

How's the Economic Weather?
Find out in Part I of
a two-part series, p. 10

Radio World®

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Radio's Best Read Newspaper

December 12, 1990

DAB Comments Pour Into FCC

by Charles Taylor

WASHINGTON When a broadcasting issue is sweeping enough to attract comments not only from the NAB and National Public Radio, but also from the likes of the National Campground Owners Association, Toastmasters International and Berger Bros. Camera & Video Exchange in Amityville, N.Y., something hot is brewing in the pot.

In all, the FCC's mammoth Notice of Inquiry on digital audio broadcasting (DAB), drew comments from 120 organizations by the Nov. 13 deadline. The Commission's notice was released Aug. 1.

Variety of respondents

Responses came from a number of industry facets, including broadcasting networks and group owners, associations, minority interest groups and companies with a stake in the development of digital.

All claimed resounding enthusiasm for the possibilities in a digital broadcasting realm. "DAB holds great promise for the broadcasting community and the public," CBS said. "The delivery of digital audio, with the clarity and dynamic range of compact discs and enhanced separation and reception characteristics,

would be a substantial advance in radio sound and service."

Behind the zeal, however, was a unanimous disdain among those commenting toward any threat DAB may bring in the near future to the current AM and FM services.

Comments from radio networks and group owners in particular stressed the importance of maintaining the stability of current stations amid the inception of DAB. Most also insisted that digital stations should be allocated strictly from the bank of current broadcasters.

"All existing AM and FM licenses—and only such licenses—should be eligible for upgrading to the new terrestrial DAB band," said Westwood One. If the Commission does not enforce such a policy, it "will be directly responsible for the wholesale bankruptcy of the present radio broadcasting industry."

Say no to birds

NAB, within 32 pages of comments, expounded on its highly publicized belief that a digital system based on terrestrial delivery is the only way to maintain the concept of localism.

It argued that national broadcasting over satellite could seriously threaten major advertising over local stations. "The effect of

heavy losses on national/regional revenues would not likely be evenly distributed among local broadcasting stations. The impact would most likely fall hardest on the class of stations most vulnerable at this time—AM stations."

While the majority of those filing agreed that terrestrial delivery held the most advantages, some acknowledged the value of satellite-based service.

National Public Radio (NPR) said
(continued on page 12)

New Day Dawning

Digital audio via cable is now a reality, from firms such as Digital Music Express (top), Digital Cable Radio (middle), and Digital Planet (bottom).



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Digital Audio by Wire

Editor's note: Radio World's West Coast Correspondent Frank Beacham begins a three-part series examining cable's move into digital radio, as broadcasters start the process of selecting a transmission standard for themselves.

by Frank Beacham

Part I of III

LOS ANGELES The testing is over. The market surveys are history. The money is on the table. The moment of truth has arrived. Digital cable radio is ready for blastoff with the turn of the new year.

For three pioneering companies, 1991 is a chance to influence the history of ra-

dio. Their mission is to convince cable television subscribers to pay an extra \$6 to \$10 a month for a diverse menu of commercial-free, compact disc-quality digital audio programming.

If digital cable radio is successful it could forever change the economic landscape of audio broadcasting. And it could be the kick-in-the-pants that would move terrestrial broadcasters into the digital future.

"We are not radio, we are not commercially-supported and we are not free," said Jerry Rubinstein, chairman of International Cablecasting Technologies' Digital Music Express. "We take the original digital information from the

(continued on page 8)

NEWS BRIEFS

Expanding on AM

WASHINGTON A new FCC study shows that the migration of AMs to the expanded band "could" provide added interference reduction in the existing band, based on more than one station on each channel moving to the new band once fully implemented.

The FCC noted, however, that the study may not be representative of all cases but was conducted to demonstrate benefits of migration.

The Commission continued that the new study revealed a more substantial reduction of interference on the subject frequency than indicated in a previous example.

For information from the FCC, contact Henry Straube at 202-254-3394.

More Pirates Apprehended

WASHINGTON Oh, those pesky pirates.

The FCC has fined three more would-be broadcasters \$1,000 each for operating on unauthorized radio frequencies.

Stephen McGreevy was charged for his illegal pirate broadcast of "The Muddy Sound of KMUD" over 7435 kHz in San

Rafael, Calif. McGreevy was operating the station from his home.

In Donna, Texas, George Hopp Jr. was fined for operating on the same frequency, which is assigned to the International Fixed Public Radio Service. The station was using the call letters XERX.

Finally, Joe and Connie Mat-tausch were charged for operating the "Citizens Emergency Broadcasting Service" on 89.5 MHz in Adrian, Mich.

Their station aired a single tape continuously in an effort to demonstrate against a local gay

activist group that was protesting the arrest of several gays in the city.

Broadcaster Granted Ownership Waiver

KNOXVILLE, Tenn. The Commission has granted a Tennessee broadcaster a permanent waiver of FCC cross ownership rules.

The action allows South Central Communications Corp. (SCCC), John Engelbrecht and Knoxville Channel 8 Limited Partnership to retain interest in stations WEZK-FM and WKXT-TV.

In June 1989 the Commission previously granted SCCC and Engelbrecht an 18-month waiver to permit divestiture of their controlling interest in WEZK, in order to retain their interest in Knoxville Channel 8 Limited Partnership, licensee of WKXT-TV.

The petitioners stated that they are not in a controlling position of the television station and noted "numerous media voices in the Knoxville market." As well, they noted that WEZK was not a dominating facility in the market, and was separately staffed and operated from the TV station.

In granting the request, the Commission said this is a unique situation in the public interest. The FCC noted, however, that it will not permit any future increase in Engelbrecht's equity or involvement in WKXT-TV, or the use of shared staffs, consultants or resources without prior Commission approval.

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Circle 76 On Reader Service Card

World Radio History

WARC Nations Air Their Views

by Alan Carter

WASHINGTON International differences on spectrum allocation are surfacing as countries prepare for the 1992 World Administrative Radio Conference (WARC), and radio broadcasters will be in the middle of the debate.

At an Annenberg conference here in November, a Japanese official said a U.S. proposal to reallocate 1493-1525 MHz to broadcast satellite sound (BSS) for digital audio broadcasting (DAB) with a complementary terrestrial broadcasting service conflicts with the allocation of that spectrum to land mobile services in Japan.

"We have a problem . . ." said Satoshi Kobayashi, senior advisor in the telecommunications bureau of Japan's Ministry of Posts and Telecommunications. "We have a conflict here because we just allocated that to land mobile services."

Kobayashi said a worldwide allocation scheme may be impossible if the U.S. position is advocated.

International debate

Based on comments from a Canadian representative, the U.S. will not be alone in pursuing the reallocation. Canada "would like to associate itself" with 1525 MHz for BSS, according to Bruce Gracie, head of WARC-CCI affairs for the Canadian Department of

Communications.

DAB is only one item on the agenda for WARC, slated Feb. 3-March 5, 1992, in Madrid, Spain. But the differences on international positions at this early date sets the stage for what promises to be a lively debate.



FCC Chairman Al Sikes addressed attendees of the recent Annenberg conference.

The Annenberg conference portrayed the scope of WARC, which will address new space services, high frequency broadcasting, satellite sound, high definition television, terrestrial mobile services and low earth orbit issues.

"I expect that there hasn't been a conference since Napoleon III set up the ITU in Paris to standardize telegraph operations which hasn't been billed as

the most crucial ever," FCC Chairman Al Sikes said in a keynote address. "But I do think that WARC-92 presents a number of difficult challenges and choices, the sound resolution of which is important for our country."

Sikes outlined three issues important to the U.S. at WARC, noting he did not want to oversimplify the position.

First is high-frequency broadcasting, or shortwave radio. "Having just come back from Central and Eastern Europe, and having listened to a number of gripping stories in the emerging democracies about the value of Voice of America and Radio Free Europe, I certainly have a strengthened sense of their value," Sikes said. "They have played and will continue to play a crucial role in stimulating and sustaining freedom and democracy." He also noted the commercial use of shortwave directed overseas.

Mid-range issues

Second, he called attention to "mid-range issues" in 100-3,000 MHz, including terrestrial and satellite-based mobile services such as personal communications service (PCS) and DAB, and low earth orbit satellites services.

Third, Sikes said the U.S. will direct attention to frequencies above 10 GHz for satellite communications. Included is expanded communications for the U.S. space station and manned space explo-

ration programs, plus the possible creation of a new, international allocation for global, satellite delivered HDTV.

Sikes continued his call for the support of innovation and technological advancement. "If there is one overarching message that I would like you to take away, it is that the FCC wants to encourage innovation," he said. "And, we want to ensure that the results of this important, upcoming international conference are hospitable to accomplishing that goal."

NAB Science and Technology Senior VP Michael Rau acknowledged that broadcasters are at a disadvantage going into WARC because they occupy 45 percent of spectrum below 1 GHz, a much-sought-after commodity.

From an international perspective, he said that Europe needs WARC more than the U.S. because of the economic unification.

"They are trying to unify, and new technology is how they want to do it," Rau said. "In terms of broadcasting services, we don't need the WARC."

Rau also suggested that just because a system is being developed for Europe, that doesn't mean it is also being developed for the United States.

Issues to be debated at WARC aren't technical questions, Rau maintained. Rather, he continued, they are economical.

Other positions outlined during the conference included work in Canada on efforts to establish a hybrid DAB system.

Also, Japan is expected to have a draft of its WARC positions by early 1991.

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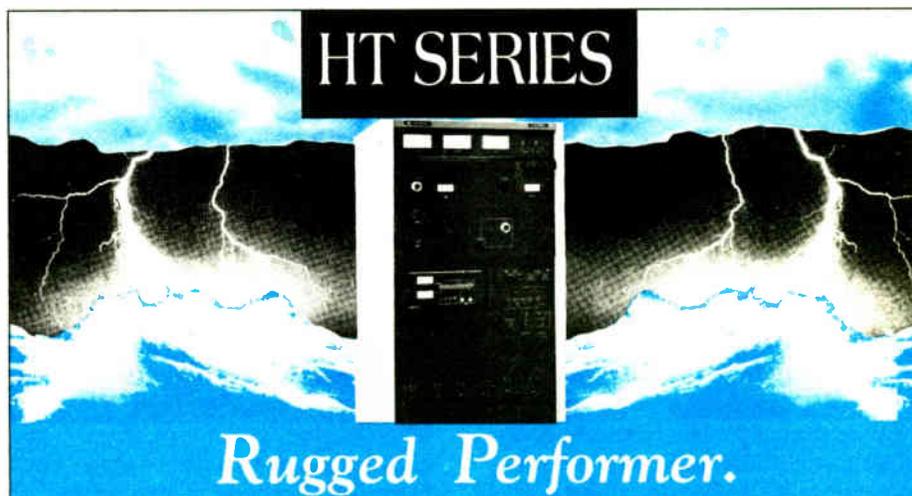
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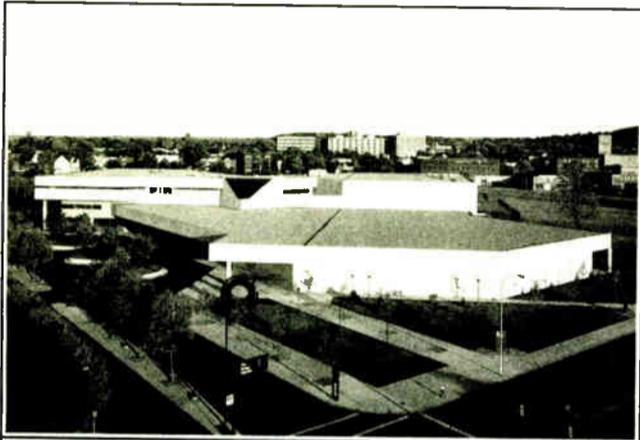
"Send me literature." Circle 122.

The Peanut Gallery Has Its Say

by Judith Gross

FALLS CHURCH, Va. Remember back in grade school when Mrs. Kiffelhoffschnauer thought a good way to teach us all about (look out, here comes the "G" word) **grammar** was to get us all writing letters to somebody who would never answer them?

You know, we'd write to **President Johnson** (Lyndon, not, Andrew, geesh, I'm not that old!) and get a highly intimate and personal mimeographed form letter back starting "Dear Seventh Graders," remember?



Rochester's radio daze

Well, as I read over some of the 120 comments filed on the FCC's **Notice of Inquiry on DAB** I wondered why some teacher somewhere hadn't assigned the class to write letters to be filed as comments ("Class, give me one original and nine copies . . .") on the NOI. Heck, everybody and everybody's relatives seemed to have gotten into the spirit of things.

I could almost see this as a **school project**:

Dear Very Important Communications Regulators,

I would very much like to see my radio go digital. I am getting tired of the *schtik schtik schtik* when my Daddy drives me to school and the static from my little sister's *My First AM Radio* is giving me a headache. Oh, and if you say yes to satellites can we have an all-

Ninja Mutant Turtles station?

Bobby, Age 9

Well, it wasn't a school project, but it did become something of a grass roots **lobbying effort**. A lot of the lobbying seems to have been done by **CD Satellite Radio**, the company that wants to bring 66 satellite and 34 terrestrial stations of digital audio to the listening public.

The company has a petition before the Commission but the NAB and radio stations in general **oppose** the idea of satellites as a threat to radio's localism.

Anyway, I kind of suspected something was afoot when groups like the Wyoming

Farm Bureau; Toastmasters (the folks who teach you how not to lose your cool speaking before groups); the Canterbury Choral Society in Oklahoma City; the Westport Country Playhouse in Connecticut; Rick's College in Rexburg, ID; a Betty J. Rudolph in Boise, ID; the American Boat and Yacht Council; the Pennsylvania Farmers' Association and (my personal favorite) the National Campground

Owners Association each filed cookie-cutter comments on DAB.

But best of all, along with the **Wyoming Farm Bureau's** letter (which forgot to use the word "satellite") were three pages of instructions on how to file, along with a cover page faxed from Satellite CD Radio, **Grass Roots Division**.

The instructions gave general guidelines for writing to the Commission and contained a sheet with "Satellite Message Points for Your Personal Letter to the FCC." That last set of instructions was copied almost **verbatim** by many of those "concerned citizens" who filed.

Comments came from far away, geographically speaking, as well. The **Eureka 147** folks filed, as did the **EBU**. Of course all the proponents of the various systems filed. And all the broadcast biggies.

General consensus is "We want it but slowly, thoughtfully and as an enhancement to existing services."

The **WARC planning** bumps along. Some draft comments by the ad hoc groups looking at spectrum were interesting in that, for the first time, they defined a **standalone terrestrial DAB** service. Previous language had talked about terrestrial only as gap-fillers for satellite DAB service.

Also interesting were some statements supporting the Voice of America's desire for **international satellite** sound service. Of course, if we send satellite audio overseas, international broadcasters from other countries will want to send us theirs, too.

And then there's **National Public Radio**, which is asking for 20% of any spectrum allocated for new services. One interesting point made by NPR is the idea that public radio preserves the uniqueness of **American culture**. And ya gotta admit it's hard to find commercial stations that offer drama, comedy, jazz and esoteric Americana in the way of blue grass or zydeco in most markets.

☆☆☆

Now that we're all thoroughly exhausted either filing or reading comments on the massive **AM improvements docket**, the NAB is suggesting that the FCC start some action on FM—specifically to set criteria for **directional antennas**.

Hammett & Edison has already asked the Commish to clarify this one. Past statements from the FCC have been murky at best.

Thought you might like to know that radio will have its day in **Rochester, NY**. The little town nestled at the edge of the Finger Lakes region is putting together a look at radio called "Radio Daze: The Radio in American Family Life, 1920-1940."

It opens on **16 February** and will look at technological as well as cultural changes. It's a chance to get a little history and take that scenic drive through upstate NY, where I spent many a happy year. Who knows, if it's a success they may cover 1940 on and we'll really see some changes.

CBS Radio pioneered a first when it used **Switched 56** phone service to bring updates from the Paris summit last month. Digital quality, and look, Ma, no satellites!

Northern Transdata Network (516-231-8045), which does these kinds of things for broadcasters, took care of the phone arrangements and **Corporate Computer Systems** provided the codec equipment.

It was a little tricky since the Switched 56 (56 kbits) in the US had to interface Europe's **ISDN** lines (64 kbits). But the quality attested to the success.

You might also like to know that **Denon** finally did unveil its **recordable CD**. It's a write-once-read-many precursor to a full-fledged recordable CD and Denon is calling it the "CD cart recorder." Canada is slated to be the first market for it.

One more thing before I get ready for the holidays. For the person on your gift list who has **everything**, you might want to find out more about a device that, in some mysterious way, signals carpoolers and kids being chauffeured by Mom and Dad that their ride is approaching.



Two **Indiana inventors**, through a Pittsburgh marketing arm (412-288-1300) have come up with the gizmo, which they aren't saying much about, except that it will cut down on those pesky car horns and the annoying "Yo, Louie" in your neighborhood.

What's it called? What else but "I'm here." Catchy name. And I'm outta here.

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

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Progress should include AM

Dear RW,

Please extend congratulations to the country of Mexico, Gamma Electronic Systems, Archer Communications, BBE Sound, and a handful of other pioneers and "blue-chip" audio component manufacturers.

Why would anyone place a country and these companies in the same category? Read on.

Looking through the pages of RW (11/7), I noticed the absence of a headline that has been missing for far too long, and was missing in this issue, also. It is the headline that titles that long-awaited article on the adoption of an AM stereo standard in the United States . . .

The government of Mexico has gone with Motorola C-QUAM (joining Brazil, Australia and Canada). Congratulations, Mexico. And yet, according to a RW article in the same issue, the FCC has not endorsed a standard, and is "seeking comments" on the benefits of AM stereo.

The same issue also highlights 3-D stereo, a science that takes audio processing into—literally—a new dimension. It is applicable to both FM transmis-

sion/reception and to the recording industry. Congratulations, industry!

Receiver manufacturers, both old-timers and newcomers, seem to have found the time and technology to build encoders and decoders that will further enhance the stereo signal. FM stations have yet another advantage; the AMers, however, are locked out.

Foreign and domestic companies are not convinced that it will be worth their while to improve upon our medium. But if our own government does not support their efforts by getting rid of the existing double standard (whereby the word "stereo" is synonymous with FM and mutually exclusive when referring to AM), one cannot blame them.

The cost of improved electronics in FM stereo transmission and reception, whether it's minimal or not, will be a pill easy for the consumer to swallow. FM stereo is already a given; it is standardized. No one will resist an upgrade in sound. (We had no problem converting to CDs, in spite of the format's cost when first introduced.)

The AM band is alive (at least here in Boston and in other large markets). The content of the article on 3-D stereo is testimony that the amount of R&D going into finding an AM stereo standard palatable to broadcasters, manufacturers, consumers, and the government is disproportionate to the amount that has gone into the improvement of FM stereo.

I am not suggesting that any regulatory body stifle progress, or that consumers boycott new and improved products. I am a consumer, and want to purchase whatever product produces the best sound for the money. However, there needs to be an awareness that listeners want a good AM signal, and will pay for it if they have to.

But why should they have to? Why isn't R&D going into a chip or another form of non-coded AM stereo? Although AM is the older of the bands, it is not obsolete. We AM broadcasters in the United States deserve some attention.

Furthermore, what does our hesitation to set a standard do to our reputation in the world-wide market? Forget the consumers . . . they've left for Japan. Developmentally, we're becoming followers instead of trailblazers. How many other countries will adopt a standard before we do?

There are at least three parties that should be responsible for making AM stereo a reality. Among them: AM stations, the manufacturers, and the government. Without the participation and cooperation of any single one, the efforts will be fruitless. Many large and not-so-large AM stations are doing their part. And, in order for products that decode our signal to be made, someone has to take them by the hand and insist upon it.

DAB and DBS are looming over both bands. Digital is on deck in the U.S. and already threatens to wipe out AM and FM internationally. However, because our American system of communication is so entrenched in politics and economics, it will probably not be as easy

Chicken Little spread panic when an acorn hit him on the head; he was convinced the sky was falling. It wasn't. And while reality is rarely like a storybook, we still can learn a lot from Chicken Little by not jumping to conclusions too quickly, especially when it comes to matters such as the economy.

Clearly an economic slowdown started this year. The trend is affecting some industries more than others, but most vendors in the radio equipment business are trying to maintain the status quo. In short, even though the country is experiencing recession-like conditions, equipment buyers can be found.

Some industry observers, however, have begun to notice that broadcasters seem increasingly wary about spending; they are either convinced they are in a recession or are just unsure about the future.

The Sky Is Not Falling

Lack of buying means less sales, which in turn means fewer vendors overall. And losing vendors creates less competition and higher prices in the industry.

Broadcasters can't spend money they don't have, and smart buyers should put some money aside for new equipment utilizing anticipated technological breakthroughs. But broadcasters *shouldn't* sit on their budgets out of fear of what lies ahead.

Stay calm. It's a buyer's market. In fact, if it doesn't cause any cash flow problems, why not consider advancing some equipment buys or upgrades that were scheduled before the slowdown?

After all, the end of the year is coming and there may be some tax advantage in buying before 31 December. You could have purchases work for your business by making them earlier rather than later. What's more, advancing your purchasing could give the industry a shot in the arm that would pay off later on.

Don't feed a panic. Be a careful buyer, but don't hoard your budget, worrying needlessly. The sky is *not* falling—the sky's the limit. —RW

to make the switch as it has been for Japan and Canada. Thus, I do not agree that it is futile to improve AM.

Will the pages of *Radio World* continue to highlight advances in audio that are applicable to the whole audio

industry—exclusive of the AM stations? As a listener and a concerned programmer, I hope not.

Emily Barsh, Assistant PD
WBZ-AM
Boston, Mass.

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Next Issue
Radio World
December 26, 1990

The Formal Process Of Filling Out Forms

by Anthony Kord, DE
WERI/WWRX/WHIM

WESTERLY, R.I. In this demanding era of lightning-fast information exchange, the speed and ease with which we obtain desired data routinely is improved by re-evaluating earlier systems. I therefore wholeheartedly welcome FCC-207, a form designed by the FCC to make FCC forms easier to obtain. Let's review the former method of form procurement and the new, improved way with FCC-207.

In the past, obtaining forms was unduly complicated. You called 202-632-FORM, the form request number, and requested desired forms. The Commission mailed the forms to you. As you can see, that's a rather complex process, involving mounds of red tape.

Luckily, the process is now much simpler. To obtain forms, call 202-632-FORM—formerly the form request number, now the form request form number—to request FCC-207, the form request form. When your form request form arrives, formulate your request for forms and forward this form to Washington. The Commission reads your request and mails your forms.

Isn't that easier? FCC-207 simplifies the entire process by eliminating needless intermediate steps!

However, as a concerned American, I feel compelled to draw attention to serious potential problems with this new procedure. With form request forms so easy to obtain, soon everyone will want one. In no time, forms will be spewing from the Commission's doors at an alarming rate, perhaps seriously bogging down the entire communications arm of the U.S. government.

For the sake of our national security, form request forms should not be handed out with a mere phone call. Clearly we need a form request form request form.

Eager to inform the Commission of this innovative solution, I called to share my idea, via the request form request line.

"Could I request a form, please?" I nervously asked. Having worked in radio for 10 years, I shouldn't have been surprised by the response.

"We don't take requests," asserted the secretary, "especially if they're not in the format."

■ ■ ■
Anthony Kord is director of engineering for WERI/WWRX/WHIM, and an occasional RW contributor. He can be reached at 401-596-7728.

GUEST COMMENT

**GET IT
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FCC Modifies Translator Rules

by Charles Taylor

WASHINGTON The FCC, at its November open meeting, initiated slight changes to its recent rulemaking on the use of FM translators.

The primary modification affects policies regarding ownership and operation of the equipment, which commonly is used to extend a station's signal into weak areas of its one millivolt per meter (1 mV/m) contour.

The Commission's long-awaited March rulemaking was directed at returning translators to their original function as a secondary means of signal carriage. Many in the industry had complained that translators were acting for some as low power FM stations.

No help with operation

The new changes, according to Mass Media Chief Roy Stewart, will prevent a commercial station whose signal is carried over a translator from helping an independent owner with operating costs. The primary station already is forbidden to own the translator or help pay for its construction, but it had been allowed to supplement costs of operation.

The primary station still will be al-

lowed to provide technical assistance to the translator owner under these changes.

The Commission also initiated technical modifications. First, all FM translators



Changes to the FCC's rules regarding FM translators passed 5-0 at the Commission.

may operate on any of 80 non-reserved commercial channels with the 20 reserved non-commercial educational channels available for non-commercial educational FM translator use.

Second, the maximum effective radiated power standard has been reduced from the proposed 1 kW to 250 W. The Commission also established power and antenna height combinations for translators operating beyond a primary station's coverage contour, yielding new coverage contour distances of seven kilometers for areas east of the Mississippi River and Southern California and 13 kilometers elsewhere.

Favorably consider waivers

The FCC added it will favorably consider requests to waive the distance provision where it can be shown that the service to greater distances will reach only

an area not within the service contour of any FM station.

While the changes received a 5-0 vote from FCC commissioners, it was not a wholehearted consonance.

Commissioner Sherrie Marshall acknowledged that translators have the potential to be misused; however, she said the ruling "goes too far and throws the baby out with the bath water."

"The effect of this decision may well be to deny the benefits of FM translator service to significant portions of rural America," she maintained.

Marshall said she would have preferred, first, removing severe restrictions on translators that would bring FM to nearby communities that receive no radio service, and second, inviting requests to waive those restrictions for translators bringing an FM signal to neighboring communities not already serviced by a minimal level of radio service.

Commissioner Ervin Duggan also took issue with the item, claiming that it focused only on returning FM translators to their original role as a fill-in service, while turning its back on other relevant issues.

He added that the FCC also should explore the potential of FM translators as a way for small entrepreneurs, in certain circumstances, to gain a foothold in the broadcast industry.

Helps prevent abuses

Commissioner Andrew Barrett, in supporting the move, commented that it helps prevent technical and financial abuses and does not affect the goal of serving unserved and underserved areas.

The NAB also gave quick support to the action. "The Commission has recognized... that localism, not economics, should be the keystone of its allocations process," the organization said in a prepared statement. According to the NAB, the Commission also has acknowledged "the important role played by full-service

broadcast stations and moved to prevent the undermining of that important role by FM translators, which have no public interest obligations."

Translators already in operation are grandfathered from the FCC amendments for three years, the Commission said, unless they are found to pose interference problems in the meantime.

After that time, the FCC will accept applications for waivers "for those licensees who show that service to the public would be unduly lost as a result of compliance with the revised rules."

For information, contact the FCC's James Coltharp at 202-632-6302.

NRSC Set To Test FM Processing

by John Gatski

WASHINGTON The National Radio Systems Committee (NRSC) FM Composite Subgroup has finalized test plans to determine the effects of processing on FM receivers. The results are scheduled to be released by the 1991 NAB show.

Test procedures were finalized during the subgroup's November meeting, and it was decided that an outside consultant would be hired to conduct the tests, estimated to cost \$5,000.

The consultant has not yet been hired, according to NRSC Coordinator and NAB Staff Engineer Stan Salek.

The receiver tests will include three receivers: an NRSC-spec tuner that will be produced by Denon, a car receiver and a "boom box," Salek said.

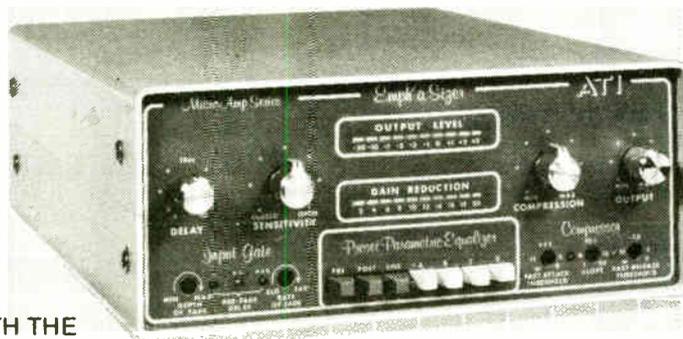
The receivers will be subjected to various processing levels and then first adjacent channel interference measurements. Measurement equipment will include three different modulation monitor designs and a Digital Store Oscilloscope (DSO).

Many engineers believe that processing adversely affects receiver performance and has resulted in manufacturers limiting receiver bandwidth to reduce audible interference.

The NRSC does not plan to recommend any U.S. receiver standards based on the test results, Salek said, but will forward its findings to the CCIR, an international standard-setting body.

The findings could be used to develop an international modulation measurement standard that will take processing into account, Salek added.

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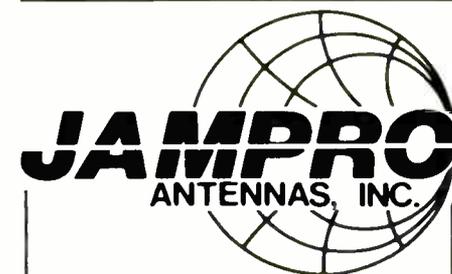
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Digital Cable Radio a Reality

(continued from page 1)

compact disc and bring it into the home in the form of uninterrupted music programming."

Home listening

Digital audio is distributed to the subscriber's home through the local cable television system. A special digital-to-analog tuner capable of receiving dozens of audio channels is provided with the service. The tuner is directly connected to the user's home stereo system and is operated via remote control.

Rubinstein, a former chairman of United Artists Records and ABC Records, said New York-based Digital Music Express is a premium music-driven service and will offer the listener 30 channels of talk-free music formats.

Many of the formats are not available on commercial radio, he emphasized.

Digital Planet of Carson, Calif., and General Instrument's Digital Cable Radio of Hatboro, Pa., also offer digital music programming. Both provide a children's channel. Digital Planet will add exclusive programming produced by American record companies as well as digital simulcasts of international radio stations.

All three services will offer digital simulcasts of basic and premium cable video channels. Subscribers will be able

to hear motion pictures and video music programming in digital stereo sound.

Digital Music Express will offer the most music channels. Its 30 digital channels narrowly focus formats to specific listeners. For example, there are symphonic, chamber music and opera channels as well as folk rock, blues, reggae, rap and alternative rock channels. One can hear today's country or traditional country or Latin ballads, soul ballads or Latin rhythms.

To announce or not

On the issue of whether to use announcers or not, there is a clear difference in programming philosophy among the services.

Rubinstein said research indicated that listeners "feel very strongly about not being interrupted" in a premium service. "By the time I get home at night I don't want to hear any disc jockey hammering at me and I may want to hear a format of music I can't even find on the radio," he noted.

Paul Goldstein, vice president of programming for Digital Planet, has a different perspective. "The problem is that when you just play song after song with nothing in between, you create a very impersonal, antiseptic feeling," he said. "After awhile the audience craves that one-on-one interaction. We

are offering more than just a music service."

Goldstein, who co-created "The Wave" format in 1987, said Digital Planet has assembled an elite corps of top programmers and consultants as well as a lineup of 18 on-air personalities to drive its commercial-free programming.

Like Digital Music Express, Digital

stations in Rio de Janeiro, Paris, and Milan, Goldstein said.

"We want to carry the most progressive, hip stations in the world," Goldstein said. "Our service is committed to the concept of the global village and we plan to bring our subscribers the best from all over the world."

All three companies have been aggressively marketing themselves to cable operators in the past few months. They all are targeting 1991 as their major public roll out.

John Abel, executive VP of operations

All three companies have been aggressively marketing themselves to cable operators in the past few months. They all are targeting 1991 as their major public roll out.

Cable Radio is launching without announcers. "We market-tested eight channels of CD-quality music in three cities using some announcements," said Paul Clough, the company's director of marketing. "What we learned in that test is that the subscribers on balance did not like the announcements. So we've gone to a continuous music format."

Superstation reception

In addition to music programming, Digital Planet is developing a series of "superstation" channels featuring the air signal from top radio stations in the United States and abroad. The station's programming is delivered to Digital Planet before processing in order to preserve the wider dynamic range of the original audio signal.

So far, Digital Planet is simulcasting Picadilly Radio from Manchester, England; Los Angeles classical station KUSC; L.A. jazz station KLON and L.A. album-rock station KNAC. The service currently is negotiating with several additional major market American stations, the BBC, Radio Luxembourg and major

at the NAB, has closely observed recent action among digital music services.

"These digital audio cable businesses think they can be viable with only 200,000 to 300,000 subscribers, although they expect to reach 10 percent penetration of the 52 million cable households within the next two to three years," Abel told the NAB board in a report earlier this year.

Responding to Abel's report, Rubinstein said, "We talk about reaching a break-even position at something just under 300,000 subscribers. But I haven't spent this kind of time or money on this project just to break even, so viability to me is not breaking even. I don't agree it's a viable company at those numbers but I do agree that once those numbers are reached then profits are around the corner.

"As far as a 10 percent penetration of cable households, our research shows a much higher potential penetration than ten percent," Rubinstein added.

Part II of this series, in the next issue of RW, will profile the key players in the digital cable radio sweepstakes.

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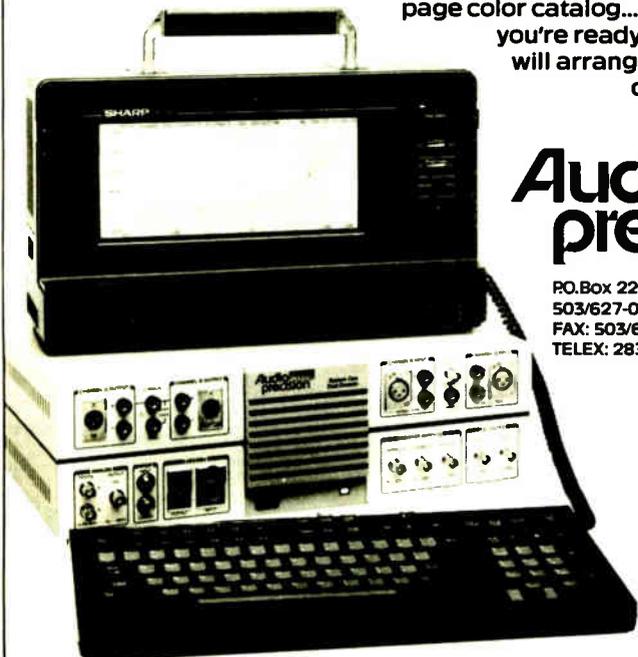
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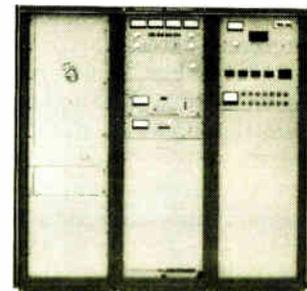
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Copyright Office Has Its Own DAB Inquiry

Notice Raises Questions About the Impact DAB Would Have on Copyrighted Material

by Charles Taylor

WASHINGTON Just as a first round of public comments on the issue is reaching the FCC, the United States Copyright Office has launched its own Notice of Inquiry on the development of new digital audio broadcast (DAB) and cable services.

The agency, a branch of the Library of Congress, is investigating the potential effects of digital audio programming transmitted by satellite systems, terrestrial systems or cable TV systems on copyright owners.

In addition, the office asks that if implementation of new audio systems indeed produces negative effects on copyright owners from retransmissions of their works, what proposals might be effective in developing proper methods of

compensating copyright owners while promoting the greatest availability of creative works for the public?

The issue of DAB's effect on copyrighted material was taken up by a number of organizations in the FCC's inquiry, for which comments were due Nov. 13. Many of the issues queried by the copyright office are discussed in filings by the Recording Industry Association of America (RIAA), the Home Recording Rights Coalition and the NAB.

Comments on the copyright office's proposal are due Dec. 15, with reply comments due Jan. 31, 1991.

Prompted by senator

The inquiry was prompted by a request by Sen. Dennis DeConcini of Arizona, chairman of the Senate Subcommittee on Patents, Copyrights and Trademarks.

Specifically, the office of copyrights is looking for suggestions on how to compensate copyright owners for "copying of near-perfect" reproductions of their works through regional, national or international digital audio transmission systems. Comments also are asked for regarding the impact of copyright controls and royalties on public access to new digital services.

Questions the office solicits include: Would introduction of digital transmission prompt the average listener to copy copyrighted works more so than with current AM, FM and TV services? What technical limitations on home taping are feasible?

Other question include, would home copying significantly displace sales of copyrighted works, and should a royalty be placed on blank tapes and recorders, to be distributed among copyright claimants? Should digital broadcasters scramble their signals?

The concerns of the copyright office

mirror comments filed on the FCC's query by the RIAA. In its filing, the group said, "Without adequate and effective protection for the copyright owners of sound recordings, the livelihoods of recording artists, musicians, record companies, recording engineers and the numerous other individuals involved in the creation of sound recording are placed in jeopardy."

Transmission prohibitions

RIAA asked the FCC to prohibit digital audio services from transmitting more than an individual selection from a particular album unless prior consent is obtained. In addition, the association asked that digital audio services be required to acquire licenses from the copyright owners of sound recordings they transmit; to recommend to Congress

that it grant public performance rights in sound recordings; and to require digital audio services to transmit all subcode information embodied in recordings in usable form.

The NAB opposed the majority of RIAA's stance, claiming that "much of (it) is either clearly outside the FCC's jurisdiction and/or is of dubious

constitutional validity."

NAB also noted opposition of the notion that DAB broadcasts should be scrambled. "To adopt such restrictions, the Commission would move in a direction completely opposite (of the) Communications Act. This country's over-the-air broadcast service is based upon an advertising-supported and 'free' system."

Ben Ivins, NAB assistant general counsel, added that the copyright's inquiry into similar issues may be overkill.

"I don't think it necessarily warrants the kind of investigation the copyright office is asking for," he said. "They're launching a full-blown inquiry into the effects of DAB and looking at whether it will put the recording industry out of business, and we haven't even allocated spectrum yet."

Comments filed at the Commission by the Home Recording Rights Coalition (HRRRC), a group of consumers, manufacturers and retailers of audio and video recording products, said that the RIAA's concerns should not delay or deny the public the benefits of digital radio.

The HRRRC added that the RIAA's complaint that digital radio outlets will become "the electronic record stores of the future disingenuously ignores that immense profit potential of digital radio for the record industry."

For information, write the Library of Congress, Department 17, Washington, D.C. 20540; or contact Ben Ivins at the NAB: 202-429-5460.

Would introduction of digital transmission prompt the average listener to copy copyrighted works more so than with AM, FM and TV?

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Radio Weathers Hard Economy

by Charles Taylor

Part I of II

WASHINGTON While the nation's general economic downturn has made itself apparent in many of America's industrial pocketbooks, its effect on various facets of the radio industry has been curiously mixed.

The manufacturing front is divided between those who admit across-the-board flat sales and others who claim the only real effect of national recessionary conditions has been a tougher time pulling in new business.

Station engineers charge that allocation budgets are tighter for the coming fiscal year than in previous terms; however, most say they are not worried about obtaining equipment deemed necessary.

Meanwhile, radio advertising—which stations expect to provide the cash flow needed by engineers to purchase from manufacturers—is actually on the rise.

Radio sales on the climb

According to the Radio Advertising Bureau (RAB), which monitors industry trends, advertising for the first six months of 1990 was up 5.5 percent over the same period last year.

"Historically, over the last several eco-

nomie downturns, radio has done reasonably well. People start to rebel at the high cost of TV production and look to see how they can get more bang for the buck," said RAB Executive VP George Hyde.

"Radio is also the targetable media. You can identify different consumption patterns, age, lifestyles, which is not as easily done with newspapers or television," he said. "It allows immediate tactical success."

But whether or not stations are indeed bringing in consistent ad revenue, at least a portion of manufacturers said they are bearing the brunt of a sales decline.

Market down as a whole

Mike Palmer, president of Arrakis, said that company sales are "flat to slightly up," but acknowledged that the market as a whole is lagging.

"I will say this: In all the years we've been building broadcast equipment, this is the first year I've heard manufacturers and distributors across the board say absolutely that sales are down."

According to Fidelipac Sales Director Jack Ducart, company sales generally are flat.

"What I'm seeing is that sales really haven't increased, but we're holding our own, which I think is better than a lot of companies," he said. "What I'm

getting from people around the country is cautiousness. They're watching their dollars until they see what happens."

Broadcast Electronics' Marketing VP Curt Kring said the company is slightly ahead of last year's sales, but it has

BE's Marketing VP Curt Kring said the company has had to work harder to get ahead of last year.

had to work harder to get there.

"We've been lucky so far," he said. "Some product lines are down, some are up. It's more competitive because the whole market is down. We're implementing some market strategies to try to get things up, and in general are trying to be cautious."

Neil Glassman, national sales manager at Bradley Broadcast, a distributor for 150 to 180 manufacturers, said that thus far, the company's business has evaded recession conditions.

"We recognize that business is in a slump, however, we've been able to counter that and continue in a growth phase," he said. "Granted, we're finding it more difficult at times to make the new customer, but we're not having any trouble keeping him or her once we've made them."

Hiring as fast as we can

On the other extreme, Gary Snow, president of Wheatstone, said his company is currently building a new headquarters to double its space and "hiring new people as fast as we can assimilate

them.

"Sales are well above our goal. We haven't gotten a downturn," he said. "If a company isn't strong enough to handle reductions in its cash flow, or if it is operating out of projections rather than out of its current results, then a company not properly financed could have a problem right now."

Snow added that he is seeing a more cautious attitude from new business, but that regular customers have been very loyal.

Station engineers agree that budgets for new equipment are tighter this year, with corporate powers wary of major allocations; few, however, complained that they are unable to get the essentials.

Paul Donahue, director of engineering for Gannett radio stations and the company official who oversees equipment allocations, said the company is maintaining the conservative position it has always had.

"Everything we look at, we ask if we need it, if we need it now and if we'll save money in the long run by buying it. We've been asking that for 10 years," he said.

"I think everybody has a concern level right now. We're trying to balance that—nobody wants to make commitments without a general sense of where the economy is. But people who have invested in the long haul with good plans just aren't as concerned about the short haul," Donahue said.

Caution but no cuts

According to Glynn Walden, director of engineering for AM at Group W, "We're being told to be cautious but at this point, we've been given no directive nor have we seen any cuts. That doesn't mean there won't be any.

"We don't buy technology for the sake
(continued on page 15)

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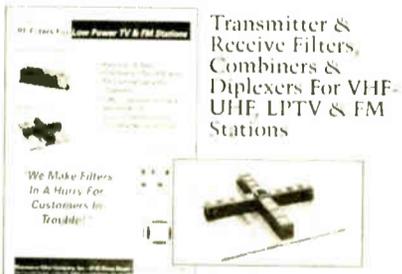


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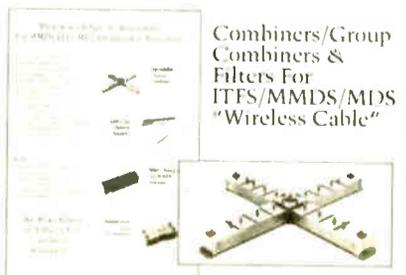


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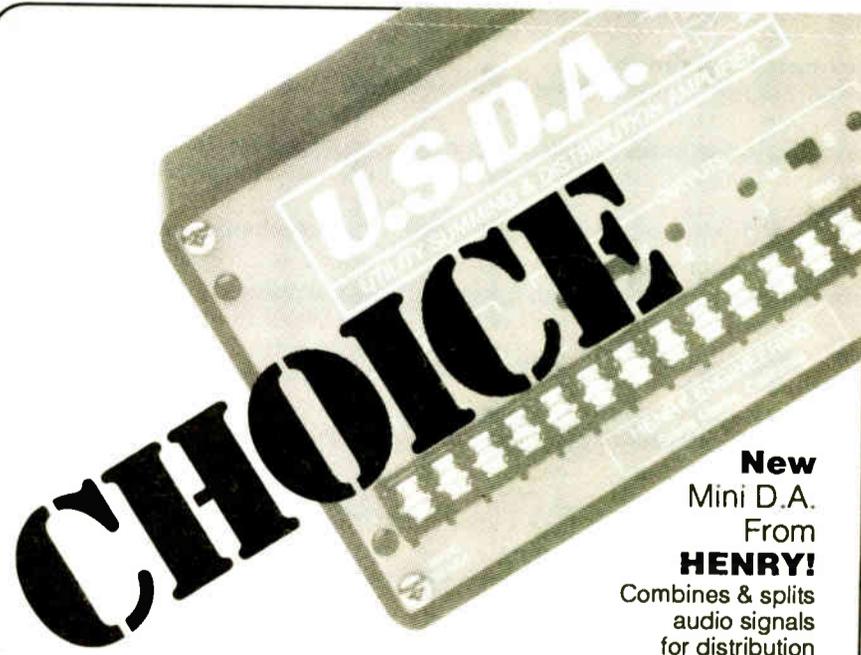
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Opinions Vary Concerning DAB

(continued from page 1)

satellite-based DAB could provide new radio service for communities now unserved or underserved by public radio.

"For example, many communities in the west are so small that there is an insufficient economic base to support a locally based public radio translator, let alone a full-service public radio station," NPR said. "In some urban areas, the spectrum congestion in the NCE-FM band precludes the development of new public radio outlets designed to serve diverse audiences."

The Association of Broadcast Engineering Standards (ABES) suggested

that direct satellite transmissions be viewed as a secondary service designed to fill in gaps in the coverage of terrestrial stations. It asked the Commission to act on satellite broadcast only after a terrestrially-based digital radio service is well on its way to maturity.

But where do we put it?

A sensitive issue that drew uncertainty was spectrum allocation of the new service. Most simply acknowledged that spectrum efficiency would be increased with digital, thanks to tighter geographic spacing and the frequency reuse capacity.

Capital Cities/ABC said that, in light of

the benefits of international coordination, it should defer any specific action on spectrum until after the World Administrative Radio Conference (WARC) in 1992.

One spectrum issue that did draw a measurable amount of consensus regarded the use of 722 MHz to 788 MHz for DAB. The frequencies now are occupied by about 100 UHF stations, and have been earmarked for advanced television allocations.

The Association for Maximum Service Television adamantly opposed the spectrum's use for DAB. "There is one clear certainty," MSTV stated. "ATV and (DAB) cannot share the UHF television band."

Added association President Margita White, "MSTV, private industry and government have an enormous investment in the development of advanced television, which depends on the availability of sufficient spectrum in the UHF-TV band. We urge the FCC to focus on other spectrum options."

NAB advised the Commission not to make any spectrum decisions prematurely, but opposed the use of the UHF band for DAB. "These frequencies are critically needed to implement advanced television service to the public," NAB said. "Such availability must be preserved pending further developments in MM docket 87-268."

Westinghouse added that enough spectrum should be reserved to allow all current licensed facilities to migrate to the new DAB band, plus additional spectrum for eventual satellite providers. But "in no event should spectrum be taken from the UHF television until such time as it is finally determined that such spectrum is not needed for HDTV."

Allow freedom in receivers

In its comments, the Electronic Industries Association noted opposition to governing standards for future DAB receivers. "The industry will not acquiesce in—and will actively resist—any proposals that impose unnecessary or unreasonable burdens on consumer electronics manufacturers or the consumers they serve," it said. "For reasons of both law and policy, such decisions are properly left to the marketplace."

Gannett said that in order for the service to reach the general public, DAB radio receivers must be economically priced. "Low prices and wide-spread accessibil-

ity can be accomplished by designing the system with most of the intelligence in the transmitter and by reducing the cost of integrated circuits that enable the reception of digital signals," it wrote.

Civil rights organizations advocated guidelines that would encourage minority DAB ownership. The National Association for the Advancement of Colored People (NAACP), the League of United Latin American Citizens and the National Black Media Coalition suggested that comparative hearings to select DAB permittees should contain a much stronger minority preference enhancement than that now awarded in broadcast comparative hearings.

The groups scoffed at the fact that minority ownership was not discussed in the FCC's August notice, claiming that it may shamefully signify a Commission following in the footsteps of predecessors, "whose insensitivity and ambivalence to minority concerns caused and perpetuated the present extreme minority under-

representation in media ownership."

They recommended the FCC set up an approach similar to one established for a 1980 Clear Channel appropriation: eligibility criteria for groups with the greatest need (in that case,

daytimers, public broadcasters and minorities) with waiver provisions to avoid unfairness to other strong claimants.

Summarizing their case, the groups added, "Essentially, all of the most valuable television and radio facilities have long been licensed. Thus, unless minorities receive a preference for the expanded AM band and for the proposed new digital audio service, there will be few remaining opportunities to increase minority broadcasting ownership," they said.

NAB, however, said that the Commission should consider DAB another "enhancement" of existing radio broadcast service, "the implementation of which need not require the use of novel procedures or policies. Instead, traditional broadcast-related allocation and assignment policies should govern the introduction of DAB."

The Corporation for Public Broadcasting and NPR encouraged set-aside service for non-commercial stations. CPB said that a public radio spectrum would be required to ensure the orderly migration of those broadcasters amid a land rush in which the economic power of commercial broadcasters might overpower public stations.

NPR noted that a 20 percent set-aside exclusively for public radio services would be appropriate.

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In its comments, the Electronic Industries Association noted opposition to governing standards for future DAB receivers.

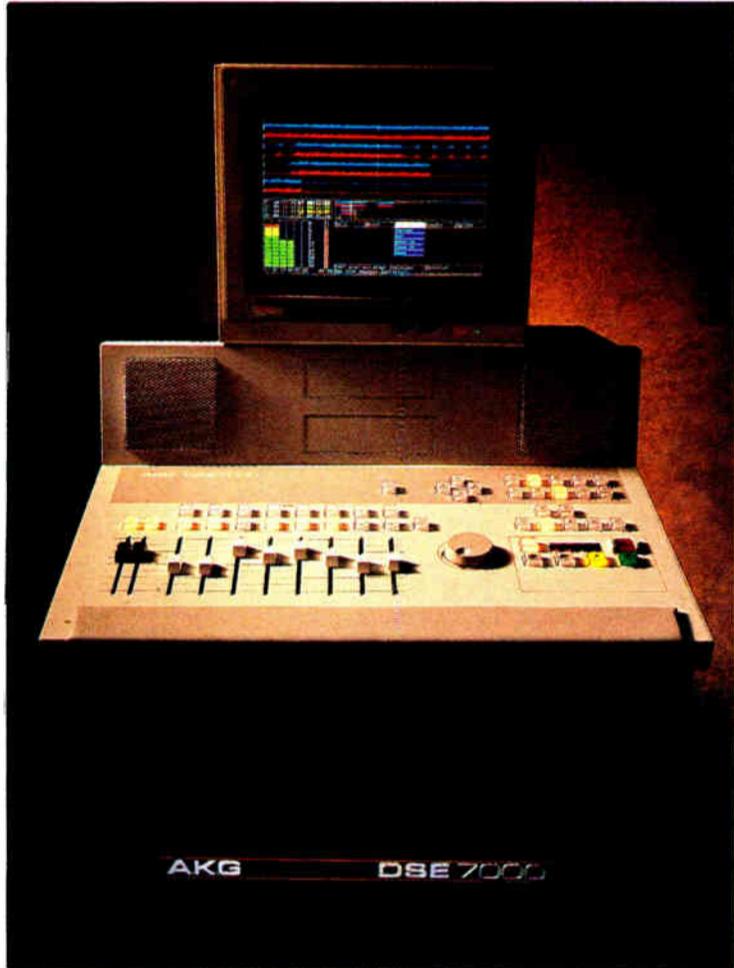
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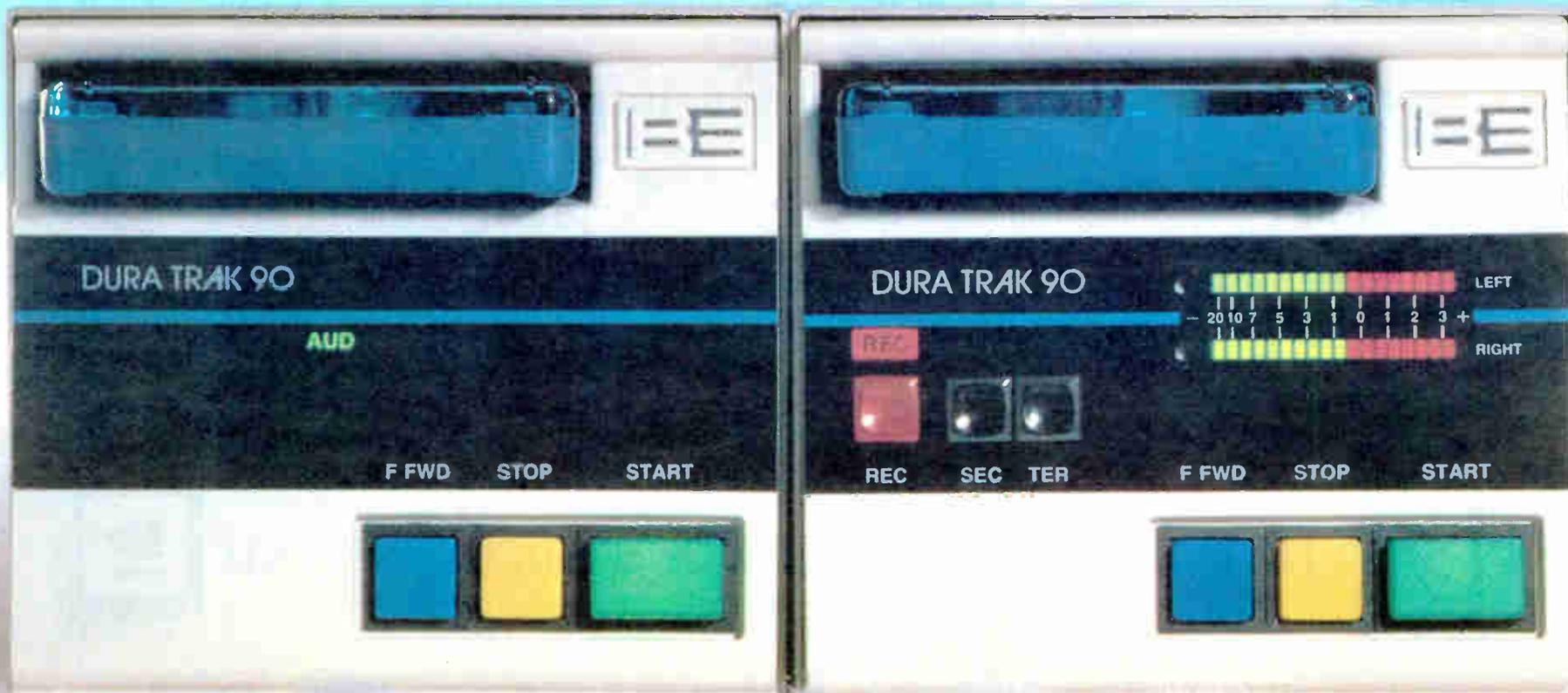
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Radio Rides the Economic Tides

(continued from page 10)

of buying it," he added. "We buy it to save money and to increase efficiency and quality."

However, at WPAT-FM and AM in Paterson, N.J.—the largest of 19 radio stations owned by Park Communications—equipment allocations have been halted until further notice, according to CE Ken Stout.

"My budget has gone to zero and everything is on hold right now until we see how things go," he said. "They're running very scared right now, and haven't given any indication of when they might lift it."

Stout intended to spend between \$30,000 and \$40,000 in the coming year on replacement equipment, including new consoles.

Where is the money?

The question remains: If ad revenue is up at stations, why is it not trickling down more generously to engineers and ultimately, equipment manufacturers?

For one, a number of companies that spent fortunes to purchase stations now must reduce their debt load before gearing up with new equipment for those properties, according to Arrakis' Palmer. "They have to work their way out of their cash flow situations. It'll probably be two or three years for them."

In addition, he said, "The industry as a whole is down in terms of capital spending, but there are also budget problems in Congress and the general economic opinion is that we're in or shortly will be in a recession."

"On top of that, add what's happening in the Middle East with gas and oil. Nobody knows what's going to happen. If there's a war, how is it going to affect our economy?"

Wheatstone's Snow theorized that in general, the freewheeling attitude that was prevalent in the industry a few years ago is quelling.

During that time, he said, rampant station sales added to manufacturers' sales as new owners revamped their properties. Now, fewer stations are trading hands.

"Banks are not going to lend money on projected value of the stations like they were, but on real value," he said.

Another speculation is that radio and TV broadcasters are waiting for digital technology and the supposed impending digital revolution to reach maturity before investing.

"I think that's causing peo-

ple to hold back a couple years," said Rob Corrigan, VP of marketing for Ampex, a manufacturer of television broadcast equipment. "The transition to digital hasn't occurred as quickly as many manufacturers and broadcasters thought it would."

Another effect of digital audio broadcasting, Palmer said, is that banks are questioning the value of stations now, with

the threat that current methods of broadcasting might someday be obsolete. "Financial institutions are not going to lend on it," he said.

Adding to the trouble, judging from a study conducted by Los Angeles accounting firm Miller, Kaplan, Arase & Co., is the fact that station profits are being divided among higher talent and programming costs.

Radio morning drive salaries, the study said, on average, have increased 82 percent in the past five years, from \$65,000 to \$118,000. Afternoon drive salaries have elevated 60 percent, from 1985's \$45,000 to today's \$72,000.

Whatever the situation, one manufacturer who asked not to be named cautioned the industry to hold its own during the lean times.

"A lot of people have resorted to deeper discounts as a way of keeping up business. It's bad for everyone," he said. "Some people think that the fast quarter is better than the slow buck, but after a while, riding your cash flow is going to catch up."

Part II of this series will look at how the industry intends to weather the recessionary conditions.



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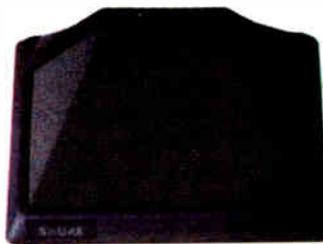
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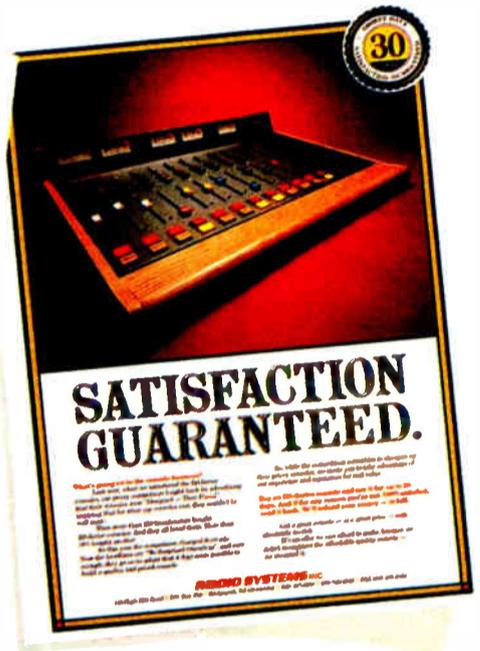
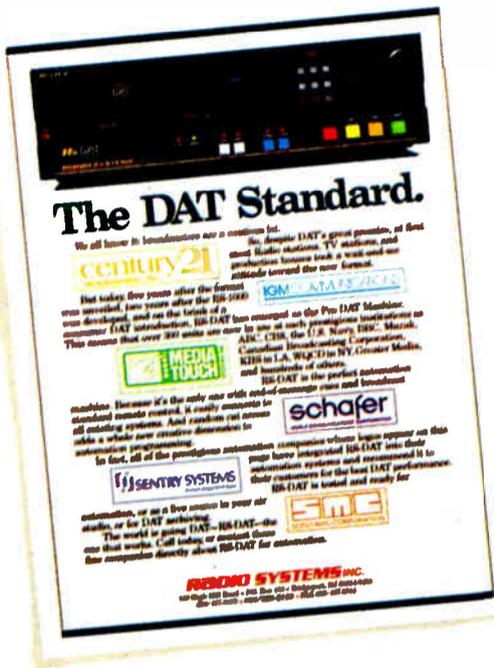
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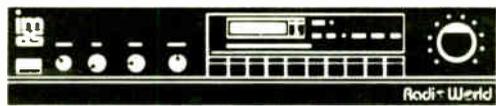
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CUE and REVIEW



Digital's Latest Entry

Editor's note: This is the first installment of a new column called "Cue and Review." Written by RW News Editor John Gatski, the series will analyze the role of consumer audio products in the broadcast industry, and will postulate trends likely to emerge in this arena.

by John Gatski

WASHINGTON Just when engineers are getting comfortable with CDs—and to some extent, DAT—at their stations, another product comes along that promises to confuse an already muddled digital audio market.

The new kid on the digital block was finally acknowledged by Philips recently when it confirmed development of the much-rumored digital compact cassette (DCC).

According to Philips, DCC technology will enable digital and analog cassettes to be recorded and played from a single machine; it is thought to be a step between analog and full-fledged DAT technology.

The cassette resembles a conventional analog cassette, but is digitally recorded and played back. DCC's hook, however, is its ability to record in both digital and analog on the same machine.

Philips has not yet released technical details of DCC, but record and playback will be accomplished via a linear, stationary head, much like analog. Similar technology—S-DAT, or stationary head DAT—was dropped in favor of rotary head DAT, early in the development of digital audio recording.

The DCC machines initially will cost \$500 to \$600 (less than DAT's lowest starting price of around \$799); the price will likely decline if sales are brisk. Blank tapes and pre-recorded tapes are likely to be cheaper than DAT as well.

Sounds great, you say. On paper, yes, but DCC seems to be one more thorn in the side of a fragile DAT market.

DAT is already several years behind its projected market penetration, mainly because of opposition to the technology from songwriter/recording artist groups, such as the Recording Industry Association of America. They fear (perhaps unnecessarily) that DAT will increase tape piracy because of its ability to make "perfect" copies of CDs.

These groups have threatened and followed through with litigation against foreign and domestic DAT manufacturers who retail recorders that can digitally record CDs. Sony is the first company to end up in court over the copyright issue; others may follow.

Such legal troubles have made manufacturers timid about producing consumer DAT, which has kept products on the expensive side. Just a year ago, consumer models that could not digitally record CDs were selling for \$1,500 and more. Blank tapes cost about \$12-\$15 and the few pre-recorded titles available are nearly \$20.

Of course, DAT prices may fall if the market succeeds. There already is some evidence of the economy of scale that occurred with CDs as DAT units have trickled into the country.

DAT was given somewhat of a boost this year by the advent of the Serial Copy Management System (SCMS), developed, ironically, by Philips. SCMS permits one digital recording of a digital source such as a CD, but that tape cannot be copied.

Sony now sells SCMS-equipped DAT recorders starting at \$800 and other companies are making similar low-cost marketing decisions.

SCMS was supposed to be a way to settle the copyright issue and let DAT flourish, but apparently it has not. Even with

SCMS, continued litigation threats persist by the recording artist and songwriter organizations who insist on tying the technology to royalty payments.

Potential buyers are another factor to consider in the digital tape dilemma. Informal surveys suggest that would-be DAT buyers are not sure whether DAT's increased fidelity is worth paying several hundred dollars more over an analog deck.

Apparently, the music-loving public is not as concerned about DAT's higher signal-to-noise ratio or increased dynamic range, especially when those benefits may not be audible to them. They just want inexpensive tape recorders and tapes that sound good to them.

If you add together the consumer indifference toward DAT's fidelity, the dogma of copyright litigation and DCC's promise of digital/analog capability at a cheaper starting price, you can see that DAT's future is not assured.

Before you write off DAT and embrace DCC, however, remember that the audio industry has yet to embrace it at this point.

"Audio" Magazine's Equipment Editor Leonard Feldman said little is known about DCC's technology yet, but he believes it will not equal DAT's fidelity, because of its use of linear head recording.

Does all this digital alphabet soup af-

fect professional digital audio users? The answer is yes.

Radio stations have used CD players for over-the-air broadcasts and as a cart dub source for a few years. Some are now using DAT. Although professional units are available, consumer units have found their way into radio studios because of their lower prices. Stations will benefit from a successful DAT market because costs will come down for every DAT-related product, including blank tapes and pre-recorded tapes.

This scenario of lower prices based on demand has already occurred with compact discs. Unlike DAT though, the CD achieved mass acceptance relatively quickly (five years), due to both its uniqueness and a decision to promote it as a replacement for the audibly inferior LP.

Also, CD technology was not designed as a consumer recording medium; thus, it did not incur the wrath of the copyright gods. Today, technology is available to allow home CD recording, but consumers are still a few years away from getting their hands on it.

Rumor has it that the audio industry will get a better look at DCC at the Winter Consumer Electronics Show in Las Vegas. Maybe then we'll get an idea of where it fits into this mess. Maybe.

RDS Subgroup Aims For Standard by '91

by John Gatski

WASHINGTON The National Radio Systems Committee (NRSC) subgroup on Radio Broadcast Data Systems will likely have a draft RDS (Radio Data System) standard recommendation by early 1991.

Based on discussion at the group's first meeting Nov. 6, NRSC Coordinator and NAB Staff Engineer Stan Salek said there may be a recommendation by the 1991 NAB show.

The standard will include the program format codes necessary for RDS receivers to lock onto music formats anywhere in the country.

About 25 people—including representatives of 18 receiver manufacturers, the Electronic Industries Association (EIA) and federal highway officials—attended the meeting.

RDS technology is based on a 57 kHz digital subcarrier system that was developed in Europe for traffic alerts and automatic receiver switching to government-owned stations.

U.S. RDS proponents believe the technology can be used to automatically tune receivers to a designated music format in any area of the country.

Broadcasters also are interested in RDS because it can transmit text, such

(continued on page 19)



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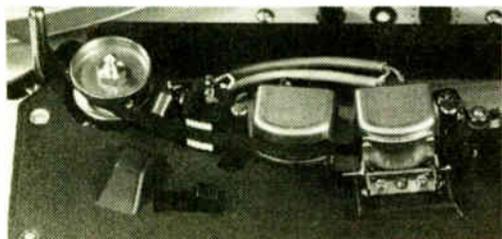
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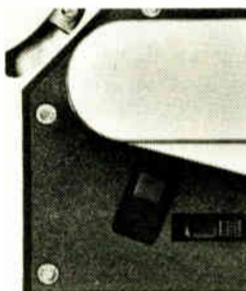
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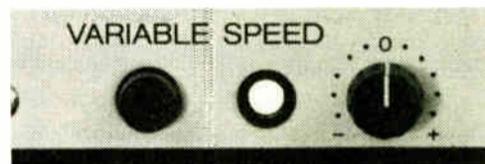
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Harris Allied Plans Expansion

by John Gatski

RICHMOND, Ind. Harris Allied Broadcast Equipment has announced it will open a national telemarketing center at its headquarters here and expand its domestic field sales staff, effective Jan. 1.

The move is a continuation of Harris' and Allied's merger that began in 1988. It will likely strengthen the company's hold on the radio equipment broadcast sales and distribution market, according to suppliers.

The company will add three U.S. radio sales positions to its current 12-member domestic sales staff and create a toll-free broadcast telemarketing center that will provide information and service for all Harris Allied products.

Gentner Electronics CEO Russ Gentner, whose products are sold exclusively through Harris Allied, said he liked what he has heard about the new plan.

"I think it's a natural evolution of the Harris Allied merger," Gentner said. "I think this is a positive change."

Arrakis President Mike Palmer said the expansion will strengthen Harris Allied field and telephone sales.

"I think it is very aggressive. They are actually adding people. It's real positive, I think," Palmer said.

Confusion eliminated

Palmer also noted that the new structure should eliminate the confusion concerning where to place orders that has existed since the merger.

RDS Draft Anticipated

(continued from page 17)

as station call letters and traffic alerts.

Others RDS features include automatic receiver switching to the strongest transmitter of a station that broadcasts on multiple frequencies.

The automatic format selection feature would require every region of the country to have universal RDS program format codes, which will be a large part of the subgroup's standard work, Salek said.

"The question is can we adequately choose format codes that provide for all of the different music formats today," he said.

Other discussion items at the subgroup meeting included technical parameters of RDS modulation characteristics and receiver company discouragement of RDS advertising because they claim the system could distract drivers. The subgroup also addressed problems with automatic clock synchronization in European RDS receivers because stations do not always reset the clock after a power outage.

As separate companies, Harris, which produced its own RF equipment, relied mainly on field sales for its business. Allied, which distributed an assortment of broadcast studio equipment and supplies, sold most of its products through phone orders.

That structure stayed intact through the first two years of the merger, causing some confusion when customers called in orders or wanted information, company officials said.

Any confusion stemming from the two-company legacy should be eliminated by the expansion, according to Harris Allied Worldwide Sales VP Gus Ezcurra.

Overall, the company sales staff will increase 18-20 percent with the new domestic and telemarketing structure, Ezcurra said. "It's the biggest investment we have made in our sales organization in years," he added.

Although the broadcast equipment economy is soft right now, Harris Allied saw an opportunity to solidify its hold on the market, Ezcurra said.

Harris Allied strengthened

"We see a lot of opportunity to exploit the strengths of Harris Allied," Ezcurra added. "We felt that this expansion coupled with the telemarketing center would strengthen our position."

Besides encouraging news on the domestic sales front, Ezcurra said Harris Allied's international business remains strong.

Domestically, Harris Allied executives see the creation of a central telemarketing department as a way of accommodating two customer bases more efficiently, he noted.

In addressing the change, Harris Allied Marketing and Development VP Roy Ridge acknowledged past confusion among customers when they phoned in their orders.

"Many customers complained that this was too confusing—that it was hard to know who to call for what," he said. "A single sales organization with one toll-free number should remedy this situation."

The telemarketing center will have about 15 employees. They will be knowledgeable about all Harris Allied products, enabling them to respond to questions and orders beyond just studio equipment, Ezcurra added.

Increased service

The domestic sales staff will continue to sell RF equipment such as large transmitters, but also provide technical advice and recommendations, and will assist with facility planning in all areas of broadcasting, he said.

Besides the addition of new personnel, the staff structure also has been shifted somewhat to accommodate the change, Ezcurra said.

The restructure includes shifting sales

people from the field into the telemarketing center and laying off two salesmen, Ezcurra explained.

Two field sales offices will be moved during the expansion, he added. In the Midwest, the already-closed Dallas office will be moved to Houston and the Seattle office will be relocated to Oakland.

Although telemarketing usually costs companies less than direct sales, Harris Allied actually will invest more money because of capital costs, Ezcurra said.

Ezcurra said the Richmond headquarters is being expanded to accommodate the telemarketing center and the com-

pany will invest heavily in a new computer system.

Beyond the initial investment, however, industry analysts believe Harris Allied will be able to increase its sales at a lower cost through telemarketing.

"Sales calls are a lot cheaper by telephone than in person," said Doug Sheer, co-director of industry consultant Sheer and Chaskelson in New York.

Sheer said Harris Allied's new telemarketing emphasis is not a novel idea. "There is a lot of telemarketing out there. For Harris, however, it's a little bit of a change," he said.



A single sales organization should reduce customer confusion, said Harris Allied VP Roy Ridge.

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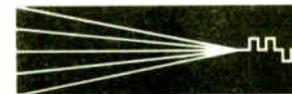
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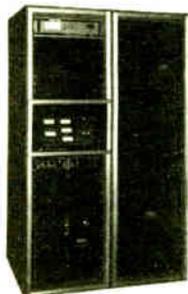
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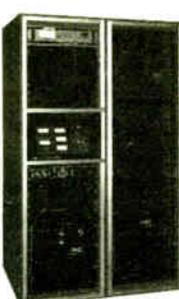
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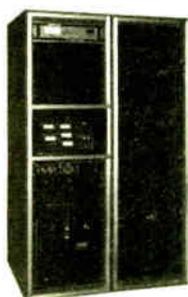
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Circle 5 On Reader Service Card

What to Do When Your Station Is Sold

by John "Q" Shepler

Part I of II

ROCKFORD, Ill. The production manager bursts into the shop, leaning one hand against the test rack to catch her breath. "Guess what?"

You look up from the schematic sprawled across your desk. "What?"

"We've been sold!"

You feel the knot rising in your throat. Oh, no. It's really happened. Sure, there have been rumors on and off for months. What station doesn't have them? But suddenly the rumor is reality. What happens now? Is the requisition for the new transmitter still alive? Wait a minute . . . do you still have a job?

It's a scary feeling, being sold. Your life is likely to change and you really don't know whether it will be better or worse.

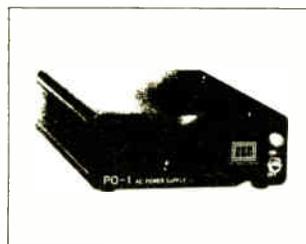
I've been there. Twice, in fact. The message I want to share is that you *can* survive changes in ownership. Play your cards right and you'll probably even benefit.

How to face change

Change is a frightening thing in itself. The worst kind is the type you fear most: You don't know what is really happening and you have absolutely no control.

Naturally, you jump to the conclusion that changes are going to be for the worse. The new owners are going to slash the budget. They'll probably cut salaries and benefits. Of course, there won't be any new equipment. You probably will be replaced by some hotshot they're grooming at another station. Not only won't there be any money for Christmas presents, but your whole family will starve. It's the end of the world!

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The voice of fear is pretty potent, isn't it? Before you let fear get a tight grip, think about this: Many changes, no matter how upsetting initially, lead to better things in due course. Many other changes can go either way, bad or good. You will have the opportunity to nudge these changes in your favor.

Here's something else to cheer you up. You may not have to do anything. Some changes are going to work to your benefit whether you deserve them to or not. That tyrant owner who thinks you talk too big is going to hit the road. The new owner, from a more sophisticated market, is delighted to have somebody on the staff that wants to make the station sound exciting. Sometimes you just get lucky.

Here are some other suggestions on how to improve your luck with the new owners.

just get lucky.

Here are some other suggestions on how to improve your luck with the new owners.

Get the facts

First, get past the anxiety. Nobody can do a good job if he or she is spending half the time working and the other half pondering fate. You need to try to get some solid knowledge about what is happening and how you may fare.

Start with finding out who the buyer is. Your general manager will know. What do you know about the new company? What is its track record? Have a connection at another of the company's properties? Make a few calls and try to get some objective data.

There will probably be a staff meeting soon after the sale is leaked. Listen carefully and take notes. What is the timetable? You will use this as the schedule for your own plans. When will the owners visit? Is there a special meeting planned? Are you expected to prepare in any way? Take lots of notes, especially names and dates.

Observe how the upper echelon is taking this. Are the top managers morose or do they seem to just have a few jitters? Don't barge in and yell, "what about me?". Keep the questions short and friendly. In a day or so, try to have a cup of coffee with the GM and quietly get a better understanding of the situation.

You might feel around a bit to see what is planned for your area. Chances are you won't learn much at the station, but you might from your personal contacts. Just take what you hear with the proverbial grain of salt.

Everybody has his own perspective. Unless the new owners are plotting your demise and bragging about it at the flagship, you won't really know how you'll fare. Many times the new owners will want to get to know the staff before they make any irrevocable decisions.

If you are chief engineer, you probably have less to fear than the management or programming people. Most executives are a little spooked about technical things and aren't about to storm in and blow away a capable engineer. Even

(continued on page 23)

Multitrack Radio Production

by Bruce Bartlett

ELKHART, Ind. It can be a pain to mix a complicated spot live to mono or 2-track. If you make a mistake in cueing the sound effects, or in setting balances,

LINE OUT

you must re-record the entire spot. This wastes the announcer's time and places great demands on your concentration.

There's a solution. Now that multitrack recorders are easily affordable, you can create sophisticated spots much more easily.

Figure 1 shows a suggested setup for recording a spot with an 8-track recorder. You'll need at least an 8x2 mixer. The eight direct outputs from the mixer feed the inputs of an 8-track tape recorder.

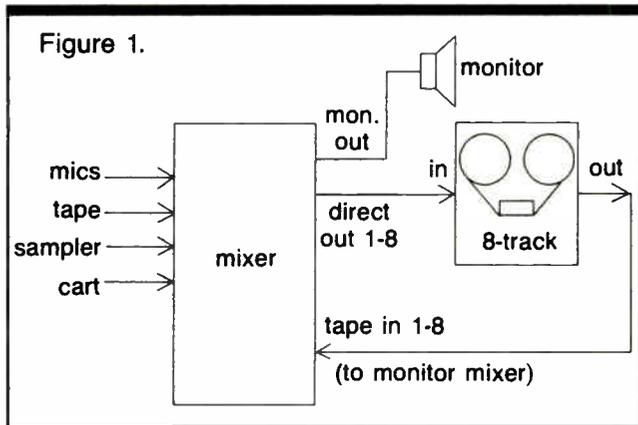
You'll want to monitor those eight tracks and set up a monitor mix. To do that, connect the 8-track's outputs to the mixer's tape inputs. Monitor an aux buss, set each input's aux knob to accept a tape-track signal, and turn up the aux knobs to create a monitor mix of the

tape tracks.

Let's run through a typical 8-track production of a spot. The commercial includes two announcers, stereo music and stereo sound effects. The program starts with music, which fades under the announcers. Various sound effects play at certain times. Finally, the music fades up and ends right on cue.

The music is already recorded on a tape deck, while effects are recorded on a sampler and a cart machine. The announcers are live.

You might assign the eight tracks like this:



- Track 1 stereo music (left)
- Track 2 stereo music (right)
- Track 3 announcer 1
- Track 4 announcer 2
- Track 5 sampler sound effects (left)
- Track 6 sampler sound effects (right)

- Track 7 cart sound effects (left)
- Track 8 cart sound effects (right)

The spot is one minute long, so you edit the musical piece to last one minute. That is, you splice out enough of the middle of the musical piece so that the total running time is one minute. You edit the music so as not to disturb the continuity of the beat. (Listeners will be unlikely to hear the splice because the music will be playing under narration.)

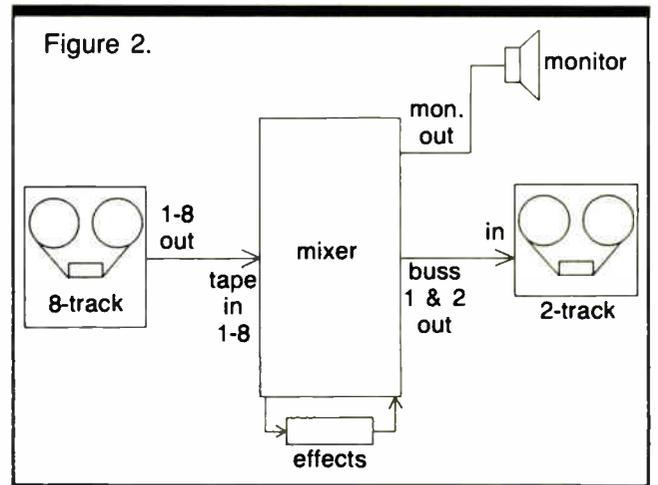
Now you can dub that music onto your multitrack. First, set recording levels and set the multitrack in record mode. Play the 2-track tape deck and record the music on the multitrack recorder (tracks 1 and 2) for the entire length of the piece. During the transfer, don't bother fading the music up or down; you'll do that later during mix-down.

After the music is recorded, you can overdub the announcers. Using the direct out jacks in your mixing console, patch the announcers' line-level signals to tracks 3 and 4. Now set tracks 1 and 2 to Safe and Sync mode, and set tracks 3 and 4 to Record Ready mode. Monitor tracks 1, 2, 3, and 4 (pre-recorded music and live an-

nouncers).

Rewind to the head of the tape and hit Record. You'll hear the music start. On your mixer, fade the monitor knobs for tracks 1 and 2 (music), and cue the announcers. You'll be recording the announcers on tracks 3 and 4.

Time now to add the sound effects.



Patch the sampler direct outputs to tracks 5 and 6. Set tracks 1, 2, 3, and 4 to Safe and Sync mode, and set tracks 5 and 6 to Record Ready mode. Monitor all the tracks on the aux buss.

Set the sampler to the desired sample number of the effect you want to hear. Rewind the multitrack tape to the top and hit Record. You'll be recording sound effects on tracks 5 and 6 while listening to the music and announcers on tracks 1 through 4.

At the appropriate point in the program, manually trigger the sampled sound effect. Similarly, overdub the cart sound

(continued on page 23)

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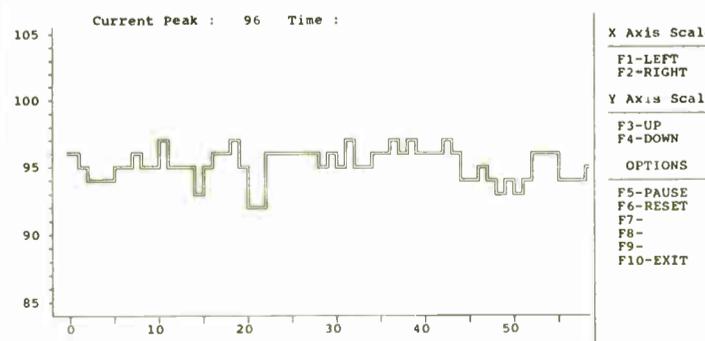
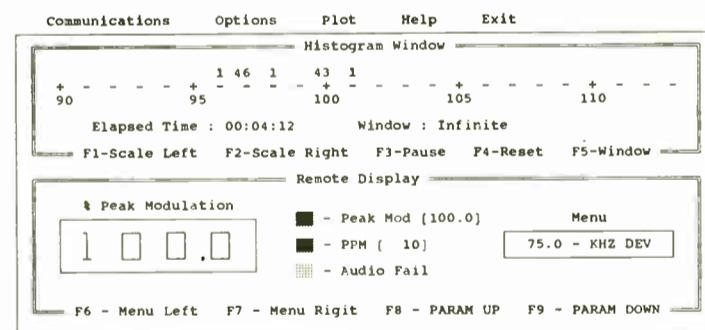
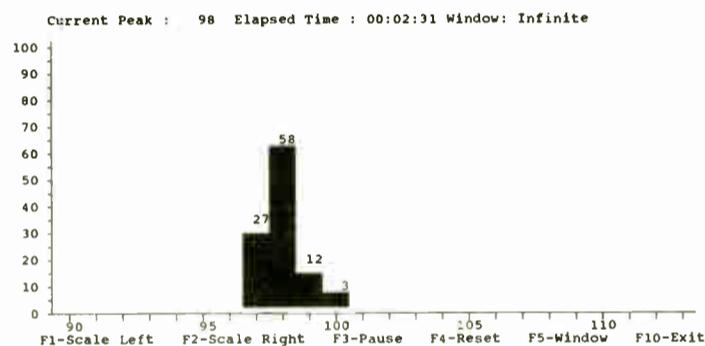
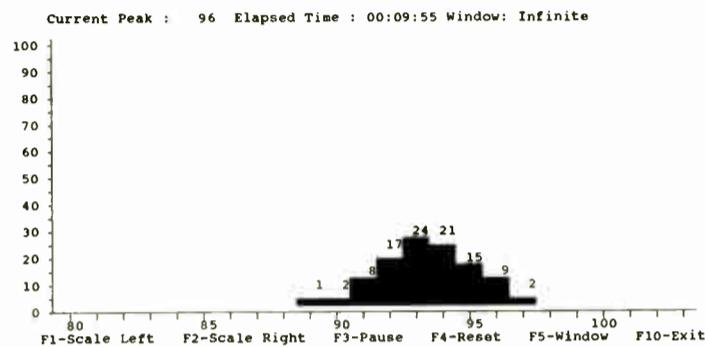
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- ^ TIME MODE - REAL ^
- V MENU PARAMETER V
- ^ DEV 75.0 KHZ ^
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Multitrack Recording in Radio

(continued from page 21)
effects on tracks 7 and 8.

Finally all your tracks are recorded, and you're ready to mix the spot. Monitor your mixer output busses 1 and 2. Set up your mixer to receive the tape-track signals (Figure 2). Using the mixer assign switches, route the tracks to channels 1, 2, or both (for panning).

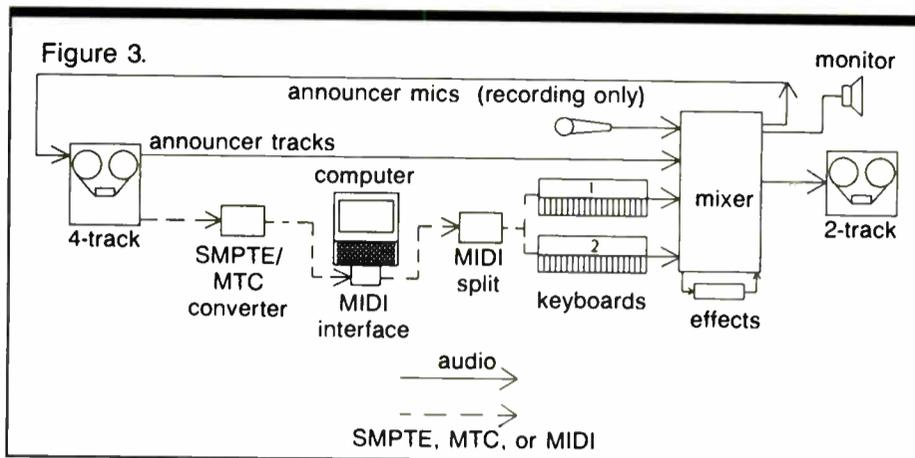
You might want to write a cue list noting the tape counter times to make changes in the mix. You note the fader levels at each change. For example:
00:00 Music starts, 0 dB.
00:10 Fade music to -10.
00:32 Effects -4.
00:40 Bring music up to 0.
00:50 Effects -1.

After practicing the mix several times, hit Record on your 2-track machine and record the mix. There's your perfectly produced spot.

A more sophisticated way to handle the same job involves SMPTE time code and MIDI time code (MTC). You'll record SMPTE time code and the announcers on the multitrack tape. The time code will

sync the audio tape tracks (of announcers) to two MIDI keyboards (playing music and sound effects).

Here's a possible track assignment using a 4-track recorder:
Track 1 announcer 1



The first MIDI keyboard will play some internally sequenced music. The second will play sound effects—samples you loaded from disk. You assign the various samples to different keys, so that, if you play a C4 note, you hear a thunder crash, and if you play F4, you hear a horn honking.

Track 2 announcer 2
Track 3 blank
Track 4 SMPTE time code.

You will record SMPTE on one track of the 4-track machine. As shown in Figure 3, the SMPTE time code feeds a SMPTE-to-MIDI time code (MTC) converter, and the converter's MTC signal feeds a personal computer running a cue-list program. The computer's MIDI Out signal triggers the MIDI keyboards (music and sound effects) at the times you preset on the cue list.

Connect the keyboard audio outputs to your mixer so you can hear them mixed with the announcers.

First, record SMPTE time code on track

4 for the entire length of the production, plus several seconds extra. Then, using the cue-list program, enter the SMPTE time for keyboard 1 to start playing its musical sequence. You do that by setting keyboard 1 to MIDI channel 1, and enter something like:

00:00:00:00 Start sequence Ch. 1

Rewind the tape about 10 seconds before the zero point. Play the tape. At the time you preset, keyboard 1 should start playing its internal sequence of music. While monitoring the music, record the announcers on the multitrack tape.

Now you're ready to add sound effects—that is, to trigger MIDI keyboard 2 to play its sound effect samples. Set keyboard 2 to MIDI channel 2. Play the multitrack tape, watch the SMPTE counter, and note the times that you want the various sound effects to play. Enter them using your cue list program. For example,

00:00:30:04 C4 Ch. 2

00:00:47:11 F4 Ch. 2

00:00:55:01 G4 Ch. 2

Using SMPTE has a great advantage: If any of these timings are off, you can type in a new cue point and try again.

Now, every time you play the multitrack tape, the music and sound effects will play live and in sync with the narration on tape. This sync is due to the SMPTE time code.

Plug the outputs of the multitrack tape and the MIDI keyboards into your mixer, and mix the program to 2-track.

Bruce Bartlett is a microphone project engineer and technical writer with Crown International. He can be reached at 219-294-8000.

When You Are Sold

(continued from page 20)

if they fantasize about cutting back, they probably won't do this immediately for fear of lost air time. Breathe easy. You have time to work this change in your favor. If not, you have time to get positioned to do something else.

"First impressions last forever." A young programmer told me that was his credo. It worked, too. He went on to become general manager of a couple of heavyweight stations. Your strategy for winning over the new owners has to revolve around making a favorable first impression.

This is where the whiners and worrywarts lose out. Some people sink into a blue funk as soon as they hear there might be some changes. They let their whole area of responsibility degenerate while they fret over what might happen. The result: They make a terrible impres-

sion on the new owners and seal their own fate.

Do just the opposite. Run your operation better than ever. Get the place cleaned up. Make sure all the paperwork is in order, especially the legal documents. Use the transition time to prepare the best presentation you can. Those first impressions will come soon.

The message: Act like you expect the best and you will probably be pleasantly surprised.

Next month, we'll look at some more specifics on getting ready for the new owners, and steps you can take to ensure that you'll be OK no matter what happens. 'Til then, best of the holidays to you.

John Shepler is an engineering manager, broadcast consultant, writer and regular RW columnist. He can be reached at 815-654-0145.

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Shortwavers Prepare for WARC

by Lex Felker

WASHINGTON In the midst of all the high-tech hoopla which seems to be evident in every corner of broadcasting, broadcasters employing one of the oldest media—shortwave—is squaring off against the government over when single sideband transmission ought to replace conventional AM in the international HF service.

Except for amateur operators who suffer interference from Radio Moscow on the 40 meter ham band, the American public seems to be generally

unaware of shortwave broadcast. Surprisingly, however, the HF bands are used widely throughout the world for both domestic and international broadcasts. The BBC, for example, has an extensive HF system, as do the U.S. government-sponsored Voice of America and Radio Free Europe/Radio Liberty services.

The U.S. also has a number of private shortwave broadcasters. In the late 1970s, when preparations were being made for the last general World Administrative Radio Conference (WARC-79), only four private broad-

casters were on the air, operating a relatively modest 125 frequency-hours. Today, however, there are 19 private U.S. broadcasters using more than 770 frequency-hours daily.

The world's shortwave broadcasters meet every two months or so to coordinate frequency usage for upcoming seasons, and it is becoming increasingly difficult to accommodate all the requirements expressed by broadcasters. In fact, studies prepared for a previous HF broadcast conference found that more than half of the stated requirements could not be satisfied at a level that ensured a quality broadcast service. By all accounts the requirements of U.S. broadcasters, as well as those of other countries, are expected to increase steadily for the foreseeable future.

History of increases

These increases are not entirely unexpected, and as far back as WARC-79 the U.S. has sought substantial expansion of the HF broadcasting allocations. Some increase in broadcast spectrum was adopted at the 1979 conference, but this increase was not immediate (frequencies were not scheduled to become available officially for either 10 or 15 years), nor did it provide access in the 6 and 7 MHz bands used most for broadcasting. The U.S. and several other countries took a reservation to the Final Acts of the Conference, and began using these expansion bands on a non-interference basis.

The question of spectrum scarcity was also addressed at the 1987 HF broadcast conference (HFBC-87). Here, conferees concluded that, to make more intensive use of scarce allocations, single sideband (SSB) emissions ought to be employed in shortwave broadcasting. In recognition that many existing receivers might not be able to receive SSB, however,

broadcasters were not required to convert to this new emission mode until 2015.

In preparing for WARC-92, the Commission again proposes an expansion in HF broadcasting allocations. But because of the increasing scarcity of HF broadcasting frequencies, the agency has also proposed a more rapid conversion to single sideband emissions than that just

FELKER'S FORUM

agreed to at HFBC-87. Under the proposal sketched out in its second Notice of Inquiry on the matter, the FCC would have, with some exceptions, stations employing the newly allocated frequencies operate in an SSB mode no later than July 1, 2007.

Timetable concerns

Despite what could still be viewed as a very lengthy transition period, many private broadcasters have expressed concern with the new calendar. Because SSB receivers are somewhat more complex (and costly) than the simple envelope detectors used in typical DSB/AM receivers, and many target reception areas are in the poorest, least sophisticated locales in the world, many broadcasters have questioned whether a 15 year transition period is sufficiently long to accomplish a complete changeover to a new population of receivers.

I expect that the comments to the NOI on this point from shortwave broadcasters will be caustic, and that some broadcasters will go to great lengths to have the Commission scale back its proposal. Inasmuch as many of the shortwave broadcasters deliver religious programming, I have even seen predictions of a "holy war" breaking out with the Commission on this issue.

Although equipment availability could very well be a non-issue in 17 years, the broadcasters may still have the better argument here. Irrespective of questions of cost, there is at least some uncertainty as to whether spectrum congestion is so severe as to warrant such a conversion. Some have suggested, for example, that a spectrum surplus might arise as fewer frequencies are needed to overcome interference.

Moreover, it is hard to believe that, if the 1300 kHz expansion in HF broadcast spectrum proposed by the FCC is adopted at WARC-92, short-run spectrum congestion will be so severe as to require broadcasters institute a technology change.

I consider particularly suspect any speculation as to shortwave spectrum demands two decades into the future. I keep having a sneaking suspicion that by the time the world approaches the end of the first decade of the 21st century, new distribution media will have relegated shortwave broadcasting, and the entire SSB controversy, to a memory.

Lex Felker is a technology/engineering consultant with the law firm of Wiley, Rein & Fielding, Washington, D.C.

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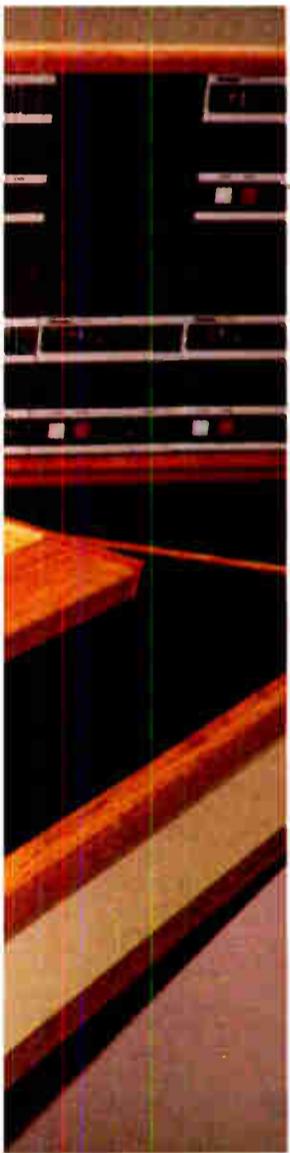
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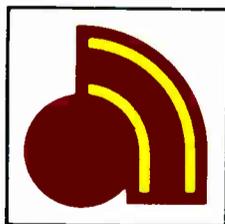
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Assessing Compression Systems

by Mel Lambert

Part II of III

STUDIO CITY, Calif. In this installment, let's focus on the types of subjective and objective assessments that can be used to evaluate audio data compression schemes and how that information might help identify which of the competing systems is best suited to your particular situation.

Let's face it: The laws of physics and information theory tell us that all of these data compression systems are going to degrade—however slightly—the audio quality. In most broadcast-related applications, so long as we are aware of these limitations versus the savings provided by reduced bandwidth and disc-storage requirements, virtually any of the currently available systems will get the job done.

As a rule, transform-based compression schemes, because of the need to divide the data into a number of discrete "frequency slices," tend to require more time to do their processing stuff than time-domain systems.

For example, the Dolby AC-2 coding process, utilized in the DP501 encoder and DP502 decoder units, has a quoted time delay of 45 milliseconds (encode/decode cycle). And the MUSICAM system—in essence a "hybrid" coder utilizing both sub-band and frequency-domain techniques—involves an encode delay of around 20 mS, and a decode delay of just under 20 mS.

ASPEC features a quoted delay time of between 80 mS and 167 mS, dependent upon the degree of data reduction.

Time-based compression schemes, on the other hand, tend to require less time to perform an encode/decode cycle. The familiar speech-quality CCITT G.722 process, for example, has an overall processing delay of 1.4 mS, while

the APT apt-X 100 sub-band ADPCM system requires 3.8 mS to perform an encode cycle (at a sampling rate of 32 kHz); decode is effectively instantaneous since it only involves a few clock cycles from the main AT&T DSP16 processor.

DIGITAL DOMAIN

Why should broadcasters be concerned with such processing delays encountered during most data-compression schemes? Consider the case in which a bit-reduction system is being used for STL or back-haul applications from remote sites, and the announcer/DJ/talent is listening off-air for continuity and/or cueing purposes. Professionals used to talking across complex IFB and cueing channels might be able to handle maybe 20-25 mS; beyond that point even the most seasoned sports commentator would find it virtually impossible to accommodate over-the-air delays.

Asynchronous operation

All data compression schemes require a word-clock signal to synchronize the encode and decode processors. Such signals are a way of life for hard-disk recorders, for example, and enable the data highways that carry digitized audio from the I/O ports, through the encoder/decoder processors and to/from the Winchester or optical drives, to identify the start of each data bit and the start/end of each discrete data word.

For satellite and STL links, the modem at each send and receive point will multiplex the word clock with the compressed signal, and then modulate the carrier signal.

Some coding schemes can automatically detect the loss of synchronization

signals, and drop quickly into an "Elegant Failure Mode," rather than producing high error rates and resultant audio anomalies.

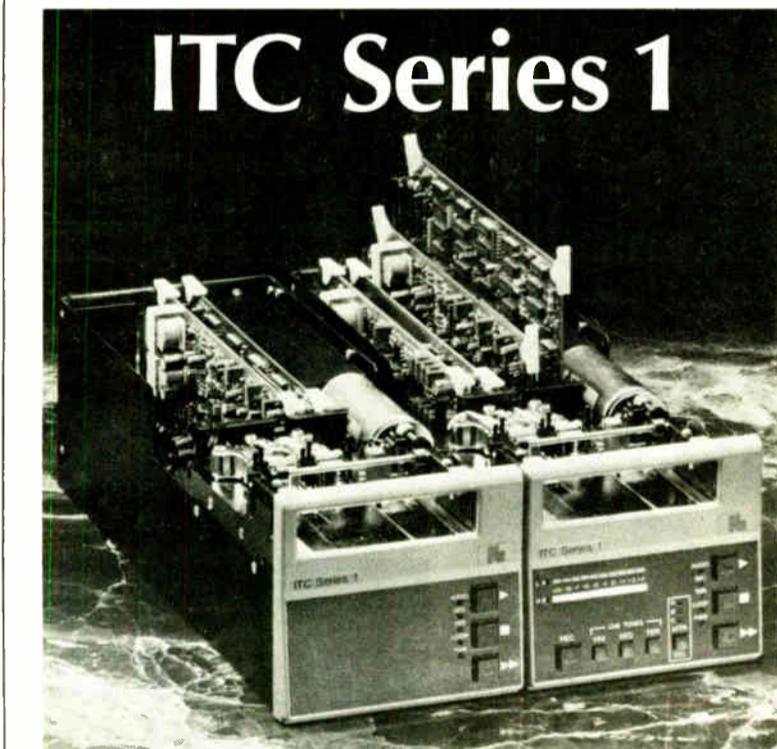
In some bit-reduction systems that attempt to implement enhanced levels of digital compression, individual channels might be processed individually, rather than as a stereo pair. For instances where the data channels are uncorrelated—speech on one, maybe, and music on the other, let's say—then it does make a degree of sense to process them differently, and maybe snatch a few valuable bits from either left or right channels with Adaptive Bit Allocation, a technique utilized in some transform-based systems.

Such schemes, however, can cause audible image shift on stereo material, since our hearing is very unforgiving of subtle frequency- and time-related phase shifts between left and right channels, and can spot that something just doesn't sound right.

Multiple generations/copying

As with any signal-processing techniques, there is a limit to the number of times we can perform an encode/decode cycle on audio material. In most instances, we might only be data reducing the signal once via a backhaul, satellite feed or STL, but imagine a situation where we are sending the signal from a remote lock, outputting it to a second hard disk during program assembly, and then routing it to the transmitter via a data-reduced STL microwave hop. Radio audiences might very well hear anomalies introduced by multiple processing stages.

And consider the case of a random-access recording and editing systems that utilizes data compression. Each time the material is re-recorded to disc it passes through another generational stage of compression. Any processed audio has to be de-processed before passing back to hard disk.



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Now for most applications these are minor operational limitations, given the cost savings available from smaller hard drives. But there might be occasions in which the audio will be subjected to several generations of processing before, during and after it has passed through a hard-disk system. You need to ensure that no significant problems will be encountered after as many as maybe six to eight encode/decode cycles.

PCM system compatibility

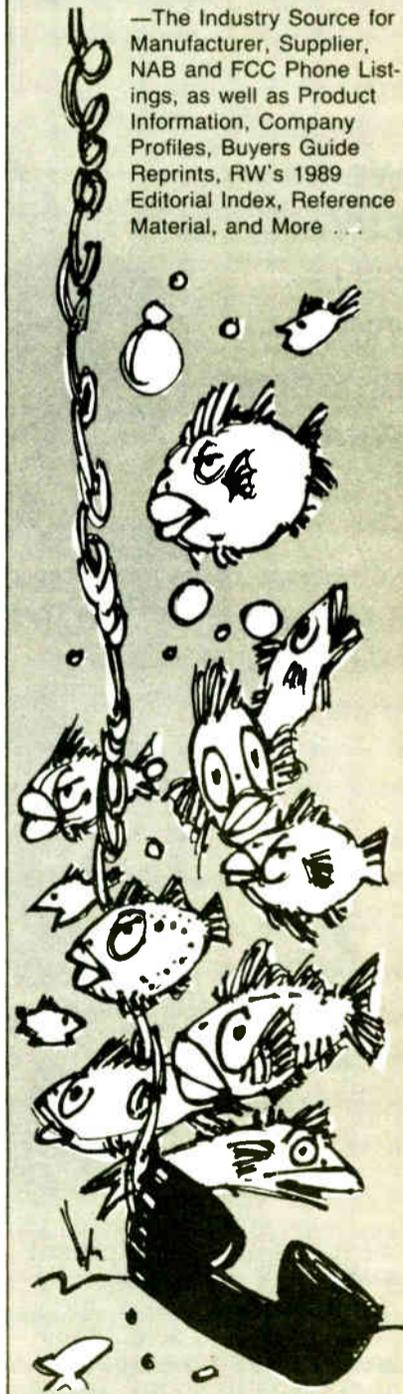
As more and more broadcasting systems incorporate additional items of digital hardware, including DAT recorders, affordable consoles, STLs and even direct digital transmissions, it is extremely useful if the compression system being used is directly compatible at the bit level with existing and future 16-bit

(continued on page 30)

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FCC's Mansbach Scuttles Pirates

by Dee McVicker

NEW YORK Early morning, July, 1987. "Sarah," a 160-foot fishing boat, was rocking gently to waves almost four miles off the south shore of New York's Long Island. Its captain was also rocking the boat. He was transmitting rock and roll music on the AM, FM and shortwave bands without the benefit of FCC licensing. And had been for the last few days.

Just up the coastal shore, the U.S. Coast Guard cutter "Cape Horn" fired up its engines. At the helm was Judah Mansbach, electronic engineer with the

FCC's New York Field Operations Bureau and pirate buster extraordinaire.

Mansbach had postponed his annual vacation for this auspicious occasion, and would have arrived sooner if not for the necessary legalities: His nemesis,

OFFBEAT RADIO

described by some as a notorious radio pirate, had dubiously registered the rusting, 160-foot former trawler to the country of Honduras and anchored it in inter-

national waters.

Even so, within minutes, the radio ship would be hit with a restraining order to cease operations and its captain would be escorted from the vessel. The charge? According to Mansbach, a violation of international treaty that states, in essence, "Thou Shalt Not Broadcast From a Ship."

For the past 28 years Mansbach has been firing similar restraining orders across the bows of radio pirate vessels, most of them land stations. He is both revered and feared by the East Coast pirate community, and for good reason. In 1989 alone, Mansbach busted, among others, notable East Coast pirate stations WHOT, WJPL, and WNYS.

Mansbach doesn't keep count of the pirates he's busted over the years, but he is quick to comment that he wouldn't hesitate to add to his already impressive list of customers.

"You have to understand something," said Mansbach. "Even if there was no interference at all, let's say there was no harm, they still have to be stopped. Why? Because the Commission was given the authority to issue licenses, to regulate the airwaves."

Pirate interference

Many pirate stations, however, *do* interfere with licensed stations and often with other services on the radio spectrum. FM pirates, said Mansbach, "pick like 91.5, which is the Board of Education station (in New York City); when they go off the air, (the pirates) pick up." Popular frequencies for AM pirates, according to Mansbach, "are just above the AM band, around 1620."

Power can range from a few hundred watts up to licensed power. Typically, said Mansbach, "they operate at night, or on weekends when they think we're not around."

But Mansbach isn't at all opposed to monitoring the airwaves when he is off

duty. In fact, some of his most memorable pursuits have begun by punching up the AM or FM dial at these odd hours. He recalled one pirate who had the misfortune to operate his station on an evening when Mansbach and another Field Operations engineer were within earshot of a receiver.

"One of the guys at the office heard the signal from his home. He happened to be listening to the station, which happened to be a pirate, and he called me. Luckily,"

(continued on page 34)

Selecting a System

(continued from page 29)

formats. In other words, a digital bit-reduction algorithm that codes data into a format that is directly compatible with normal recording formats and transmission schemes.

Also, with some systems it is possible to multiplex as many as eight channels of encoded data for transmission over a satellite, microwave or hardwire link. A single decoder unit can then be programmed to detect, via a data pointer, which of the various channels should be output at the receiver location.

Such a function allows an existing 1.024 Gbps stereo PCM link, for example, to carry up to eight channels, without any modification to the clocking circuits, thereby quadrupling the number of available stereo audio channels (assuming a 4:1 digital bit-reduction ratio).

Dependent upon the width of each frequency band in a transform-based scheme, and the degree of overlap (if any), it is sometimes possible for the decoder to produce variable amounts of pre-echo.

Consider, for example, the case of a sudden transient that has its rising edge within a frequency band. The coder quite correctly detects its presence, and codes the information within the appropriate frequency band, and also uses that information to steal valuable data bits from the surrounding masked envelope.

Upon decoding, however, the output level is turned on for the complete duration of the coded frequency band, which means that the signal will be heard before the arrival of the actual transient. Such pre-echoes sound very much like analog tape print-through, and may be unacceptable for more critical applications — particularly on material that contains a large number of sharp level excursions.

...

Mel Lambert has been intimately 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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WORKBENCH

Monitors and Cables

by John Bisset

FAIRFAX, Va. Tony Gervasi, the CE at WNOK in Columbia, S.C., came up with what is probably the simplest tower light monitor scheme I've seen. Built entirely of "junk box parts," the monitor interfaces nicely to Tony's Moseley MRC-1600 status channels. In his case, each beacon is assigned an LED on the MRC-1600.

The circuit monitors the power to each beacon and therefore gives a "real time" indication of whether the beacon is

VAC, and 14 turns around the secondary yielded about 12 volts out—you can experiment with the turn ratio for your particular site. When the beacon flashes "on," you'll get a DC voltage at the collector. When the beacon goes out, 0 volts appears. Tony Gervasi can be reached at 803-771-0105.

This next "Workbench" item is one of the slickest ideas yet for maintaining remote cables. With the possible exception of getting a last minute circuit out of the phone com-

removed.

Next remote, take along a spray can of WD-40™. After the remote, and after you've removed the sticky duct tape, take a clean cloth and dampen it with the WD-40. In cases where the sticky residue has built up or hardened, spray the WD-40 directly on the cable and wait for it to penetrate. Then wipe the cable clean with the cloth.

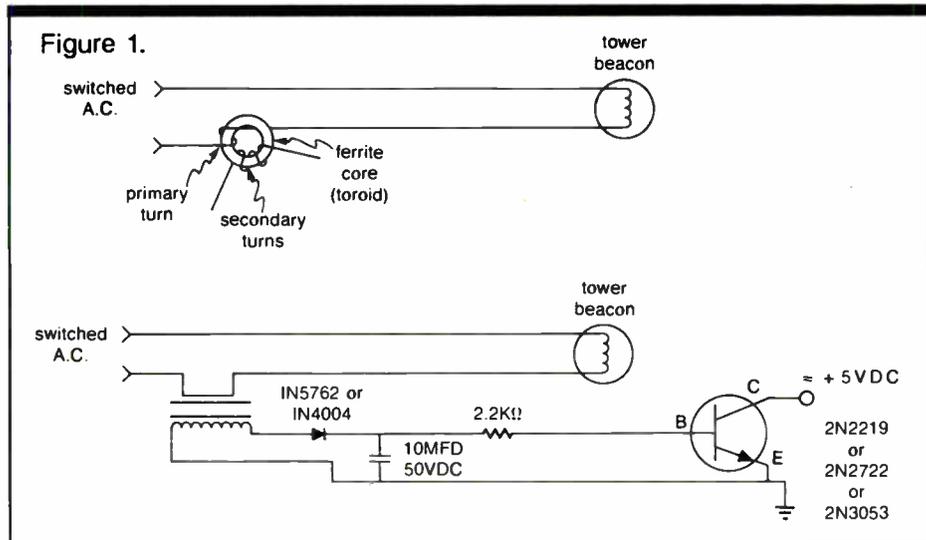
After your cables are clean, the WD-40 residue can be removed by wiping the cables down with a rag and some alcohol.

Television engineer Larry Albert from Murray State University offered this tip, and cautions not to use the petroleum-based WD-40 on rubber cables or power cords, as it attacks the rubber. But for the synthetic jacketed cables, a slicker solution to a sticky problem cannot be found.

Murray State University is located in Murray, Ky., and Larry Albert can be reached at 502-762-4664.

In the Oct. 24 "Workbench," John Fischer, CE for KFUC-FM in St. Louis,

provided a schematic for a neat transmitter status monitor. The device would alert the studio of the status of the transmitter, should the studio power fail (and therefore also the power for the studio end of the remote control). The two power supplies were mislabeled in that issue. A cor-



flashing or burned out. Figure 1 shows the circuit. T-1 is simply a toroid core through which the hot wire to the beacon passes. You can wrap this usually stiff solid conductor around the toroid for one turn.

The WNOK tower lights run on 110

pany, perhaps the most bothersome task associated with remotes comes after the actual remote is over.

All those extension cords, speaker and mic cables that were so neatly (and safely) covered with grey duct tape need to be collected—and that sticky tape needs to be

The Ethics of Buying Station Equipment

by Barry Mishkind

TUCSON, Ariz. My recent column on ethics in broadcasting brought some interesting responses, both by phone and letter. In the column, I commented on a certain group of salespeople and engineers who make side agreements while negotiating an equipment purchase.

ECLECTIC ENGINEER

After thinking about the responses to this piece, and after talking to a few people, perhaps it's important that we focus on this issue a bit further.

Unfortunately, some sales types apparently saw it as a blast at sales. Some called it biased, even though it was made clear that there are engineers out there seeking and demanding kickbacks.

"If the engineers didn't demand kickbacks, the sellers wouldn't be providing them," goes the argument. But that seems

a rather weak line of reasoning. Trying to place the blame for ethical breakdowns at the feet of the engineering community ignores the old maxim "It takes two to tango."

On another frequency, so to speak, a few engineer types were unhappy because they feel their personal ethics are not one's business but their own. If there's money out there, they want it, without any comment from the sidelines.

The basic reason all of this has become important to us is the radical change in our industry—or more correctly, the world—over the past twenty years.

Sure, there were dishonest engineers and salesmen 20 years ago. But then and now, our industry also has been filled with many dedicated professionals adhering to a high standard.

Deregulation, however, brought a new set of dynamics. The era of the "bean counter" arrived with reduced engineering budgets and/or salaries, and a trend toward fewer full-time engineers, even in larger markets.

(continued on page 32)

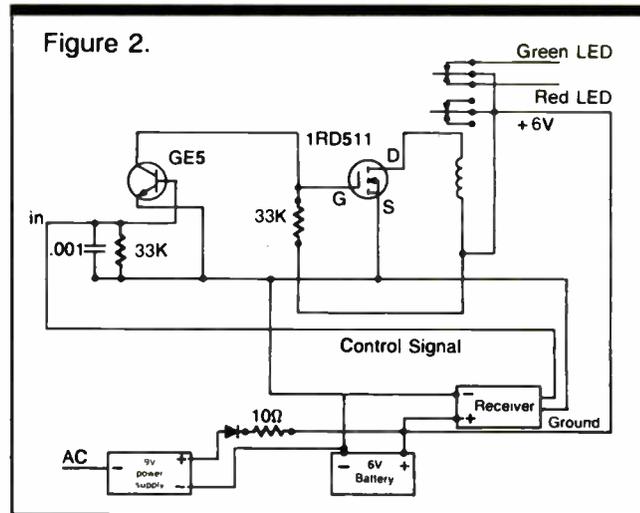


Figure 2.

rected schematic appears in Figure 2. John can be reached at 314-725-0099.

John Bisset recently left Delta Electronics to concentrate on Multiphase Consulting, a contract engineering company. He is also RW's technical editor. John can be reached at 703-379-1665.

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Radio Odds & Ends

by George Riggins

LONG BEACH, Calif. After driving about 16,000 miles since the first of June, and listening to a lot of AM stations, I think that it is fairly easy to ascertain which stations have installed the NRSC filtering system. If there is no splatter up or down 10 kHz on most stations, the filter system is installed. If there is splatter, the chances are very good that the NRSC rules are not being observed. In my non-scientific tests, I find the compliance figure is at best mixed and spotty.

Phil Wells of KJQY, San Diego, has taken me to task for making comments regarding the lack of commercials on many stations. Yes, there is a difference between the clustered commercial format that some stations use and the two or three PSAs that one sometimes hears in an hour on other stations. The latter is a lack of commercials! At least I hope I can recognize the difference between the clusters



and the lack of commercial content.

Another barb comes from Colonel Elmer Goetsch of Three Lakes, Wisc., regarding the WWI experiments conducted by the University of Wisconsin under the direction of Professor Earle M. Terry, using the call 9XM.

According to Col. Goetsch, the University of Wisconsin Physics Department was authorized to continue experimentation during WWI. Col. Goetsch goes on to say that the experimental communications were carried out "telephonically with naval stations on the Great Lakes."

There is evidently much more to the story about 9XM and the later commercial call of WHA. According to Col. Goetsch, "Regular broadcasts since 1915, even through WWI, supports WHA's claim that it is the 'Oldest Station In The Nation,' KDKA notwithstanding (Reference H. Russell Austin, 'The Wisconsin Story: The Building of a Vanguard State,' p. 605). Therefore, all non-government radio activity did not cease during WWI, unless you count the University of Wisconsin Physics Department as a governmental activity."

Am I wrong in assuming that the experimental activity was carried out under supervision of a governmental agency? If under the supervision of a government agency, then the activity would have been—technically—not a

(continued on page 36)

Ethical Considerations In Equipment Buying

(continued from page 31)

Some escaped these pressures by leaving the ranks of active engineers and going into sales, consulting or other fields. Others became accustomed to the sharply reduced budgetary levels, perhaps doing with a smaller support staff.

Still others contracted with several stations in order to make a living. And a few coped by developing shady schemes for generating the income level they wanted.

How widespread is such activity? As you might expect, it depends on where in the industry you look.

What is happening

Most national suppliers want no part of any deal that's not above board.

For example, Neil Glassman, sales manager of Bradley Broadcast, said he'd run into more dishonest taxi drivers or waiters than broadcast engineers trying to work an underhanded scheme through him. Glassman said, "I could count on one hand the number of those trying such stuff in the past few years."

Like Glassman, Carl Peterson, Sales Manager of IGM Communications, won't even get started with anyone proposing a convoluted billing scheme or side payments. "A finder's fee is one thing, but we don't negotiate payments to anyone connected with a sale," he said.

Bill Newbrough of Allied Broadcast Equipment considered the matter from two viewpoints, having been a chief engineer at KNBR in San Francisco before coming to sales.

Newbrough had a high opinion of the engineers in San Francisco, saying that while he worked at KNBR he never saw dishonest buying practices in the market. Similarly, at Allied, he "doesn't see (those practices) as a problem."

However, by contrast, some smaller companies aren't as emphatic on the matter—especially some of those companies owned or run by active station engineers.

For example, one engineer was alleged to have sent out tape cartridges to be re-wound at *his own company*. While that in itself is not wrong, it was alleged that the company routinely overcharged the station. That is wrong.

On the other hand, there are the occasional station owners who try to manipulate the system themselves. Many suppliers have stories of purchase orders issued when the owner never intended to pay. And what of the owner who calls a supplier and demands a product be shipped instantly, only to pay six months or a year later?

What's at stake

None of us can legislate morality. There are countless examples in all walks of life to confirm this point. That leaves peer pressure.

For example, trade groups can be of value in encouraging ethical behavior. But is there enough interest for pressure in this area? That's a tough question, because underneath it all is the quest of the engineering community for more respect. It's not easy to get.

One obstacle is that while engineers generally consider themselves professionals, they aren't licensed or regulated as such. True, emergency information can be essential. Yet, transmitter repair truly isn't as critical a job as, say, practicing medicine or nursing.

Returning to the basic point: Even if engineers don't operate under some sort of professional oath of integrity, employers deserve to have confidence that the counsel offered is for their best benefit.

Many sales organizations are part of the solution. But pressure from the different trade societies is needed to keep the industry clean. Perhaps they can establish an office to refer complaints for investigation and action.

In the final analysis, perhaps it is up to managers who have the most control, via your checkbooks. Make an effort to understand some of what goes on in engineering; It's a wise investment of your time.

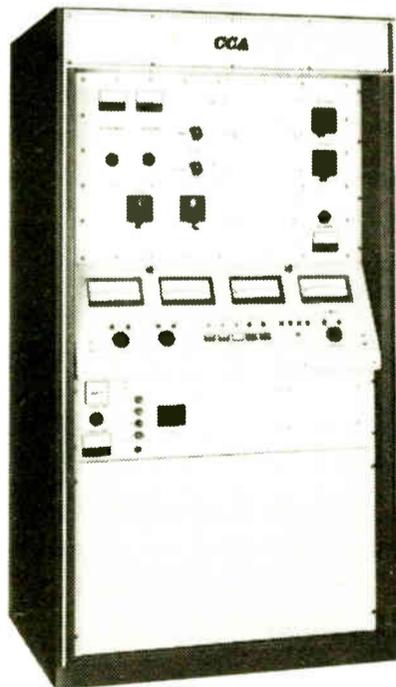
As we said before, a good engineer actually can *save* you money as he looks after your interests. When you find one, take good care of him.

Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797, or on FidoNet 1:300/11.

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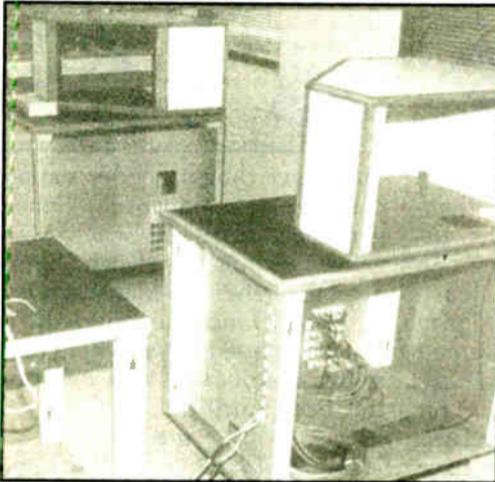
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Modulink Custom Studio System



Modulink Prewire On Air System 12



FEATURES

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The FCC's Pirate Eradicator

(continued from page 30)

I was home and I had a car—a DF car," recounted Mansbach. Within a half hour, the pirate station was silenced.

The DF—or direction finding—car assists Mansbach in most of his pirate chasing ventures. Equipped with a sophisticated computer system to determine pirate signal strength and direction, it can lead Mansbach to the doorstep of any pirate that dares to stay on the air long enough.

Mansbach also is assisted by the Commission's nationwide monitoring system. A network of 13 antenna stations throughout the country, this system monitors 24 hours a day, seven days a week for unlicensed signals. It can also pinpoint a pirate within a 10 mile radius, depending on the signal propagation.

Generally useful for tracking high frequency piracy, these monitoring stations give Mansbach a class rating of the signal and the approximate location. For instance, said Mansbach, "they will tell me it's New York City Class C, which means 40 mile radius of New York City." A Class A rating, in contrast, offers Mansbach a 10 mile radius of the unlicensed signal. From these directives, Mansbach usually drives his DF vehicle to the center of the radius, where he can easily pick up the signal.

After the pursuit is over and he is face-to-face with his adversary, Mansbach's primary concern is to get compliance. Although penalties for operating an unlicensed station can hold a criminal fine of \$100,000 with a possible one year jail term, by far the most effective way to get immediate compliance from the pirate, commented Mansbach, "is to take his toys away."

Yesterday and today

At one time, taking the toys away from a radio pirate demanded criminal action, requiring a criminal search and seizure. "In the old days, we used to get a search and seizure, possibly an arrest warrant, and go in and seize the equipment and arrest the individual," said Mansbach.

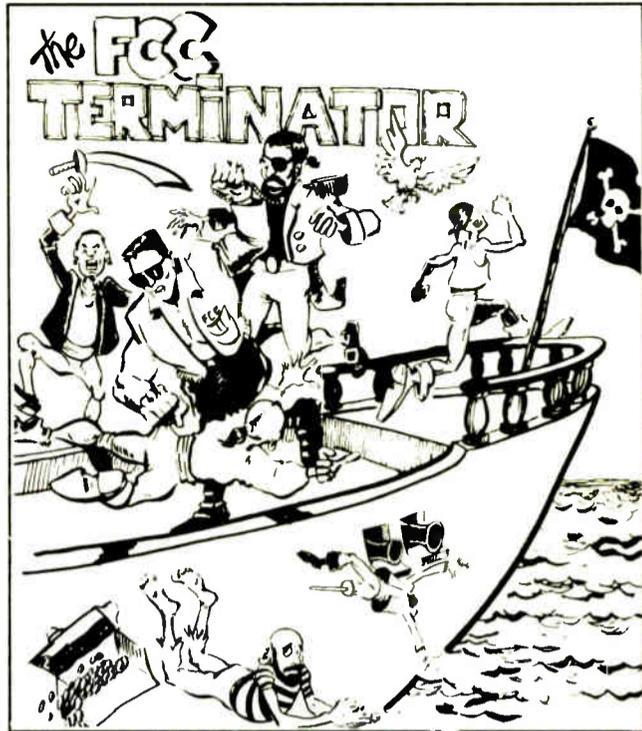
Today, Mansbach's job is a lot easier, "The Field Bureau has been given some authority over the past few years, which gives us a much stronger weapon to work with," commented Mansbach. "(Now) we have a civil procedure that was picked up from the drug enforcement, where we can proceed civilly in a case." To Mansbach and other FCC pirate busters, this means far more authority with which to rein unlicensed stations into compliance.

What is the typical profile of a radio pirate? Sometimes, commented Mans-

bach, "he's a frustrated disc jockey and he wants to get on the air but he can't get a job at a regular radio station."

Or, said Mansbach, "he wants to get on the air to play his type of music, which he claims he cannot otherwise." For example, cited Mansbach, "A guy in upstate (New York) who happens to like classical music—and in his part of the country there's no station that plays classical music—went on the air and started playing classical music."

In addition, he said, there are others that just simply want to join the entrepreneurial spirit of broadcasting. "In the case of 'Sarah,' besides them wanting to play a certain type of music, they wanted to eventually make this into a full-fledged broadcasting station." If not for the station being unlicensed, speculated Mansbach, "it probably would have worked—probably would have sold." Although most radio pirates know



they'll get caught sooner or later, according to Mansbach, most are genuinely surprised when Mansbach arrives to pull the switch. Sometimes even the venerable Mansbach is a little surprised. Once, he reflected, "(I) had a station closed down where the transmitter was located in a dog house in the back yard!"

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

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PS Form 3526, Feb. 1989

(See instructions on reverse)

Transistors in Amplifier Design

This is the seventh in a 12-part series called Amplifier Fundamentals. Northern Virginia Community College will offer 1.2 CEUs (continuing education units) to registered students who successfully complete the course and an examination mailed at its conclusion.

Successful completion of the course and the final exam also will earn 1.3 professional credits toward recertification under the maintenance of certification provisions of

by Ed Montgomery

Part VII of XII

ANNANDALE, Va. Transistors exhibit many unique characteristics that must be considered when an amplifier is designed. One is the family of characteristic curves. The collector current conducted is not always the same for equal increases or decreases in base current. Figure 1 is an illustration of this.

In this example, the operating point is a base current of 40 microamps, with a signal of ± 20 microamps applied to the base circuit. Sine wave "A" is an illustration of the input signal and sine wave "B" illustrates how the collector to emitter voltage will vary. Sine wave "C" illustrates what the output current will be.

Striving for accuracy

One major factor in amplifier design is the ability to reproduce signals accurately, introducing as little distortion as possible. All amplifiers introduce distortion, even the digital designs. The very fact that the digital ampli-

fiers are dividing up the signal into segments to sample indicates they are introducing some form of error. Their advantage is in the fact that they are less likely to introduce additional error when sent over long distances, where additional amplification is necessary or

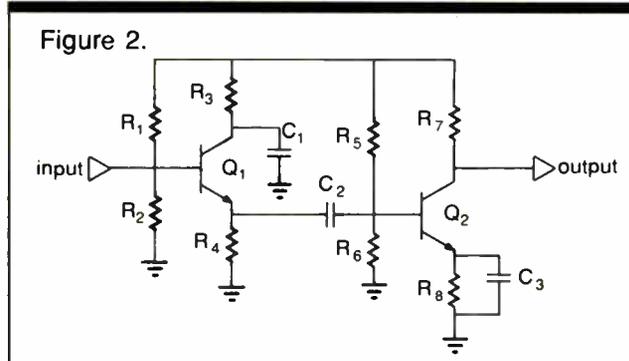
when reproducing digital recordings.

Figure 1 is an illustration of a transistor operating in the active region.

off state. In this design, more amplification can be attained with the transistor making a more accurate reproduction of the signal.

As mentioned in installment three of this series, amplifier impedance matching is important to proper operation and power transfer from an amplifier to its load. If the load is more—or less—than what the design of the amplifier calls for, the load line will shift, possibly

causing the transistor to operate in the saturation or cut-off region, causing distortion.

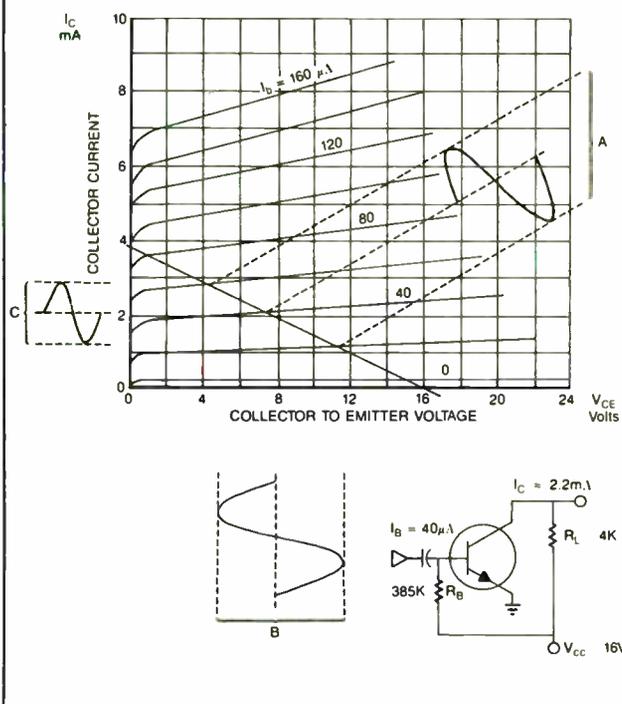


Current is flowing continuously in this amplifier. Small signal amplifiers often use this type of a design. However, power amplifiers using greater base current changes often cannot reproduce a signal without introducing intolerable amounts of distortion.

Usually two transistors operating in push-pull, complementary-symmetry or totem-pole are used in class AB design to reproduce the signal. Class AB amplifiers are used to eliminate a phenomenon known as "crossover" distortion, which occurs when the transistor approaches its cut-

Improper impedance matching can also cause the power dissipation limits (continued on page 36)

Figure 1.



the Society of Broadcast Engineers (SBE) Certification Program.

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Understanding Transistor Traits

(continued from page 35)

of the transistor to be exceeded, thereby destroying the device.

Using the common collector

Impedance matching can be performed with transformers or with the common collector (emitter-follower) amplifier.

Figure 2 illustrates how the common collector can be used. Q_1 is the stage that has the collector placed at an AC value equal to ground through C_1 . DC bias for the transistor's operation is not affected by this. R_4 is the load resistor with the emitter section of the transistor being used as the amplifier output. This input exhibits a very high impedance.

The input resistance depends on the value of the load. It is equal to the input of the impedance source mul-

a "buffer" or isolation stage. The high input impedance loads down the signal source only lightly while dropping the impedance to a more acceptable level where further amplification can take place.

Figure 3 illustrates a field-effect transistor (FET) common source amplifier. FETs offer some advantages over bipolar devices. The FET is a voltage-controlled device rather than a current-controlled component, resulting in a very high impedance. The amplifier in Figure 3 has an input impedance of 470,000 Ohms.

FET advantages

FETs exhibit very low noise output; this makes them excellent preamplifiers. They also have the ability to reproduce signals better than bipolar transistors, with superior linearity. Still, the bipolar transistors are cheaper to manufacture and—in non-specialized applications—work as well as FETs. Field effect and bipolar transistors are often used together.

Figure 4 illustrates a design using an FET and a bipolar transistor. In this circuit the FET offers a high input impedance and low noise while bipolar transistor Q_2 offers the necessary

is used to perform various functions as requested by the circuit designer. These functions include a differential amplifier stage to reject specific signals, high input, and low output impedances.

The op-amp

Most op-amps are integrated circuits and must be replaced in their entirety if any one section fails. They can use either bipolar or field effect transistors.

Ruminating About Radio

(continued from page 32)

civilian endeavor. Perhaps I should have used the term "most non-government radio activity ceased" rather than the positive comment "all non-government radio activity ceased." Always leave a loophole (or, CYA).

Early radio parts maker

A chance comment on a recent research trip to Salt Lake City lead me to a copy of "Radio Age," dated Sept. 1990, Vol. 15, No 9. The featured company and product was the Workrite Products Company of Cleveland, Ohio.

Workrite was started by Vernon H. Meyer in 1908, and was in business until about 1929, when Vernon Meyer left the company and moved to Glendale, Calif. In 1936, Mr. Meyer repurchased—or perhaps a better term is, resurrected—the business. Workrite continued to manufacture such items as dry cleaning equipment, gliders, periscopes, toy machine guns, rocket cars, musical merry-go-rounds, Lucite art kits, high pressure switches, float and sump switches, margarine mixers, automatic lawn sprinklers, spark plug and coil testers and a welder.

Included in the file folder were several pages of ads from publications such as "The Talking Machine Journal" for August 1924, "The Phonograph and Talk-

The op-amp offers excellent performance at a low cost. All preliminary design work has been done, leaving the technician with the task of connecting the various pins on the chip in a manner that will meet his desired needs. Manufacturers' data sheets offer a technician numerous ways to use an op-amp; several books also address the subject.

Ed Montgomery currently is an electronics teacher in the Fairfax County school system. He has taught broadcast engineering at Northern Virginia Community College and worked as a broadcast engineer for several radio stations. He can be reached at 703-971-6881.

ing Machine Weekly," June 22, 1927 and "The Saturday Evening Post," Sept. 17, 1924.

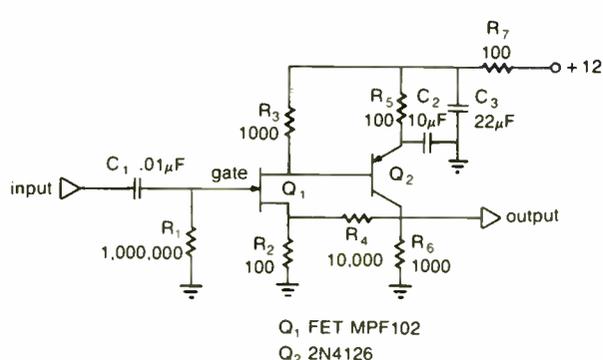
The opening paragraph of the "Radio Age" issue on Workrite contains a thumbnail sketch of the company. "Workrite Products Company was established in Cleveland, Ohio in 1908 to manufacture automobile products. Its founder was Vernon Howard Meyer who was born in 1883. Many early cars like Rambler, Garford, Stoddard-Drayton, Hupmobile, Cadillac and others used Workrite parts as standard equipment. They also made hundreds of thousands of accessories which were sold to Sears, Wards and Western Auto Supply."

It was after WWI that the company got into the manufacture of parts for the burgeoning radio market.

Among the several pages of ads accompanying the data on the Workrite Company were ads for two other manufacturers that many of us remember as big players in the Hi-Fi years of the post WWII era: tone arms by Empire, and phonograph motors by Thorens. In 1927, Thorens was listing itself as a "Swiss" company.

How about purchasing a "New Metallic Grid Leak" from Electrad, Inc.? It's been a long time since most of us have used a "grid leak." Wonder if there are any "grid leak pans" still in use anywhere in the world?

Figure 4.



tiplied by $(1-\text{Alpha})$. The amplifier has a voltage gain of less than one, but it has a very high current gain. Output impedance across R_4 is much lower. This circuit design is applicable to taking an input from a microphone, tape head, phonograph cartridge, CCD, etc., and preparing it for further amplification.

The common collector also acts as

amplification.

Often specialized amplifiers are encapsulated into one container to perform the necessary functions required. For example, two transistors in a Darlington arrangement can be encased in a common base capsule. This one device can be used to conveniently increase input impedance.

The operational amplifier (op-amp)

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Pushing the panic button

Do you need a panic button for a computer? According to a short blurb in the October issue of "Spectrum," by IEEE, such an accessory is now available for \$1.00. The button attaches to any computer and is available from Memory Makers, 3024 Haggin St., Bellingham, Wash., 98226. The button is red plastic, measures 1.9 cm x 1.9 cm x 1.3 cm and looks like a computer key with the word "PANIC" printed on it.

The button can be affixed to any surface with its adhesive backing. Sounds just like what many of us need in times of stress. (Could Carl Peterson of IGM have had anything to do with the development of this product?)

We are indebted to Mrs. Jacquie Meyer, daughter-in-law of Mr. Vernon H. Meyer for passing the information along about the Workrite Company.

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

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This satisfied BMX III user is Herb Squire, Chief Engineer at WQXR-FM/AM, New York, N.Y.



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Complying with FCC RF Rules

by Harold Hallikainen

SAN LUIS OBISPO, Calif. As part of station license renewal, stations are to submit an environmental assessment if the facilities to be authorized will have a significant effect on the environment, as specified in 1.1307 of the rules. If the facilities will not have a significant effect on the environment, an explanation of why there will be no significant effect is required (see question 7, FCC form 303-S).

INSIGHT ON RULES

Over the next couple months we'll look at these FCC requirements and how to determine compliance. Get out your copy of "FCC Bulletin OST 65"; I think you can get a copy from the FCC Office of Public Information (phone: 202-632-7000).

The instructions for Form 303-S summarize 1.1307, saying that a station will have a significant impact if it is located in a sensitive area (wilderness area, wildlife preserve, flood plain or historic area); if it will involve significant changes in the surface features; if high intensity strobe lights are to be used in a residential area; or if workers or the public will be exposed to RF levels above the ANSI guidelines (ANSI C-95, 1-1982). The ANSI spec is available from ANSI by calling 212-354-3300 or 212-354-3473.

The FCC also has published guidelines for evaluating compliance. These guidelines are in OST Bulletin 65 (FCC Office of Science and Technology). Many stations are now required to determine compliance with the RF radiation limitations for the first time as part of license renewal. Let's look at what is required to answer "no" to question 7.

The FCC wants to know how you determined the station will not have signifi-

cant environmental impact. OST 65 provides background information and information on predicting RF fields, measuring the fields and controlling exposure.

Human RF exposure regulation

The National Environmental Policy Act of 1969 (NEPA) requires federal agencies to take into account the potential environmental impact of their actions. The FCC adopted rules in 1974 implementing NEPA in FCC procedures.

In 1985, the FCC added human RF exposure to the list of possible environmental effects. The FCC adopted the exposure guidelines adopted by ANSI (American National Standards Institute), because no other scientific widely accepted standards existed.

The ANSI guidelines suggest maximum human exposure levels to RF radiation in the frequency range of 300 kHz to 100 GHz. The most restrictive frequencies are between 30 and 300 MHz, where human "absorption" occurs at the highest rate.

As the body absorbs energy (power times exposure time), it converts the electromagnetic energy into heat. The ANSI guidelines are based on the heating effect of the radiation as opposed to any possible but not yet detected effect of the radiation itself (induced current's interference with nerve communications, interference with DNA replication, etc.).

As power is dissipated, temperature will slowly rise. The rate of temperature rise is proportional to the power and inversely proportional to the heat capacity of the tissue being heated. Further, as the temperature of one object or area rises, heat flows away from the warmer area towards cooler objects. This heat flow (in calories per second) is proportional to the temperature difference and inversely proportional to the thermal resistance of the medium.

Taking all this into account, ANSI determined the maximum allowed temperature rise in a six minute (0.1 hour) period,

considered the power absorption rate at various frequencies and came up with suggested power density (ideally, metric units of watts/square meter, but practically, milliwatts or microwatts per square centimeter) limitations for these frequencies.

Power density is the amount of power that is absorbed in a unit area. If, for example, we have a one-watt isotropic (radiates equally in all directions) radiator and place a sphere around the radiator, the sphere will absorb all the power being radiated (one watt). If the sphere has a radius of one meter, the surface area of the sphere is

$$A = 4\pi R^2 \\ = 4\pi \text{ square meters} \text{---about} \\ 12.566 \text{ square meters.}$$

Each square meter receives about 79.6

Figure 1.

$$S = \frac{E^2}{377} = 337 \text{ H}^2$$

where:

- S is power density in watts/square meter
- E is the electric field strength in volts/meter
- H is the magnetic field strength in amperes/meter
- 377 is the impedance of free space in ohms.

To convert S to milliwatts per square centimeter, multiply the entire equation by 0.1, which does the meter to centimeter and watt to milliwatt conversion.

milliwatts. If the distance from the radiator is doubled, the power density drops by a factor of four to about 19.9 milliwatts per square meter.

The power density can be broken down into the product of the electric field strength and the magnetic field strength (volts/meter times amperes/meter yields watts/square meter). Far from the radiator

(the far field), the electric and magnetic field have a proportional relationship based on the impedance of free space (377 ohms).

The electric field strength (volts/meter) is the magnetic field strength (amperes/meter) times the impedance of free space (ohms). This is another expression of Ohm's Law ($E=IR$, with both sides of the equation divided by distance in meters). Further, once we have a relationship between electric and magnetic fields, we can determine the power density (watts per square meter) based on one or the other. These relationships are as shown in Figure 1.

Near the radiator, the magnetic and electric field will not have the proportional relationship they have in the far field. A current carrying coil generates a strong magnetic field while a high voltage conductor (such as the base of a half-wave antenna) generates a strong electric field. Since the limits anticipated by ANSI are generally near-field measurements, the limits assume the far-field relationship and put the resulting limits on both electric and magnetic fields.

Even if the product of the electric and magnetic fields does not exceed the power density limitation, the system is considered non-compliant if either the electric or magnetic field strength limitations are exceeded. Since the power density is proportional to the square of E or H, the limits are specified in terms of volts squared per square meter and amperes squared per square meter (E squared and H squared).

Time of exposure

Because the heating effect is slow and the human body is able to compensate for variations in heat generation in its tissues (such as through normal metabolism), ANSI has applied the power density limits to a six minute exposure.

If the exposure is at twice the power density limit (or twice the limit of the squared electric or magnetic field strength) the exposure must be limited to three minutes. With a changing power density, the power density is to be integrated over a six minute (0.1 hour) period.

In this six-minute period, a uniform field at the limits would result in energy absorption of 144 joules per kilogram of body mass (0.4 watts per kilogram). Where the field is non-uniform (such as with a hand-held radio), the peak absorption is limited to 8 watts per kilogram averaged over any one gram of tissue.

AM stations need to consider the limits that apply between 0.3 and 3 MHz. Here, the electric field strength squared (volts squared per meter squared) is to be limited to 400,000. The magnetic field strength squared (amperes squared per meter squared) is limited to 2.5. The power density (milliwatts per square centimeter) is limited to 100.

FM stations need to consider the limits that apply between 30 and 300 MHz. Here, the limits are 4,000 volts squared per meter squared, .025 amperes squared per meter squared and 1.0 milliwatts per square centimeter.

■ ■ ■

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.

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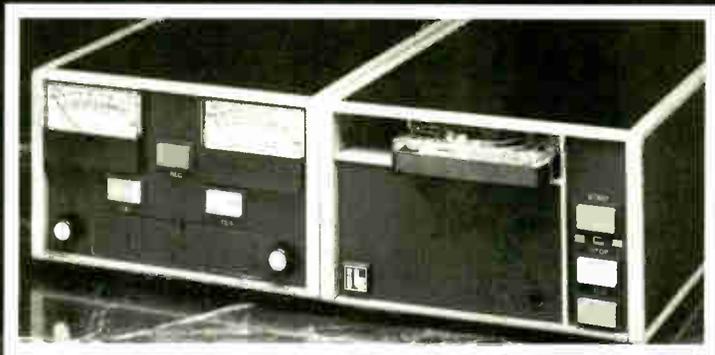
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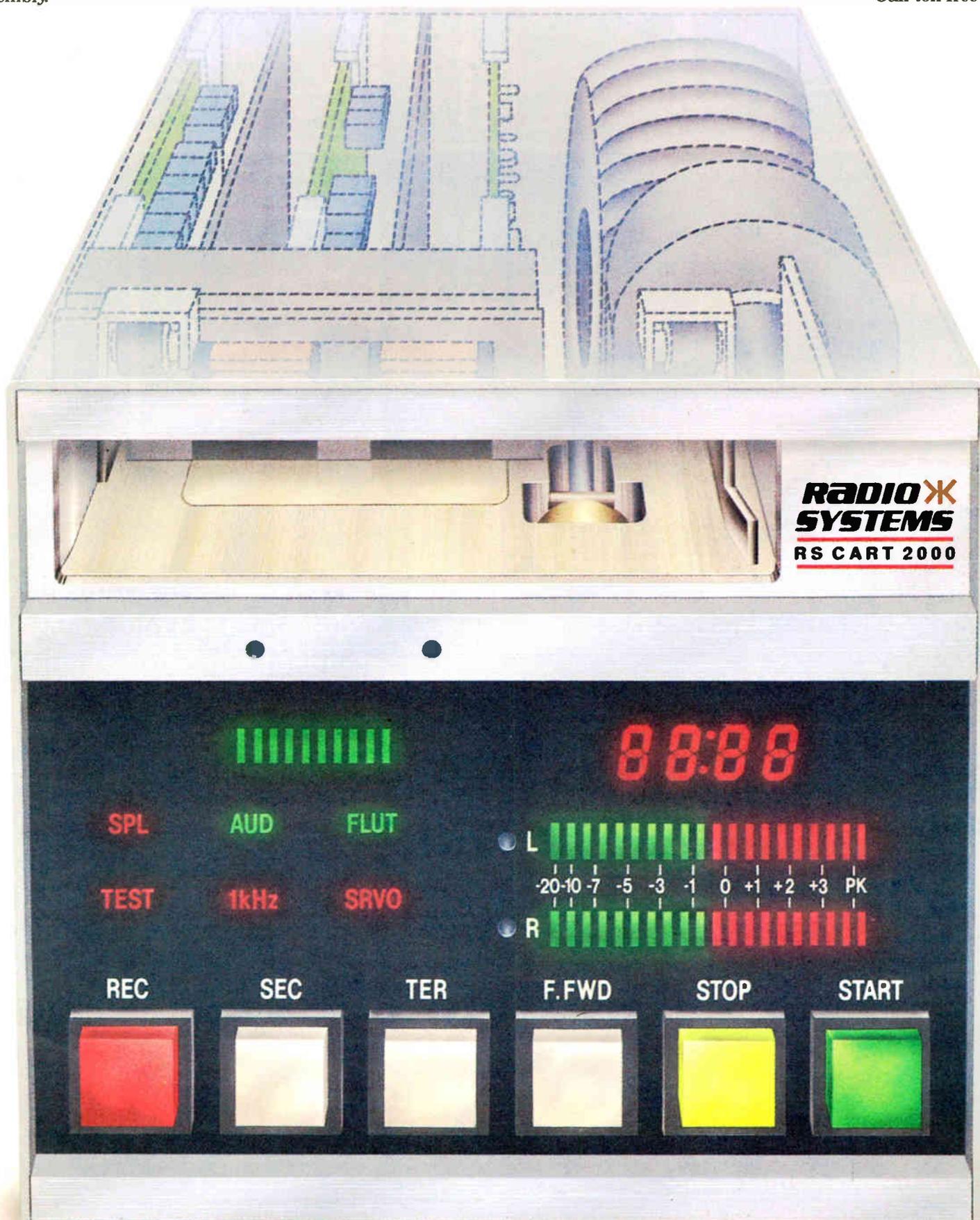
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AMPLIFIERS

Want to Sell

Marantz PM500 stereo amp, \$250; Yamaha preamp C4, \$250. J Parsons, Parsons Recdg, 10375 Cannas, N Huntingdon PA 15642. 412-863-9590.

Panasonic WA-750 120 W PA amp, 4 inputs, tone controls, master, VU meter, like new, \$100. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Crown USA Power Line 19" rack mount w/handles, black level control L&R, balance of warranty applies, 120 W (2), will pay UPS, \$300 ea; Nikko Alpha 400 pwr amp, like new cond, balance of warranty applies, wall manuals & packing, \$260. C Keith, ALI, Box 313, Keene NH 03431. 603-352-8460.

Ampex 601 amp, JBL speaker, heavy case, mint cond, \$100/BO. B Baker, Pinetucket Recdg, 747 Wire Rd, Auburn AL 36830. 205-826-0390.

Gates M5546A compressor expander amp, BO. A Terry, WODY, Box 545, Bassett VA 24055. 703-629-5900.

Radio Systems PA-1 stereo phono preamps (2), \$125 ea. G Fullhart, WVKs, 4665 West Bancroft, Toledo OH 43615. 419-531-1681.

RCA BA-44, monitor amp, BA-48 line amp, never used, \$100 ea. R Humphrey, WLTJ, 7 Parkway Cir, Pgh PA 15220. 412-922-9290.

McIntosh 75 tube power amp w/manual, \$325. D Lundy, Lundy Tape Duplicators, Cumberland Gap Pkwy, Heidrick KY 40949. 606-546-6650.

Bogen 30 W RMS stereo integrated amp, tube type, BO. M Saady, First City Recd, 141-60 84th Rd, 3E, Briarwood NY 11435. 718-846-2062.

Bogen CHB-35A 35 W, \$50. Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

McIntosh MC-2500, silver, \$2875/BO; MC-2500, black, fact sealed, \$3475/BO; MC-240 (2), \$975 ea/BO; MC-40 (3), MC-225 (2), \$475 ea/BO. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Marti PGM-20 line amp, \$50; Spotmaster 1x5 mono DA, \$50. P Wells, KJQY, San Diego CA, 619-236-1037.

UREI 6260 amp, Carver PM-200 amp, both in gd cond, BO. N Kuvshioff, Compact DJs, POB 2913, Salisbury MD 21802. 301-548-5352.

Rane MA6 multi chnl amp, 100 W chnls, \$550. M Norman, KCCU, 2800 W Gore, Lawton OK 73505. 405-581-2425.

McIntosh MC-60 (2), 60 W tube amps, consecutive serial number, gd cond, \$750. P Patton, WAPO, 29 W Main, Jasper TN 37347. 615-942-5611.

Threshold Stasis-2, 200 W/Ch Class A, patented Stasis output stage w/48 outputs, 83 lbs, rackmount, smooth snd, \$1475/BO. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Audionics Point Zero III 100+ 100 RMS rack mount, silver w/handles, gd cond, \$125. R Glenn, WIER, 1718 Shenandoah, Wm. FL 33598. 813-634-1940.

Bozak CMA-150 rack mount pwr amps (4), no fans they are silent, 150 W/8 ohms/Ch, new pwr caps, very fine sound, \$800/all. P Appleton, Appleton Stds, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Bogen MO-100 (3) pwr amps, \$50 ea; Eico HF-85 stereo preamp, \$35, all in gd cond. E Davison, Beatty Televisual, 135 N Illinois, Springfield IL 62702. 217-787-0800.

McIntosh MC-240 in excel cond, \$500. Z Masoomian, WQXR, 141 Park Ave, Arlington MA 02174. 617-646-2037.

Dynaco PAT-4 stereo preamps (3), gd cond, \$30 ea. B Weiss, KLSI, Kansas City MO 64111. 816-753-0933.

Langevin B102 mono, \$250; Pilot AA904 mono tube, \$100; Scott Lab 210 mono tube, \$150; Dynakit PAS2 tube preamp (3), \$100; Dynakit FM3 tube tuner, \$100; Dynakit FC35 tube amp/preamp, \$150; (3) Altec 351-C solid state 50 W, \$100/ea; Realistic stereo tube, Lyne 7, earliest Radio Shack equip label: Technical Apparatus Co., Boston 17, Mass, BO. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

Dynaco PAT-4 stereo preamps (3), gd cond, \$30 ea. B Weiss, KLSI, Kansas City MO 64111. 816-753-0933.

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Tube amps & remote mixers incl RCA OP-6, OP-7, BA series & WE 22D remote mixer. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

WE, Westrex, Marantz tube amp catalogs, specs, ads relating to above items. D deForrest, 7441 Wayne, Ste 10-D, Miami Beach FL 33141. 305-866-5401.

WE, Mac, Marantz, etc. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

WE 86, 124, 142 & others; McIntosh & Marantz tube amps, also wrecked amps w/missing parts, any cond. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

WE 86, 91, 92, 118, 124, 142, 143, any cond. D deForrest, Insight Prod, 7441 Wayne Ave, Ste 10-D, Miami Bch FL 33141. 305-866-5401. 208-743-2502.

McIntosh tube tuners, preamps, amps in any cond, working or not. R Glenn, WIER, 1718 Shenandoah, Wm. FL 33598. 813-634-1940.

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

Western Electric tube type amps, speakers, tubes, etc. Will pay above market price. Bob Aranyi, 2730 Vinton Ct, Charlottesville VA 22901. 804-977-7035.

ANTENNAS & TOWERS

Want to Sell

Celwave CFM-LP2 face mount 2 bay on 100.1 w/domes, \$1200 plus shpg. M Heuberger, KTIG, POB 409, Peguot Lakes MN 56472.

Shively 6813 NP 2 bay, 92.7 radomes, 1 yr old. E Santmyre, WVPN, 12 N LaVale, LaVale MD 21502. 301-729-8876.

ERI 8 bay Class C 98.5, single bay, various RF connectors. T Rusk, KUAR, 2801 S University, Little Rock AR 72204. 501-569-8485.

Phelps-Dodge CFM HP-10 10 bay FM, circularly polarized, tuned to 105.9 MHz, 3-1/8" center fed w/3 point tuning, gd cond, you pay freight, \$6000/BO. M Sprysenski, WOCL, 2101 SR 434 Ste 305, Longwood FL 32779. 407-682-2121.

Shively 6813 2-bay, circularly polarized w/deicers & matching transformer, 5 yrs old, tuned to 90.7, \$2000. J McDermott, KCVQ, POB 800, Camdenton MO 65020. 314-346-2763.

ERI single bay w/radome on 107.1, BO; Multitronics 160-220-1 RF contactor, BO. Z Hoffmaster, KTHS, Radio Ave, Berryville AR 72616. 501-521-0104.

Anixter Mark 4' parabolic dish for 950 MHz band, pair w/hardware, \$800. D Schresser, WKFR, 4154 Jennings, Kalamazoo MI 49001. 616-344-0111.

Potomac AM 19 (204), 3 tower phase angle/loop current antenna monitor, w/6" phasor cabinet, complete w/tuning coils, freq 1360, \$2500. D Woodrome, KVLL, 100 Spring Valley, Woodville TX 75799. 409-283-3734.

Shively 6810 6 bay w/1.5 yr old deicer, BO. Eddie, KCFX, 10800 Farley Ste 310, Overland Park KS 66210. 913-661-0101.

ERI FML-2 2-bay, one at 96.7 & one at 92.7. M Ripley, KOZE, Box 936, Lewiston ID 83501. 208-743-2502.

Andrew HF7-50A air dielectric helix approx 326' w/87R gas pass & 87G gas barrier, last off reel, 2 yrs old, splice, on reel ready to ship, \$1850. D Kelly, KWPN, Box 84, W Point NE 68788. 402-372-5423.

FM ERI type G5CPS-2AE 2-bay rototiller, 32 kW, complete w/shorting stub, input transformer, face mounts for Rohn 55-G tower, on 98.3 MHz, in excel cond, in storage, BO. T Baun, WFM, W172 N 7348 Shady Ln, Menomonee Falls WI 53051. 414-255-3100.

Cortana folded unipole, upper skirt. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

Cablewave 250' 35" transmission line w/o connectors, (2) 550' 7/8" transmission line w/connectors, pressurized, Eddie, KCFX, 10800 Farley Ste 310, Overland Park KS 66210. 913-661-0101.

Phelps Dodge 91318 hangers (20) for 3-1/8 rigid line; Interbay lines & misc parts for JSCP Jampro antenna; parts off of FMH12AC mixer cut antenna, blocks, tees, interbays, arms, etc.; (2) Andrew 78ARF connectors for 3" helix; (2) Cablewave 738350 connector for 3" helix. WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

Utility 42" face 496' tower w/full lighting, excel cond, in Texas, you move, BO. P Parks, KLVJ, 27 Sawyer, Beaumont TX 77702. 409-838-3911.

Jampro JSCP-10 in excel cond, 9 yrs old, on 93.3 MHz, BO. P Parks, KYKR, POB 5488, Beaumont TX 77726. 409-838-3911.

Harris 2-bay CP FM tuned to 92.1, you ship, BO. G Perich, WVXR, POB 1, Jacksonville FL 32234. 904-259-2272.

Jampro JA Series HP antenna system (4) 50 ohm bays using power divider, used on 94.5 MHz, gd back-up. C Murray, KMGE, 925 Country Club Rd, Eugene OR 97401. 503-484-9400.

Andrew 4" helix, 480', 18 mos old, BO. P Parks, KYKR, POB 5488, Beaumont TX 77726. 409-838-3911.

Jampro JSCP-8 93.3 MHz, broadband, will tune, recently on air w/480' of Andrew 4" helix, coax is 18 mos old, 55 kW rating, both in excel cond, will sell separately, BO. P Parks, KYKR, POB 5488, Beaumont TX 77726. 409-838-3911.

Tower bracket, 14" x 18" for Rohn 25; (2) tower brackets. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

Dielectric 4-1/16" rigid sections w/spring hangers, 4-1/16" field flanges, also some 3" rigid spring hangers. C Murray, KMGE, 925 Country Club Rd, Eugene OR 97401. 503-484-9400.

Soft drawn uninsulated #10 copper wire, approx 2600', 2 full reels of 100' ea & (3) partials; 74' of 5/8" helix; 141' of 5/8" helix; 50' RG 8/U coax; various runs of 27 pair multi-cable shielded; punch blocks, jack panels & panduit. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

ERI G4-CPH-10 10 bay CP high power FM tuned to 96.1 MHz, w/500 W deicers, all functioning & mounting brackets, makes 100,000 W ERP H&V w/20 kW xmtr. C Murray, KMGE, 925 Country Club Rd, Eugene OR 97401. 503-484-9400.

ERI G5CPS 10 bay, no deicers & 1° of beam tilt, tuned to 100.7 MHz, BO. Eddie, KCFX, 10800 Farley Ste 310, Overland Park KS 66210. 913-661-0101.

Phelps Dodge HFM-LP5 tuned to 89.5 MHz w/4 bays CFM, \$1500. D Karrs, KOPN, 915 E Broadway, Columbia MO 62201. 314-874-5676.

Phelps-Dodge 3-bay, 107.1 ready to ship. D Sports, WCLA, POB 427, Claxton GA 30417. 912-739-3035.

Helix, 350', 1-5/8", never used, w/connectors, \$2000/BO. K Kushnir, Empire Comm, 2120 Bluebell, Santa Rosa CA 95403. 707-545-8300.

Pirrod towers (5) 160', ATU's, loops, lots of phasing components, other surplus like sat rec dishes, STL dishes, monitors, etc. write or call for list. G Whitaker, KSSA, 3500 Maple Ste 1310, Dallas TX 75219. 214-528-1600.

Potomac Instrument AM-19, 204, antenna phase monitor, used 6 mos & in new cond, 2 tower set-up, \$2000/BO. G Fields, KDXI, Drawer 1306, Mansfield LA 71052.

Anixter Mark 4' parabolic grid, 890-960 MHz, 4' w/hardware, \$1000/pr. D Schasser, Hicks Bldg, 4154 Jennings Dr, Kalamazoo MI 49001. 616-344-0111.

Jampro FM antenna elements (4) tuned to 99.9 MHz, hor polarized, pwr divider, no cables or connectors, \$500/BO. A Wasilewski, KMWX, POB 1460, Yakima WA 98902.

Jampro JCP FM elements (3) w/heaters tuned to 107.3 MHz, connection cables w/out pwr divider, \$1500/BO. A Wasilewski, KMWX, POB 1480, Yakima WA 98902.

Phelps-Dodge CFM-HP-7 7 bay, hor & vert polarized, S Cichorsky, KPRL/KDDB, POB 7, Paso Robles CA 93447. 805-238-1230.

Side lights for towers w/globes (11), \$40 ea; side light for tower w/out globe, \$40; (20) tower control boxes for lights, \$100 ea; (2) Huey Philips side lights, \$40 ea; photo electric lighting control Fiser Pierce/Sigma Instrument 63305/DA 120 V load 300 W; Rohn tower beacon, \$800; (2) RF tower lighting chokes CSC M-600-160-2, \$100 ea. Delta Bldg, POB 430, Helena AR 72342. 501-338-8361.

Decibel Products Db 413 11 dB gain, offset pattern 450 MHz colinear array, \$300. E Swanson, WZTR, 520 W Capitol, Milwaukee WI 53212. 414-964-8300.

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Potomac Instruments AM-19D (210) antenna monitor, 5 tower, digital readout, never used in perfect cond, BO. E Bie, KWAM, 64 Flicker, Memphis TN. 901-320-1755.

Phelps-Dodge CFM-2P CP 2-bay at 107.1 MHz, \$475. P Wells, KJQY, San Diego CA, 619-238-1037.

Shively 6813 2 bay CP FM w/heating elements, 5 yrs old, you ship, \$2000/BO. J McDermott, KCVQ, POB 800, Camdenton MO 65020. 314-316-2763.

Cablewave 450' 3" helix with connectors, gd cond. Williston ND, 701-572-4811.

Want to Buy
4 Bay tuned to 102.3, must be in excel cond. C Hargrave, KSPK, POB 1052, Walsenburg CO 81089. 719-738-3636.

Shively 6813 or 6812 NP 2 bay, 104.5 w/radomes. E Santmyre, WVPN, 12 N LaVale, LaVale MD 21502. 301-729-8876.

Bogner B Series, UHF TV bdct/translator antennas, chnls 20-30, 43-54, 55-69, prefer B16U or B24U, can use B4U or B8U antennas, or Bogner LPS 1, 3 & 4, Thomas UHF panels on any UHF TV chnl. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

FM 6-10 bay tuned or tunable to 90.5. M Schwarzbauer, Family Educ Bdctg, 1715 Michigan, Sturgeon Bay WI 54235. 414-743-6065.

Rigid coax, 50 pieces of 20'3-1/8", Andrew or Celwave accepted, can fax info. E Anderson, WEAS, 912-234-7264 or fax: 912-233-7247.

LPTV VHF & UHF antennas & transmission line, 1-3/8" & larger, 60'-600'. M Ernst, WBUD TV, 720 Fairhill Dr, Louisville KY 40207. 502-893-6656.

UHF TV bdct/translator antennas; Scala parapanels, any channel; Scala SL-8 chnls 19-23, 32-46, 60-64; Bogner B Series chnls 20-30, 31-42, 55-69 or Bogner LPS 1, 2 & 4; Thomas UHF panels any chnl. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

Tax credit avail or cash for tuned 89.7 FM antenna, cable & de-icer for community charity. Rev Sylvester Williams Jr, ICU Ministries, POB 3931, South Bend IN 46619. 219-287-4700.

UHF TV translator antennas on old chnl 70-83 band; Scala SL-8 or parapanels; Bogner B4, B8, B16 or B24; Emcee DGA-10 corner reflectors. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

AUDIO PRODUCTION

Want to Sell

dbx 119, \$50; SAE 5000A, \$100; Vector Research VQ-110A EQ 10 band, \$75. V Gray, GCA, 6840 Sterling, Raytown MO 64133. 816-358-8929.

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Boss RPS-10 digital pitch shifter/delay, excel cond, \$100. J Shade, WFAN, 34-12 36th, Astoria NY 11106. 718-706-7690.

Attec 1567A (3), \$125 ea. J Parsons, Parsons Recdg, 10375 Cannas, N Huntingdon PA 15642. 412-863-9590.

Wegener SPCP satellite rcvr, 6-bay FM antenna tuned to 99.3 MHz, approx 280' of 3/125" air dielectric helix transmission line, Gates stereo Producer audio console, mono Audimax & mono Volumax. B Herzog, WKPR, 3891 Waukau, Oshkosh WI 54903. 414-236-4242.

Sound Craftsmen TG-2209-600 EQ; (2) Ampex 351 R-R's; McMartin TBM-2500C FM RF amp; ORK 12C TT; Russco Cue Master TT; Collins 212Y remote amp; Gates M-5138 tube type 2 pot mixer; Ampex 4 pot tube type mix; (2) Revox A77 R/P for parts; Marantz PMD 220 for parts; Technics SP-15 TT for parts; (3) mic swivel stands; BE cart rewriter; Rust remote control system. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

Pultec EQP1, EQD1A3, EQ4. M Block, Production Block, 2838 N Front, Harrisburg PA 17110. 717-233-4155.

Lang PEQ-2A (2) program EQ's, solid state, \$300 ea; Pultec HLF-3C filter set, passive, \$200; will sell all for \$700 plus shipping. D Glasser, Airshow Inc, 7021 Woodland, Springfield VA 22151. 703-642-9035.

Attec 9880A active filter, \$150. D Lundy, Lundy Tape Duplicators, Cumberland Gap Pkwy, Heidrick KY 40949. 606-546-6650.

Henry Engineering Mix-Minus Plus, \$100/BO. G Fullhart, WVKs, 4665 West Bancroft, Toledo OH 43615. 419-531-1681.

White Instruments 4003 1/3 octave, active EQ's w/manual & security covers, BO. E Domesech, Audio Tape Srvs, 160 E Chester, Valley Stream NY 11580. 516-825-3969.

Rane SM6 splitter/mixer, \$200. M Norman, KCCU, 2800 W Gore, Lawton OK 73505. 405-581-2425.

dbx 222 type 2 NR module, \$80. D Miller, Airborne Audio, 11647 W 83 Terr, Lenexa KS 66214. 913-492-8822.

RECORDING STUDIO AUCTION

Tuesday: December 18, 1990: 10 AM

Due to the death of the principle, John C. Hanson, we have been commissioned to liquidate the (2) studio/voice over & post production facility known as the Cleveland Recording Company, 1908 Euclid Ave, (7th Fl) Cleveland, Ohio.

(2) Audionics 110A "Grandson" console (1) 12x4, (1) 8x4; Ampex AG448B 4-trk tape machine; Audionics PD-10 patchbay w/coils; Ampex 350-1 tape machine w/Inovonics amp (new electronics); MCI JH110C-8-HP tape machine; McIntosh MC2100 power amp; Ampex 351-2 tape machine; Orban pwr snd dual reverb Mdl 111B; UREI 530 graphic EQ; UREI LA-4 compressor/limiter; Russco stereo mixer & much much more.

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AUDIO . . . WTS

CRL Dynafec DX-2 stereo NR unit, single ended, high freq noise gate, downward expander, like new cond, never rack mounted, \$550/BO. T Alexander, WDOK, 1250 Superior Ave, Cleveland OH 44114. 216-696-0123.

Shure SE30 gated compressor mixer, excel cond, \$100. CBS Audimax 3, fair cosmetics, works, \$50. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

Want to Buy

Tube limiters, compressors & EQ's, especially Fairchild 660 & 670, Teletronix LA2A & LA3A; Pultec EQs or NABECs; Lang EQs, Sonitec & SPI EQs, etc; other vintage tube signal processing equip. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

AUTOMATION EQUIP

Want to Sell

SMC automation system, complete w/2000 events, currently in use w/Satellite Music, avail 10/90, w/(4) Carousels, (4) reels & controller, works great, \$9500. Tony, FM97, POB 1465, Grand Island NE 68802. 308-381-3697.

SMC DP-1 intact w/all boards, ideal for spare parts or for backup, w/pwr supply, BO. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

IGM Go-Cart 24 (2), \$2500 ea; **SMC 721** dual mono cart PB, \$500; **SMC 710** cart PB, \$250, both SMC's in rack mount drawers. J Wenstrom, Wynne Bldg. 503-882-4656.

Xtel AF-11R printer, working, \$75; **Xtel AF-11R** printer for parts, \$25; **Otari ARS-1000** w/SMC card, \$800. M Persons, KLTf/KFML, 70 N.E. 1st Ave, Little Falls MN 56345. 218-829-1326.

SMC w/DP-1 digital programmer, (6) racks, (6) SMC 350 mono Carousels, (2) SMC 721 dual mono cart decks, **SMC 710** PB cart deck, (2) **ARS-1000** stereo PB reels, (2) **750** ITC stereo PB reels, network back fill & join, system can accept up to 20 sources for total of 40 stereo inputs. (2) **SMC 710** RP decks, one mono, one stereo, stereo deck needs work, automation has desk type brain, many spare cards, manuals, \$8700. G Smith, KORQ, 2449 S Tread Way, Abilene TX 79606. 915-672-5149.

Format Sentry FS-12B w/latest updates, remote control panel & wired for satellite of R-R, IBM compatible, computer included, IGM stereo Instacart, 48 trays, all in rack, on air, \$7500/BO. M Wilson, WGRK, POB 246, Greensburg KY 42742. 502-932-7402.

5025 BPC w/(4) Otari's, (4) Carousels, time gate, complete, BO. B Histed, WSIR, 665 Lake Howard Dr SW, Winter Haven FL 33880. 813-425-3411.

SMC DS20-DP2 Brain, (6) Carousels stereo, (4) Otari ARS 1000 R-R's, in use, excel cond, \$12,500. P Swint, KIXQ, 2620 Dogwood Rd, Joplin MO 64301. 417-624-1310.

Sigma 301R2-24, dataclks (7). B Hicks, KBAT, 3306 Andrews Hwy, Midland TX 79703. 915-697-7300.

Robojock CD-600 (4) will interface w/IBM for automation or live assist, like new, complete, \$1200. C Keith, ALI, Box 313, Keene NH 03431. 603-352-8460.

IGM stereo Instacart 48 trays, Format Sentry interface, gd cond, on air, \$4000/BO. M Wilson, WGRK, POB 246, Greensburg KY 42743. 502-932-7402.

Audiometrics AMCDs-1000 multi play CD players w/SMC automation controller, live assist CD playing system, gd cond w/all schematics/manuals, BO. J Glass, WZOK, POB 6186, Rockford IL 61125. 815-399-2233.

Schafer 903E stereo, spare parts, (4) Ampex AG440 stereo tape PB, (3) IGM 42 stereo Go-Carts, Extel printer, (6) equip cabinets, gd cond, \$12,000. Blake, KJAX, POB 201-075, Stockton CA 95201. 209-948-5569.

SMC ESP2 incl (6) Otari ARS 100 R-R's, (2) 452 bi-directional stereo Carousels, (4) racks, control system, remote control w/CRT, dual play cart, printer, 2-1/2 yrs old, BO. L James, KYQQ, POB 650, Wichita KS 67201. 316-265-1065.

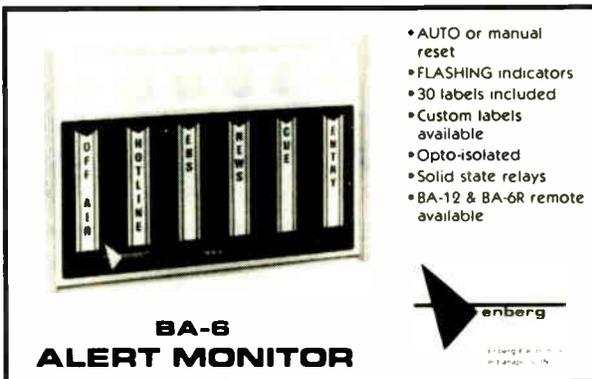
SMC DP-1, complete system, DP-1 programmer, AS-16 switcher, (5) 350 Carousels, (2) 710 cart machines, 721 dual cart machine, TS-25 dual sensor, remote control, \$5500. J Keane, KAPS, Box 70, MI Vernon WA 98273. 206-424-7676.

Harris System 90 automation system including (5) ITC 750 R-R decks, stereo; **SMC 24** bin Carousel, mono; (2) IGM 42 bin Go-Cart, stereo; **IGM 78** bin Go-Cart, stereo; **ITC 3D** PB cart deck, stereo; logging encoder; Texas Instruments 700 ASR elect data terminal; (4) AMCO equip racks, recently rebuilt & upgraded, works great. WGER, 6165 Bay Rd, Saginaw MI 48604. 517-792-1063.

IGM EC system w/BAI monitor panel & (2) IGM stereo Instacart interface units, \$2500. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

SMC MSP-10 w/(2) stereo 452 bi-directional Carousels, (2) racks w/network card, SA-1 Silence Sence unit, almost new, will help buyer set up if within 75 mi of NW Florida, buyer pays shipping, \$10,000. Scott, 904-892-3158.

Schafer 800T automation controller for parts, AG 440 PB, (2) Scully 270 PB, large rack, (2) Gates Criterion PB, all for \$800/BO. F Morton Jr, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.



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Microprobe automation controller, 6 source w/manual, BO. R Coleman, WGEN, 1003 S Oakwood, Geneseo IL 61254. 309-944-4633.

Format Sentry 12B automation systems (2), w/updated software, ready to ship, \$2500 ea. B Schloss, KRRQ, 1704 S Cleveland, Sioux Falls SD 57103. 605-335-6500.

SMC 350RSB Carousel, recently overhauled, will consider trade for cart machines, \$1500/BO. D Brintnall, KBUF, 1309 E Fulton, Garden City KS 67845. 316-276-2366.

Cetec 7000 w/(3) Audiophiles & Level II memory. S Cichorsky, KPRL/KDDB, POB 7, Paso Robles CA 93447. 805-238-1230.

IGM Basic III in excel cond, clean complete w/manuals, \$4000; 48 tray Instacart system, \$5000; (3) Otari R-R PB tape machines, \$500 ea. Delta Bldg, POB 430, Helena AR 72342. 501-338-8361.

IGM Basic A, complete, 12 yrs old, just removed from service, working well, w/(2) 42 tray Go-Carts, ITC 3-deck, ITC single, R-R, will demo at Hutchinson MN, \$6500. D Gander, KJQR, Box 10, Hutchinson MN 55350. 612-587-2140.

Automated Broadcast 25 Hz sensors (3), ea runs 2 decks, \$85. P Wells, KJQY, San Diego CA, 619-238-1037.

Cetec/Schafer 903 automation brain w/pwr supply & control head in equip rack; **IGM 48** tray stereo Instacart; **SMC/Schafer** mono 250 Carousel in rack, \$4000 plus shipping, M Persons, WJYJ, Box 706, Brainerd MN 56401. 218-828-1244.

Schafer 903E stereo automation system w/(4) Ampex AG440 stereo PB's, (3) stereo IGM 42 Go-Carts, (6) cabinets, Extel printer, full memory & 901 control unit w/keyboard, manuals, excel stock of spare parts, gd cond, manual sell as complete unit. S Thomas, KJOY, 110 N El Dorado, Stockton CA 95202. 209-948-5569.

Complete SMC DPI-C automation system w/(4) 350 RSB Carousels, (4) SMC/Otari R-R PB's, SMC dual cart, single play deck, (4) matching equip racks, logging w/X-tel printer, digital programmer w/brain & remote encoder w/monitor & all manuals. D Kulbel, KCIM, 1119 E Plaza, Carroll IA 51401. 712-792-4321.

Brain for a SMC automation system w/ESP-1 Brain & programmer, DS-20A switcher, PDC-4a superclock, pwr supply w/battery support, AL-1 memory loader, Extel printer, Rac-31 remote control, Green SMC rack, (2) TS-25 dual tone sensor units, BO. J Hartmeyer, WCLT, POB 880, Newark OH 43055. 614-345-4004.

BE SAT-16 complete w/SAT 16 microprocessor, (4) stereo Go-Cart 24, printer, racks. J Bennett, Great Trails, 717 E David, Dayton OH 45429. 513-294-3333.

Schafer 900 stereo, junked out operating system, all decks & pwr supply avail at \$100/deck. V Clayton, CEC Inc, 1380 Oakcrest, Provo UT 84604. 801-375-1357.

Otari ARS-1000 (2) like new, less than 2 yrs use, \$1800 ea. D Canipe, WSVN, POB 99, Valdese NC 28690. 704-874-0000.

Satcuc 400 switchers for Unistar formats by Colorado Magnetics (2), \$500 ea. H Widsten, KGNB, 1540 Loop 337 North, New Braunfels TX 78130. 512-625-7311.

Want to Buy

Simple function automation Brain, advise via fax, 603-352-8461 as to specs, etc. C Keith, ALI, Box 313, Keene NH 03431.

Manual for a Gates AMS-10, any info desperately needed, will pay per page fee on copies. A Branch, KYAY, 2402 Woodridge, Decatur GA 30033. 404-325-7847.

BE Sat 16-X interface card 908-6810 for Instacart, source cable 945-6433 for Instacart, source cable 945-6430 for Go-Cart, source cable 945-6462 for satellite SMN, L Maierhofer, WTGC, 101 Army Blvd, Lewisburg PA 17837. 717-523-3271.

Commercial insertion equip & cart machines, low to mid price range. M Ernst, WBUD TV, 720 Fairhill Dr, Louisville KY 40207. 502-893-6656.

Insta-Cart or Go-Cart machines, Mandel, KAMP, POB 1018, El Centro CA 92244. 619-352-2277.

Automation system, must be ready to go on air, very reasonable price for educ station. D Parsons, KLUH, POB 1313, Poplar Bluff MO 63901. 314-686-1663.

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CAMERAS (VIDEO)

Want to Sell

Ikegami HL-79A in excel cond, Canon 13x1 lens, gd plumbicon tubes, \$5000; **Ikegami HL-79DA** in excel cond, Fujinon 14x9 lens, WT 2X extender, gd plumbicon tubes, \$7500. R Yerema, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Sony 1610 single tube, color, aluminum case & access, like new, \$400. R Yerema, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Ikegami HL-79-E, Fujinon 14x9 lens w/2X extender, gd plumbicon tubes, camera in fine shape, \$12,000. R Yerema, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Panasonic color CCD WVEX1, \$600. J Parsons, Parsons Recdg, 10375 Cannas, N Huntingdon PA 15642. 412-863-9590.

Sony HVC-2200 3 tube color camera, electronic zoom, excel cond, low hrs, carrying case & manuals, \$150/BO. M Gehring, WKTU, Q-19 Redbank Run Apts, Woodbury NJ 08096. 609-384-1435.

Sony E90100 Hi-8 industrial camcorder, 3 mos old, generates TC on address track internally, Uni-omni mic, extras, \$1500. S Weiss, 1st Generation Film/Video, 429 W Ohio, Chicago IL 60610. 312-661-3456.

Ikegami 730 retubed Canon 15:1, AC/batteries, case, manual, extender card, sharp, \$2600. Gene Sive Productions, 31844 Rancho Amigos, Bonsall CA 92003. 619-749-7662.

Ikegami HL-95 w/14x9 lens w/2X extender, no recorder, very gd tubes, \$9000. R Yerema, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Sony BVW-30, w/Beta camcorder, Fujinon 14x9 lens w/2X extender, excel cond, \$10,000. R Yerema, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

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| Automation Equip. | Microphones | Transmitters |
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| Cameras (Video) | Monitors | Turntables |
| Cart Machines | Movie Production Equip. | TV Film Equip. |
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CAMERAS . . . WTS

Sony DXC 1640 tube camera w/case, \$700/BO; (2) RCA TK-630 w/CCU, BO; Sharp XC 700 w/case & access, shop manual, battery, pwr supply, overhauled w/new tube, \$1800/BO. T Quinn. 408-475-0423.

Hitachi FP-C1 w/15x1, AC adapter, case, shooting cable, Anton Bauer charger, Sony VO-6800 w/Porta Brace & batteries, \$8500/BO; Panasonic AG-7400 w/Porta Brace, batteries, AC adapter, \$1700. A Pagan, Metrovision, POB 595013, Miami FL 33159. 305-828-9471.

Hitachi KP-C1000 color chip CCTV w/low time & white balance, \$125. P Russell, Bowdoin College, Sill Hall, Brunswick ME 04011. 207-725-3066.

RCA TK76B w/PS, case, manual, working, \$500/FOB; JVC KY-1900CH w/PS, case, manual, working, \$450/FOB. K Kuespert, A-V Prod, 1794 Russell, Baroda MI 49101. 616-422-2235.

Panasonic 300 CLE ENG package w/Porta-Brace case, \$5900. V Michael, WHOT, 575 Montgomery Pk, S Williamsport PA 17701. 717-326-8200.

Sony DXC 1200 studio color cameras (2) w/tripod, head, dollies, \$1200; Ampex 3-tube color w/CCU, cables, \$800; Hitachi 3-tube color w/CCU, cables, \$800; (2) Norelco PC 70 systems, complete, \$500. J Krepol, RNDL, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

Sharp XC-800 3 tube, color, 2L image enhancer, 54 dB S/N, 800 line hor, resolution w/AC adapter, new Pro-Pac battery, extender card, case, \$2850/BO. R Jensen, Telecable Prod, 5812 21st St, Racine WI 53406. 414-632-3131.

Want to Buy

CART MACHINES

Want to Sell

SMC 792 dual stereo deck, mounted in pull-out drawer, works well, \$450. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

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Otari CTM-10SR stereo R/P, FF, splice find, 3-tone, cue erase, Dolby HX-Pro, brushless PLL servomotor, \$2700/firm. G Silvers, KECH, POB 2158, Ketchum ID 83340. 208-726-5324.

ITC 3D stereo w/WRA record amp & spare motor, \$2500. B Weiss, KLSI, Kansas City MO 64111. 816-753-0933.

Broadcast Electronics 605B 5-spot cart deck (4 avail), gd cond, \$495/BO. Josh 708-492-1577.

Fidelipac Dynamax CTR124 stereo record cart, new, dealer demo, less than 10 hrs use, \$2890; Tascam ATR-80 2T 2-trk plus SMPTE code reel recorder, new \$4190. Jeff, Trax, 332 Martin Ln, Salt Lake City UT 84107. 801-262-3601.

Want to Buy

ITC Premium WP Series, mono, must have all three tones, in gd cond, w/rack ears preferred. D Williams, Lincoln City Bdctrs, 1103 Utah, Libby MT 59923. 406-293-6234.

Collins dual tape, stereo, play, record, also manuals. J Panza, LL&S, POB 9847, Kansas City MO 64134. 816-763-9820.

ITC triple deck 3D's, mono or stereo, ITC record units, stereo. R Dymond, Group D, 8402 Lake Ave, Cincinnati OH 45236.

Gates Criterion (2) 150 Hz detector cans. J David, KMPL, POB 907, Sikeston MO 63801. 314-471-1520.

ITC 3D capstan motor. R Yaw, KOJM, POB 7000, Havre MT 59501. 406-265-7841.

CASSETTE & REEL-TO-REEL RECORDERS

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Otari MX-5050QXD 4 trk, 1/4", tape heads just lapped, vgc, buyer pays frt, \$850. B Petruzzi, Rouse St Prod, 13727 Sylvan Ste 11, Van Nuys CA 91401. 818-780-4572.

Scully 250 FT, 1/4" w/meter bridge & rolling cart, gd cond, \$1500/BO. N Cleary, Audio Innovators, 5001 Baum, Pgh PA 15213. 412-621-1950.

Scully 280 4 trk 1/2" in Ruslang console, late mdl w/motion sensing, spare cards & capstan motor, low hrs, gd cond, \$1400 plus shpg; Teac 2300X stereo 1/4 trk, 7" reels, excel cond, \$180. K Peckham, 5824 Danville, Madison WI 53719. 608-271-8763.

Tascam 8516 1" 16 trk w/dbx, stand & wired for synchronizer, \$5500 or possible trade. Funkenstein Recdg Std, 7811 La Cosa, Dallas TX 75248. 214-239-4075.

Ampex AG-440B 2 trk, 10.5" rack mount, vgc, \$700 plus shpg; Denon DH-510 prof 2 trk, 10.5" reels, 7.5 & 15 ips, excel cond, \$900. K Peckham, 5824 Danville, Madison WI 53719. 608-271-8763.

Crown 700-SS vgc, stereo, will pay UPS to you, \$300. C Keith, ALI, Box 313, Keene NH 03431. 603-352-8460.

Auditronics AV123-4TS 1/4 trk; Infonics RR-2 2 trk, all in gd cond, BO/all or part. R Meyers, Benchmark Comm, 4700 SW 75th, Miami FL 33155. 305-264-5963.

Gates ATC recorder, vgc; (3) Gates ATC tape decks, vgc. L Popp, 814-467-7894.

Soundscribe audio logging recorder, fair cond, BO. R Meyers, Benchmark Comm, 4700 SW 75th, Miami FL 33155. 305-264-5963.

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Telex 1422 (2) 2 trk, \$350/both; Tapesonic 70 TRS 2 trk, \$350; Teac A3300 2T 2 trk, \$400; Teac A7030 portable, \$400; Teac tube type 505 stereo, \$300; Crown SS800 4 chnl tube, \$300; Sony TCC300, \$125; Akai 4000D, \$100; Akai X355, \$225; Wollensak 3M cassette 47C5, \$50; Viking 230 decks (3), \$200/all. J Parsons, Parsons Recdg, 10375 Cannas, N Huntingdon PA 15642. 412-863-9590.

3M M79 24 trk, 2" w/selectake one, vgc, w/meter overbridge & roll around console, \$9500. N Cleary, Audio Innovators, 5001 Baum, Pgh PA 15213. 412-621-1950.

BE 5301 mono triple deck, circa 1977, working cond but needs top motor bearing, which is still avail from BE, \$500. B Bicoy, WMFO, POB 65, Medford MA 02153. 617-625-0800.

Audi-Cord 31R, play, mono, \$500/BO; mdl 36R, play, stereo, \$600/BO; mdl SZ6R R/P, stereo, \$900/BO, all in gd cond. C Ibarra, KTAN, 2300 Busby Dr, Sierra Vista AZ 85235. 602-458-4313.

Sparta MC 104 PB's (4) ea plus spare in cabinet w/spare pwr supply, 150 Hz & 8 kHz tones, \$700. L Beigel, On-Cue Record, POB 85042, Los Angeles CA 90072. 213-466-3595.

ITC stereo R/P, \$1200. J Wenstrom, Wynne Bdcrg, 503-882-4656.

Tapecaster 700RPS, recently rebuilt, new parts, vgc, \$650. M Stephens, WAEC, 1465 Northside Dr, Atlanta GA 30318. 404-355-8600.

Telex 36 cart deck, 4 trk play w/elect trk switching, rack mounting, all new, factory cartons, \$200. E Davison, 217-787-0800.

RCA RT-7B (6), (4) BA-7 record amps, 4-unit cabinet, gd-poor cond, BO/all or part. R Meyers, Benchmark Comm, 4700 SW 75th, Miami FL 33155. 305-264-5963.

SMC 590 R/P, \$250; BE 2000 play for parts. WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

ITC PDII mono cart play decks (8), excel, \$400 ea; Spolmaster 500C mono cart recorder, \$200. M Persons, KKIN, Box 930, Aitkin MN 56431. 218-829-1326.

Audi-Cord A Series dual R/P w/db feature, stereo, \$1250. E Douglas, KUNQ, POB 30, Houston MO 65483. 417-967-3353.

ITC RP Series (3), stereo, 3-tone, \$750/BO. G Fullhart, WVKs, 4665 West Bancroft, Toledo OH 43615. 419-531-1681.

BE 500-C (8) mono R/P, \$400 ea or \$2500/all. J Linn, WHKS, 62 N Main, Port Allegany PA 16743. 814-642-7004.

ITC 99A mono, excel cond, meets full factory spec, splice finds, bulk erases, does head alignment by microprocessor automatically, \$1200. E O'Donnell, WIBW, POB 119, Topeka KS 66601. 913-272-3456.

SMC 792 stereo R/P, A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

Stereo 48 tray Instacarts (2) w/interface for Format Sentry automation, ready to ship, \$3000 ea/BO. B Schloss, KRRO, 1704 S Cleveland, Sioux Falls SD 57103. 605-335-6500.

ITC 99B mono recorder, \$1750; ITC RP mono recorder, 3 tones, \$775; ITC SP mono player, 3 tones, \$475; UMC 11-113 mono repro, 3 tones, \$375. P Wells, KJQY, San Diego CA, 619-238-1037.

BE 3200RP R/P, 3 tones, direct drive capstan, mono, manual, like new, \$750. R Rocks, KEMC, 1500 N 30th, Billings MT 59101. 406-657-2941.

ITC PD-II mono cart recorder, works, \$350. T Ray, WTIC, Hartford CT, 203-522-1080.

ITC SP w/rack mount, \$800; ITC PD-II w/recorder, \$1000; UMC Beaucart II, \$500 ea. Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

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Circle 7 On Reader Service Card

Scully 280B 4 trk 1/2", vgc, \$995/trade. G Liebisch, WPTF, POB 29521, Raleigh NC 27626. 919-876-0674.

RCA RT-21 mono w/cueing knob, w/manual, \$150. M Cramer, WGBA, 1391 N Road, Green Bay WI 54307. 414-494-2626.

Revox A77 MK III 1/4 trk stereo, 7.5 & 3.75 ips w/built-in pwr amps & speakers, vgc, just serviced, \$235 plus shpg. A LeFay, APL Prod, POB 371, Walnut CA 91788. 714-920-0175.

Maganecord 1024 stereo R/P (2), excel cond, \$100 ea; (2) Scully 270 chassis, misc parts, \$150/all. F Fess II, WLRB, POB 250, Macomb IL 61455. 309-833-5561.

Ampex 350 FT transports w/Inovonics solid state R/P elect & floor cabinets (2), \$500 ea. G Liebisch, WPTF, POB 29521, Raleigh NC 27626. 919-876-0674.

Reel hubs (2), \$20; Ampex mono AG 500 in working order w/record amp, \$525; Emerson MM-314 transistorized w/speeds 15/16, 1-7/8, 3-3/4, 7-1/2 ips, gd working cond, \$45. S Dynes, Dynes Prod, Wheeling WV 26003. 304-233-8856.

Teac 450 (2) stereo, new belts, heads, rebuilt motor, excel cond, \$135 ea or \$260/pr plus shpg. A LeFay, APL Prod, POB 371, Walnut CA 91788. 714-920-0175.

Tascam 38 8 trk, 3 yrs old, low hrs, perfect heads, w/remote, like new, \$1500. K Thomas, Rebel Recdg, POB 207, Atlantic Bch FL 32233. 904-388-7711.

Scully 280B stereo mounted on table w/wheels, amps, on rack, mint cond, working when removed from service, \$2000. L Pereira, Radio Ribatejo FM, POB 5334, Newark NJ 07105. 201-484-8574.

Crown SX-711 FT (2), \$100 ea; Telex Viking TD 235 stereo decks (2) 7-1/2, 7, 15 ips, \$150/pr; MCI JH 110 stereo 7-1/2, 15 & 30, roll around console, \$2800; Ampex AG 440-B FT, roll around console, \$850. D Lundy, Lundy Tape Duplicators, Cumberland Gap Pkwy, Heidrick KY 40949. 606-546-6650.

Sony TC-277-4 4 chnl quad deck, needs work, \$40; Sony TC-650 3-head stereo 1/4" recorder, solenoid driver, \$100. P Russell, Bowdoin College, Sill Hall, Brunswick ME 04011. 207-725-3066.

Otari 5050BII in excel cond, \$1800. G Arroyo, WONQ, 2483 John Young Pkwy, Orlando FL 32804. 407-293-0000.

Record elect for ITC 750 R-R deck; mono record elect for ITC RP series cart deck. WGER, 6165 Bay Rd, Saginaw MI 48604. 517-792-1063.

Studer port case for A77 w/m on spkrs & pwr amps, excel cond, \$275. R Katz, Allegro Snd, 1505 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Ruslang R-R push carts, (3) adjustable decks, castered base, woodgrain finish w/black facing, \$450 ea/BO. A Wasilewski, KMWX, POB 1460, Yakima WA 98902.

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Sony TC-580 1/4 trk stereo, 3 speeds, bi-directional R/P, new heads, excel cond in walnut cabinet, \$175 plus shpg. A LeFay, APL Prod, POB 371, Walnut CA 91788. 714-920-0175.

Stellavox SP 7 crystal sync recorder w/pwr supply, cables, case, (3) manuals & spares, like new, \$1800. Gene Sive Productions, 31844 Rancho Amigos, Bonsall CA 92003. 619-749-7662.

Ampex AG440-C in Ruslang console, 1/2 trk stereo, 7.5 & 15 ips, (2) Inovonics electrs, excel cond, \$1500. R Barwig, Barwig Recdg, 5254 W Agatite, Chicago IL 60630. 312-283-2620.

Sony CCP13A high speed cassette duplicator, 4 trk, 3 slaves, excel cond, \$750/BO. B Baker, Pinetucket Recdg, 747 Wire Rd, Auburn AL 36830. 205-826-0390.

Scully 270 2 trk stereo, R/P, works gd, \$500. WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

Ampex 350 (2) in excel cond; Magnecond, solid state in own cabinet, excel cond; Gates rack mt cabinet; (2) Gates TT's; several old mdl RCA mics, BO. R Raines, Dixie Snd Stds, Rt 8 Box 491, Corinth MS 38834. 601-287-6783.

Scully 280 FT (2), \$500 ea or \$800/both. J Linn, WHKS, 62 N Main, Port Allegany PA 16743. 814-642-7004.

Otari MX-5050 Mk III 1/2" Pro, 4 trk w/factory roll around floor stand, low hrs, mint cond, \$3400. K Stallings, SLP & Co, 19 West 36th, NY NY 10018.

Marantz PMD-221 portable mono 3-head, still under warranty, like new, \$195. J Ellingson, J Ellingson Voice, 913 Warwick Dr, Cedar Falls IA 50613. 319-277-8535.

Revox A-77 (10) in various conditions, \$200 ea/\$1500 all; ITC ELS-IV bulk eraser/splice finder, \$400/BO. G Fullhart, WVKs, 4665 West Bancroft, Toledo OH 43615. 419-531-1681.

Otari MK-5050BII, wall factory mods, no wear on heads w/service man & rack mounts, low mileage, \$1850. P Appleton, Appleton Stds, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

3M M56 8 chnl 1" tape pro-studio recorder w/full remote, sel-sync, Dolby B interface cables & new tape stock, \$2900; Audix MXT1000 8 chnl master mix down console, \$1500, or both for \$4000. J Krepol, RNDL, 6147 Walker St, Philadelphia PA 19135. 215-624-1050.

Telex Series 235 stereo tape duplicator system, 1 master w/complete spare & 4 slaves, in new cond, \$600. J Krepol, RNDL, 6147 Walker St, Philadelphia PA 19135. 215-624-1050.

Dictaphone 5612 logger tape system. D Johnson, WFYR, 130 E Randolph Ste 2303, Chicago IL 60601. 312-861-8132.

Technics SV-100 records digital audio on any NTSC VCR. VTR w/AC pwr supply & manual, \$500. P Patton, WAPO, 29 W Main, Jasper TN 37347. 615-942-5611.

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Circle 91 on Reader Service Card

CASSETTES . . . WTS

Ampex AG-440C 4 trk, 1/2", in roll around stand, gd cond. \$1200/BO. J Bible, KEZO, 11128 John Galt, Omaha NE 68137. 402-592-5300.

MCI/Sony JH-110A (6) 1/4" 1/2 trk 1980, may need heads, just removed from service, working, well maintained, also many new repair parts & motors & books, \$1500 ea. T Nelson, WCAL, St Olaf College, Northfield MN 55057, 507-663-3328.

Nakamichi 1000-ZXL computer-controlled w/NR-100 Dolby C, rack mount w/rosewood case, low hrs, excel cond. \$1475/BO. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Studer HS-77 MK IV special fact order FT mono, 15-75 ips, only 10 hrs use, wood case, excel cond, \$475/BO/trade. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Magnecord w/record amps, (2), one newly record & one cond unknown, BO. R Coleman, WGEN, 1003 S Oakwood, Geneseo IL 61254. 309-944-4633.

Ampex 351 w/Inovonics amps, \$800 ea; Ampex AG-600 portable w/case. \$100; Scully 280B w/amp in rack, \$500; MCI JH-110B w/Rustang cabinet, \$2600 ea. Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

Revox PR 99 R-R's (2) w/rack mounts, ready to go, \$500 ea. B Schloss, KRRO, 1704 S Cleveland, Sioux Falls SD 57103. 605-335-6500.

Teac A4300SX 7" 2 speed in gd cond, \$300/BO. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

Magnecord DPB-60 R/P, Viking R/P, Roberts R/P, \$75/all plus shpg. B Elliott, WRFX, 915 E Fourth, Charlotte NC 20204. 704-338-9970.

Scully 270 PB's (5), fair cond, \$300/all or \$75 ea. B Elliott, WRFX, 915 E Fourth, Charlotte NC 20204. 704-338-9970.

Sony PCM-2500 A & B, DAT's (2), 1990, new, BO. I Seredni, KNRV, 407 W 9th, Chico CA 95928. 916-895-1197.

Otari MX 5050 BII2 tape player/recorder (2), one w/new tape heads, \$1200 & one without new heads, \$1000, both in use. L Armer, KBOM, 500 Montezuma, Santa Fe NM 87501. 505-982-0088.

Ampex 350 stereo rcd, \$425; (4) Scully 285 repro decks, \$250 ea or \$900/all; (2) Inovonics 370 R/P elect, \$425/pr; MCI JH-110B FT stereo for 14" reels, \$2500. P Wells, KJCY, San Diego CA, 619-238-1037.

Want to Buy

Ampex MR-70 2 trk in gd original cond; Ampex NAB test tape, 15 ips; pair of RCA ribbon mics. D deForrest, 7441 Wayne, Ste 10-D, Miami Beach FL 33141. 305-866-5401.

Ampex MR-70 electr and/or transports for parts; Otari 4050-OM open reel mastering deck for high speed tape duplication. C Richardson, Richardson Recd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Nagra IV-SD, non-sync stereo recorder, cash or trade. F Beacham, 213-462-2908.

Metrotech 534A info and/or parts. A Allegra, Calvary Baptist, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

Teac/Tascam 3440/80-8 remote controls, foot or console top operation. J McCallum, McCallum Recd, 3311 E Bruce Randolph Ave, Denver CO 80205. 303-399-8548.

Inovonics 376 2 trk PB only elect. M Addey, Kaleb Sounds, 210 Riverside Dr, NY NY 10025. 212-865-3108.

Otari, MCI, Ampex, Studer or Scully 8 trk and/or 2 trk stereo. R Dymert, Group D, 8402 Lake Ave, Cincinnati OH 45236.

Carry case for Sony TCD-5M or TCD-5 Pro II portable recorders. R Schneider, POB 80795, Springfield MA 01138. 413-736-5853.

Ampex MR-70 2 trk in gd, original cond. D deForrest, Insight Prod, 7441 Wayne Ave, Ste 10-D, Miami Bch FL 33141. 305-866-5401.

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

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

Tandy Mdl 4 TRS-80 computer w/2 floppy drives, 5 meg hard drive, daisy wheel 410 printer & software, \$650. R Allen, WRBS, 3600 Georgetown Rd, Baltimore MD 21227. 301-247-4100.

CONSOLES

Want to Sell

Teac Tascam 3, like new, 8x4x2, \$500. E Davison, 217-787-0800.

SSR 32x8 bi-amp recd console, less than 1 yr old, \$9500 or possible trade. Funkenstein Recd Std, 7811 La Cosa, Dallas TX 75248. 214-239-4075.

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Gates Dualux II 8 chnl w/manual, gd cond, need only one new stereo pot to put in excel cond, \$800/BO pls shpg. C Ibarra, KIAN, 2300 Busby Dr, Sierra Vista AZ 85235. 602-458-4313.

Collins 212-M & 212-S, one mono, one stereo, lots of spare parts & manuals for both, BO. S Carter, WRKN, POB 145, Brandon MS 39043. 601-825-5045.

S-I-S T40, 2 chnl parts only, trade for Ampex AG 350 transport parts. B Butler, WELF, 432 S Nova, Ormond Bch FL 32174. 904-677-4122.

Ramsa 8118, 18 in 4 out, mint cond, \$1800. B Ranes, DIR, 32 E 57th, NY NY 10022. 212-371-6850.

Gatesway 10 pot board, completely rebuilt. L Popa, 814-467-7894.

McCurdy SS8800 stereo 8 chnl 24 input w/furniture & patch bays, \$3000/BO. B Mitchell, WSYR, 500 Plum, Syracuse NY 13204. 315-472-9797.

Micro-Trak Sport III dial-up remote sports mixer, mixes 2 mics, line level & spotter mic, A/C or battery pwr, VU meter, (3) headphone outputs, compact, briefcase format, nice cond. B Fisher, KPOK, Box 477, Bowman ND 58623. 701-523-3883.

Sound Workshop Logex 8 16 chnl mixing board w/stand & shelf. BO. D Coffman, WSDR, 940 Tarpon, Ft Myers FL 33916. 813-334-1393.

Gates Producer w/new replacement pots, dual chnl w/q switch not installed, 4 chnl mono, could modify for stereo or mix minus, \$200. L Beigel, On-Cue Record, POB 85042, Los Angeles CA 90072. 213-466-3595.

Ramsa T820B 20/40 input, full metering, 18 mos old, like new, full EQ on ea chnl, 8/16 buss out, \$5000. R Thomas, Rebel Recd, 5555 Radio Ln, Jacksonville FL 32205. 904-388-7711.

Wheatstone Audioarts 8X w/24 input, excel cond, \$9500/BO. D Kocher, DLK Snd Stds, 1901 Hanover, Allentown PA 18103.

Norcom Maxi-Tel 4 chnl telephone/remote mixer, rotary dial-up, (4) mic inputs, switchable to line level inputs, (4) headphone outputs, radio monitor in, record out, A/C or battery power, LED clock & timer, \$300. B Fisher, KPOK, 122 S Main, Bowman ND 58623. 701-523-3883.

Audio Interface Systems 8 pot mono dual chnl, one in excel cond & one for parts, \$500/BO. J Linn, WHKS, 62 N Main, Port Allegany PA 16743. 814-642-7004.

Bauer 910 8 chnl mono, \$400; Bauer 912 5 chnl stereo, \$400. WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

BE 4M50 4 chnl mono board, excel cond, manual, \$250. P Russell, Bowdoin College, Sill Hall, Brunswick ME 04011. 207-725-3066.

Gates Gatesway 8 chnl mono for parts, BO. E Douglas, KUNQ, POB 30, Houston MO 65483. 417-967-3353.

Dugan System automatic mic mixers (3) 6x1 auto or manual, 19" rack mount, \$125 ea. D Lundy, Lundy Tape Duplicators, Cumberland Gap Pkwy, Heidrick KY 40949. 606-546-6650.

Maxi-Tel remote sports console & Telex CS-75 Sportcaster headset w/mic, \$275. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

BE 4S-45A 4 chnl stereo mixer, 12 inputs, monitor, cue & headphones, amps w/manual, excel cond, \$550. G Hill, KEWB, 1538 Market, Reading CA 96002. 916-243-5392.

BE 4BEM 50 Spotmaster, w/4 pots, mono solid state; Ramko SC-5M, 5 pot, mono solid state; Ramko DC 8M 8 pot stereo solid state; Collins 212 F-2 6 pot mono tube type. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

McMartin B-500 5-chnl stereo, needs work, \$200/BO. G Fullhart, WVKS, 4665 West Bancroft, Toledo OH 43615. 419-531-1681.

McCurdy SS8500 Series, 11 stereo faders, 11 machine controls, 4 program busses & meters, digital clock & up/down timer, 4 EQ chnls, XLR I/O wiring & numerous other deluxe features & controls, clean, \$4950. W Clark, 318 E Calhoun, Macomb IL 61455. 309-837-2244.

BE 8BES100 8 chnl, stereo mixer, spare cards/parts, gd cond, \$550. G Hill, KEWB, 1538 Market, Reading CA 96002. 916-243-5392.

LPB Signature II S-20 10 chnl stereo, step attenuators w/manual, mint cond, \$2500. S Horner, KKUR, 255 W Stanley, Ventura CA 93003. 805-654-0577.

Broadcast Audio System 20, 12 stereo inputs, P&G faders, 7 band EQ on ea input, 3 stereo outputs, 3 remote inputs addl on ea fader, ext reduct pwr supplies, excel cond, 5 yrs old, \$8200. M Graziano, Cath Comm, 65 Elliot, Springfield MA 01105. 413-732-4546.

RCA BC7 in gd cond, works but needs wiring work, BO. J Ballentine, WSBF, POB 2156, Clemson SC 29632. 803-653-5222.

LPB Signature II S-15A 8 chnl mono, excel cond, \$1200/BO. K Kushnir, Empire Comm, 2120 Bluebell, Santa Rosa CA 95403. 707-545-8300.

Audionics 110A Grandson, 18 inputs, 4 outputs, 3 band EQ, 2 echo sends, 8 VU's, \$3900/BO. Mr. Freeman, Pranava Prod, 1227 Sierra Alta Way, Los Angeles CA 90069. 213-457-8390 aft 1PM.

LPB 4 chnl mono, \$475. S Dyrnes, Dynes Prod, Wheeling WV 26003. 304-233-8856.

Sparta A-10B monaural, mint cond, \$400; Gates Studioette monaural, gd for parts, \$100. B Weiss, KLSI, Kansas City MO 64111. 816-753-0933.

Yamaha PM 700 12x2x2 mixer & PM 400 8x2 mixer, both \$900; UREI 527A 27 band graphic EQ's (2), both \$700. J Krepol, RNDL, 6147 Walker St, Philadelphia PA 19135. 215-624-1050.

Arrakis 2000 SC's, (2) stereo, both in use, on-air board, \$1250, production board, \$1750. L Armer, KBOM, 500 Montezuma, Santa Fe NM 87501. 505-982-0088.

Ampro AC-6-5B 6 mixer dual chnl, gd for small prod or on air use, \$700 plus shpg. B Elliott, WRFX, 915 E Fourth, Charlotte NC 20204. 704-338-9970.

UREI Mod One 10 chnl stereo, OK cond, \$850 plus shpg. B Elliott, WRFX, 915 E Fourth, Charlotte NC 20204. 704-338-9970.

NorthEast Ohio combo looking for specialists who can rebuild an RCA BC-8A stereoidal chnl console mdl M1-11667A. B Walz, WFUN/WREO, 3226 Jefferson Rd, Ashtabula OH 44004. 216-993-2126.

LPB Citation C-10S 10x3, stereo, \$2500. P Wells, KJCY, San Diego CA, 619-238-1037.

Gates MI-5136 remote mixer, old but appears to be complete, \$50 plus shpg. B Elliott, WRFX, 915 E Fourth, Charlotte NC 20204. 704-338-9970.

GE BC1A in gd cond, needs minor work, \$50 plus shpg. G Heidenfeldt, 2880 W Lake, Wilson NY 14172. 716-751-6187.

Snake, 16 phantom-pwr inputs w/ext ps, 250' Belden 19-PAIR cable w/mil connectors & stainless steel strain reliefs, 10' Neumann XLR snake mates w/box or Belden snake, excel cond, \$575/BO/trade. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Quantum QM-8, 8 inputs, 4 busses, quad & stereo mon, +4 dBm nom, +30 dBm max, lrg Triad input xmrs, Duncan linear faders, audiophile quality, excel cond, \$475/BO/trade. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Shure M67/M675 mixer/prod master combination, excel cond, \$400/set. T Ray, WTIC, Hartford CT. 203-522-1080.

Altec 250T3 12 chnl stereo, gd working order, \$1750/BO. K Kushnir, Empire Comm, 2120 Bluebell, Santa Rosa CA 95403. 707-545-8300.

Want to Buy

McCurdy SS8500 spare parts needed desperately. R Gates, KTLG, 1602 S Brownlee, Corpus Christie TX 78404. 512-882-4394.

McCurdy 8500, 8600, 8550, 8650; Ward-Beck R1200, R2000; Audionics 110, 200 or 300; Harris M-90 or ADM stereo boards. R Dymert, Group D, 8402 Lake Ave, Cincinnati OH 45236.

API & Neve consoles, also API & Neve EQs, anything considered, especially API 550A & 550B's. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

DISCO & SOUND EQUIPMENT

Want to Sell

Altec Acoustica Voice passive filters, individual & rack mount on 1/3 octave centers, \$5-50. J McLane, 115 W Gutierrez, Santa Barbara CA 93101. 805-963-3941.

Lexicon 200 reverb, mint cond, \$1800; Lexicon Prime Time II, mint cond, \$900; Sony PCM 701, mind cond, \$950. D Kocher, DLK Snd Stds, 1901 Hanover, Allentown PA 18103.

Westlake RB5M 6, (2) woofers, one mid, one tweeter, pr in vgc, \$1000/pr. B Ranes, DIR, 32 E 57th, NY NY 10022. 212-371-6850.

Yamaha NS-10 (4) wiremainder of warranty, (2) boxed, (2) open, \$320/pr. C Keith, ALI, Box 313, Keene NH 03431. 603-352-8460.

AKG The Tube, 2 mos old, \$1650; (2) Orban 642B para EQ's, \$650/ea. T Campana, Dan Yessian Music, 33117 Hamilton Ste 175, Farmington Hills MI 48334. 313-553-4044.

Eventide H969 Ultra Harmonizer w/warranty card, \$1750; (28) play stereo Scully tape heads, \$25 ea; several Magnecord Presto lapped play heads. S Russell, Russell Music, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Fisher MC 708 audio component system; Marantz TT; Audionics 132 multi-trk, multi-head large reel machine tape duplicator w/carrying case; xmri breaker box, 200 VAC 200 A; (6) formica 7 wood turntable cut-outs for Technics SP-15 TT's. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

Sequential Circuits 6 trak, all original programs, Midi Arpeggio stacks, cables, excel cond, \$300/BO. N Brecher, Traxx, 192 Kelton, Brighton MA 02135. 617-739-9261.

Mobile DJ system, top quality components w/JBL speakers, complete w/extensive library, SASE for complete list, \$11,000. American Music Formats, 15205 W Lynwood, New Berlin WI 53151. 414-784-5463.

JBL Century L-100 in excel cond, \$325; JBL D-120 12" low freq drivers (2), new cones, excel cond, \$125/pr. R Glenn, WIER, 1718 Shenandoah, Wm FL 33598. 813-634-1940.

Graphic EQ, 12-band stereo, like new w/papers, \$85; Holmes 75 W bass amp, \$140. W Dougherty, WLD Recd Std, Rt 1, Mill Spring MO 63952. 314-998-2377.

Community Light & Sound RS440 (1 pr) 4-way speakers w/Community VB790 bass bins, in Anvil cases, excel cond, \$1600. J Kreines, 5330 Kennedy Ave, Millbrook AL 36054. 205-285-6179.

Complete mobile disco/sound reinforcement system, turnkey business opportunity w/CD players, mixers, elec, crossovers, lighting system, all cables, road cases & 32' Ford high cube van w/2 ton hydraulic lift gate, inventory list & photos avail, serious inquiries only, \$35,000. P Appleson, Appleson Stds, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Studio Sound S-305 passive filter sets (2), matched pair, rack mount, very rare, \$175 ea. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Burwen DNF-1201 dynamic noise filter, vgc, shipping included, \$160. P Combs, Only Son Prod, 2316 Forest Home Ave, Dayton OH 45404. 513-236-2340.

UREI 518 elect crossover, 6 cards, rack frame & PS excel, \$250. P Appleson, Appleson Stds, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Altec 604-E (pair) in excel cond only; also JBL Paragon wanted. D deForrest, Insight Prod, 7441 Wayne Ave Ste 10-B, Miami Beach FL 33141. 305-866-5401.

Digital reverb for small recording studio. W Dougherty, WLD Recd Std, Rt 1, Mill Spring MO 63952. 314-998-2377 aft 5:30 PM.

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LIMITERS

Want to Sell

Gentner RCF-1 replacement card #5 for Optimid 8100A when using Prisms, \$300. M Holderfield, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.

UREI 530 9 band EQ, stereo, looks bad but works, \$50. F Fess II, WLRB, POB 250, Macomb IL 61455. 309-833-5561.

Gates FM Top-Level, excel cond, \$75; Lauderdale Electronics program lock, mono, excel cond, \$75. F Fess II, WLRB, POB 250, Macomb IL 61455. 309-833-5561.

Radio Design Labs NRSC A w/pre-emphasis & 10 kHz audio filter w/pwr supply & manual, \$200; CRL PMC 300A, excel cond. B Fisher, KPOK, Box 477, Bowman ND 58623. 701-523-3883.

UREI BL-40 Modulimiter, gd cond, w/manual, \$100/BO; CBS Volmax 4000A, working when removed, w/manual, \$75/BO. S Carter, WRKN, POB 145, Brandon MS 39043. 601-825-5045.

Optimid 8000A

\$1495 & UP

414-482-2638

CRL SMP 900 AM stereo audio processor w/NRSC-1 attachment, \$2500/BO, cash or money order. P Dale Ware, KUTY, Palmdale CA. 805-947-3107.

CRL SEP-800 audio processing w/book; Orban 674A stereo EQ w/book, all equip in gd cond, BO. L Crumpton, KZZB, POB 20495, Beaumont TX 77720. 409-833-0774.

LIMITERS . . . WTS

Optimod 8000A limiter/stereo gen, all lyrics replaced recently & limiter section ompamps upgraded to low noise FET types, works great, \$1500. M Heuberger, KTIG, POB 409, Peguot Lakes MN 56472.

Orban Optimod 8000A in excel cond, low nrs, used as backup, \$1200. L Maierhofer, WTGC, 101 Armory Blvd, Lewisburg PA 17837, 717-523-3271.

Aphex aural exciter type 3 2 chnl stereo single rack space, excel, \$175. B Fisher, KPOK, 122 S Main, Bowman ND 58623. 701-523-3883.

CBS Labs Audimax stereo limiter, 1 side chnl not working; Universal Audio BL-40 Modulimiter; Dorrough DAP 310 audio processor. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

CRL PMC 300A peak mod controller, \$450. W Nauman, WLWJ, 400J Royal Commerce, Royal Palm Beach FL 33411. 407-793-5555.

CRL APP-300A, BO; CRL PMC-300A, BO; Pacific Recorders Multi-Max audio compressor/limiter mdl MX/AM, BO; Auto-Jock for automation, \$1000. Mandel, KAMP, POB 1018, El Centro CA 92244. 619-352-2277 between 7-8 AM or 12-1 PM.

Harris MSP-90 dual chnl AGC/compressor, \$800/BO. J Linn, WHKS, 62 N Main, Port Allegany PA 16743. 814-642-7004.

CRL SEP 400A & PMC 300, two each, excel cond, \$600 ea; Kahn stereo exciter w/pwr side tuned to 1140 kHz, excel cond. G Arroyo, WONQ, 2483 John Young Pkwy, Orlando FL 32804. 407-293-0000.

CRL PMC 300A set-up w/Radio Design Labs NRSC 1 pre-emphasis & 10 kHz audio filter to meet NRSC 1 standards, complete manuals, \$750. B Fisher, KPOK, Box 477, Bowman ND 58623. 701-523-3883.

Dukane Medallion dynamic range limiter, chrome face 19" rack mount, +4 & +10 lim & gate, \$150. D Lundy, Lundy Tape Duplicators, Cumberland Gap Pkwy, Heidrick KY 40949. 606-546-6650.

Aphex 102A type C dual chnl aural exciter, still under warranty, \$170. J Ellingson, Ellingson Voice-Overs, 913 Warwick, Cedar Falls IA 50613. 319-277-8535.

UREI BL-40 Modulimiter (2), excel, \$300 ea. M Persons, KKIN, Box 930, Aitkin MN 56431. 218-829-1326.

Marti CLA-40H compressor/limiter, \$100. E Douglas, KUNQ, POB 30, Houston MO 65483. 417-967-3353.

Collins 26U-1 peak limiter in gd cond. A Terry, WODY, Box 545, Bassett VA 24055. 703-629-5900.

Moseley TFL-280 audio (2), \$500; Harris AM & AGC Solid Statesman (2), \$500. R Coleman, WGEN, 1003 S Oakwood, Geneseo IL 61254. 309-944-4633.

Texar RCF-1 Opt 5 card w/board, faceplate & manual, \$175. R Rocks, KEMC, 1500 N 30th, Billings MT 59101. 406-657-2941.

Orban Optimod 8000A in gd cond, recently removed from service, \$1500. G McCoy, KZEN, Box 100, Central City NE 68826. 308-946-3816.

Gregg Labs 2530 tri-band compressor, upgraded w/5534 IC's, \$350; Inovonics 222 NRSC processor, as new, \$400. P Patton, WA-PO, 29 W Main, Jasper TN 37347. 615-942-5811.

Collins 310Z-2 FM exciter, in operation since 1976. H Hoppe, WHMH, Sauk Rapids MN 56303. 612-252-6200.

CRL FM 4G, SMP-800, (2) SEP-400 B, SPP 800, SG 800, excel cond, \$4200. P Urso, 603-332-0930.

Harris MSP 100 audio processor. D Johnson, WFRY, 130 E Randolph Ste 2303, Chicago IL 60601. 312-861-8132.

Gates Solid Statesman AGC's (2), \$250/pr. H Widsten, KGNB, 1540 Loop 337 North, New Braunfels TX 78130. 512-625-7311.

CBS 4450A Audimax automatic level control w/manual, \$250; CBS 4000A Volumax automatic peak limiter, manual, \$250. R Yaw, KOJM, Box 7000, Havre MT 59501. 406-265-7841.

Want to Buy

Orban Optimod 8100A. M Cooney, Bdct Mgmt, 610 N Kiwanita, Sioux Falls SD 57104. 605-336-2706.

dbx 117 or 119 consumer stereo compressor in gd working cond. Glenn, 1105 Turtle Creek, Paso Robles CA 93446.

Fairchild 660 or 670, Teletronix LA2A, LA3, other tube compressors & limiters; & other vintage tube signal processing equip. J Kreines, 5330 Kennedy Ave, Millbrook AL 36054. 205-285-6179.

Orban 8100 wanted, will trade 8000. A Stevenson, WHZT. 217-355-9402.

MICROPHONES

Want to Sell

Altec 639 ribbon & dynamic classic, w/yoke & connectors complete, \$550. L Beigel, On-Cue Record, POB 85042, Los Angeles CA 90072. 800-726-9813.

Schoeps MK-8 bi-directional capsule, new, \$475; (2) Shure SM-18 surface mount mics, new, \$49 ea; Shure SM-89 shotgun mic, new, \$649. C Richardson, Richardson Recd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Norelco D119C5/200, \$10; GE CB mic, \$10; Altec 570B, \$20; RCA BK-5B, \$200; RCA BK-1A (2), one has base, other has boom mount, \$25 ea; RCA shotgun mic, \$25. S Dynes, Dynes Prod, Wheeling WV 26003. 304-233-8856.

Microphones approx 30 from home studio incl AKG 414, \$350 ea, 451, \$200 ea, D-190, \$60, D-224, \$160, Sennheiser 441, \$275, 421, \$175, Shure SM-81, \$225 ea, SM-61, \$85, mdl 300, \$100, many others from EV, Beyer, Altec, Sony & Ramsa, call for complete list & prices. K Peckham, 5824 Danville Dr, Madison WI 53719. 608-271-8763.

Schoeps CMTS-501 coincident stereo mic, switchable multipattern capsules for M-S or X-Y stereo, new, \$1795; (2) Shure 300 bi-directional ribbons, new, \$165 ea; Schoeps MK-3 omni capsule, new, \$285. C Richardson, Richardson Recd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Sennheiser ME80/K2U spot mic w/extra ME80 head, like new, \$275; MKE10-3 tie clip mic module, new, \$75. E Davison, 217-787-0800.

Neumann U-67 w/power supply, \$750. W Nauman, WLWJ, 400J Royal Commerce, Royal Palm Beach FL 33411. 407-793-5555.

EV 664, BO. E Douglas, KUNQ, POB 30, Houston MO 65483. 417-967-3353.

Neumann & AKG mics including C24, U47, U64, U67, for sale or trade. M Block, Production Block, 2838 N Front, Harrisburg PA 17110. 717-233-4155.

RCA classic ribbon mics, send for list. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Sony C-37P w/case, mint cond, \$800; Beyer M260N ribbon (pair), vgc, \$400; Amperite SR80-H classic studio ribbon mic, works, \$250; RCA Veracoustic classic ribbon mic w/art deco case, works, \$300; Bruno Labs PRL1 large classic ribbon mic, works, \$300, BO on entire lot. G Titcomb, Easy St Recdg, 2 Easy St, Woodbury CT 06798. 203-263-0785.

RCA Jr velocity, \$450; Turner dynamic U9S, \$100; Collins mobile MM1, \$100, all new in box. J Burgwyn, WJAD, Box 7397, Rocky Mt NC 27804. 919-443-4101.

AKG C460B preamp w/CK-22ULS cardioid & CK-4 figure eight capsules, \$550 plus shipping. D Glasser, Airshow Inc, 7021 Woodland, Springfield VA 22151. 703-642-9035.

Altec 639B ribbon mics (2). S Russell, Russell Music, 60410 Klett Dr, Decatur MI 49045. 616-782-9358.

RCA KV3A ribbon cardioid boom mix in shock mount, gd cond, \$600; EV 666 dynamic cardioid mics w/cable & stand adapter, gd cond, \$75 ea; Altec M49-M50 cardioid/omni condenser mics w/windscreen, AC supply & stand adapter, gd cond, \$130 ea. D Lyon, Lytec Recdg, 29539 Linda, Livonia MI 48150. 313-427-6043.

Beyer M500 cardioid ribbon, like new in box w/graph, \$150; Beyer M160 cardioid ribbon mics (2), like new in box w/graph, \$150 ea; EV 668 boom dynamic cardioid, new windcreens & mounts, like new (2), \$150 ea. D Lyon, Lytec Recdg, 29539 Linda, Livonia MI 48150. 313-427-6043.

Ross RM-7HC/C, uni-directional perfect, cord w/1/4" plug, cover. N Brecher, Traxx, 192 Kelton, Brighton MA 02135. 617-739-9261.

U87 w/shock, \$1250; SM81 w/shock, \$160; AKG 202, \$125; RE 20 w/shock, \$320; TOA wireless lavelier, \$60, all in mint cond. D Kocher, DLK Snd Std, 1901 Hanover, Allentown PA 18103. 215-432-0520.

HME professional VHF wireless mic system, System 85 mic, RX-722 rcvr & Excalibur carrying case, \$495. W Clark, 318 E Calhoun, Macomb IL 61455. 309-837-2244.

Telefunken tube CM-61 by Shoeps, very rare, uses std plug-in tube, w/custom pwr supply, mint cond, \$2475/BO. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

Sennheiser MD-421 (2); AKG D-1000E mics (2), all in gd cond, BO. N Kuvshioff, Compact Djs, POB 2913, Salisbury MD 21802. 301-548-5352.

Shure W15HT/58/W20R wireless mics (2), handheld 177 & 183 mHz, SM58 heads, new, \$525 ea. E Davison, Beatty TeleVisual, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Neumann KM-88, rare 3-pattern w/nickel capsules, hot-setup percussion mic, mint cond, w/orig case, \$875/BO. R Katz, Allegro Snd, 15015 Ventura, Sherman Oaks CA 91403. 213-859-5543.

RCA 44A on original stand, gd cosmetics, works, \$500; RCA 77C black & chrome, gd cosmetics, works, \$400; (2) RCA 74 Junior, gd cosmetics, need ribbons, \$100/ea; Shure Tri-Polar, 3 crystal, rare, original, works, BO; Asiatic D104 classic comm mic on original stand, excel cond, \$75; EV RE16, dynamic cardioid, vgc, \$60; EV RE55, dynamic omni, fine cond, \$75; EV RE20, poor cosmetics, works fine, \$30. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

Shure SM-61LC (2) in vgc, built in isolation & pop filter w/cases & spec sheet, \$160/pr or \$85 ea. W Dougherty, WLD Recdg Std, Rt 1, Mill Spring MO 63952. 314-998-2377 aft 5:30 PM.

RCA ribbon mics including (1) 44-BX; (1) 77-D; KU3A10,0001; BK-11; BK-5; SK-46; WE639A, will trade for other high quality condenser, dynamic, ribbon mics & audio equip. Tracy Eaves, 615-821-6099 (evenings).

Want to Buy

RCA, Neuman, Schoeps, AKG, Telefunken & other makes of vintage mics, any cond or parts, stands & call letter plates, will buy or have mics to trade. R Van Dyke, Caffrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9635.

RCA 44's, 77's, WE & other ribbon mics, working or not. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Neumann Z40, Z140, Z240 matrix transformers. E Kelly, Mobile Master, POB 61, Glenelg MD 21737. 301-596-9101.

Four threaded lower collars, pipe thread & compression springs & rings for RCA 74-B mics. C Lund, Cycle Sound & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

Original RCA 77-DX mic desk stand; also need pattern ID plate for back w/2 screws. C Lund, Cycle Sound & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

Classic mics, EV, Telefunken, Neumann, etc, will trade. G Titcomb, Easy St Recdg, 2 Easy St, Woodbury CT 06798. 203-263-0785.

Neumann SM 69 or SM 69fet, prefer SM 69fet w/NS69 power supply/remote control, satin finish, no swivels, will trade Neumann TLM 170. E Kelly, Mobile Master, POB 61, Glenelg MD 21737. 301-596-9101.

RCA 44 or 77 velocity mics, complete & functional only, send details, price. D Forrest, Insight Prod, 7441 Wayne Ave Ste 10-B, Miami Beach FL 33141. 305-866-5401.

Vintage tube condenser mics, Neumann, Telefunken, Schoeps, AKG & classic ribbon mics, RCA 77s, 44s; Telefunken ELAM 250s or 251s, any cond; AKG C12s & C24s, any cond; Neumann U47, U48, M249B, KM56, U67, etc, any cond. J Kreines, Demot/Kreines Films, 5330 Kennedy Ave, Millbrook AL 36054. 205-285-6179.

Altec, RCA, WE, Neumann, Sony, etc, vintage mics. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

Will buy or trade for RCA 4 AA condenser mike no major missing parts please. J Webb, 15117 Hamlin, Van Nuys CA 91411. 818-769-6738.

MISCELLANEOUS

Want to Sell

Ampex motor for an Ampex R-R hyst syn 77, cont VF-5.0 PH1, 0.4 Amp, 60 Hz, 117 V, \$45; ADC PJ 22 patch cord wire assembly, stereo, \$10; Weston 308 amp meters (2), \$5 ea; table mount gooseneck, \$15; EV 1-666, \$10. S Dynes, Dynes Prod, Wheeling WV 26003. 304-233-8856.

Switchcraft 1/4" balanced patch bays, some normalled, \$60 ea; West Penn 291 2 conductor shielded cable, all or part of 1800, new, 8c/ft. B Petruzzi, Rouse St Prod, 13727 Sylvan Ste 11, Van Nuys CA 91401. 818-780-4520.

Kato 50 kW 3 phase AC generator, 151 A at 208-240 V, supercharged diesel engine w/less than 150 hrs operation, spare voltage regulator, \$12,000. P Parks, KYKR, POB 5488, Beaumont TX 77726. 409-838-3911.

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

Dedicated pro seeking air/MD position, country & proud of it!, will consider all offers. Bryan, 904-478-5321.

Audio engineer w/4 yrs exper seeking position in Eastern Ohio or Western PA, serious inquiries only. M Anderson, 412-847-0111.

Dedicated announcer, 7 yrs exper seeks medium/large market challenge, creative, prefer oldies/classic, AC, jazz, also interested in music/promotions/production director position, relocateable. Phil, 6773 Mara Ave 29, Palms CA 92277. 619-367-7371.

Experienced & reliable sportscaster/announcer seeks sports director position in IA, IL, or WI, football, basketball, baseball PBP, production, will relocate. Robert, 319-652-6640 or 319-242-1252.

FCC licensed engineer, 29 yrs exper seeking contract work, studio/xmtr design, construction, maint. D Parrish, 813-772-5875.

Operations director/PD, knowledgeable about all facets of radio, 20 yrs exper, oldies, country, AC or newstalk formats preferred. Stacy Richardson, 918-835-2777.

CE w/big production voice & over 15 yrs of hands-on eng exper, seeks position w/production in a competitive top 100 market. G Morgan, 704-563-8676.

GM w/26 yrs exper, looking for NE small market. < Watts, POB 152, Big Flats NY 14814. 607-362-7522.

Program/Announcer, worked South FL major markets, 5 yrs on air, 20 yrs related, creative voices, prod skills, Gospel stations included, all formats, markets, open relocate correct offer, owner chain, create own niche, will program Gospel. V Harris, 305-758-3732.

Seeking GM position w/option, small market, 29 yrs radio/23 mgmt exper, strong personnel, engrg, sales, news, sports, avail now, Wisconsin, midwest, references, personal/business. Rod, 608-647-4869.

My dollars, time & mgmt, buy all or part of your station, community oriented. M Rimmerman, 215 Wendwood, Statesboro GA 30458. 912-681-6378.

Exper air personality seeking FT position, exper in news, morning & afternoon drive, prefer Christian or A/C but will work in other formats. Jason, after 4PM CST. 918-476-8849.

Ancr w/6 yrs exper in north med mkts looking for position, hard worker & team player. Brian, 612-560-6569.

Radio engineer w/major market exper seeking new challenges in new locations. Reply to: Engineer, POB 4882, Ocala FL 32678.

HELP WANTED

Tulsa AM/FM seeking assistant engineer. Formal basic electronics training & 2 yrs radio bdcgt exper required. Immediate opening. No phone calls please. Mail resume & description of your capabilities to: Chief Engineer, KRMG/KWEN, 7136 S Yale, Tulsa OK 74136. Competitive salary & benefits. New City is an Equal Opportunity Employer.

Keymarket Communcations Group is expanding its operations & needs engineers at all levels of qualification. Resume in confidence to:

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Chief Engineer for Gainesville, FL Class C station. Applicant must have strong technical skills & remote broadcast experience. Send resume to: Paul Duller, 760 Betty Court, Sunnysvale CA 44086. 408-735-7094. EOE.

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Indiana State Employment & Training Services
10 North Senate Avenue
Indianapolis, IN 46204
Attention: W. F. Shepherd

Letter of application must reference I.D. 3288086 and include applicant's social security number.

EMPLOYMENT SECTION

HELP WANTED: Any company or station can run "Help Wanted" ads at the flat rate of \$25 per listing per month (25 words max). Payment must accompany insert; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$5. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

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Extel AH11R printer for parts or repair, \$30; Hgain scanner, works gd, \$30. WJAG, 309 Braasch, folk NE 68701. 402-371-0780.

Andrew dehydrator, BO. Eddie, KCFX, 10800 Farley Ste 310, Overland Park KS 66210. 913-661-0101.

Vaco modems (2) units for sending data on telco dial up lines. C Murray, KMGE, 925 Country Club Rd, Eugene OR 97401. 503-484-9400.

Ruslang RL-500 tape transport, blk/wood-grain finish w/casters, \$100. P Parks, KLVJ, 27 Sawyer, Beaumont TX 77702. 409-838-3911.

Extel 1 AF 11 R printer w/stand & book; GE AP printer; Smith Corona 101 universal tractor feed. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

RCA PG201, 16mm sound projector, exceptionally smooth running, projector cosmetics excel, case cosmetics fair, \$175; (3) Altec N500 crossovers, excel cond, \$75/ea. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

B&W 210 audio gen, \$200; B&W 410 dist meter, \$300; Kintronic isocouplers FMC-7.5 at 103.9, \$2500; Kintronic FMC-0.5B at 450.65, \$1000; Eventide delay BD-931 6.4 sec, \$800; GE dist meter, \$100; Heathkit oscil 10-4560, \$200; Elgin ERC-16645-4 recorder connectors, \$60 ea. Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

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Cummins 4B 3.9GC diesel generator, 40 kW, 4 cylinder, liquid cooler, 6 mos old, 417 hrs, excel cond, \$7900. M Fleisher, WWBE, 333 Chestnut, Mifflinburg PA 17844. 717-966-1098.

Harrison 6200 B DC pwr supply, 150; HP 0-40 V 75A, 0-20V 1.5A. M Norman, KCCU, 2800 W Gore, Lawton OK 73505. 405-581-2425.

Telephone System, Executone 'Encore' recently removed from computer store, 12 phones, punch blocks, options, cords, installation jacks, etc., priced low. Goodrich Ent. Inc. 11435 Manderson St, Omaha NE 68164. 402-493-1886.

Kraco RPU ground plane 161.7 mHz, \$100; (4) patch panels double, \$50 ea. Delta Bdctg, POB 430, Helena AR 72342. 501-338-8361.

Harmon-Kardon mixers, new DPR7; Meissner mixer five inputs-battery; Cannon plugs, 3 prong, male & female; 40 new tubes & resistors cheap; Lafayette TE22 audio gen; Sencore transistor & diode tester; manuals for Ampex, Pultec, Altec & others. Mr. Oliver 212-874-7660 in afternoons.

Grampian cutter heads, 1D feedback (tandberg); patch bays (4) 24 inputs single, also patch cords; Daven 600 ohms attenuators (silent) (8) excel; Presto 6N cutter lead screws; Edital blocks for recorders 1/2"; EV 12TRX speakers (2) & cabinets. Mr. Oliver, 212-874-7660 in afternoons.

Want to Buy

WE, Altec, RCA speakers; old mics, tube mixers, consoles, limiters, amps, 16" transcriptions, on-air lights, blank recdg discs, bdct/recdg catalogs, magazines, manuals, mic flags. R Van Dyke, Caffrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9835.

AM-RF around 1400 kHz, EBS decoder, plug in mods for Gateway II mono console. Bill, 904-678-8943.

Glass dial plate for 1968 HH Scott 388 rcvr. Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

New FM seeks quality used studio/xmtr gear, 1 kW xmtr, boards, etc. B Jackson, WCDA, Box 12389, Albany NY 12212. 518-374-0898.

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

Belar SCM-1 SCA mod mon, 92 kHz, excel. M Persons, KTLF/KFML, 70 N.E. 1st Ave, Little Falls MN 56345. 218-829-1326.

QEI 675T200 RF & SWR monitor & PA voltage & amp monitor, fwd & rev SWR switch, 19" rack mount, 3" high, translator & up to 200 W use, \$125. S Lawson, KAK Prod, 928 Hyland, Santa Rosa CA 95404. 707-528-4055.

Modulation Sciences Mod-Minder, used 2-3 hrs, complete w/software. BO. H Plumlee, WGAP, POB 4939, Maryville TN 37802. 615-983-4310.

General Radio Type 1931-A was operational when removed, BO. A Terry, WODY, Box 545, Bassett VA 24055. 703-629-5900.

FM mod mon, stereo in gd working cond. R Lark, WXCE, Box 1260, Amery WI 54001. 715-268-7165.

es stereo mod monitor GTM 885 103.1, \$100; FM freq monitor GTM 88F 103.1, \$50; Pilot SCA freq comparator, \$25. Delta Bdctg, POB 430, Helena AR 72342. 501-338-8361.

Potomac AM-19D 6-tower DA-2 digital antenna monitor, \$3800; Sony PVM-8200T professional color monitor, \$1200; Sony BVE-800, \$400; Harris AM-80 AM modulation monitor, \$350; Tektronix 1420 NTSC vectorscope w/case, \$2100. L Morton, 805-733-4275.

Want to Buy

FM stereo monitor, gd, late mdl; also FM EBS rcvr. S Larson, KJLY, Box 72, Blue Earth MN 56013. 507-526-3233.

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

MOVIE PROD EQUIP

Want to Sell

Nagra III internal xtal, rolloff filter, Sennheiser 805 w/KAT 15, leather case, ATN pwr supply, excel cond, \$1350; & new Bell & Howell 70 DR w/Anvil case, 1" Comat, instructions, \$325. J Kreines, 5330 Kennedy Ave, Millbrook AL 36054. 205-285-6179.

Siemens 2000 16mm interlock projector, excel cond, \$575; B&H 70DR 16mm camera w/3 lenses & case, mint cond, \$325. G Ormrod, GFO Prod, 432 East X St, Tumwater WA 98501. 206-352-8028.

Arriflex 16S 16mm w/12-120mm Angenieux pwr cord, lens shade & light case, mint cond, \$1500. R Williamson, R Williams Prod, 2809 Ross Ave S Ste 305, Dallas TX 75201. 214-871-9011.

Canon Scoopic 16mm motion picture camera, zoom, etc w/charger, excel cond, \$750/BO. K Kushnir, Empire Comm, 2120 Bluebell, Santa Rosa CA 95403. 707-545-8300.

Want to Buy

Film cameras & accessories, especially Arriflex, Bolex & Eclair, also film sound items, Nagra & Stellavox recorders, reasonably priced editing & lighting equip. H Biller, 108 Hamilton, Silver Spring MD 20901. 301-565-2798.

Mitchell 35 & 16mm cameras & accessories, other professional 16/35mm cameras, incl Arriflex, Aaton, CP, etc; optical printers, Research Products 1000, 1001, & Acme & Osberry; cine lab equipment; upright Moviolas, especially 35mm. Westrex 35mm; optical recorders, & RCA & Maurer optical recorders; CP16s any condition; good cine optics (Zeiss, Ultra-T, Angenieux, Cooke, etc); also need Zeiss 9.5mm Distagon, reasonable, need not be mechanically mint. J Kreines, DeMott/Kreines Films, 5330 Kennedy Ave, Millbrook AL 36054. 205-285-6179.

RECEIVERS & TRANSCEIVERS

Want to Sell

Bogen TP200 digital tuner, AM/FM mono/stereo, new, \$200; Bogen TP50 mono AM/FM tuner, new, \$100; 450 MHz mobile RF amp, TPL mdl UD-6AC-7, 15-45 W, \$100. E Davison, 217-787-0800.

High quality micro-miniature 67 kHz SCA decoder, about 1" square, prewired & ready to install, \$15. D Jackway, 5742 Fair oak, Springfield MO 65810. 417-861-1846.

Motorola VHF radios, one 15 W Moxby base PL, one 15 W Mocom 35 busy, (3) HT210 5 W handhelds w/chargers, PL, like new, \$100 ea. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Swan 240 rcvr for SSB, covers 75, 40 & 20 meter band power of 200 W, complete w/DC mobile & AC pwr w/Hustler mast, spring & resonators, for 40 & 20 meters, \$175/BO. T Spencer, WODY, Box 545, Bassett VA 24055. 703-629-2509.

Scientific Atlantic decoder 7300 wideband BPSK rcvr, excel cond. L Popp, 814-467-7894.

Kenwood TH-21 1 W 2 meter hand-held w/service manual, \$25. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

McMartin TR-66A SCA rcvr. WGER, 6165 Bay Rd, Saginaw MI 48604. 517-792-1063.

AM STEREO RECEIVERS
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Motorola two-way system, not working, BO. E Doubias, KUNQ, POB 30, Houston MO 65483. 417-967-3353.

Motorola Pagers Pageboy II's, Director II's & monitors, VHF system w/chargers, \$40-90 ea, all in working order. K Kushnir, Empire Comm, 2120 Bluebell, Santa Rosa CA 95403. 707-545-8300.

Adcom SC50 agile demodulator, works in Harris 6500 satellite rcvr, gd cond, \$350. W Long, WMMY, 7819 Natl Serv Rd, Greensboro NC 27409. 919-688-9450.

Motorola Micor N04RTB broadband tuned to 455.15 mHz, wiring for Marti compander board, has excel intermod rejection, \$1100. E Swanson, WZTR, 520 W Capitol, Milwaukee WI 53212. 414-964-8300.

Macintosh MR71 tube tuner in Pan-Loc case, all Mac tubes near mint cond, \$400. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

McIntosh MR 77 FM stereo tuner, excel cond, \$450. G Gabriele, WFOG, 215 Brooke, Norfolk VA 23510. 804-622-6771.

Scientific Atlanta digital audio satellite rcvr w/downconverter, 15 K dual audio card, 7.5 K dual audio card, cue card, spare pwr supply, \$4500/BO. T Ray, WTIC, Hartford CT. 203-522-1080.

Communications Company 450.00 MHz antenna bases (2), not top whips or mounting hardware, have coax leads w/N-type connectors, \$200 ea or \$350/pr. A Wasilewski, KMWX, POB 1460, Yakima WA 98902.

Scientific Atlanta 7300/7325 2-piece, rack mounted rcvr & processing unit at 150 kHz. BO. G Fields, KDXI, Drawer 1306, Mansfield LA 71052.

Johnson mobile/base/handheld two-way radios at discount prices! UHF mobile transceivers: 15 watt \$399, 35 watt \$495. Deremer Radio, 33 Main, Seward NE 68434. 402-643-3338.

Want to Buy

Fairchild Dart 384 satellite receiver w/15 kHz card & down converter. P Reilly, KGRC, POB 1017, Hannibal MO 63401. 314-221-2221.

BC-474A rcvr/xmtr, AVT-112 aircraft xmtr, AVR-20 aircraft rcvr, tech manual for MAR radio set. M Starin, WJYY, 357 Varney, Manchester NH 03102. 603-625-1165.

Harris RF-201M 10 chnl marine HF SSB transceiver tech manual, mic or mic connector & power connector. M Starin, WJYY, 457 Varney, Manchester NH 03102. 603-625-1165.

REMOTE & MICROWAVE EQUIP

Want to Sell

Marti SGC-10 92 kHz SCA gen, excel; Marti R30-150 RPU rcvr, \$200. M Persons, KTLF/KFML, 70 N.E. 1st Ave, Little Falls MN 56345. 218-829-1326.

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P.O. Box 4040, Baltimore, MD 21093
(301)252-8351

Comrex LXT, LXR, TCB single line extender package, \$4500. J Gennaro, WFHR, Box 8022, WI Rapids WI 54495. 715-424-1300.

Wegener 1606 sat rcvr for SMN Star station, 1606-10 down converter, 1606-01 wideband demod, 1645 & 1646 tone decoders, 1605-03 pwr supply, 1601 main frame, \$1500. J Macke, KRBS, POB 5180, Roseburg OR 97470. 503-672-6641.

Moseley TRC-15 system for studio & xmtr, excel cond; 10 channel master satellite dish, vgc. L Popp, 814-467-7894.

Burk Technology TCB remote control system w/radio modem uplink & telemetry return, perfect cond, \$1800. Mary Clites, WCBG, POB 1290, Cumberland MD 21502. 301-724-5000.

ABC Network tone decoder, \$200. M Holderfield, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.

Tel-E-Mote Mark 60 remote phone, \$35. S Dynes, Dynes Prod, Wheeling WV 26003. 304-233-8856.

Symetrix TI-101 (2) telephone interface/hybrids, like new, \$450/both or \$250/ea. M Holderfield, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.

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Symetrix TI-101 telephone interface, new, BO. H Plumlee, WGAP, POB 4939, Maryville TN 37802. 615-983-4310.

LAUX satellite system w/(2) 8705 audio terminals. LNA LC0106, 70 MHz downconverter, (2) runs of 25-30' ea of RG/59 U coax, 9' parabolic dish for 4 GHz, w/books. A Garza, Foster Comm, 2524 Sherwood Way, San Angelo TX 76901. 915-949-2112.

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Terracom TCM-7 TV microwave link on 13 GHz, \$4900. T Hopkins, Cape Fear Enter, Rt 1, Box 269-A, Faison NC 28341. 919-594-0172.

Marti STL-8 STL xmtrs & rcvrs. WGER, 6165 Bay Rd, Saginaw MI 48604. 517-792-1063.

Micro Controls PTS-10C composite STL systems, 949.0 MHz, excel, \$2000. M Persons, KKIN, Box 930, Aitkin MN 56431. 218-829-1326.

Anixter Mark STL dish, 8', 6', 4' & mini reflector, call for details, BO. Eddie, KCFX, 10800 Farley Ste 310, Overland Park KS 66210. 913-661-0101.

Marti RR30/150 receiver tuned to 161.70 MHz, \$450. E Douglas, KUNQ, POB 30, Houston MO 65483. 417-967-3353.

Modulation Assoc ASAT freq agile SCPC satellite rcvr, \$1200. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

Marti, RPT-25P & R-50450 UHF remote pickup xmtr & rcvr, setup for telemetry operation, \$995. W Clark, 318 E Calhoun, Macomb IL 61455. 309-837-2244.

(2) Gentner SPH3A
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Moseley PCL 505/C type approved, stereo composite, tuned to 949.500 MHz, set, BO; Moseley PCL 505/C type approved, stereo composite, tuned to 951.5 MHz, set, BO. Eddie, KCFX, 10800 Farley Ste 310, Overland Park KS 66210. 913-661-0101.

Scientific Atlanta 7300 & 7325 digital audio rcvr & processor unit w/1 dual 15 kHz & 1 voice cue decoder, like new, \$5950. W Clark, 318 E Calhoun, Macomb IL 61455. 309-837-2244.

TFT 7610 digital remote R&C, \$1500; Moseley TRC-15 system control, \$1600; Scientific Atlanta 10' satellite dish w/feet assembly, \$400. Delta Bdctg, POB 430, Helena AR 72342. 501-388-8361.

Zephyrus Open House Party downlink package w/dish (2) rcvrs & (2) LNB's, complete, \$1750. D Lane, WMVO, POB 348, Mt Vernon OH 43050. 614-397-1000.

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Satellite uplinks, modulator, HPA, 2° compliant antenna, prefer K-band. U George, U.G. Satellite TV, 314 W 52 St, Nyny 10019. 212-677-2200.

Rust Series F mdl RI-108 needed for parts, any cond. J Goeman, KJAM, 1015 Eagan, Madison SD 57042. 605-256-4514.

75 kHz dual audio card for Fairchild/Comtech Dart 384 digital satellite rcvr, or will trade 15 kHz card for same. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

STATIONS

Want to Sell

Investors for new FM stations in Midwest & West Coast, must have minimum of \$50,000 cash investment. Dale, 1-715-836-9476.

FM Class A Oklahoma single market, nearly new equip, long lease on studio & xmtr tower needs owner-operator & sales exper, less than \$100,000 to qualified w/low down, \$99,500. Joyce Erway, KRMK, Cordell OK 73632. 407-283-6871.

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CLASS A FM
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\$ 249,000
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Looking to buy w/nothing down, also consider becoming GM for equity & future ownership. L Haber, POB 136, Woburn MA 01801. 617-246-5634.

Upper Midwest FT AM w/FM possibility, owner financing, gd stable medium market, must be financially qualified before any information is released. 1-404-460-6159.

Private investor will fund new stations or acquisition of existing stations, must show gd potential debt or equity investment. M Ernst, WBUD TV, 720 Fairhill Dr, Louisville KY 40207. 502-893-6656.

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Class IV AM for sale in SW Oregon. Fast growth area. Joint venture. Active/inactive. \$10K min. M. Gottesman. 3377 Solano Ave., #312, Napa, CA 94558. No calls.

Want to Buy

FM or AM/FM, previous ownership & turn-around expert, looking for owner-financed turnaround in MW or South, successful husband/wife team. B Kramer, American Forces Network-Europe, APO New York 09757.

Joplin MO super A FM, \$290,000 firm. D Stubblefield, 417-781-1100.

AM or FM, Midwest-California-Nevada only, owner financing, small down. D Ganske, 1-715-832-0691.

AM or FM, little or nothing down, prefer Southeast, consider any, 20 yrs exper. J Dalton, 703 N Webster, Taylorville IL 62568. 217-824-7342.

Small AM or FM station for sale or take over in US w/small down or complete buyout, dark stations given equal consideration, trying to turn into family operation. S Neumann, 1240 Riverbreeze Blvd, Ormond Beach FL 32176. 904-441-6956.

Exper owner seeks new TV stations, troubled or dark & CP's, full power & low power, outright sale or joint venture. M Ernst, WBUD TV, 720 Fairhill Dr, Louisville KY 40207. 502-893-6656.

AM or FM, dark or troubled OK, owner financing w/little or no down. E.M., POB 652, Mishawaka IN 46544.

CP, dark, etc. for Christian programming. P Morton, WMNV, Box 57, Rupert VT 05768. 802-394-7858.

AM, FM or LPTV problem stations, turn arounds, daytimers, dark, etc. send complete details w/price & terms. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

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Harris STX-1B, Harris built C-QUAM AM stereo exciter & BE AS-10 C-QUAM monitor, currently on-air w/manuals, \$6500. P Patton, WA-PQ, 29 W Main, Jasper TN 37347. 615-942-5611.

SWITCHERS (VIDEO)

Want to Sell

Echolab SE-2 w/keyer, matte, \$600/BO. R Jensen, MPI Productions, 5812 21st St, Racine WI 53906. 414-632-3131.

Telemation TPS-12x3, working, \$150/FOB. K Kuespert, A-V Prod, 1794 Russell, Baroda MI 49101. 616-422-2235.

TAPES CARTS & REELS

Want to Sell

Scotchcart Big Band/Nostalgia, complete, stereo, 1500 units plus software to rotate, \$7500/BO. W Schroeger, WRCH, Radio Park, Farmington CT 06034. 203-678-9100.

Fidelipac gray cart shells (170) w/complete cart except tape & pressure pad, \$1.25 ea or \$200/all. S Dynes, Dynes Prod, Wheeling WV 26003. 304-233-8856.

Video cassettes, (100) 3/4", various lengths, \$3 ea/BO. D Staats, WRZZ, POB 1346, Parkersburg WV 26102. 304-863-3319.

Easy listening music, 250 reels in vgc, no dupes, \$10 ea; production library w/SFX, mostly unopened, \$250. J Wenstrom, Wynne Bdcg, 503-882-4656.

Complete library of movies & cartoons, 270+ titles, all on VHS tape, \$500 plus shipping. D Dobrowski, WSSM TV, POB 9089, Downers Grove IL 60515. 708-971-1829.

ScotchCart II 3-7 min, new & used. Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

Reels, 175 boxed 10" reels of bulk erased high quality tape, \$350 plus shpg. A Lia, KDLM, Box 746, Detroit Lakes MN 56501. 218-847-5654.

Fidelipac Mastercart, several hundred in various lengths, commercial thru music, \$2 plus shipping ea/BO. C Condran, KLZX, 180 S 320 W Ste 400, Salt Lake City UT 84101. 801-580-3025.

Telex/Viking M4 & M6, new, double & single coated lubed cart tape, free shipping. E Davison, Beatty TeleVisual, 135 N Illinois, Springfield IL 62702. 217-787-0800.

U-matic cassettes, like new, one pass only 5/10 min lengths, \$2 ea; 15/20/30 min, \$3 ea, plus shpg, cassettes includes library cases, some shipping cases approx 500 avail. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

Adult contemporary music reels, 105", some in metal. BO. P Urso, 603-332-0930.

ABCO wire cart racks (3) on floor stands, holding 500 carts ea, \$225 or all for \$600; Capitol A-2 carts (342) in fair to gd cond, \$1.20 ea; Scotchcart II's w/easy listening/lite-jazz library (1178), well recorded in stereo, \$2/ea or \$2100/all; L.E.L. alignment gauges (1 set) for Ampco cart decks, \$15. P Wells, KJOY, San Diego CA, 619-238-1037.

Scotchcart II AC library & nostalgia, new in 1988. BO. P Urso, 603-332-0930.

Audiopak AA4 Super carts, 5000+, new shells, various lengths, take all or part, \$3 ea. R Allen, TM Century, 14444 Beltwood Pkwy, Dallas TX 75244. 800-937-2100.

ARMSTRONG TRANSMITTER

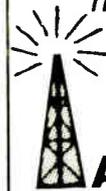
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Old bdct transcriptions, RCA Thesaurus, red label, circa 1935-6, Joe Green Marimba orch, standard radio 12 or 16", Gene Assin Trio, circa 1933-4. R McDonald, 5231 Horson, Mission KS 66202. 713-722-2677.

Capps or other hot stylus kit for Presto 80-G recording lathes; Van Epps R-D-2 instruction manual/information needed to set-up, gd photo copy OK. C Lund, Cycle Sound & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

Capital Production Music 500 series old prod music libraries for TV/motion pictures/radio, especially Capital Q Series 500, other libraries considered, for personal music collection. S Richards, Super Sonic Prod, 1401 NE 149th, N Miami Bch FL 33162. 305-949-2040.

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College radio station at small liberal arts school looking for equip of any kind, board, exciter, xmtr or cart players. J Williams, WVMH, POB 1161-C, Mars Hill, NC 28754. 704-689-1259.

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45 RPM records from the 50's & 60's, major label records stored in sleeves in vgc, small label records considered on case by case basis, entire libraries bought. B Berry, Karavan Bdcg Svc, 13 Montgomery Pl, Conroe TX 77384. 409-273-2801.

Jingles used by NBC affiliates for the News and Information Service format in early 70's, usually supplied on (2) 7" reels. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-995-1717.

RCA, Presto disc recorders & assoc equip incl blanks, needles & pre-recorded transcriptions. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

NAB alignment tape, 15 ips. D deForrest, Insight Prod, 7441 Wayne Ave Ste 10-B, Miami Beach FL 33141. 305-866-5401.

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1980	Harris FM10K, 10 kW FM	1979	Harris MW5A, 5 kW AM
1972	CCA 20,000DS, 20 kW FM	1966	Cont. 315B, 5 kW AM
1973	RCA BTF 20E1, 20 kW FM	1980	McMartin BA5K, 5 kW AM
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10 kW	Harris	FM 10H	5 kW	Wilkinson	5000E
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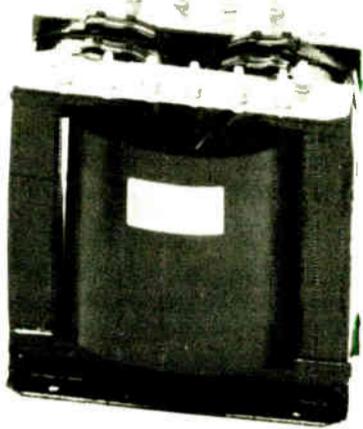
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Christian educ foundation seeks donation or low cost FM radio station equip, need everything, tax receipt given. D Parks, KSOH, POB 19039, Spokane WA 99219. 509-233-2024.

FM Christian non-profit station seeking 10K xmt, 6-10 bay antenna tuned to 90.5, studio equip. M Schwarzbauer, Family Educ Bdctg, 1715 Michigan, Sturgeon Bay WI 54235. 414-743-6065.

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Tek 380 WF vectorscope, NTSC monitor, never used, \$3500. R Ose, 317 S Butterfield, Libertyville IL 60045. 312-856-2620.

Gold Line Loft TS-1 audio test set, osc, counter, dB meter, like new, \$150. E Davison, 135 N Illinois, Springfield IL 62702.

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Tek 504 oscilloscope, vgc, strong tube, \$300/BO. B Baker, Pinetucket Recdg, 747 Wire Rd, Auburn AL 36830. 205-826-0390.

Nems-Clarke Type 120E field intensity meter in gd cond. M Ripley, KOZE, Box 936, Lewiston ID 83501. 208-743-2502.

HP 654A test oscillator & 334A distortion analyzer, both w/fresh calibration, \$1700/both. B Hildebrand, Computraffic, 8604 Hedgebur, St Louis MO 63114. 314-427-2727.

HP 3550B test set incl HP audio oscillator, HP patch panel & HP DB meter, excel cond, \$500. G Arroyo, WONQ, 2483 John Young Pkwy, Orlando FL 32804. 407-293-0000.

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McMartin BA1K 1 KW AM. Goodrich Ent. Inc. 11435 Manderson St, Omaha NE 68164. 402-493-1886.

Jetronic TDD-5, carrier current or low pwr xmt set to your freq, US Gov't surplus, rugged, 20-50 W AM. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Continental 814R-1, 2.5 kW FM, 510R-1 exciter, 103.3 MHz, excel cond, \$12,000. L Bush, KWOW, 400 Bowden, Waco TX 76710. 817-776-2640.

AEL FM 5K, working when removed. S Chichorsky, KPRL/KDDB, POB 7, Paso Robles CA 93447. 805-238-1230.

CCA FM-10DS 107.1 exciter, vgc w/manual, \$400. D Sports, WCLA, POB 427, Claxton GA 30417. 912-739-3035.

Collins 831C, 2.5 kW, great cond, \$10,000. G Herpin, KRIT, 106 Royce St, Los Gatos CA 95030. 408-354-6622.

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Partial List: 6623, 23791, TH150, 6425F, 5604, 6696, 6697, 5681, 5682, 5671, 7804, 3CX10, 000H3, 3CX20, 000H3, 4CX5000A, 4CX35, 000C

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Partial List: 6623, 23791, TH150, 6425F, 5604, 6696, 6697, 5681, 5682, 5671, 7804, 3CX10, 000H3, 3CX20, 000H3, 4CX5000A, 4CX35, 000C

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TURNTABLES

Want to Sell

Turntable, 16", \$25. WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

Studer A727 prof CD player, rackmount (2), recently factory refurbished, \$1200 ea. B Robinson, KLXK, 2110 Cliff Rd, Eagan MN 55122. 612-452-6200.

Technics SP-10 MK II, new in original box, \$800. B Weiss, KLSI, 3101 Bdwy, Ste 460, Kansas City MO 64111. 816-753-0933.

QRK 12C (2) in excel cond w/new felts, Micro-Trak tonearms & Stanton cartridges, \$100/ea. G Hutchins, WZAP, POB 369, Bristol VA 24203. 703-669-6950.

Russco Studio Pro Model B, 2-speed transcription TT, console mountable, new tonearm & counter weights, missing stylus & tonearm plate, \$500/BO. A Wasilewski, KMWX, POB 1460, Yakima WA 98902.

Rek-O-Kut G2 17", excel cond, \$75; (2) Russco Studio Pro B, new idlers, excel cond, \$150/ea. W Kremer, Kremer Kraft, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

RCA later mdl's, (2) w/stands, preamps & tonearms, \$150/both plus shpg. B Elliott, WRFK, 915 E Fourth, Charlotte NC 28204. 704-338-9970.

Technics SL-1200MK2 (2) w/Encore Series P100 stereo preamp & extra needles, carts, \$300/ea set. J Glogowski, KYND, POB 19886, Houston TX 77224. 713-373-1520.

Want to Buy

Technics SLP1500 MK II. K Thomas, WQIK, 5555 Radio Ln, Jacksonville FL 32205. 904-388-7711.

Shure, Rek-O-Kut, etc. 16" in gd cond w/shell. J Panza, LL&S, POB 9847, Kansas City MO 64134. 816-763-9820.

TV FILM EQUIP

Want to Sell

Arri 16 BL Apec auto exposure 12-120, 1-400 magazine matt box, pwr zoom, battery, cables, crystal motor lens, rebuilt, sharp, quiet, \$4200. Gene Sive Productions, 31844 Rancho Amigos, Bonsall CA 92003. 619-749-7662.

VIDEO PROD EQUIP

Want to Sell

Quanta Select 7 character gen, works gd, many different fonts, dual disk drive, 16-64 points, crawl, roll many features, \$950. R Yerma, World Video, 10625 Scripps Ranch Blvd, San Diego CA 92131. 619-695-1045.

Studio animation, audio & visual equip incl color monitors (2), Panasonic camera w/lights, digitizer, beta players & recorders, GV 386 computer, complete cubcomp system & all attendant software necessary, incl new AT&T TOPAS Software, to do any animation, painting or 3-D work currently technologically feasible for either industrial or commercial work. L Tavel, 2839 Lafayette Rd, Indianapolis IN 46222. 317-924-1300.

Channelmatic NSS-4 share switcher & Channelmatic Lil' Moneymaker, BO. D Staats, WRZZ, POB 1346, Parkersburg WV 26102. 304-863-3319.

Paltex Abner ABR-1A A/B roll editor w/CRT display, time code, cables for JVC 6600/8250, will work w/600/850, \$2750/BO. R Jensen, MPI Productions, 5812 21st St, Racine WI 53906. 414-632-3131.

Quanta 7A character gen w/shop manual, \$2500/BO; Sony MX20 8 trk audio mixer, \$700; Sony RM555 multi recorder remote control, \$400/BO; Tek RM529 waveform mon, \$750; Fuji lens N10x10, \$250/BO; Videome-dia Z-6000C edit controller, \$1000/BO; RCA telecine system w/(2) 16mm projectors & TK 27 camera, BO; 3M image enhancer w/R-B-G outputs, \$700/BO; JVC S-62 tube color camera, \$400/BO; Sony DXC 1610 tube camera w/case, \$700/BO; (2) RCA TK-630 cameras w/CCU, BO; numerous JVC CR 4400 3/4" portapaks, \$400-\$1000. T Quinn. 408-475-0423.

Panasonic VY 922 special effects gen, BO. D Lundy, Lundy Tape Duplicators, Cumberland Gap Pkwy, Heidrick KY 40949. 606-546-6650.

Microtime 1020 TBC w/manual for 3/4 or 1", works great, \$1400. Dave, Pathfinder Prod, 17094 McGuffie, Salinas CA 93907. 408-663-5192.

Sony BCR-4, telecine adapter, high resolution unipler for film to video transfer, gd cond, \$50; Froehlich 190-300 stereo video control center, interconnect (3) VCRs & (4) audio sources, lighted passive switcher, audio volume control, replace patch panel w/routing switcher, \$50. W Watrous, Watrous Video, 739 S Orange, Sarasota FL 34236. 813-366-3316.

Panasonic WJ4600 special effects gen, excel cond, \$350/BO. B Baker, Pinetucket Recdg, 747 Wire Rd, Auburn AL 36830. 205-826-0390.

Conrac 5222/RS25 reference monitors, NTSC 525 line, 60 Hz, large screen, several, \$400/BO or will trade for film equip. H Biller, 108 Hamilton, Silver Spring MD 20901. 301-565-2798.

JVC RM82U prof video editing controller for JVC 3/4" editors, excel cond, \$325. G Ormrod, GFO Prod, 432 East X St, Tumwater WA 98501. 206-352-8028.

Entire system including 1/2" & 3/4" VCR's, SEG, dist amps, sat rcvr, audio, cables, cameras, TBC, titler, audio mixers, 2-way radios, monitors, connectors, microwave STU/TSL & remote, more, for complete list call. J Andrist, TV-31, Box 273, Omak WA 98841. 509-826-0100.

Sony VO8800 3/4" w/time code gen w/Porta-Brace case, \$4500; Sony PVM 5300 3 screen monitor, \$800. V Michael, WHTO, 575 Montgomery Pk, S Williamsport PA 17701. 717-326-8200.

Idea 1V7-7 digital TBC, \$1900; Sony editing system, complete w/BVE 500 & (2) BVU 200 editing machines, \$1500. V Michael, WHTO, 575 Montgomery Pk, S Williamsport PA 17701. 717-326-8200.

VIDEO TAPE RECORDERS

Want to Sell

JVC CR4400U 3/4 port recorders (4) w/access, \$800 ea/BO; (3) Sony RM-430 edit controllers, \$500/BO; JVC BR-6400U VHS recorder, \$1500/BO. T Quinn, Monte Vista Std, 208 Cherry, Capitola CA 95010. 408-475-0423.

RCA TR-70 2" R-R VTR, BO. J Becknell, WCSC, POB 186, Chas SC 29402. 603-723-8371.

JVC BR6200U portable VHS recorder, 2 chnl audio, insert editing, audio mixing, wireless remote, (3) NBP1 Nicads, AC/charger, custom case, \$675. B Hines, IPS Inc, Rd 1 Box 413A, Export PA 15632. 412-468-4115.

RCA video heads & spare parts, call for list. J Becknell, WCSC, POB 186, Chas SC 29402. 603-723-8371.

Sony VO-2600 3/4", \$500; Sony VO-2610 3/4", \$550; Sony VO-5800 3/4", \$2500; Sony BVU-110 3/4" portable, \$2150. R Jensen, MPI Productions, 5812 21st St, Racine WI 53906. 414-632-3131.

JVC CP5000U 3/4" U-matic player, remote plus approx 30 KCS tapes, great cond, \$575. B Hines, IPS Inc, Rd 1 Box 413A, Export PA 15632. 412-468-4115.

Sony edit systems, VO5850, VO5800, RM440, \$6000/BO; VO2860, 2260, RM 430, \$2300/BO; RM400 controller, \$200; RM430 controller, \$400, other misc equip. T Quinn. 408-475-0423.

RCA TCR-100 & spare parts w/manuals & spare heads; (1000) 2" RCA carts, BO. J Becknell, WCSC, POB 186, Chas SC 29402. 603-723-8371.

Sony VO-5850 editing systems w/Convergence controllers, U-matic, gd cond, \$3000 ea; Sony BVU-110 portable U-matics w/time code, \$600 ea; Sony BVU-50 port recorders, \$295 ea; Sony BVU-200, \$700 ea. U George, Satellite TV, 314 W 52nd, NY NY 10019. 212-677-2200.

JVC CR6600U 3/4" recorder, feeder deck for JVC edit system, low hrs, nice shape, new drum, \$950. J Kreines, 5330 Kennedy Ave, Millbrook AL 36054. 205-285-6179.

Sony VP-1000, \$100; VP-1200, \$120; VP-2000, \$200; VO-2630, \$350; VO-2850, \$300; VO-3800, \$300; RM400, \$200; BVE 500, \$350; BVE 500A, \$400; AV 3600, \$200; AV 3650, \$250; Panasonic NV-9100, \$200. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

JVC 3/4 w/editor control, several repairable units or for parts, \$50 ea/FOB. K Kuespert, A-V Prod, 1794 Russell, Baroda MI 49101. 616-422-2235.

JVC CR-4400 3/4" portable in gd cond w/Porta-Brace case, AC adapter/charger, \$500. R Jensen, Telecable Prod, 5812 21st St, Racine WI 53406. 414-632-3131.

ACTION-GRAM

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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.

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Our new A-32EX is even better, with ample expansion room for additional inputs and a powerful family of accessory modules, including our new MP-32 talkshow module (that neatly interfaces multiple hybrids, tape recorders, announcer mics and studio-to-caller feeds), our ICM-32 six station intercom module (letting you communicate with other console locations and announce studios), and our SC-20 studio module (to provide comprehensive studio monitor, automatic muting, and talkback functions), plus multiple line selector and machine control modules, and a complete family of studio turret components.

The A-32EX console features modular construction, a fully regulated rackmount power supply, logic follow, full machine control and of course, an all-gold contact interface system. It has two mic channels and fourteen stereo line modules, each with A/B source select and Program/Audition bus assign, plus Cue switches on the line modules. Standard features include Program and Audition VU meters, digital timer, and a monitor module for control room and headphone functions. The console is also available in a smaller version (the A-20) with two mic channels and eight stereo line input modules.

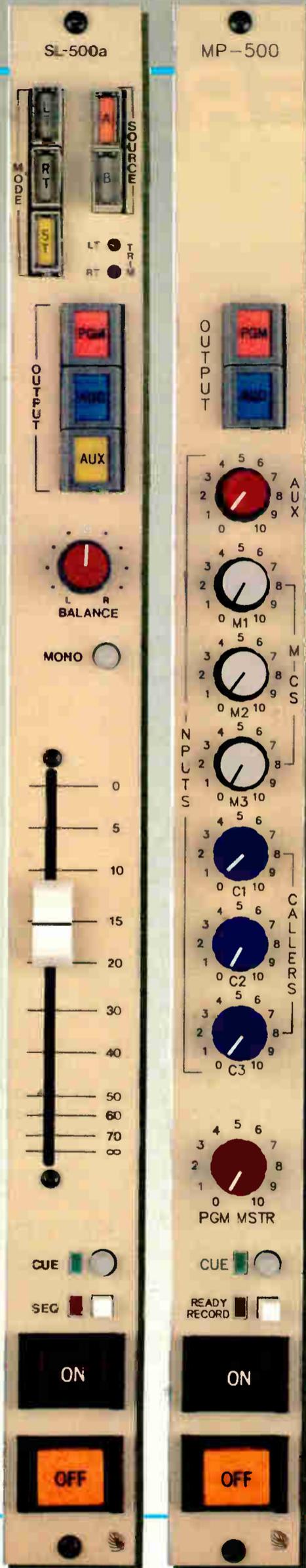
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TELEPHONE/TALK SHOW: The MP-500 multiphone module offers a totally new way of handling telephone talkshow functions. Operation is simple: when the announcer wishes to do a phone segment he simply activates the MP-500 module and all mute, level, combining, and machine control functions are handled automatically. The MP-500 permits conferencing between 3 callers and 3 microphones, and provides separate multitrack tape feeds for various mic/caller signal combinations, permitting simple track punch-ins to replace razor and tape edits. This module eliminates complicated announcer set-ups, miscalls, and feedback problems.

COMMUNICATIONS: The ICM-500 module is part of a completely integrated intercom system; a family of modules available for all Wheatstone broadcast and production consoles. It even includes a rackmount version for your equipment room or remote hook-ups. It allows direct communication between 8 locations in your facility. Your intercom needs are handled by simply plugging in this module set.

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