing Firm Formed

NEW YORK Radio network veteran, Dan Forth, has formed MediaStar Interna-

tional to provide marketing, management consulting and related services to program suppliers and broadcasters.

The new media services company will specialize in marketing services to network and syndicated radio. The company also will act as an agent for select suppliers—including negotiating distribution, clearance and advertising sales arrangements with established firms.

For information contact Dan Forth at 212-302-1100, or circle Reader Service 133.

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RCA BTE-15A w/(2) SCA gener, extender board & book. 503-774-0459.

Crown Micro-Tech 1200 stereo power, 320 wch 8 ohms, 495 Wch 4 ohms, 700 Wch 2 ohms, 1315 Wmono 4 ohms, xferable warranty. B Fisher, KPOK, POB 829, Bowman ND 58623. 701-523-3883.

Audiometrics (2) dist amps, \$160 ea. B Dees, KARX, 3507-A Van Tassel, Amarillo TX 79121. 806-355-4554.

Ward (6) modules & pwr supply in cage. D Morgan, KNZZ, Box 969, Grand Junction CO 81501. 303-241-9230.

WE FM pwr, 80 W, 88-108 MHz w/pwr supply, \$250. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

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

BE EP-1 phono preamp, clean, \$75. B Glenn, KOTY, 830 N Col Ctr Blvd, Kennewick WA 99336. 509-783-0783.

Ampex (2) R/P. D Morgan, KNZZ, Box 969, Grand Junction CO 81501. 303-241-9230.

Mac tube, MC275, 75/75, 60, 240, C-22; Marantz 7C, 9S, 1S #2. Yun, Sleeping Beauty, 1129 S Robertson Blvd, Los Angeles CA 90035. 310-274-1921.

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

Rane, Furman, other headphone amp for rdg studio application. W Dougherty, WLD Rcdg, Music Valley Rte 1, Mill Spring MO 63952. 314-998-2377.

ANTENNAS & TOWERS

Want to Sell

Collins 40 kW horiz only, 95.3 MHz, \$500+s/h. J Crawley, WMJL, POB 185, Campbellsville KY 42718. 502-465-5762.

Prodelin 20' fiberglass dish, geo-stationary, BO+s/h. T Johnson, 415-355-1020.

ERI 12-bay FM on 94.5 MHz. E Roskelley, KMRK, 4000 Rasco, Odessa TX 79764. 915-366-3711.

Delta TCA 5/10 EXR AM base current meter, removed due to AM going dark w/manuals & in orig box, \$350. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

ERI FMH12AC parts. T Wortmann, WJAG, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

Andrew/Cablewave (62) 1/2", (62) 1 5/8" insulated hangers, (100) 1/2", (50) 1 5/8" non-insulated hanger kits & angle mounting hardware for both. C Fox, WOLF, 4853 Manor Hill Dr, Syracuse NY 13215. 315-468-0908.

Gorman/Redlich AM ant wired for 3 towers, can accept 6, 11 yrs old, \$1000. J Randolph, WHIR, Box 1230, Danville KY 40422. 606-236-2711.

AP0 8 7/8 UHF horiz polar, 11 dB gain, 2 kW input, panels, \$790 per bay. A Branch, KYAY, 2402 Woodridge Dr, Decatur GA 30033. 404-325-7647.

RCA MI-27791D-1A 20' lengths, 3" universal 50 ohm trans line, excel cond w/accessories, 9" also avail, \$250 per length/BO. N Jeweller, US Tower Svcs, 5263 Agro Dr, Frederick MD 21701. 301-874-5885.

ERI single-bay, rototiller type, tuned to 104.9, \$1000/BO. E Coffman, KEZU, 7007 Riviera Dr, Ft Smith AR 72903. 501-782-0361.

Want to Buy

400' or 3-1/8" or 4" Helix. Contact Helen TV at 809-452-2693.

3-tower array on 1290 kHz. L Martino, KMEN, 2001 Iowa Ave, Riverside CA 92507. 714-684-1991.

Complete setup for talk, news & music, late, high quality equip, 14'x30' 2-axle mobile studio, 5 yrs old w/AC & restroom. 503-774-0459.

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4CX 20000 D rebuilt, \$1000. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

dbx 224x type II noise reduc unit, rack mount, new, \$105. B Dombrowski, WhirlWind Prods, 10356 W Warren Ave, Dearborn MI 48126. 313-584-4038.

Soundcraftsmen octave EQ, metered & rack mtg, excel cond, \$75/BO. B Laughlin, L-Pad Elect, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

Orban 622B parametric eq, rack mount, stereo, excel cond, \$850/BO. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Zercom Z-82 phone console, 4 chnls, rotary, \$700/BO. M Berry, KGWY, POB 1179, Gillette WY 82716. 307-686-2242.

Lexicon PCM-41 dig delay proc, clean, used little, \$400. V Richardson, WTKT, POB 12890, Lexington KY 40583. 502-863-1580.

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Kintronics 3-tower phasor & 3 Delta tuning boxes, excel cond, \$2250. J Randolph, WHIR, Box 1230, Danville KY 40422. 606-236-2711.

ERI (2) 24" rigid coax sections, 3 1/8 flanged both ends in orig box, \$250 ea/\$375 pair. K Brown, KTRZ, Box 808, Riverton WY 82501. 307-856-2922.

Kintronics FMC 7.5 isocoupler tuned to 92.7 MHz, like new, \$500/BO. C Haynes, WJMI, POB 10387, Jackson MS 39289. 601-948-1515.

ERI-Collins FML-3E 3-bay, 1979, freq 95.9 or close, 1 5/8" fittings; G5CPM-3E, pole mount pref. D Rose, KAAA, 2534 Huala Pae Mtn Rd, Kingman AZ 86401. 602-753-2537.

Harmonic filter for 5 kW, any mfr; Phelps-Dodge 8 bays+, any cond, 100-108 MHz. Dick, WOYS, 1591 Boyle Rd, Hamilton OH 45013. 513-863-0774.

S.W.R. ANTENNAS TV FM LPTV call JIMMIE JOYNT 800/279-3326

Andrew 3 1/8, 1 5/8 & 7/8" adaptors, reducers & fittings, new/used. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

RCA BFC deicers removed from RCA BFC antenna. BO, R Dees, KARX, 3507-A Van Tassel, Amarillo TX 79121. 806-355-4554.

ERI 425 isocoupler, tuned to 95-105 MHz, 3800'. D Kiker, WTKX, 8084 N Davis #138, Pensacola FL 32514. 904-478-6011.

ERI G5CPS-8 on ground Santa Fe NM, 95.5 FM, BO. J Curtis, KFRO, POB 4299, Longview TX 75606. 903-663-3700.

Potomac AMM-19-D 6-tower dig monitor, excel cond, \$2500. M Turner, WYIC, 7641 Camberwood Dr, Indianapolis IN 46268. 317-872-3004.

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Schafer 903E 4 racks, 4 Carousels, brain, cart PB unit, 200 Audiopak A-2 carts, gd cond when removed from svc, spare parts, extra heads, \$3200. K Brown, KTRZ, Box 808, Riverton WY 82501. 307-856-2922.

Schafer 903 (7) 24-tray Carousels, IO cards, cables, racks. D Widmer, KTEL, 112 NE 5th, Milton-Freewater OR 97862. 503-938-6688.

Schafer 800 auto controller w/25 Hz detector in rack, \$300. E Stanley, KBTO, Box 12, Bottineau ND 58318. 701-228-2483.

MW Persons 3-A prog w/unit sequential rotation of up to 4 sources & manual; Microprobe Elect 24-station 8-source auto controller, nds repair/spare parts w/remote control switch pad, \$100. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Harris SC-90 (4) 42-tray Go-Carts, (1) 72-tray Go-Cart, (1) 12-tray mono Instacart, (4) Scully 270, stereo, all in excel cond. R Fess, WLRP, 119 W Carroll St, Macomb IL 61456. 309-833-5561.

Format Sentry FS 12C w/UPS system, Tandy 1000 TL/3 computer, CM-5 color monitor, both w/2 yr warranty, 6 mos old, \$3500; (3) IGM 504D dual 25 Hz detectors, excel cond \$125 ea/\$300 both; Conex 25G Tone Gener, 2 mos usage, mint, \$250. Pegi, Global American, 1788 Coral Way N, Verbo Bch FL 32963. 407-231-4800.

SMC (3) cabinets, (3) #350 circ Carousels, (4) 750-series R-R decks, (1) LT-5 Brain, \$5000. T Steel, WMRX, POB 1513, Midland MI 48640. 517-631-1490.

SMC RP1000 prog w/PDC-3 clock, pwr supplies & DS-20 switcher, \$300. E Stanley, KBTO, Box 12, Bottineau ND 58318. 701-228-2483.

SMC ESP-1 '82 w/DS-20A switcher, PDC-5 clock, (3) 350 Carousels, works terrific, \$5500; SMC DP-2 w/DS-20 switcher, PDC-5 clock, (2) 350 RSB Carousels, (2) SMC racks, works great. B Christie, Grande Radio, POB 907, LaGrande OR 97850. 503-963-4121.

SMC RP1000 prog w/PDC-3 clock, pwr supplies & DS-20 switcher, \$300. E Stanley, KBTO, Box 12, Bottineau ND 58318. 701-228-2483.

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Smartcaster used Audisc/digital DJ. E Roskelley, KMRK, 4000 Rasco, Odessa TX 79764. 915-366-3711.

BE 16 system for tape/sat, 3000 events software w/pwr supply, audio proc, main proc, remote control, CRT, printer, customer & sat interface, 10 audio cards, 6 interface cables, spare cards & parts, IGM 60 Cart II 78-tray, (2) IGM 60 Cart II 42-tray & IGM spare parts w/manuals, (4) Scully P/B decks, (4) BE racks, BO+s/h. D Brown, KVLE, POB 832, Gunnison CO 81230. 602-645-8181.

BE Control 16 system w/14 source cards, cust interface panel, batt backup, keyboard, 2 video displays, download interface software, 6 Scully 270s, 4 Carousel 250s, IGM Go-Cart II-42, 4 Gates single play cart decks, manuals, spare parts; SMC DPI, keyboard, AS-15 switcher, MA-4 monitor amp, printer interface, 6 Carousel 350s, 4 Scully 270s, 2 SMC 722 dual play decks, 2 TS-25 tone sensors, 2 remote control units, 5 racks, manuals, spare parts, both in working cond, \$15000 ea. G Carter, 407-567-8366.

Instacart Stereo 48 48-tray w/Sentry interface, \$2600/will trade for stereo console. R Davis KPIK, 108 Dewitt Henry Dr, Beebe AR 72012. 501-882-3331.

Audiometrics AMCD5-1000A (4) jukebox CD plyr, holds 100, control via RS-232 port, excel cond, \$2000. R Irwin, KSAC, 1021 2nd St, Sacramento CA 95814. 916-446-2294.

Cetec 7000 w/4 ITC 750 R-R decks, (9) Audiofiles, (2) Beethiv terminals, gd working cond. C McCarthy, 916-244-9700.

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ITC delay & rec & PB, mint; (3) Tapecaster 700's. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-784-1059.

ITC Series 99 w/ELSA stereo R/P, nds work, BO. J Curtis, KFRO, POB 4299, Longview TX 75606. 903-663-3700.

Abko 300 (2) lazy susan-type storage rack, holds 300. BO. T Webb, WZQK, POB 150, Coeburn VA 24230-0150. 703-395-3997.

BE 2100 RP mono, excel cond, BO; Tapecaster 700-RP/delay, gd cond, \$300 ea. B Brinizer, WDNC, 1000 Park Forty Plaza Ste 120, Durham NC 27713. 919-361-1051.

Tapecaster 700, \$150. E Stanley, KBTO, Box 12, Bottineau ND 58318. 701-228-2483.

ITC 3-D stereo triple-deck R/P w/remote start control box, \$1200. R Reeves, Voice At Large, 5080 Bainbridge Ct, Lilburn GA 30247. 404-925-8868.

Audicord DL series (2) PB. D Brook, WNLB, POB 602, Rocky Mount VA 24151. 703-483-7011.

Fidelipac CTR-12, (3) PB only, size A cart, 3 cue, desk mount w/rack, plug in circuit boards; (1) CTR-14 PB & rec, size A, 3 cue, desk mount, plug in circuit boards; (1) ESD-10 eraser/splice locator; (115) 380-25 40-second carts; (60) 380-44 70-second carts; (10) 380-63 100-second carts; (10) 380-94 2.5-minute carts; (5) 380-207 5.5-minute carts, BO. T Webb, WZQK, POB 150, Coeburn VA 24230-0150. 703-395-3997.

ITC 3D mono 3D0003 all cue tones, new heads, bearings & pinch rollers, quiet, clean w/new IB, \$1000. Pegi, Global American, 1768 Coral Way N, Vero Bch FL 32963. 407-231-4800.

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Ampex ATR 700, \$800. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

Tascam 38 (2) 8-trk 1/2", 1 in very gd cond, \$1500, 1 mint, \$1700. R Messick, WKGR, 3223 Comm Pl #101, W Palm Bch FL 33407. 407-686-9505.

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Otari MX 7308 1" 8-trk, 15/30 ips, w/remote, \$3900; Studer/Revox PR99 2-trk, 7 1/2 & 15 ips, both w/low hrs, excel cond; Technics 1500RS 2-trk, 15, 7 1/2, & 3 3/4 ips + 1/4-trk PB head w/remote, \$950. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

Scully 280 parts. R Robinson, 203-269-4465.

Recordex 5-cess duplicator, both sides w/reel deck, \$500. R O'Kelly, 503-733-2217.

Revox A-77 (2) w/wood cases, \$300 ea; 1 rack mount, \$200; 1 for parts, \$75. R O'Kelly, 503-733-2217.

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Scully 284B-8 8-trk 1", 3 3/4 to 30 ips, w/VS-78 variable spd module, less than 100 hrs & manuals; MCI JH110A 1/2", 9 yrs old, 7 1/2, 15, 30 ips, gd cond w/manuals, will ship, \$2500, 415-969-3030. T Sherry, Rcdg Cons, 1412 Clarity Ave, San Jose CA 95130. 408-244-3848.

Revox 278 1/2" 8-trk, excel cond, \$3000; Tascam 32 2-trk, gd cond, \$800. J Rose, Digital Playroom, 20 Marion, Brookline MA 02146. 617-277-0041.

Radio Systems RS-1000 DAT R/P w/updated software, PROM installed, low hrs, excel cond, \$1500. P Temple, Carson Radio, 120 Beechwood Trail, Exeter RI 02822. 401-846-8141.

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MCI JH110A (6) 2-trk, most need heads, w/ consoles, many spare parts, \$500; (2) w/roll-around consoles, \$500. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

GX77 clean, gd shape, \$250. J Parsons, 2781 Fayson Cir, Deltona FL 32738.

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Scully 2813-8 8-trk 1", 3 3/4 to 30 ips, made w/VS-76 variable spd, less than 100 hrs use w/manuals, BO over \$4000. T Sherry, Rcdg Cons, 1412 Clarity Ave, San Jose CA 95130. 415-969-3030.

Ampex 602/601 (4) w/cases, BO; 440 (2), 1 mono, 1 stereo, very gd cond, BO. B Brinizer, WDNC, 1000 Park Forty Plaza Ste 120, Durham NC 27713. 919-361-1051.

Telex 6120 high-spd cass duplicator master & 3 slaves, \$2500; Telex/Viking RP110 & RP112 transports & elects, several sets in various conds, \$100 set. Katherine, Linden, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Otari ARS1000 stereo, play, excel cond, \$900/BO; ITC 850 (2), fair cond, BO. B Brinizer, WDNC, 1000 Park Forty Plaza Ste 120, Durham NC 27713. 919-361-1051.

Dictaphone (2) logger/recorder, slow spd w/manuals. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-784-1059.

MCI JH110A 1/2", 9 yrs old, 7 1/2, 15, 30 ips, heads in gd cond, analog meters w/manuals, \$2500 incl s/h. T Sherry, Rcdg Cons, 1412 Clarity Ave, San Jose CA 95130. 415-969-3030.

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JVC R431 (7) R/P, bi-directional wired for remote start/stop w/Henry Match Box Interface, 2 mos usage, mint, \$200 ea/\$1200 for 7. Pegi, Global American, 1768 Coral Way N, Vero Bch FL 32963. 407-231-4800.

TEAC A2300S, \$175. E Stanley, KBTO, Box 12, Bottineau ND 58318. 701-228-2483.

Ampex 440. T Wortmann, WJAG, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

Otari MX5050BII 10 1/2", \$1195; tiltble floor stand for Otari, \$95; Scotch 8206 1" tape on 10 1/2" NAB metal reels, \$15 ea. G Wachter, FYI, 6312 N 1st Ave, Phoenix AZ 85008. 602-258-6161.

Otari 5050B 1/2", 4-trk w/case & remote, very gd cond, \$4250. G Fern, Best Audio, POB 2366, Van Nuys CA 91404. 818-763-2378.

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Miniature: prof/consumer, small, colored, empty, 3-5" & 1 & 2" any color, red leader tape. J Morinelli, 215-789-2742.

FX RCA MI 141100H manual/pinout for control connector. S Dorsey, WCWM, 173-7 Merriam Terr, Williamsburg VA 22163. 804-229-1547.

Cash for tube type R/R, Ampex, Roberts, Magnecorders, Reagertones. J Schramm, 205-826-0390.

Otari MX-5050 MKIII-4 in gd physical/elect cond in roll around cabinet. J Glass, WROK, 3901 Brendenwood Rd, Rockford IL 61107. 815-399-2233.

Scully '100' recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 1131 Virginia Ave, Campbell CA 95008. 408-866-8434.

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Comtel CBC 3000 (2) w/printer & Akai R/PB cass decks, \$2000. S Kozak, 216-871-5897.

Apple 2E w/dbct software, \$500. E Stanley, KBTO, Box 12, Bottineau ND 58318.

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Edcor MX300P (3) 8-chnl audio mixer, mic/line inputs, rack mountable, 1 3/4" H, new, \$90 ea/BO. M Wagner, LTM, 177 Hartford Rd, Manchester CT 06040. 203-565-9851.

Tascam 224 24x4x2 rcdg/live sound mixer, very gd cond. R Messick, WKGR, 3223 Comm Pl #101, W Palm Bch FL 33407. 407-686-9505.

Soundcraft 200B mixing desk, 16x4x2, clean & quiet, \$1800; Otari MK-III 8-trk, low hrs, great sound w/cables, \$3000. C Lallo, Earthheart Inc, 465 W Anderson St, Hackensack NJ 07601. 201-646-0277.

Gates Gatesway tube-type, mono, excel cond, some spare tubes, \$200/BO. P Wasson, Palm Tree Prods, 1106 Pineland Ave, Venice FL 34292. 813-488-4569.

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Opamp Labs 20-input, 8 subs + stereo mix out, gd prod board, \$2500. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

Radio Sata Octopus 2408 24-chnl in, line out, 250 W out, 10 W cue, talk back, aux & RF out, subgroup & more, \$22000 incl s/h. A Branch, KYAY, 2402 Woodridge Dr, Decatur GA 30033. 404-325-7847.

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Harris Dulux 80 8-chnl, gd cond, mono, \$900/BO; BE Spotmaster, 8-chnl, mono, gd cond, \$800/BO. B Brinizer, WDNC, 1000 Park Forty Plaza Ste 120, Durham NC 27713. 919-361-1051.

Ramko DC5RA 5-chnl board, fair cond. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-784-1059.

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CBS DPE-450 EQ w/book, works well, \$350/BO. R Rushing, Rcdg Studio, 11710 Hoyt Ave, Tampa FL 33617. 813-988-0496.

Gas moving coil cart preamp, black rack mount, excel cond, \$195/trade; Leak Point One stereo tube, hi-fi preamp, 1959 mdl, \$150/trade; Pultec HLF-3C, excel cond, \$250/trade. J McLane, Oddeo, 115 W Gutierrez, Santa Barbara CA 93101. 805-963-3941.

JBL 4911 (2) speakers, never used, BO; TFT EBS1 rec (94.7) & encoder; Micro-trak audio DAs 7215; dbx 900 mainframe, BO. B Brintizer, WDNC, 1000 Park Forty Plaza Ste 120, Durham NC 27713. 919-361-1051.

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LIMITERS

Want to Sell

Marti CLA-40H (2), \$100 ea. J Michaels, WMVR, 2929 Russell Rd, Sidney OH 45365. 513-498-1055.

Gates SA-39 tube type, gd cond, \$100. D Merrill, WROA, POB 2639, Gulfport MS 39505. 601-832-5111.

UREI BL-40 w/manual, \$175. D Stebbins, KZZN, Box 192, Littlefield TX 79339. 806-385-4474.

Harris MSP90 AM peak, \$300. R O'Kelly, 503-733-2217.

Optimod 8000 and 8100 Buy—Sell—Trade 414-482-2638

CBS Audimax needs some tubes, \$75. R Rushing, Rcdg Studio, 11710 Hoyt Ave, Tampa FL 33617. 813-988-0496.

dbx 140 type II noise reduc, stereo; Comrex RLX single space rack mount; CRL FM-2 w/SPP-800 stereo prep proc & SP-800 stereo mod proc, BO/all. J Geerling, KYKY, 3100 Market St, St Louis MO 63103. 314-531-9898.

CBS 4000 Volumax, \$400. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

ATI Emph-A-Sizer, \$400. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

Volumax 4000A, \$300/BO, 1 for parts; Orban 245E synthesizer, \$200. R O'Kelly, 503-733-2217.

Mod Sciences Stereomaxx FM audio separation enhancer, 1 yr old, \$1200. A Keddie, WTPI, 3135 N Meridian St, Indianapolis IN 46208. 317-925-1079.

FXR Psychoacoustic proj, like new cond, BO. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

CBS 410 FM Volumax auto peak controller, \$175/trade; CBS 400 Volumax auto peak controller, \$150/trade. J McLane, Oddeo, 115 W Gutierrez, Santa Barbara CA 93101. 805-963-3941.

Audio & Design Xpress FM stereo compressor/expander, gd cond, \$100; dbx 142, stereo noise-reduction system, new, \$75. B Glenn, KOTY, 830 N Col Cir Blvd, Kennewick WA 99336. 509-783-0783.

CRL PMC-450 meets NRSC, installed 1990, removed due to AM going dark w/manuals & in orig box, \$1000. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

UREI BL 40 AM compressor, \$400. J Randolph, WHIR, Box 1230, Danville KY 40422. 606-236-2711.

Orban 8000A pulled from svc 1/92, rechipped, \$1600. D Christien, KPLU, Adm 207, Tacoma WA 98447. 206-535-7265.

Orban 8100A/ST studio chassis for 8100A, BO; CRL SEP-400B (2), low mileage, BO. B Brintizer, WDNC, 1000 Park Forty Plaza Ste 120, Durham NC 27713. 919-361-1051.

Optimod 8000A gd cond, \$2300. K Smith, WNCG, Box 66, Clyde OH 43410. 419-547-8792.

Gates Solid Statesman, BO. D Morgan, KNZZ, Box 969, Grand Junction CO 81501. 303-241-9230.

Want to Buy

Gates Solid Statesmen/similar. Rick, GRN, POB 2495, Patchogue NY 11772. 516-736-6347.

Aphex 103A Compellor, aural exciter. R O'Kelly, 503-733-2217.

CRL PMC 300A peak. D Brown, WBZ, 49A Prairie Ave, Newton MA 02166. 617-332-9326.

MICROPHONES

Want to Sell

EEV RE-11 w/bass roll-off switch, blast filter, 90 Hz-13 kHz, lined metal storage box, gd cond, \$80; Nady 49-R wireless system, lavalier mic, body xmt, rcvr has signal & audio bar graphs, 120/12V oper, tuned to red chnl 49.830 MHz, gd cond, \$75. R Williams, Kreuger Prods, 6333 Pacific #203, Stockton CA 95207. 209-461-2123.

EV RE16/RE10 (3) EV RE165 & EV RE10, new, \$240 ea/BO; (1) RE10, \$160 ea/BO. M Wagner, LTM, 177 Hartford Rd, Manchester CT 06040. 203-565-9851.

AKG D-900 (2) dynamic long shotgun, \$125 ea; (1) CK-9 long shotgun capsule, \$125; (1) N46E 2-mic, AC, pwr supply, \$75. E Toline, Audio Etc, 525 W Stratford Pl, Chicago IL 60657. 312-975-6598.

beyerdynamic hand held, works well, \$30+s/h; EV 664, dynamic cardioid, \$30+s/h; EV 655C wide range dynamic omnidirectional 50/150/250 ohm output choice, \$30+s/h; Shure SM50 50/150 ohm dual impedance, \$40+s/h; Shure A55M isolation shock mount for SM57, will work w/any mic w/similar diameter, \$15+s/h. R Zimmer, 602-326-2088.

Alan Gordon Sonic #312 fish pole mic boom, new, \$105. B Dombrowski, WhirlWind Prods, 10356 W Warren, Dearborn MI 48126. 313-584-4038.

Shure SM61 (2), excel cond, gd for announcer, remotes, sports, \$75 ea/\$140 both/trade for EV RE20 or headphone amp. W Dougherty, WLD Rcdg, Music Valley Rte 1, Mill Spring MO 63952. 314-998-2377.

Telex FMR-50 hand-held wireless mic & rcvr, \$295. G Wachler, FYI, 6312 N 1st Ave, Phoenix AZ 85008. 602-258-6161.

Desk mics (hiZ), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books #8 & #9; RCA tube manual; Sony head demagnetizer (new); jack female connectors; EV 502 transformer primary/secondary. Mr. Oliver, 212-874-7660/0274. Call afternoons till 10PM.

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

HP lab reference prefer 1" condenser unit. S Dorsey, WCWM, 173-7 Merrimac Terr, Williamsburg VA 22183. 804-229-1547.

MISCELLANEOUS

Want to Sell

Audio Xformers: (9) Ampex 4580116-20, 600 ohm input-15k ohm out; (4) Triad A10-J & Peerless 15095, both 150/600 ohm input to 60k ohm out, \$15 ea. S Lawson, KAK Prods, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

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Triad 120/7 isolation xformer for breaking pwr line to load grd loops, 120 V in/out, 7 amps, \$70; (2) EEV T-350 hi-freq tweeters, (2) University mid range 1040A, (2) 3-way University, N-3 crossover ntws, \$200 all. S Lawson, KAK Prods, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Texas Instruments mdl 700 printer. T Wortmann, WJAG, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

Patch panel ADC-J341 harnessed w/Belden shielded cable to ADC PJ106 conn block, BO/trade for R/R ATR. J Schramm, 205-826-0390.

ACTION-GRAM

Equipment Listings

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

Please print and include all information: I would like to receive or continue receiving Radio World FREE each month. YES NO

Contact Name: _____ Title _____ Signature _____ Date _____

Company/Station _____ Address: _____ Please circle only one entry for each category:

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Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Line ad listings & display advertising are available on a per word or per inch basis. Call 1-800-336-3045 for details.

I. Type of Firm

D. Combination AM/FM station F. Recording studio
A. Commercial AM station G. TV station/teleprod facility
B. Commercial FM station H. Consultant/ind engineer
C. Educational FM station I. Mfg, distributor or dealer
E. Network/group owner J. Other _____

II. Job Function

A. Ownership D. Programming/production
B. General management E. News operations
C. Engineering F. Other _____

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

Price: _____

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

Price: _____

*Closing for listings is the first and third Fridays for the next month's issue. All listings are run for 2 issues unless pressed for space or otherwise notified by listee.

Broadcast Equipment Exchange

703-998-7600 PO Box 1214 • Falls Church VA • 22041 FAX: 703-998-2966

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

Creative 9-yr pro, major mkt, exper CHR, UC, jazz, seeks PD, APD, MD in med-small mkt. Skip, 212-465-3416.

1-yr college grad w/BS in Comm, prod specialization w/quality voice & superb prod, the investment your station is looking for. Colin, 703-754-2681.

Take charge mgr revenue/ratings driven w/25 yrs exper, new constructions, upgrades, sales, programming, short term considered, South/Mid West. J Parker, 502-247-0090.

Aggressive, tireless, company-minded seeks sml/med Midwest mkt mgmt pos, 13 yrs exper as Ops Mgr, Bus Mgr, CE, sales on-air. Deb, 712-792-5653.

Exper friendly highly-motivated adult communicator w/great prod skills seeks stable oppor, team player. AColdies/C&W. Dave 712-262-7954.

Bdct adv specialist w/19 yrs exper in mgmt/sales, NE area, radio/TV/agency corp promo expert, copy, prod. 617-834-0028.

Irish CE hard working, AM/FM/STL/construction w/11 yrs bdct exper, SBE senior cert wants to move to USA. Peter, 011-353-1-406778.

Sports/News announcer looking for the right area w/ 5 yrs exper in p-b-p, host, etc, have tape, will travel. Jack, 812-838-4484.

Production/personality exper, skilled, talented & creative, countless voices & accents, solid & conversational, seeking good home in Madison WI. Scotty Matthews, 615-526-7099.

BET grad working on bus degree, 10 yrs comm broadcast exper in prog & ops & cust svc/repair exper. D Koehm, 217-228-2115.

Novice announcer looking for pos in San Antonio TX area, any format/shift. Tracy, 512-654-7530.

CE w/big prod voice & over 15 yrs hands-on engrg exper seeks CE pos w/prod or air shift in competitive top 100 mkt. G Morgan, 704-563-8676.

1 yr & 2 wks exper on the air +1 month prod dir. Gary, 914-266-1173.

HELP WANTED

CHIEF ENGINEER: WCOL AM/FM COLUMBUS, OH
Top market AM/FM combo seeks Chief Engineer. Must have 5 years broadcast experience, solid AM/FM transmitter RF and troubleshooting skills. Personal computer use/repair ability a ply! Must be organized, self-motivated and able to work with people. Send or Fax resume to:

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WCOL AM/FM, DEPT. K
195 E. BROAD ST.
COLUMBUS, OH 43215
FAX: 614-461-1193

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EMPLOYMENT SECTION

HELP WANTED: Any company or station can run "Help Wanted" ads for \$1.50/word or buy a display box for \$55/column inch. Payment must accompany insert, use your MasterCard or VISA; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

POSITIONS WANTED: Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 2 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$10 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

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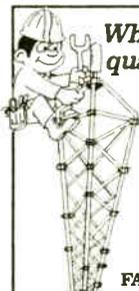
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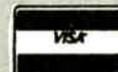
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MISCELLANEOUS . . . WTS

2-Meter type photo light controllers. D Morgan, KNZZ, Box 969, Grand Junction CO 81501. 303-241-9230.

Weather radar Raytheon color 4804C, 80 mile range, \$3500/BO. M Berry, KGWY, POB 1179, Gillette WY 82716. 307-686-2242.

Rotron Blowers for Elcom, CCA, CSI, McMartin, Harris, rebuilt & new.
Goodrich Enterprises Inc.
11435 Manderson St., Omaha, NE 68164
402 493 1886 FAX 402 493 6821

Gentner (4) pre-wired patch panels, great cond, \$190 ea. R Dees, KARX, 3507-A Van Tassel, Amarillo TX 79121. 806-355-4554.

Gates (3) meters in panel, PA voltage, amps, ant current amps. D Morgan, KNZZ, Box 969, Grand Junction CO 81501. 303-241-9230.

Attn Country stations: mid-60s Gretsch Atkings Country Gent guitar autographed by Chet Atkins w/case, great promo giveaway, \$1000. A Peterson, 203-350-6697.

AM retiring, equipment and parts must go. Write or call for list. James Doiron, 505-522-0331.

Combiner, Shiveley FM high pwr xmtr combiner, excel cond, Electro (20 kW) FM air cooled dummy or reject load. Goodrich Ent., 11435 Manderson St., Omaha NE 68164. 402-493-1886.

Want to Buy

Triad HS-29 audio interstage xformer w/push-pull plates to pushpull grids; Triad HS-56/HS-56V audio xformer line to line. A Grundy, Inst Audio Rsch, 64 Univ Pl, NY NY 10003. 800-544-2501.

Non-profit school station has CP. Need audio equipment & 150W transmitter & antenna. Good tax incentives. WWTa, 508-748-2000 x282 or FAX 508-748-0552.

UTC LS xformers; schematic for Western Electro-Acoustic Labs condenser mic pwr supply. R Robinson, 203-269-4465.

Software R/S TRS 80 I word proc, cassette-based; Apple II E. E Stanley, KBTO, Box 12, Bottineau ND 58318. 701-228-2483.

Capacitor new 6 MFD & 5 kV, no PCBs, BO. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

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

TFT 760, \$150; Gates MO2639 AM mod, \$100. R O'Kelly, 503-733-2217.

Gates GTM-88F FM freq. BO. J Michaels, WMVR, 2929 Russell Rd, Sidney OH 45365. 513-498-1055.

Harris AM 80, T Wortmann, WJAG, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

TFT 753 AM w/TFT 755 preselector option, mint, removed from svc due to AM going dark, \$1000. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

TFT 753, \$400. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Want to Buy

FM stereo, working with IB, reasonable price. J Crawley, WMJL, POB 185, Campbellsville KY 42718. 502-465-8884.

MOVIE PROD EQUIP

Want to Sell

McMartin parts specifically tuning fork in EBS decoder. S Engelke, 215-828-6965.

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

Bell & Howell 1500 several 16mm projs, 1 autoleed, ea w/extra lamp. Katherine, Linden, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Bach Auricon MA-11 all-transistor Filmagnetic high Fidelity sound on film amp w/AC pwr pak in fitted case w/cables, BO/trade for Ampex R/R. W Rudd, 205-826-0390.

RECEIVERS & TRANSCEIVERS

Want to Sell

Sony SRF-A1 AM stereo Walkmans, new, \$100 ea. C Fox, WOLF, Box 1490, Syracuse NY 13201. 315-468-0908.

Marti MR 30/150/170 w/pwr supply, tube, \$150. J Michaels, WMVR, 2929 Russell Rd, Sidney OH 45365. 513-498-1055.

McMartin SCA TR 66C; TR 55A; TR 55C. T Wortmann, WJAG, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

Sony SRF-A1 Walkmans, \$100 ea. C Fox, WOLF, 4853 Manor Hill Dr, Syracuse NY 13215. 315-468-0908.

AM STEREO RECEIVERS
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Motorola 2-way radio RPU equip, 161 MHz; Micor 110 W mobiles, 450 MHz; Micor 7045/75 W mobiles, 161 MHz; 15 & 45 W Motrac, Mocom 70 & 30 mobiles & base stations, 450 MHz; Micor & Motrac 12/75/90 W repeaters, 161 MHz. D Davis, KMBA, 5000 Marble NE, Albuquerque NM 87110. 505-262-1866.

SCA decoder, high quality micro-miniature 6792 kHz, prewired & ready to install, \$15. D Jackway, Background Music Eng, 5742 Fair oak, Springfield MO 65810. 417-881-8401.

REMOTE & MICROWAVE EQUIP

Want to Sell

TFT 7601-C digital, \$1200. R O'Kelly, 503-733-2217.

SA DAT (2) 15-kHz cards, \$200 ea. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

Moseley SCG-9, \$250. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

TFT 7700 series composite STL w/hot standby xmtr & rcvr w/T801 remote, BO. L Dupree, KQID, 1115 Texas Ave, Alexandria LA 71301. 318-445-1234.

Moseley TRC15AW 15-chnl remote w/2nd control panel, spare relays, works great, replaced due to FM relocation, \$450. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

COMREX RENTALS
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Marti RPT2 & RPT15 161.67 MHz w/Bearcat rcvr, new. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-784-1059.

db PE/GHz & CV5 Ghz STL link, 950-1000 MHz, 0-8 W, synthesized freq on both w/2 alum 1.2m dish & supports. A Branch, KYAY, 2402 Woodridge Dr, Decatur GA 30033. 404-325-7847.

Moseley TR215 xmtr unit, 10 yrs old, \$250. J Randolph, WHIR, Box 1230, Danville KY 40422. 606-236-2711.

Micro Controls RCR/RCT-9 system, wireline, gd cond w/manuals, \$1000/BO. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Marti 450-455 MHz RPO (2) RP125 xmtrs, (2) RPT 2 W portable, (2) R-R rcvrs, 2 rcvrs, all dual freq, BO. M Berry, KGWY, POB 1179, Gillette WY 82716. 307-686-2242.

Marti Studio Xmtr Link System w/STL-8 xmtr & R-200 rcvr, both FCC approved, excel cond w/manuals, \$4000. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Moseley 505c; 303c; (2) MAD mods for STL. T Wortmann, WJAG, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

Want to Buy

Gentner VRC/Sine System. R O'Kelly, 503-733-2217.

Wegener 1801/1601 systems. R O'Kelly, 503-733-2217.

Burk TC-8/ARC-16 system w/DSU, can be single ended system, either wireline/radio, also Gentner. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

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Systemation Superswitch for sat music ntwk, 1 1/2 yrs old, \$300. S Beery, KRMS, Box 4584, Osage Bch MO 65808. 314-348-2772.

Fairchild Dart 284 digital, very gd cond, 75 audio cards, \$1800. R Lawrence, CHMG, 2251R Winston Churchill, St Albert Alberta, T8N 1B4, Canada.

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STATIONS

Want to Sell

250W daytimer in SW MO just outside Springfield, gd community spl, \$34900. G Muse, KMRF, POB K, Marshfield MO 65706. 417-468-6188.

Class C FM/10 kW AM, Miles City MT, top audience share, reg signals, mint equip, \$595000. Paul, 612-222-5555.

10 kW AM clear chnl, mid dial pos, owner finance. Nights/weekends, 501-470-1525.

Fultime AM non-directional, SE, terms avail w/downpymt, \$85000. L Henley, POB 95, Opelika AL 36803.

Nice AM & LPTV combo in central NC, nr Raleigh, nice bldgs & studios, 2 towers on 8 acres, TV on 4 cable systems, \$550K, financing avail, \$100K down. G Waters, WBZB, POB 1, Selma NC 27576. 919-965-5328.

AM/FM in SE WA state, great ratings, gd billing. Write to: Seller, 1893 32nd Ave NE, Salem OR 97303.

Missouri AM & FM, financing. Hal Duff, 1-800-424-2157 ext 545.

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Want to Buy

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STEREO GENERATORS

Want to Sell

Moseley SCG-3T, \$175. J Michaels, WMVR, 2929 Russell Rd, Sidney OH 45365. 513-498-1055.

Harris/BE STX-18/AS-10 C-Quam AM, works well, very nice mon & Kosmik audio 2300A phase chaser, new, \$995. P Patton, WAPO, 29 W Main St, Jasper TN 37347. 615-942-5611.

Moseley SCG-9 (4), \$750 ea; Dolby 361 A-type (4), \$400 ea; Dolby 334(330) B-type (2), \$700 ea. This equipment has not been put into regular service. Also, Teac 22-2 2-track ATR L/N, \$400. John Zwart, 212-355-7540.

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B&W 410 (2) harmonic distortion & voltmeter, \$50. B Glenn, KOTY, 830 N Col Cir Blvd, Kennewick WA 99336. 509-783-0783.

B&B Phase Scope AM2 used once w/manuals, \$2000. G Fern, Best Audio, POB 2366, Van Nuys CA 91404. 818-763-2378.

Hickok 610 TV/sweep marker gener, gd cond, \$35; NE Nixie frequency counter, gd cond, 240 MHz, \$100. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

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2500 W AM w/cutback, 1979 w/spares & manuals. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-784-1059.

Bendix TDD-5 25 W AM tube-type w/instruction book, on your freq, excel cond, \$320. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Moseley DRS 1, \$2000/BO; DLS 1 logging system, \$1000/BO; RCA BTF 40 E1, gd cond, BO. R Dees, KARX, 3507-A Van Tassel, Amarillo TX 79121. 806-355-4554.

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Collins 20V1 1 kW AM. T Wortmann, WJAG, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

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Collins 20-V-3 new tubes, great shape, \$4000. V Richardson, WTKT, POB 12890, Lexington KY 40583. 502-863-1580.

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FMS 1-C 1 kW, tube w/o exciter, gd cond, \$1500+s/h; Gates TE-3 Statesman FM exciter, solid state, \$750. J Michaels, WMVR, 2929 Russell Rd, Sidney OH 45365. 513-498-1055.

Gates FM1B manual. D Morgan, KNZZ, Box 969, Grand Junction CO 81501. 303-241-9230.

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50 W AM, \$500. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

40 W PA board for CCA exciter, gd shape, BO. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Harris 2.5K gd cond, \$13000. K Smith, WNCG, Box 66, Clyde OH 43410. 419-547-8792.

CSI 25 kW AM, like new cond, 200 hrs, tuned to 1200 kHz, \$25000; Phasemaster T-10K rotary phase converter, gd cond, \$2500. G Arroyo, WONQ, 2483 John Young Pkwy Ste R, Orlando FL 32804. 407-297-1140.

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Technics SP10 MKII electronic, gd cond, \$400. B Glenn, KOTY, 830 N Col Cir Blvd, Kennewick WA 99336. 509-783-0783.

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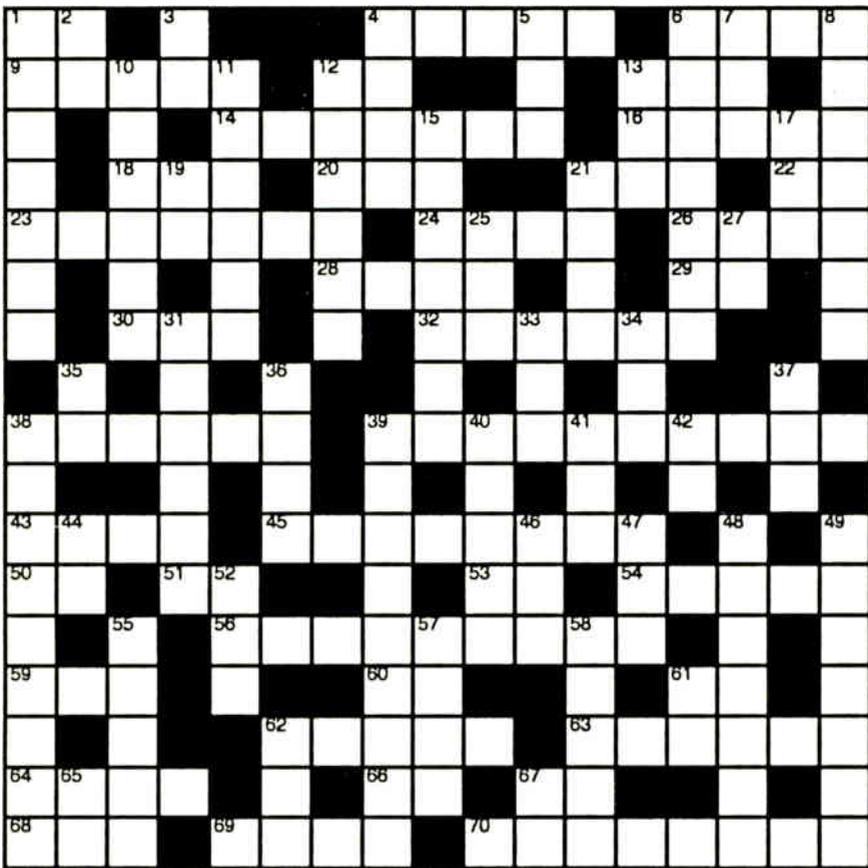
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Sony U-Matic 5000 1/4" play w/RM 580 remote control, mint, 25 hrs head time, \$1500. Pegi, Global American, 1788 Coral Way N, Vero Bch FL 32963. 407-231-4800.

Sony RV-8 (RP) upper drum assembly for VO-4800, \$100; VO-4800 (2) portable, need repair, \$500 ea; AC-340B w/AC pwr & adapter for VO-4800, \$75; svc manuals, \$30. D Christien, KPLU, Adm 207, Tacoma WA 98447. 206-535-7265.

This Month's Crossword



ACROSS

1. Higher
4. Ability
6. Memory
9. What most radio stations play
12. All right
13. Thus
14. Processor from a division of AKG
16. Once more
18. Unit of resistance
20. Medical group
21. Microwave Communications Inc.(abbrev.)
22. Type of flip-flop
23. King
24. Precious gem
26. Try
28. Bird
29. Prefix, from
30. Reed instrument
32. Makes new Ampfet FM7
38. Discovered reactive laws of physics
39. Whirlwind Active Press Box
43. Country singer
45. VR240 digital logger
50. Big state
51. EMF measure
53. Logical operator
54. Companded Quadrature Stereo
56. "True blue" carts
59. Clock maker
60. Continent, abbr.
61. Concert sound system
62. _____ 2000 from Cutting Edge
63. Undead
64. Fake
66. Acknowledgement
67. Therefore
68. One side of phone line
69. Towers from design to installation
70. Loss of power

DOWN

1. Unspecified large number
2. Stink
3. Roman eleven
4. Glide
5. Type of "lamp"
6. On or off
7. Nipper Acoustics
8. Fred Gwynne was one
10. Expensive test sets
11. "Speak Easy"
12. Tape decks
13. Bag
15. Logitek console
17. Revenuers
19. Pronoun
21. "Perfect Fit" RF components
25. Country
27. Green Acres character
31. Train
33. Computer backup power
34. 6th sense
35. Revolutionary or Evolutionary Digital
36. Bending point
37. Quality "Engineering" Innovation
38. Broadcast Lab
39. Portable One is made by Audio _____
40. To prevent
41. Grass
42. Prefix, before
44. Former
46. Investment
47. Acronym for a European steel and coal community Technologies
48. Gremlin
49. General noise level
52. Enclosed vehicle
55. Install new condensers
57. Promise
58. Wind instrument
61. Nighttime
62. One
65. Hello
67. Mr. in Spain

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