

Radio World

**Our Scoop
On the
Scoopman
RW's Road Test
Begins on p. 7**

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Radio's Best Read Newspaper

August 5, 1992

Scoopman Debuts in U.S.

In the following story, RW takes a look at the innovative new Sony NT-1 Scoopman micro recorder, which records digitally on a postage stamp-sized tape.

by Frank Beacham

NEW YORK The Sony Scoopman has landed in America. If first reactions are any gauge, this tiny five-ounce broadcast-quality tape recorder may well redefine portable audio recording for many applications.

Words like "wow," "revolutionary" and "unbelievable" were uttered by seasoned audio professionals upon first seeing the Scoopman. The specifications explain why: Two hours of digital stereo can be recorded on a tape cassette the size of a postage stamp. The shirt pocket-sized recorder runs a continuous seven hours on a single AA battery. And the unit boasts a frequency response of 10 Hz-

14.5 kHz (+1, -3 dB), with a dynamic range and signal-to-noise of better than 80 dB.

Using a newly-developed non-tracking (NT) technology with semiconductor memory, the micro cassette recorder—with a list price of \$999.95—offers 12-bit non-linear digital recording capability. It is designed primarily for high quality voice recording with broadcast journalism targeted as a key application.

RW obtained one of the first Scoopman recorders to reach America. Over the period of a week RW put the unit through its paces, recorded a variety of audio material and obtained comments from veteran tape recorder users on this breakthrough technology.

Expert opinion

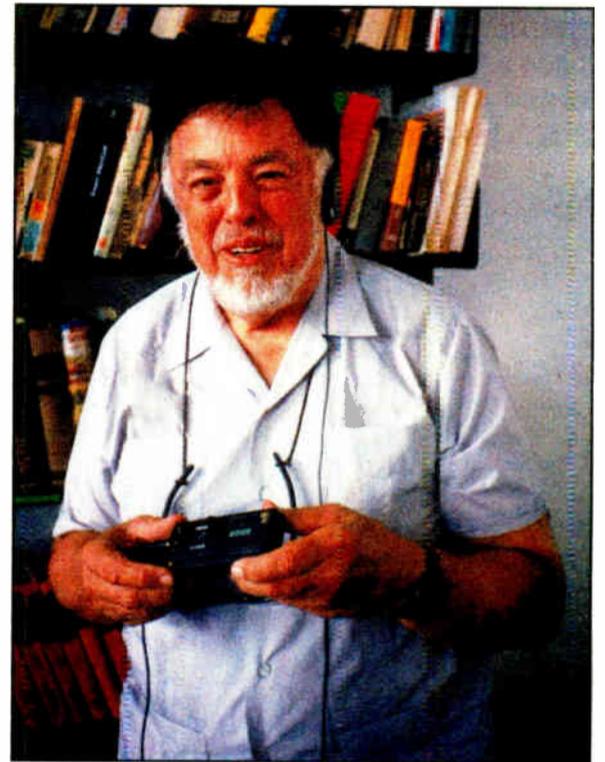
Veteran folklorist Alan Lomax, who virtually invented the concept of field audio recording in the early 1930s, was given an au-

dition of the Scoopman. Lomax was the first to record such performers as Muddy Waters, Leadbelly, Woody Guthrie and Burl Ives.

"Wow," said Lomax upon eyeing Scoopman. "I don't believe this."

Then he plugged in a microphone, put Scoopman in record and began singing a song he has used to initiate new recorders for nearly 60 years. The song, "Ain't No More Cane on the Brazos, They Done Grind It All in Molasses," is a prisoners' lament about sugar cane cutting that was the subject of Lomax's first location recording—made on a 500-pound Presto recording machine in a Texas prison in 1933.

"The Presto engraved an aluminum disc with a diamond needle," Lomax said. "I bought the first portable tape recorder in 1947. It weighed 150 pounds and used paper tape. Fell to pieces on our first



Small Wonder: Audio veteran Alan Lomax finds the Sony NT-1 fascinating.

Growth Predicted for Radio

by Lucia Cobo

NEW YORK Forecasting a radio future that some may find comfortingly rosy, media brokerage and investment firm Veronis, Suhler & Associates released its sixth annual five-year forecast.

The report, "Communications Industry Forecast" said advertiser spending on radio will rise to \$11.5 billion by 1996 from \$8.45 billion in 1991, at an annual rate of 6.4 percent. That rate of growth is higher than the previous five year's rate of growth of four percent.

The decrease in spending in 1991 had a large impact on the five-year growth. Between 1986 and 1990, radio station advertising rose at six percent per annum, whereas expenditures on radio decreased by 3.2 percent on 1991.

Radio station advertising decreased in 1991 by 3.5 percent to \$8 billion. National spot advertising accounted for \$1.6 billion, and local revenue accounted for the remaining \$6.4 billion.

The report forecasted that the economic recession will bottom out in 1992, thus leading radio stations to recover what they lost in advertising expenditures in 1991. Spot radio will benefit from political advertising, the study said, but continued problems of debt in the retail industry and sluggish growth in retail sales will hold back local advertising.

The study forecasts spot increases of 5.1 percent in 1992 and local increases of 3.8 percent, a combination that will garner stations \$8.3 billion—or what they earned in 1990.

Network radio advertising increased 2.7 percent to \$495 million in 1991, and grew 3.2 percent compounded annually in the last five years. A factor contributing to the

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NEWSWATCH

NAB Says SEC Changes Would Help Radio Stations

WASHINGTON The NAB supports a Securities and Exchange Commission proposal that would "make it easier for radio and TV broadcasters to issue stock to raise needed capital."

The NAB considers the proposal significant for radio stations because it removes costly equity-raising rules. If adopted, the SEC proposal could assist some stations in raising as much as \$5 million.

"Broadcast stations urgently need to tap into equity markets for capital because traditional bank financing has virtually dried up over the last three years," the NAB said.

TM Century Board Elects Turner CEO

DALLAS The board of directors of TM Century, Inc. has elected President P. Craig Turner to the position of chief executive officer (CEO). Turner had been acting chief executive officer since the resignation of Dave Scott earlier this year.

The board also elected Marjorie L. McIntyre as chairman of the board. McIntyre, founder of the company, has served as a director for 20 years.

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NEWSWATCH

► continued from page 1

DCC's Doubters

CAMPBELL, Calif. A random survey of U.S. tape duplication facilities last year indicated doubt about the new Digital Compact Cassette (DCC) format.

The poll was conducted by Versadyne International, a major tape duplication system manufacturer.

Although DCC will be introduced as a consumer format, there has been talk in the industry that the format may be adopted for professional use. DCC is a digital recording system that uses compression, but is

backward compatible in that it can play analog cassettes.

That unscientific poll indicated doubt about consumers' acceptance of DCC and whether it would become as big a part of duplicators' service as analog tape has become.

Also, nearly 50 percent of those surveyed said that the Sony Mini Disc will further confuse the market and possibly hinder DCC acceptance.

AM Stations Comply With NRSC Limit

WASHINGTON The overwhelming

majority of AM stations measured by the FCC early this year were found to comply with the 1989 NRSC spectrum limit.

The FCC's Field Operations Bureau (FOB) measured 174 AM stations and found that 94 percent were within the spectrum tolerances mandated by the rules.

Christian Joins RAB

NEW YORK Former NAB Radio VP Lynn Christian has joined the Radio Advertising Bureau (RAB) as the organization's senior VP/West Coast region.

Christian will represent RAB and coordinate all of its activities in the West Coast Region, according to RAB President Gary Fries. He replaces J. Ray Padden who left to pursue other radio business interests.

Christian will continue to produce the NAB Marconi Awards and other events through the NAB's radio show in September, Fries said.

Vriesman on NAB Radio Board

WASHINGTON The NAB Radio Board has elected Wayne Vriesman its chairman and Robert L. Fox as its vice chairman.

Vriesman is VP of Tribune Broadcasting Company's Radio Group and Fox is CEO/chairman of KVEN-AM/KHAY-FM in Ventura, Calif.

Vriesman previously served as president of the Radio-Television News Directors Association. Fox is serving as the NAB's Radio Board vice chairman for the second time.

ABC Launches News Wire

NEW YORK ABC News launched its ABC News Wire service August 1. The hard copy news service provides news entertainment, weather and sports to ABC affiliates.

Program suppliers include Reuters America (national and international news), and Gannett (state and regional). Weather forecasts will be zoned and numerous sports and business summaries are broadcast daily. The service is delivered by satellite.

continued on next page ►

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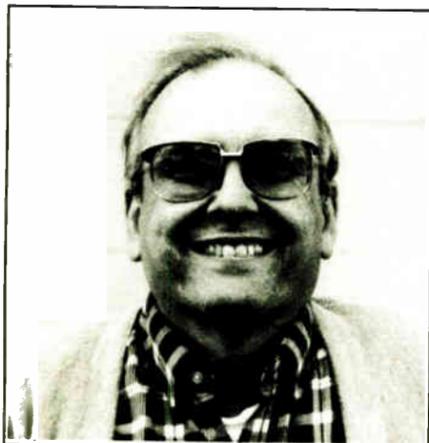
FORT LEE, N.J. The Russian-American Broadcasting Company (RABC) has launched a new service aimed at Russian immigrants to the United States.

The service will be distributed via Space-Com Systems' FM-Squared audio transmission system. Subscribers that use the satellite receiving equipment will be able to pick up practical information such as banking tips, housing information, English lessons and music, according to the company.

The service also will provide regular news updates during its initial 17 hours per day of programming. RABC eventually plans to expand the service to 24-hours.

RABC has its roots in WMNB, an ethnic station subscription station in Fort Lee that is distributed by FM subcarrier. That service now includes Boston and Chicago and has plans to go into other cities.

Harris-Allied's Jim Jones Dies



Jim Jones

RICHMOND, Ind. James D. Jones, a longtime Harris-Allied salesperson, died of cancer on May 13, 1992. He was 55 years old.

Jones joined Allied Broadcast in 1973, after working in the engineering departments of the Purdue University AV Center and Motion Picture Unit, Federal Electric Corp. and RCA Service Co. He earned an MS degree in agriculture from Purdue University.

Listeners Get "Music On Demand"

by Frank Beacham

BOCA RATON, Fla. A new software-based technology—trademarked "Music On Demand"—allows a radio station to be programmed interactively by its audience.

Radioactive Radio Network, Inc., a new Florida-based company headed by former employees of the Video Jukebox Network, has developed the new system, which can be customized for various levels of interactivity with listeners.

When implemented in its fullest form, a Music On Demand system allows a fully-automated radio station to operate an all-requests format while building a database of information on its listeners. In simpler configurations, the system can automate crowded station request lines and offer the illusion that the listener is actually programming the station.

WHQT (Hot 105 FM) in Coral Gables, Fla. has been on-line with the system for over four months and has increased its request line calls from 300 to over 3,000 per day, said Steve Williams, president of Radioactive Radio Network.

The WHQT configuration, which Williams calls "a smoke and mirrors" approach, offers the listener a menu of 20 musical selections when dialing the station's request line. Once the listener makes a choice, he or she simply punches the song number on the touch tone keypad of the phone. The system responds by saying how long it will be until the selection is to be played. The requested selection, the listener will always find, is only minutes away.

This is because the Music On Demand system is interfaced to the station's RCS Selector programming software. Therefore, the request line menu list is always changing, tracking the upcoming pre-selected recordings in the station's playlist. This means the only choices the listener really has are what has already been entered by the program director into the Selector software. Thus, the illusion is given that the

station is offering the listener a personalized response.

The Music On Demand system also can take actual requests as it is doing for Super Radio Networks of Boston on a satellite-delivered music program to 160

The requested selection, the listener will always find, is only minutes away.

stations on Saturday nights. And it can accumulate data on callers, such as their phone number, age, musical tastes, etc., giving stations and advertisers a better profile of a station's audience demographics.

The system even has the ability to call a listener back just before a requested song plays on the air or to record the listener's dedication for the selected song when the request is being made. If a DJ chooses, a dedication left on the request line may be instantly played back on the air from the computer.

A Music On Demand system consists of a personal computer and proprietary software. A four-line system, Williams said, can be purchased outright for about \$12,500 and an eight-line system for \$13,500. The

company also will do joint ventures, lease programs and barter deals with individual stations, he added.

"Our grand vision is to create various types of all request Music On Demand formats like The Country Jukebox Radio Network," Williams said. "These could contain built-in phone company sponsors to take care of the 800 line expense as well as other national sponsors that would provide advertising revenue."

"We feel that a club-type approach that provides callers with a frequent caller-type card connected to a merchandising campaign would generate significant revenues to the bottom line," he continued. "We capture the phone number of the caller, their age, and the song that they requested."

Williams provided an example. "We know that Chris Kampmeiser is 40 years old and called five times last month to request 'Achy Breaky Heart' by Billy Ray Cyrus. We also know where he lives and what his income and lifestyle is. Hence, Chris automatically receives a coupon in the mail a few days later from Mercury Records for \$2.00 off a Billy Ray Cyrus album at any Musicland Store."

As technology progresses, Williams said, the system could sell Chris the record directly over the phone line by sending a compressed digital signal to his stereo recording system.

Radioactive Radio Network is located at 1700 SW 12th Ave., Boca Raton, FL, 33486; telephone: 407 368-2010.

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Buffaloed by Radio Council Hearings

Where Do You Draw the Line Between Listeners' Special Interests and Maintaining Your Profitability?

by Alex Zavistovich

WASHINGTON Newton Minnow, chairman of the FCC from 1961 to 1963, once referred to television as "a vast wasteland." Last month, a councilman from Buffalo, N.Y., said much the same thing about radio in that city, but he was a bit more direct.

"Radio in Buffalo stinks," he said. The man is David Franczyk, and he made the eyebrow-raising remark (and more) July 8 at a meeting of the Buffalo Common Council. His point was that Buffalo radio stations could do more to promote local artists.

Apparently the meeting chamber was filled to the rafters with Buffalo natives, both musicians and other radio listeners, and a number of radio stations were contacted to defend their programming decisions. Many of the stations chose to send letters of reply rather than send a representative, and one—WGRF(FM)—listened to the proceedings in absentia, via a Marti link set up in the council room.

A business, but . . .

OK, first a disclaimer: I'm a frustrated musician myself, and I've often thought that radio stations could devote more time to local music programming. On the other hand, I understand the competitive nature of commercial radio programming. You just can't give away air time to music that may not generate income for your station. That's the bottom line.

For his part, I think Franczyk understands that. He acknowledged to me that radio "has always been a business," but he maintains it could be handled with more creativity. He

blames the "tyranny of Arbitron" for what he calls the "paucity of local music on the radio."

So what's the deal? Is Buffalo a vast wasteland of sound-alike stations? Have local programmers forsaken their native sons? Here's what I discovered:

There are more than 20 stations that call Buffalo their city of license. For brevity's sake, let's focus on the FM stations. (No offense to you AMers. Read on, there's a success story in here that should interest you.)



WBNY is licensed to the State University of New York. It's a typical college station that plays an eclectic mix of alternative rock, indie and local artists. You can't really factor 'BNY into the equation, though, because it's non-commercial and not really in it for the money.

Then there are the Buffalo stations Franczyk targeted: WGRF, WUFX, WBUF and WKSE (the latter actually licensed to Niagara Falls).

WGRF and WUFX are rock stations that also share a local marketing agreement. Not surprisingly, these stations do play some local talent—both on Sunday nights, which, as WUFX's PD Bob Richards says, is the "only place where you can really break format."

WUFX has a show called "Buffalo Licks," which features two bands performing live in a local club. The station airs the program as a remote from the club, with prerecorded music as an intermission while the first band tears down and the second sets up. As Richards says, "I agree that local radio should provide some vehicle for local talent, but I disagree with anyone who thinks he has the right to tell me what to play or in what rotation I should play it." (Except the GM, I guess.)

Balancing the equation

WGRF features a Sunday evening show called "97 Rock Music Papers." Jim Meltzer, the station's executive VP, also believes that local music deserves some airplay, but noted that "you could play more local music if you didn't have to worry about having a debt to service." A former musician himself, Meltzer is sympathetic to local music, but business is business.

Which brings us to WBUF and WKSE. According to a story in The Buffalo News following the council meeting, Chuck Hill, WBUF's GM, said, "I am not concerned about whether any (of the artists on WBUF-FM) are from Buffalo . . . and I suspect our listeners don't care either." WKSE

management, which responded by letter, said, "It is our opinion that our ratings would be damaged and our profitability impaired if we were to increase our commitment to local musicians."

OK, so neither of these guys win any prizes for subtlety or good public relations (especially considering the remarks were made to a roomful of local musicians). But do they have a point? Is local music the kiss of death for radio stations that may be carrying a heavy debt?

WTRI is a 500 W AM daytimer licensed to Brunswick, Md. It was purchased out of bankruptcy by Tri-State Broadcasting's Liz Roberts and went on the air Feb. 3 of this year with a new format—all local music, all the time.

That's right: no Genesis, no Tori Amos, Mariah Carey or Billy Ray Cyrus. Just music from local, unsigned artists. Roberts says the station's programming includes bluegrass, folk, rock—anything of suitable broadcast quality that comes WTRI's way will eventually make it on the air. She has even said that "if you give us music, we'll put it on the same day." Listeners decide whether a song will ever get back on the air.

"Everyone wants to root for the local heroes," Roberts said. "It (the local programming) is far and away the most fun thing we do around here. We've gotten an enormous amount of media attention because of it."

Red ink to black

Sure, but what does that mean in dollars and cents? According to Roberts, WTRI was way in the red when she bought it. She also agreed to assume the debts of the previous owners (who programmed a country format on the station). Since going on the air, WTRI has been showing a 20 percent to 30 percent increase in profits each month; by late August, Roberts expects the station to be comfortably in the black, with accounts including The United Way and Jaguar.

In fact, WTRI has had a \$100,000 bank loan approved for an upgrade of its facility to 10 kW—an approval based on the station's performance over the past months. Local music . . . who'd have guessed?

Here in the nation's capital, New Rock station WHFS has had a long-standing affection for local music. According to Assistant Music Director Pat Ferrise, 'HFS plays local artists twice a day at 11:30 a.m. and 8:30 p.m. The station also features a local music program, "Now Hear This," at 7 p.m. on Sunday evenings, and manages to work local artists into outdoor concerts, back to back with national acts.

"Everyone wants to be the hometown radio station," said Ferrise. "The D.C. music scene is starting to get a lot of recognition nationally, and we've always been a music intensive station, so (playing local music) makes sense for us. It's something people expect from WHFS."

I could go on, but you get the point. Up in Buffalo, people are looking at the Buffalo Radio Hearings as a tempest in a teapot. WGRF's Meltzer suggested that the meeting was "a stunt by a councilman to get re-elected,"

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Radio means sharing

Dear RW,

Since all forms of radio are dead, according to C.F. Nye of Cottonwood, Ariz. (*Readers Forum*, RW, June 24), maybe he'd like to set a date for all of us to shut down. Surely, in his view, nobody would miss us.

The radio that C.F. is rejecting, whether delivered by cable, satellite, or terrestrially, represents the concept of sharing. Listeners share musical selections with a disc jockey and other listeners—or they share ideas with a talk-show host and other listeners.

Sure, there's a place for me-only listening such as that represented by Digital Music Express . . . or by simply buying the latest CD at the store.

But C.F.'s total exclusion of everything else, even to the point of playing tapes of DMX in his car, reminds me of joggers I see, ignoring the sweep of the Rocky Mountains to their side, staring straight ahead while listening to their Walkman™.

One hopes C.F. at least occasionally glances at the headlines in USA Today. Otherwise, when troops and bombers of the Third World Coalition have finished with New York and Chicago and are heading through Cottonwood toward Phoenix, somebody will need to tap on his car windows to tell him what's going on.

Lew Jones
JSA Radio Network
SuperAudio Cable Radio
Denver, Colo.

Yearning for real radio

Dear RW,

The broadcasting industry is changing so rapidly and going downhill so quickly that I hardly know where to begin. For now I'll try to limit my comments to two areas.

About 13 years ago, while serving as engineering manager for the NBC Radio Network Bureau in Washington, D.C., I wrote a letter to one of the broadcasting magazines. I suggested that great portions of the country were not being properly served by broadcasters, that in many portions of the country,

especially after dark, no radio stations could be received.

My solution was essentially to suggest that the National Bureau of Standards stations (WWV, etc.) expand to include high power operations on the AM broadcast band. Programming would include the time signals interspersed with news rotated from all the networks, and weather from the weather service. My basic point was that it was ludicrous in this day and age for people in large areas of the country (especially in the West and Midwest) to not be able to get time, news and weather.

Driving trips across the country in the last couple years have shown that the situation has gotten worse, not better. Now even if you can receive a radio station, you probably won't get the basic public services of time, news and weather. Not only that, they won't even tell you what town they're located in. If they have news at all, you won't hear it promo'd in advance so you can even listen for it.

I usually hear a direct segue from music into network news—no time, no ID. One station kept driving me crazy by repeating that they were "your hometown station" without ever telling me what town! Believe me, I was a long way from *my* hometown. I have resorted to traveling with a portable short-wave receiver and listening to VOA, etc., to have at least something to listen to in the car.

I believe that broadcasting has a higher mission than being a wireless jukebox. I read again and again how radio, especially AM, is dying. It's not hard to see why: Service is not being rendered. Direct satellite broadcasting will not solve this problem. WCBS-AM in New York, in spite of its sloppy production techniques (doesn't anyone care about cassettes and carts wowing up to speed anymore?) imparts considerable information quickly—a good example for broadcasters trying to learn to serve the public. KYW in Philadelphia is a fair second place, although you can hear the difference.

From a network standpoint, I have to give kudos to NPR. I don't know what the numbers are, but I believe you can hear "All Things Considered" and "Morning Edition" in more places in the country than any other single news program. Of course the affiliates may botch their end of the deal, too, especially with NPR's declining budget for training.

Moving on to my second point, I read about and hear the on-the-air results of a serious decline in the level of technical competence available at both radio and TV stations.

Digital Is Here to Stay

This fall marks the tenth anniversary of the digital audio compact disc. Judging by the ever-increasing number of products introduced since the advent of the CD, digital technology has had quite an impact on audio.

Radio engineers realize the importance of digital when it comes to professional products that help them get better audio on the air.

While most stations still operate mainly in the analog world, it is important that every station utilize digital technology at whatever level is possible. Although often thought of as a "cold" technology, broadcasters have come to realize the enormous value of products that allow more efficient editing and higher sound quality.

In the professional realm, new digital products are introduced each year that can benefit station operations. The latest example is the Sony Scoopman micro recorder that can record broadcast quality audio on a postage stamp-sized digital tape. The product is intended for voice, but the unit's music reproduction capability is also impressive. One radio network has already sung the praises of its potential on long-form vocal recordings.

The Philips DCC system and the Sony Mini Disc are other upcoming digital products that may have potential for broadcasters. Sony is now exploring the possibility of whether the consumer-based Mini Disc recording/playback system could become a replacement for the analog cart machine. The chief advantage is its near instantaneous access to tracks.

With the prevalence of DAT in the professional ranks, companies have spun-off products that eliminate problems associated with multiple formats and non-standardized interconnections.

Traditional broadcast equipment manufacturers have heard the call for digital as well. Digital STLs and digital audio storage systems, for example, are being offered by various vendors. So are digital editing systems and test equipment.

As new digital products continue to be developed for the broadcast industry, station managers and engineers need to keep informed and up-to-date. There should be no second thoughts about going digital. It is here to stay.

—RW

Article after article in RW bemoans the state of affairs. Believe me, these problems are not going to be solved by engineers talking to engineers. Why doesn't RW talk to the owners, CEOs, managers and program directors about why they are making the decisions to do away with good engineers and good engineering practices? I'd love to read one honest explanation.

I used to say about radio that in the beginning when it was invented by engineers that we should have made it a secret cult, passing its secrets on from father to child to keep the infidels from taking it over. And that TV started to fall apart when they invented the "white-set" button for TV cameras.

Broadcasting is falling apart, and I for one reject the notion that the blame lies with cable or CNN or satellites or the government or any of the myriad of excuses the corporate offices claim. Broadcasting is killing itself. When NBC did not have adequate staff on duty at the network to accept news of the San Francisco earthquake, when WCFL's power climbs out of sight and unlighted towers endanger aircraft and station lawyers fight to allow profanity on the air, how can these be blamed on anything but questionable management practices?

Do we need to return to the FCC require-

ing a station to announce its call letters, frequency and location on the hour and half hour? Can't we figure out the importance of that kind of stuff ourselves? To paraphrase the movie: Build a real radio station and they will listen.

Terry Skelton
Consultant/trainer
Doylestown, Pa.

Another source of cable

Dear RW,

I wish to point out that the new stereo cable product from Belden that Mark Persons just wrote about (*Buyers Guide*, RW May 20, 1992) has actually been on the market for almost seven years. It is available through Clark Wire & Cable in Northbrook, Ill. in three different color combinations—for \$235 per thousand feet. In fact, it has been mentioned two or three times now in John Bissett's *Workbench* articles in RW in the past.

For more information, people should call Clark Wire & Cable at 1-800-Cable It (1-800-222-5348).

Susan Clark, President
Clark Wire & Cable
Northbrook, Ill.

Radio World

Vol 16, No 15 August 5, 1992

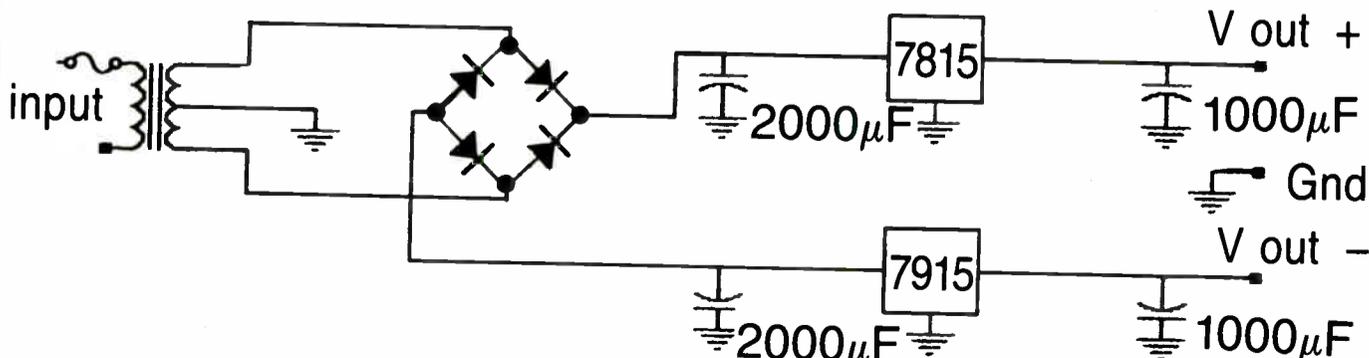
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Next Issue of
Radio World
August 19, 1992

Correction

In the May 6 installment of RW's *Bottomline Broadcaster*, a fuse was omitted from the power supply schematic, and some of the diode symbols were reversed. RW regrets the error. The correct schematic is as follows:



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Road Testing the Sony NT-1 Scoopman

by Frank Beacham

NEW YORK My initial fear when using Sony's new Scoopman digital micro recorder was that I had forgotten something. The gear bag was simply too light and my highly-developed sense of technical paranoia was at work.

But in reality, I had all that I needed. Suddenly my standard DAT field recording

package—assembled with great care less than a year ago—was looking heavy and bulky. As a writer and sometime audio producer, I like to record interviews. For special ones, I have been using Sony's TCD-D3 portable DAT recorder.

The D3 gear package is deceptively large—mostly because it needs lots of juice. That means a bag of nicads or a hefty six C-cell alkaline battery pack for an all-day run.

Then there's the AC power supply/charger, extension cord, adapters, tapes, etc.

Scoopman does away with this clutter. First of all, the recorder weighs only 5.2 ounces (with tape and battery) and runs seven hours on a single AA battery. This eliminates all the power paraphernalia associated with the TCD-D3. Secondly, the tapes are the size of a postage stamp, which takes away more bulk. And, surprisingly, Scoopman has the

Scoopman Makes U.S. Debut

► continued from page 1

trip. Later we used the Magnecorder and then bought the first stereo machine from Ampex."

Fascinated with the Scoopman, Lomax mulled over its possibilities. "If we had these little machines all over the world, we could preserve the culture of the entire planet," he said. "If we could just find a way do that."

ABC Radio Impressed

ABC Radio engineering executives Dick Martinez and Robert Donnelly also were impressed by Scoopman. They said the recorder's sound quality was very good and predicted it would serve radio users for long-form recording.

"Could you imagine distributing a program on a tape this size?" Donnelly asked. "You could mail it in an envelope with a 29-cent stamp."

However, after doing a quick test and finding that the pause mode left a slight gap in the audio, Donnelly expressed doubt that the machine could be used efficiently as a spot news recorder. The Scoopman is not equipped to easily feed telco lines, nor does it have the editing flexibility of its larger cassette counterparts.

The Scoopman's next stop was Audio Services Corp. in North Hollywood, Calif., where its performance through analog inputs/outputs was measured on an Audio Precision test system. The frequency response and distortion measurements

came very close to Sony's published specs.

"When we sit and listen to this recorder, we all comment on how great it sounds," Audio Services Product Specialist Mike Riner said. "But after taking a look at the frequency response, one has to say it's not up to the standards of a true professional recorder."



The Sony NT-1: Two hours of digital audio on a postage stamp-sized cassette.

"The frequency response is flat and then begins to roll off at 2K. At 3K it's about half a dB down. At 5K it begins about a 6 dB slope to 14.5K," Riner said.

"That's why in Sony's spec they say 10 Hz to 14.5 kHz (+1, -3dB), because if they kept it at ±1 they could only quote it out to maybe 5K in maximum frequency response. They are giving themselves that minus side so they can print 14.5 kHz.

"The distortion is hovering at about 0.1

percent," Riner continued. "It's almost like the frequency response is inverted. It holds to about 2K and then it shoots up to about one percent at 10K. But one percent distortion probably isn't audible in most applications."

Riner said he thought Sony had correctly positioned the Scoopman as a high quality voice recorder. "I would say the sound recorded on it is just as useful as the sound recorded on a Nagra," he said. However,

Riner warned that the roll-off in the high end and increased distortion in the high frequencies could lead to some unnatural effects in demanding recording environments.

According to Riner, the Scoopman is a major breakthrough in tape recorder design. "As a tape recorder, this forever changes your reference," he said. "It is totally revolutionary. It shows how powerful Sony really is when they decide they are going to do something."

capability to provide phantom power to professional lavalier microphones directly from the recorder, eliminating battery power supplies (more on this later).

Just as Sony says, Scoopman is the perfect tool for the journalist or interviewer who wants to make high quality voice recordings with ease. One of its best features is the digital automatic gain control (AGC). As a "one man band" operation, this allows me to concentrate on my interview subject and not worry about recording levels being too hot.

My first Scoopman recording was an interview with former Attorney General Ramsey Clark. An admitted non-technical type, Mr. Clark immediately spotted the thumb-nail-sized cassette and expressed amazement.

At this point, I should mention a negative with the Scoopman "system" as packaged by

continued on page 10 ►

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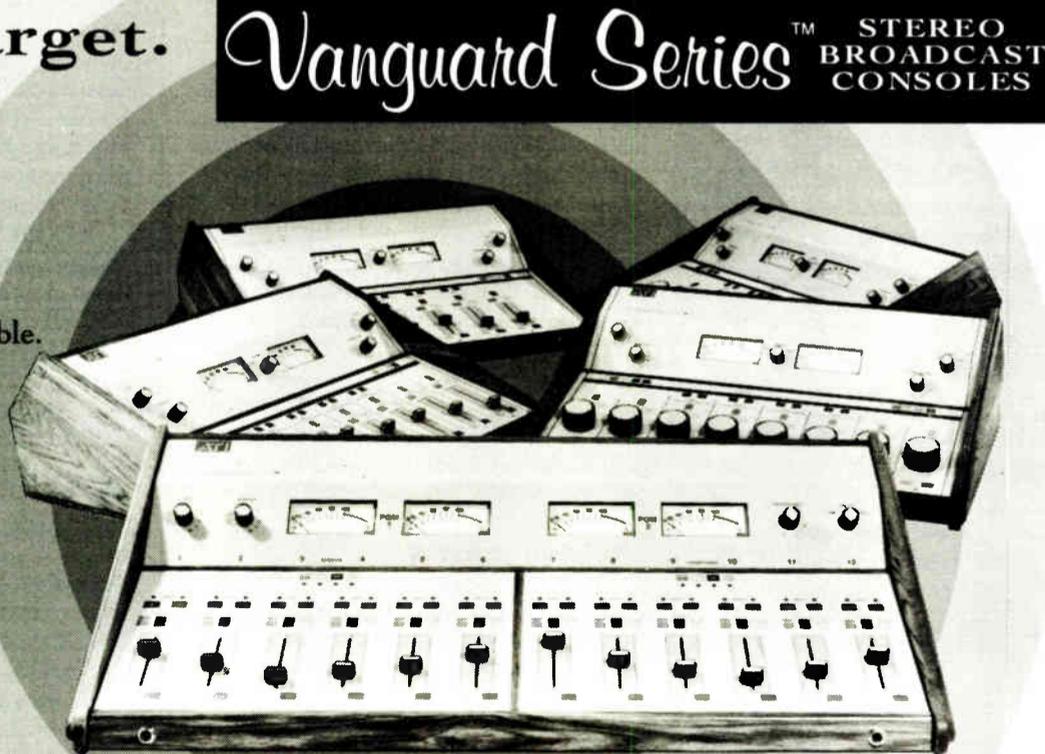
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Format Converters Circumvent SCMS

by John Gatski

WASHINGTON So you want to make multiple generations of a jingles tape that was recorded digitally on a consumer DAT machine using the dreaded Serial Copy Management Systems (SCMS).

You hook up the cables to the digital inputs of another consumer machine and attempt to copy. Sorry. The recorder won't record. The tape has been SCMS flagged so it cannot be digitally copied for editing purposes. Growling under your breath, you curse the deck.

You are not alone. Many recording engineers and broadcast engineers—each of whom often utilize consumer DATs in their facilities—consider SCMS a major annoyance.

What can you do to avoid this problem? You can spend \$1,500 or more to find a pro machine that either ignores or removes SCMS; you edit in the analog domain (but why even have digital?); or you can use your technical prowess to try and defeat SCMS within the consumer recorder to prevent future copy limiting functions.

The SCMS Law

The latter will be illegal when the law requiring SCMS on all consumer equipment takes effect. At press time, the law was poised for passage by the Congress.

That leaves one other option: purchase of an external "box" that will

remove the copy status bits and allow digital editing—and unlimited dubs.

Several companies, such as Digital Domain, Lexicon, Drake, Roland and Audio Design, already manufacture format converter/interface boxes that can remove SCMS. These boxes also have



Format converters like the FCN-1 from Digital Domain can defeat SCMS copy protection.

other useful editing features including elimination of the consumer and professional digital input/output mismatches that plague digital recording.

Although defeating SCMS in a consumer deck will be illegal, there is some

question (see related story) as to whether these interfaces will be legal.

The interface manufacturers are convinced that these format converters will remain legal under the SCMS law because they are sold for professional use. They also offer other features such as

connection between consumer and professional recorders (S/P DIF, SDIF-2, IEC-958 to AES/EBU), and other channel bit manipulation. Some even allow recording from sources with a different sampling rates, polarity inversion and other functions.

Although combining the less expensive boxes with a \$500 consumer DAT recorder can be cheaper than a professional deck with equivalent capabilities, radio engineers should keep in mind that these boxes will require an extra investment.

For example, the products can range from \$450 for the Digital Domain FCN-1 without options; \$1,995 for the Lexicon LFI-10; \$2,600 for the Roland SRC-2; all the way to \$5,000 for the Drake FC-1.

Audio Design, a British company, recently introduced an SCMS remover-only box called the Copy-Rite, which will sell for slightly more than \$500, according to the firm. High-dollar digital editing workstations also can perform SCMS removal.

The boxes basically get around SCMS (pronounced "scums" by one manufacturer) by manipulating the channel status bits.

Copy limiting

The SCMS scheme operates by checking the copyright status and generation status information bits of digital audio that is to be recorded. SCMS also depends on the category bit status. In the case of prerecorded CDs and DATs that have copyright protection, the SCMS automatically determines the generational status bit of the recording.

If the generational status bit indicates that the source is an original recording, such as a CD, the digital recorder will allow unlimited original copies, but will flag each one so that copies cannot themselves be copied.

Digital Domain President Bob Katz said his interface can control the channel status bits including those that make up the SCMS scheme.

Problem solvers

"It's not a sampling rate converter, but any of the flags from emphasis to copy to category code and so on can be changed," Katz said. "You can turn any degree of SCMS on or off so that the tapes you are making can be infinitely copyable, or one copy can be made, or no copies."

The FCN-1 has been highly acclaimed by recording industry publications for its digital editing flexibility and reasonable price. Besides the SCMS bits in

the consumer format, it also controls other professional and consumer status bits including sample frequency flag, emphasis, category code and audio/non-audio status. Digital Domain also offers two options for the FCN-1 including optical in/out and expanded inputs/outputs.

continued on page 10 ▶

SCMS and The New DAT Bill

by John Gatski

WASHINGTON If digital audio recorders are required to carry Serial Copy Management System (SCMS) copy protection, will it be legal to sell equipment capable of defeating the technology?

The legality of digital interfaces/format converters that include SCMS defeat circuitry among their features is not directly addressed in the digital audio legislation now before Congress.

The legislation does list several categories of considerations for determining whether digital audio recorders are exempted under the professional category; peripheral equipment such as interfaces is not addressed, however. The law would also levy a royalty on blank tapes and each recorder.

On the surface, it would appear that one section of the law would make illegal the interfaces that can defeat SCMS. In straightforward terms, the law states that, "No person shall import, manufacture or distribute any device or offer to perform any service, the primary purpose or effect of which is to avoid, bypass, remove, deactivate, or otherwise circumvent any program or circuit, which implements in whole or part, the Serial Copy Management System (SCMS)..."

However, David Leibowitz, general counsel for the Recording Industry Association of America (RIAA), said the key to determining the legality of the devices would be their "primary purpose."

Although each specific product would have to be evaluated to determine its legality, Leibowitz noted that professional interfaces/format converters that allow a variety of digital editing functions are probably safe.

Leibowitz emphasized that the RIAA will be "vigilant" about going after low-cost products—such as the \$200 European-made SCMS Stripper—whose sole function is to defeat SCMS.

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Road Testing the Scoopman

► continued from page 7
 Sony. The tinny-sounding, clip-on stereo microphone included with the recorder does a disservice to the sonic quality of the recorder.

Scoopman should be used only with a high quality microphone. For the Clark interview, I went with a Sony ECM-959 M-S stereo mic and got excellent results. The digital AGC performed flawlessly. There was no noticeable pumping, excessive compression or other undesirable artifacts in the recording.

The Scoopman has a stereo mic input with a feature called "Plug In Power." This is a phantom power system for Sony's consumer mics. I wondered if there were enough power at this connector to operate one or two high-quality professional condenser lavalier mics. (Sony specs do not give the voltage at this connector.)

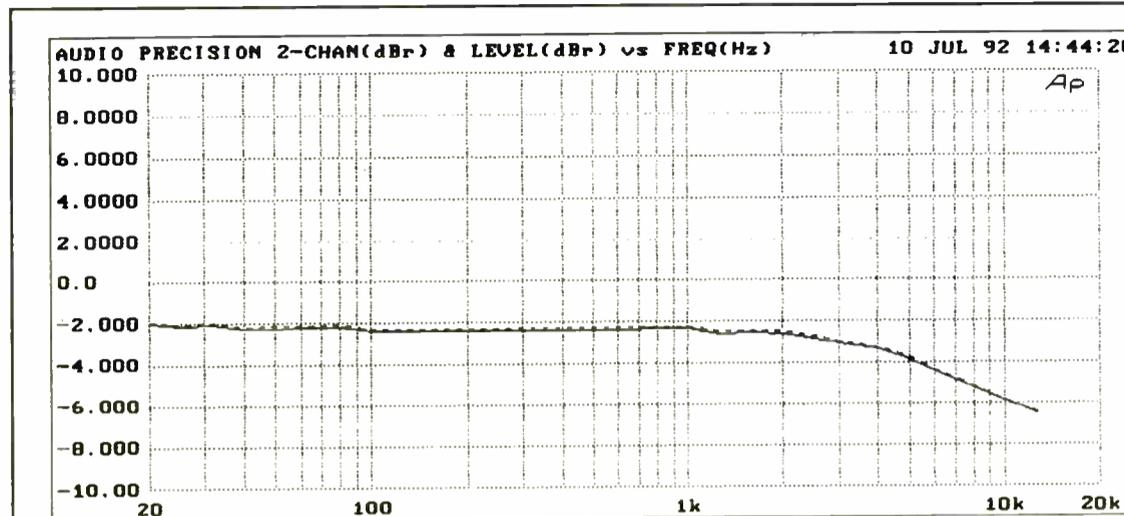
Since the battery power supplies for most of these pro mics are almost the size and weight of the entire Scoopman recorder, it would

be great if the tiny mic capsules could get power directly from the Calif., who tested the Scoopman. It delivered 2.71 volts at the mic con-

works perfectly. Other models, like the Tram, also work. In fact, with a custom RYS cable, I could use one of these pro condenser mics on each channel of Scoopman with full recorder powering and digital AGC.

just as I heard it, complete with the roar of the crowd from all sides. This machine has the potential to fuel a re-birth in binaural recording.

It is distressing, however, that Sony has chosen to limit the new



Bench Test Summary: Audio Services of North Hollywood, Calif., measured the Sony NT-1 and found its specifications to be close to the factory specs. Shown here is the frequency response graph.

Sony NT-1 Scoopman
 List Price \$995

Factory Specifications

- Quantization:
12-bit non-linear
- Frequency Response:
10 Hz to 14.5 kHz
(+1, -3 dB)
- Signal-to-Noise:
More than 80 dB
- Dynamic Range:
More than 80 dB
- Total Harmonic Distortion:
Less than .08%

recorder's input connector.

The good news came from Mike Riner, product specialist at Audio Services in North Hollywood,

connector. The new-generation Milimic, manufactured by ASCU's sister company, Professional Sound Corp., needs only 0.9 volts and

Next, Scoopman and I took a trip to New York's Central Park for an experiment in binaural recording. Using a Sennheiser MKE 2002 binaural microphone in my ears and Scoopman in my pocket, I wanted to capture the sounds of a concert featuring Pete Seeger, Arlo Guthrie and Suzanne Vega.

NT format with SCMS copy protection. In fact, the first Scoopman model, the NT-1, does not even have digital inputs or outputs. Since the format's main application is voice recording and copy protection is not yet required by law, addition of SCMS to the format seems to have been based on political rather than technical reasons.

On first thought, one may dismiss the significance of SCMS on a machine with no digital inputs or outputs. But copy protected tapes made with the Scoopman could limit their post-production flexibility when future Scoopman models with direct digital connections appear. SCMS could become a real hindrance in performing narration or dialogue editing in the digital domain.

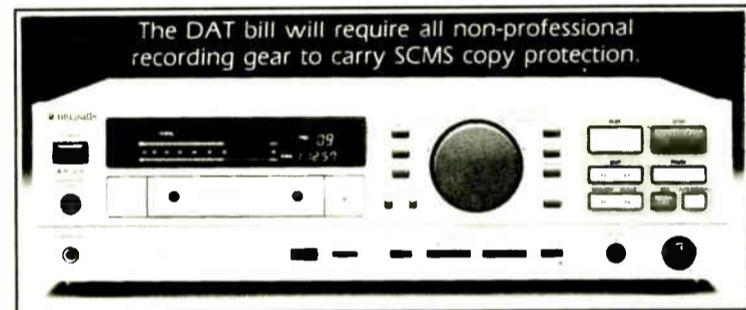
Other than that limitation, Scoopman is an exciting new recording tool with wondrous creative possibilities.

Real-world test

Before the concert, I thought that if all worked well, I should be able to re-live the concert later on headphones in super-realistic 3-D sound. It was 80 degrees, muggy and drizzling. Scoopman was moist to the touch and would get a real test since the NT (non-tracking) format is subject to tape sticking if there is moisture condensation on the head drum.

Would Scoopman work in this soggy weather? Like a champ! Scoopman captured the concert

Less expensive "SCMS strippers" are already poised for market launch, such as a European product that is "the size of two



whether to export the product to the U.S. yet, he added.

Converters Circumvent SCMS

► continued from page 8

Katz said the FCN-1 is not intended for consumer use, but was designed to circumvent problems and obstacles recording engineers have with the multiple formats that exist in digital recording technology.

"I didn't intend the box to be used specifically that way (to defeat SCMS), but thank God, it is a solution for those that need it," Katz said.

The unit also will be compatible with future digital technologies such as Mini Disc and DCC, according to Katz.

Lexicon Product Development Manager Will Eglestrom said that Lexicon is not concerned about the LFI-10 being considered an outlaw device once the SCMS law takes effect. "This box was not conceived as a bandage or a fix-it for SCMS. It is a professional device. During the course of product development, certain issues get raised. We feel as though we have answered all those questions with regard to the legality of this product."

Mike Joseph, editor of the recording industry magazine REP, said that most of the companies selling the format converter/interfaces that defeat SCMS have kept legal challenges in mind when advertising their products.

"Those boxes are available, but you'll note that they are not advertised as (SCMS) flag strippers," Joseph said.

He said the companies are downplaying the anti-SCMS capability of their devices because once the law passes, some of the companies that sell low cost format converter/interface boxes may be the targets of recording industry challenges.



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Set It And

TV Marti Still on Air Despite Criticism

Study Says Video Service Has Few Viewers Within Havana and Nearby Communities

by John Gatski

HAVANA, Cuba Although the disadvantages appear to outweigh the benefits when it comes to TV Marti, the expensive government-operated service is still on the air.

The latest wrinkles that point out the two-year-old service's shortcomings include an attempt in April to expand the broadcast's hours, which led to

Cuban retaliation on U.S. AM radio frequencies, and a congressional General Accounting Office (GAO) report that concludes that the audience is severely limited.

TV Marti is the controversial service approved by Congress and put on the air in 1990. It uses an unorthodox TV transmitter located in an Air Force blimp 10,000 feet over south Florida. The broadcasts con-

sist of pro-western news and entertainment to Cuba—mostly in Havana. More than \$56 million was allocated for TV Marti

Despite its ambitious agenda, TV Marti is not heavily viewed by Cuban residents. Many viewers in the Havana area

that time of day previously had not been used, according to the VOA.

Cuba's retaliatory AM radio

The NAB also opposes the TV Marti service, calling it too expensive and a source of interference for U.S. radio broadcasters.

over several years and the broadcasts cost about \$28,000 per broadcast hour.

cannot receive it because of Cuban government interference. Those who can must get up early in the morning because the programming—much of it reruns of U.S. television shows—airs from 3 a.m. to 6:30 a.m.

There also have been technical problems for TV Marti, including a runaway transmitter caused by a break in the blimp's tether line.

According to government sources and U.S. radio stations, U.S. attempts to add afternoon hours to TV Marti's schedule last spring were answered by the Cuban government's jamming signal (a test pattern) on TV channel 13 and high-powered broadcasts on AM frequencies. The TV channel at

broadcasts were transmitted on 830 kHz and 1100 kHz, interfering with some U.S. stations. Government agencies have estimated that Cuba has several 500 kW transmitters.

TV Marti ceased the afternoon broadcasts after two weeks and Cuban interference on AM frequencies also stopped, a VOA official said.

Since its inception, several congressional attempts have been made to kill TV Marti's funding. The NAB also opposed the service, calling it too expensive and a source of retaliatory interference for U.S. broadcasters.

Radio Marti, which went on the air in the mid-1980s, is considered more successful.

Strother Prepares DAB Tests

NEW ORLEANS Although on-air testing of the Strother-LinCom in-band digital audio broadcasting (DAB) system has not yet begun, Ron Strother believes preliminary results will be available in time for the NAB's radio show this fall.

Strother, president of Strother Communications, said tests of the in-band adjacent channel system will be conducted at KQLZ(FM) in Los Angeles. The station is owned by Westwood One, which was granted experimental authority by the FCC in May 1991 to test DAB in the L-band and on existing FM frequencies.

Transmission and other related equipment is already in place at KQLZ, Strother

said. TFT is providing some of the equipment required for the tests; a LinCom receiver designed for the DAB system also will be used, he added.

Strother noted that some additional wiring was required at the station's transmitter site on Mt. Wilson in the Los Angeles area to solve some "RF intermodulation problems" that were discovered while setting up the site.

"We've learned some good lessons about RF impact on low-powered digital transmission equipment," Strother said.

Preliminary results of the tests are expected to be available in time for the NAB's fall radio show, he added. After that, in the final quarter

of the year, testing also will take place at WPGC(FM) in Washington, D.C. and WGBH(FM) in Boston, Mass.

The Strother-LinCom project coordinators also are working to meet the system proposal deadline set by the Electronic Industries Association (EIA) subcommittee on digital audio radio. The EIA group requested intent to test proposals in June and wants to begin evaluating systems by mid-1993 for selection of a standard. Strother is confident his system will be ready for evaluation, but acknowledged that meeting the EIA deadline has been difficult.

"The aggressive timelines issued by the EIA are placing a strain on all (DAB system) developers," he said.

Industry Analysts Predict Improved Radio Revenue

► continued from page 1
network increase was the growth in audiences for stations associated with radio networks.

Although total radio listening decreased by 0.8 percent, affiliated stations posted an increase of 0.6 percent in the number of persons 12-plus listening in an average quarter-hour.

The outlook for network radio is growth at a 5.8 percent compounded annual rate for the five-year period—rising to

The report forecasted that the economic recession will bottom out in 1992.

\$655 million by 1996 from \$495 million in 1991. In the previous five-year period, network radio advertising growth averaged 3.2 percent.

The report also finds that although there were marked shifts in listening patterns in the 1980s (from AM to FM, and from in-home to out-of-home) radio remains one of the "most stable of all U.S. media." Listening in the aggregate to radio has changed very little, the study found.



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Future Uncertain for Digital Planet

Editor's note: With this story, RW writer Frank Beacham begins a three-part series updating the status of three major players in the digital cable audio industry, which he first profiled in 1990.

by Frank Beacham

LOS ANGELES Digital Planet, one of three ambitious new digital cable audio networks that began in 1990, has become the first casualty in the pioneering effort to bring personalized music services to American homes.

After failing to secure needed financing,

Digital Planet placed "a significant number" of its employees on indefinite furlough on June 26, a company official said. The service however, was still operating at press time.

When asked whether Digital Planet will survive, the company's chairman, David L. Meister responded: "It was predicted that the Soviet Union was going to survive, you know. All I'm saying is that at this point in time we certainly have not closed up and we've made significant steps to change the way we are operating in the short term."

Meister said a recent failure to secure anticipated funding—first from a public offer-

ing and then from a private placement through Prudential Securities—resulted in Digital Planet's troubles. He said the company is now "going on another route in its search for financing."

"The big difference is that investors will not do as well as they had expected to do in the short term because of the difference in valuation," Meister said. "Whatever deal gets done, they are going in at a less than advantageous valuation."

Meister declined to say how many employees had been furloughed or to give specific numbers of how many subscribers Digital Planet has to date.

Funding problems

"We have July (program) guides in our subscribers' hands," he said. "But the marketing is cut back significantly. There are several launches that are now delayed that would have begun over the next couple of weeks."

Digital Planet's competitors, Digital Music Express (DMX), Los Angeles, and Digital Cable Radio (DCR), Hatboro, Pa., both claim to be financially healthy and quickly growing. Each is launching on a rapidly accelerating basis throughout the United States. DCR and DMX's combined figures claim a paid subscriber base in early July approaching 100,000 on more than 150

cable systems.

Dave Del Beccaro, president of DCR, said the race is now between his company and DMX. All but writing Digital Planet's obituary, he termed the company's impact now as "inconsequential."

He said Digital Planet failed to team up with heavy hitter partners within the cable industry and used the wrong manufacturer to build its equipment.

Digital Planet is now looking for new financing in order to keep the service operating.

"Digital Planet is kind of unfortunate," Del Beccaro said. "They had some good people and good ideas. But they didn't get anybody who was familiar with the cable industry involved early enough in their business. And while their equipment was made, it wasn't made by anybody with close ties to the cable industry."

Lack of familiarity

"So cable operators were naturally hesitant about what kind of service they would get with that manufacturer and also whether or not the manufacturer would stick around the market. No one in the cable industry of any size whatsoever felt any confidence in Digital Planet's technology because of that."

"They also had no strategic relationships with operators and they didn't develop a

continued on page 15 ►

Consumer Mini Disc Format Eyed for Pro Applications

MONTVALE, N.J. Hardware and prerecorded media for the Sony Mini Disc are not yet available to consumers, but Sony executives already are considering professional applications for the digital technology, including the possible replacement of NAB cart machines.

"It's something we've definitely talked about, but we have nothing in development right now," said Ron Renschel, Sony's marketing manager for audio products.

The Mini Disc was introduced in prototype form in May 1991; it was also exhibited at the Consumer Electronics Show in Chicago later that summer.

The palm-sized playback or record/playback Mini Disc units use 2.5-inch discs with 74-minute audio storage capacity. A three-second memory buffer enables the Mini Disc to play back uninterruptedly, even if the unit

is jostled or the disc itself is accidentally removed.

Sony's stated frequency response for the Mini Disc is 5 Hz to 20 kHz. At 44.1 kHz sampling rate, the signal-to-noise ratio is listed as 105 dB.

Renschel acknowledged that the Mini Disc could have "great application" as a cart machine replacement, or "maybe even an entire library management system." He added, however, that such applications are still down the road, as the Mini Disc originally was not intended to be a professional product.

"It's a consumer product, and we have to introduce it in the consumer market," Renschel explained. He anticipated hardware and software will be introduced to consumers in November.

The Mini Disc also will include the Serial Copy Management System, which limits digital copying.

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Broadcasters Concerned about RF Bulbs

by John Gatski

WASHINGTON With the recent publicity over a new energy-saving light bulb that could last as long as 14 years, the broadcast industry is seeking assurance that the radio frequency-based product will not interfere with AM and FM radios.

Rumors have been flying around the industry that the bulb, known as the E-Lamp, could interfere with AM radio as do some fluorescent lights. The E-Lamp uses high radio frequency (RF) energy instead of the old-fashioned filaments and elements.

The bulb is being developed by Intersource Technologies in Sunnyvale, Calif., and is slated to hit the market in

Despite the rumors, the NAB said there is no proof that the bulbs will cause any interference.

The FCC Office's of Engineering Technology (OET) said the bulb has not yet been approved.

1993. The company said the bulb will meet FCC interference requirements, but no independent tests confirming those claims have been released yet.

"It appears to be a promising piece of lighting technology that could save Americans billions of dollars in energy costs," an NAB press release said. "Our only concern is that the new technology not interfere with radio broadcasts, and we have seen no evidence to suggest the new bulb does cause interference."

The NAB is reserving specific comment on interference potential until it actually obtains a sample bulb to test, according to John Marino, NAB manager for technical regulatory affairs.

Marino said the NAB has not received a sample of the bulb to test. "We have requested it," he said. "Until you do

some tests on them, there's no way to tell what kind of potential interference there could be with these things."

According to the E-lamp's developers, illumination results from high RF signals, which react with gasses and a phosphor coating in a sealed globe. The bulb is said to last longer because there are no filaments or electrodes, which eventually burn out

in ordinary bulbs.

The RF emitted by the bulb is 13.56 MHz and falls under the Industrial, Scientific and Medical Equipment Section of the FCC Rules.

Karl Johnson, a research manager for the Electrical Power Research Institute in Palo Alto, Calif., said that RF interference has been an obstacle for this type of bulb since it was first developed in the mid-1970s as a U.S. Department of Energy project.

"They say they have solved it," Johnson said. "They say it meets Part 15 and Part 18 of the FCC Rules."

According to Intersource Technologies' press kit on the E-lamp, "specifications available from the base technology" include meeting FCC requirements for Parts 15 and 18, which require tight RF tolerances in order to minimize interference to



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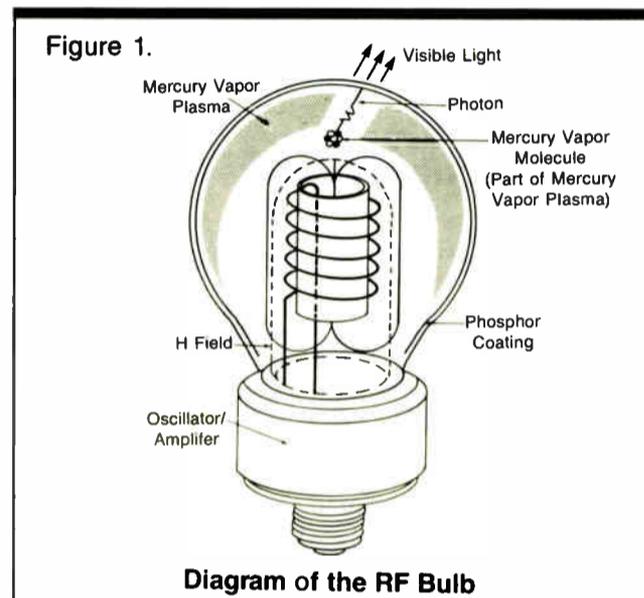
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other electronics such as computers, TVs and radios.

The FCC Office's of Engineering Technology (OET) said the bulb has not yet been approved, but approval is not necessary until the product actually hits market. If the E-lamp meets the FCC requirements, there is little chance that the bulb would interfere with radios, an OET spokesman said.

Radio Buffaloes in Buffalo

► continued from page 4

and pointed out that Franczyk was the only council member to show up for the hearing.

Even WBNY, the alternative music college station, questioned whether the hearing was appropriate. According to WBNY Promotions Director Kris Kraus, who attended the meeting, the members of the audience (largely musicians) took the opportunity to promote themselves.

"There was a lot of chest-beating and grandstanding," Kraus said. "The musicians in the audience just seemed jealous that they weren't getting a piece of the pie."

Kraus, like others in Buffalo's radio community, also raised the point that perhaps the city council should be addressing issues of crime and drug control, instead of monitoring how many local artists are getting on commercial radio. Franczyk has become the butt of many a morning DJ's wit since the hearing.

Defending his initiative, Franczyk noted, "When I took the job of councilman, I did it to address not only crime and drugs, but economic and cultural is-

ues, too." Local music on the radio "helps Buffalo—it's an economic issue," he said.

Regardless of the motivation for the hearing, many of the Buffalo natives (Buffalonians? Buffalites?) I spoke with have expressed some dissatisfaction with radio in their home town. Some admit to listening to CFNY(FM) in Toronto, when they can get it, more frequently than stations in Buffalo itself.

True, Toronto is just over the border, and routinely competes with Buffalo for listeners. But hey, let's think globally: When your listeners decide to go out of the nation entirely to hear what they want, maybe it's time to rethink programming strategies.

If all they want is a little more recognition of the talent within their own city limits, it's a minor adjustment to make. And as I think we've seen here today, some people *are* making money with it.

Food for thought, anyway.

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

Alex

Radio Enthusiast Collects Call Signs

by Dee McVicker

DALLAS Bob Nelson collects call signs like some people collect postage stamps.

To date, he has almost 600, perhaps the largest collection of call letters and their historical meaning. Included are the hidden, sometimes humorous, messages behind a good many grandfathered AM call signs.

"What a radio station was all about, maybe who put it on the air or what it once meant during the so-called Golden Age of radio, lies lurking behind those call letters," said Nelson, who started collecting call signs early in his radio career. Nelson currently has the collection on the BBS at TM Century, where he now is writing computer code for the company's new digital studio.

What's in a call sign?

Lurking behind some of the call signs are promotional slogans dating back to the dawn of radio. Behind others are initials of owners or cities, and a few remain of questionable origin.

The call signs in question, noted Nelson,

Digital Planet Future Hazy

► continued from page 13

critical mass that would ensure their success," Del Beccaro continued. "Both DMX and DCR have ensured their success because their partners alone give them enough of a base to make money. If no one else does business with DMX or DCR other than their partners, both of these companies will be around forever and make money."

Cable alignment

Seven of the top 10 cable companies in America are partnered with either DMX or DCR, but none with Digital Planet, Del Beccaro said. Digital Planet's original backers included six major venture capital groups.

Multiple channels of CD-quality digital audio—mostly tightly-formatted music-only programming without commercials—is distributed for each service to the subscriber's home through a 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.

DCR's equipment is built by partner Jer-Communications, while Scientific-Atlanta is the hardware for its partner DMX. Mitsumi Electronics Co. was contracted to build Digital Planet's first 30,000 tuners.

DMX Chairman Jerry Rubinstein, a former chairman of United Artists Records and ABC Records, said it is too early to declare a two-man race. "Digital Planet has not been able to get their financing together and, therefore, I think their future is very much in question," he said. "But they are still operating on satellite. I would not count them out until they say uncle."

□ □ □

In the next installment, Mr. Beacham updates Digital Music Express.

son, are usually those that go back the furthest in history, typically the three-letter call signs. Nelson cites WLW(AM) of Cincinnati, Ohio, as an example. For lack of historical record, the meaning of WLW is widely misinterpreted.

But it is likely, speculated Nelson, that WLW's original owner intended the call signs to mean "We Love Wattage," because at one time the station had been operating at 500kW.

There is also some question regarding the advertising slogan surrounding

WBT(AM) of Charlotte, N.C. Widely known to mean "World's Best Textile," the call letters, according to a note left on Nelson's computer bulletin board, could in fact have more to do with the automobile industry than the textile industry.

Unfortunately, the BBS note was accidentally erased and Nelson has not been able to update his files with this information.

"At one time the government just simply assigned them, and people would try

to force slogans on to call letters," said Nelson. Ralph Atlass' Chicago station, for example, was assigned the calls WBBM. The station slogan became "We Broadcast Better Music" by some accounts.

Taking on new meaning

Other calls assigned by the regulatory agency of the time were not as easy to define, requiring licensees to stretch beyond even the elasticity of imagination to come up with slogans.

One can only imagine how amused—if not frustrated—one station owner must

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Canada Moves Forward With L-Band DAB Plans

by Lucia Cobo

TORONTO The Canadian government earmarked \$1 million for the research and development of digital radio earlier this year. The money is part of a government and industry initiative to introduce digital radio to Canada by 1995.

The Department of Communication set up an action group to coordinate the initiative, which also will receive money from the private broadcasting sector.

The Canadians have been carrying out demonstrations of digital radio since 1990. The Canadian Association of Broadcasters (CAB), the Canadian Broadcasting Corp. (CBC) and the Department of Communications have worked together on the development of the technology as well as on the country's World Administrative Radio Conference (WARC 1992) position in support of an L-band allocation for digital radio.

The unified effort has yielded the Canadians results promising enough to interest the Mexican and Australian governments. Both countries have been coordinating efforts with the Canadians to set up testing and demonstrations by the fall or by early 1993.

Propelled by the WARC 1992 allocation of L-band and their own test results, the Canadians are moving forward with plans to set up experimental stations in Toronto, Montreal and a third, yet-to-be-determined location.

According to Francois Conway, CBC engineer involved in the project, "We don't have a firm date yet, but we will move ahead as soon as possible."

The main obstacle is the availability of equipment for the stations. "The only equipment ready is Eureka's—and we are talking to them about equipment that can work at L-band," Conway said.

Eureka has said that equipment will be ready in 1993, he added. "The commer-

cial broadcasters are close to endorsing Eureka, but until we (CBC) have assurances that it (the equipment) will be available, we will not make a commitment," Conway said.

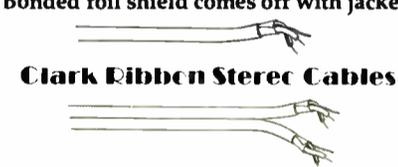
Conway also said the Canadian group is looking to continue propagation and coverage testing in the fall. According to Conway, the group is looking for a high-power L-band transmitter in the 1-10 kW range.

Also on the Canadian agenda for the fall is single frequency network testing at L-band. Using currently available Eureka equipment, the group plans to test coverage of "small, medium and large" size territories. Conway defined "medium size" as a 100 kilometer coverage area.

Single frequency network is a concept developed to counter the effects of "shadowing" and "fading" on a signal. The technique was developed by Eureka 147 and consists of a series of regularly-spaced terrestrial transmitters operating on the same frequency to provide wide-area, continuous coverage.



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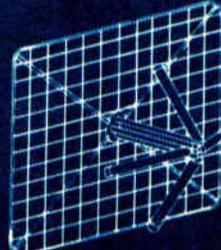
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Radio's News Legacy Began at KDKA

by James T. Wold

MINNEAPOLIS Radio broadcasting and journalism have been intertwined since commercial radio was launched in Pittsburgh with KDKA(AM)'s airing of the Harding-Cox election results on Nov. 2, 1920. Less than a year later, in September 1921, KDKA began regular news broadcasts directly from the newsroom of The Pittsburgh Post.

Other radio stations across the country began adding news to their programming mix. In July 1922, WJAG(AM) Norfolk, Neb. began a daily news broadcast. WJZ(AM) Newark, N.J. began a daily 15-minute summary of the news in February 1923.

By 1925, KOIN(AM) Portland, Ore. was billing its newscast as the "newspaper of the air." And in the late 1920s, WOMT (AM) Manitowoc, Wisc. was broadcasting news "every hour on the hour."

One of the first regular newscasts was a nightly news summary that The Detroit News began in 1920 over an experimental station, 8MK. The first daily network newscasts were given by Floyd Gibbons in 1930.

Radio established a reputation for on-the-spot coverage of important public events in many different parts of the world. WGN(AM) Chicago broadcast the Scopes Monkey Trial live from the courtroom in Dayton, Tenn. in 1925.

Newspapers helped radio

There is no question that the amazing growth of radio broadcasting from the start was aided, in part, by the newspapers. Newspapers fostered the growth of radio by carrying radio columns and schedules.

Daily space was devoted to the publishing of radio station schedules, beginning with The Pittsburgh Post of Saturday, Sept.

10, 1921, where the offerings of KDKA appeared. Thereafter, each day's program schedule was published.

Newspaperman H.V. Kaltenborn, of The Brooklyn Eagle, was among the first print

journalists to be heard on the air. He broadcast over WVP (formerly WVCB), operated by the Fort Wood Signal Corps, Bedloe's Island, N.Y., with a discussion of an ongoing coal strike. Kaltenborn's piece was the first editorial analysis of a news event heard on the air. A year later he began a weekly series of news talks over WEA.

Radio news had many dramatic high-

continued on next page ►

Enthusiast Collects Vintage Broadcast Call Sign Trivia

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have been when a listener contest yielded the "World's Jolliest Aerial Station" to promote his station's assigned calls WJAS(AM) in Pittsburgh, Pa.

The slogan was in good company, for across the state from the "World's Jolliest Aerial Station" was "We Never Are Tired in Philadelphia," the message behind WNAT(AM).

Some calls took on a geographic meaning, such as KBST(AM), which spells its city of license of Big Springs, Texas, or KERN(AM) in Kern County, Calif.

Other calls spell out a euphony describing some feature of the community, such as KQAK(AM) of Eugene, Ore., an area known for its ducks; and KOTN(AM) of Pine Bluff, Ark., a community whose major crop is cotton.

Nameplates

Then too, some are simply vanity call signs, spelling out the initials of owners' names or perhaps the company that put the station on the air. Among the better known of these is KMA(AM) of Shenandoah, Iowa, owned by May Seed and Nursery Company, which sold its seeds through the airwaves.

Nelson gets his information from a myriad of sources, including publications such as the "Radio Station Treasury 1900-1946," by Tom Kneitel and "Radio Broadcast Stations in the United States," published in 1932 by the Federal Radio Commission, the precursor to the FCC.

He also depends on the input of broadcasters and radio enthusiasts, many of whom can access Nelson's listing of calls through CompuServe, an on-line information service and BBS for computer users. Recently, Nelson has been receiving a flurry of electronic mail from the service, due to an article that appeared in the March issue of CompuServe's magazine.

It was, in fact, the computer BBS that provided Nelson with the impetus to compile "all those little shirt pocket notes into one text file."

Said Nelson, "When I first started getting into computing, most of the bulletin boards had a policy that you had to upload something for every ten downloads." It wasn't long before Nelson's compilation of call letters became currency for the many files downloaded from bulletin board services.

Now, like then, Nelson reminds everyone that the collection is meant "basically for fun," and to "enjoy it."

"It is not meant to be serious study," he said. "I don't think any college course is going to be built on this, nor do I think this will appear in any time capsule anywhere."

But for curious radio history buffs, the file does appear on CompuServe under GO BPFORUM as ORIGIN6.TXT, and on the TM Century BBS, which you can log onto by dialing 214-392-1615.

□□□

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

BOTTOMLINE BROADCASTER

Getting Loud on a Budget

by Jim Somich

BROADVIEW, Ohio What do you do when you are in a life-or-death loudness war with the competition and you have no budget to buy the latest "magic box?" You have to rely on your own resourcefulness and ingenuity. In the current budget crunch, even some of the larger stations are not able to rush out and buy the latest processor in order to guarantee dial dominance.

Sad but true, I have also heard stations that have been able to spend *whatever is necessary* and still come up short against that super loud station across town. What is the secret to loudness? How can some stations be so loud and yet so clean? The difference usually lies with the chief and his creativity.

The building blocks of audio processing have not changed much over the past 20 years or so. Even the latest, greatest digital boxes still rely on levelers, multiband compressors, peak limiters and clippers. Everybody starts with the same tools, but the results can be very different!

The power of suggestion

Two rules of competitive processing are unbreakable:

1. The only way to compare yourself with the competition is on the same record.
2. If you are evaluating a new box, be sure you can instantly compare it against your existing processor or chain.

If you break either rule, you might fall victim to the power of suggestion and hear what you want to hear, instead of what is really there. To these two rules, I might add a third: Be slow to believe that a new product is revolutionary.

Major breakthroughs in processing technology are few and far between. New boxes are often old ideas with a few bells and whistles thrown in. Before you plop down your hard-earned money, you want to be sure your audience can appreciate an improvement in your sound.

A plan for action

If you are suffering in a competitive situation, I suggest that you take the time to map out a strategy for success. With a well thought out plan, you will avoid "panic moves" that

may hurt your sound more than help it.

A good first step is to draw a block diagram of your processing chain and visualize how each component affects your audio. Seen on paper, some chains do not make a lot of sense. Be sure that two boxes are not fighting each other or cancelling their respective benefits.

Remove processors that you believe have doubtful value. Try to simplify the chain as much as you can. You can add elements back in later if you truly miss their contribution on the air.

Every chain will have a compressor (single or multiband), and a peak limiter. But, if your chain is typical, you probably also have EQ, and perhaps reverb or a stereo separation enhancer. No component should be in your chain unless you are absolutely certain it is a positive influence on your competitive sound.

Next, dig out the manuals and tweak each piece of processing gear for maximum performance. Follow the setup procedures outlined in the manuals and you will probably realize an immediate improvement in performance. If you are typical, these adjustments have probably not been touched since the equipment was installed.

Pay attention

Lastly, listen closely to your station. After a while, most of us listen unconsciously. A new magic processor often sounds great only because we have not listened to our station critically for many months or years. You must spend some time listening critically to yourself and your competition.

Now, and only now, are you ready to make changes and adjustments. The fundamental rule of competitive audio processing is that a successful and competitive processing chain is the result of dozens of compromises. The most fundamental compromise is the one between quality and loudness: between fidelity and distortion.

Some trade-offs are good and you will gain a lot of perceived loudness for a small amount of increased distortion. Other trade-offs are bad—that is, when you achieve a very small improvement in loudness at great expense in fidelity.

continued on page 18 ►

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► continued from previous page
lights in the 1930s, including numerous broadcasts from Admiral Byrd's Antarctic expedition, between 1933 and 1935; a sensational on-the-spot description of the burning of the vessel Morro Castle, off the New Jersey coast in 1934; the farewell address of King Edward VIII, who abdicated his throne for "the woman I love"; and the impressive coronation of King George VI in 1937—covered in the most elaborate overseas broadcast arrangements to that date.

Another example was Herbert Morrison's famous report of the Hindenburg disaster. On May 7, 1937, Morrison, of WLS(AM) Chicago, was in Lakehurst, N.J., recording a description of the arrival of the passenger dirigible. The ship suddenly burst into flames. The horrified Morrison described the holocaust as his engineer continued to record.

Dollars were tight

In 1932, the Associated Press furnished presidential election bulletins to the networks and the following year began the policy of interrupting broadcast programs with news flashes. But the advancement of radio as an effective news medium was faced with the nation's press associations prohibiting live news for the airwaves.

As the Depression deepened, newspapers were concerned about losses of advertising dollars to radio. Publishers were especially upset to see sponsorship of network newscasts and commentators. The newspaper industry began efforts to curtail radio news.

Because newspapers were still the biggest customers of news services UP and INS, the publishers brought pressure on them to discontinue selling news to broadcasters. CBS started its own news service in opposition to this and NBC made plans to enter the field also.

In December 1933, a meeting was held in the Biltmore Hotel in New York City with the publishers, networks, and press associations. Agreement was made to start a Press-Radio Bureau. Beginning in March 1934, the Press-Radio Bureau was to provide a restricted diet of news

to broadcasters for limited use on the air.

The radio news bulletins were limited by agreement to 30 words and were prohibited from being aired while the news was still hot off the wires.

The agreement eventually broke down, and radio was free once again to broadcast news supplied by news agencies. A news organization, Trans Radio Press, organized by John Shepard III, began selling news to stations that gave newscasts whenever they wished and with sponsorship. Networks built up their own news

The place of radio journalism was . . . well established. For news as it happened from where it happened, radio had no equal. It won its way into the public's ear as being conclusive and dependable.

staffs and sent correspondents to the important capitals and news centers of the world.

A changing world

As the decade of the 1930s wore on, the world moved closer to war. World-wide interest focused on Europe. The radio networks increased their news activities overseas.

With World War II in full swing, networks were broadcasting to the country the fast-moving events that were changing the map of the world. In May of 1940, Winston Churchill broadcast for the first time as England's prime minister.

In June, radio audiences heard the German-French armistice proceedings from France. In September, they heard on-the-spot coverage of the war in Europe, broadcast live to the U.S. networks by short-wave radio.

Perhaps the most famous broadcasts were Edward R. Murrow's reports from London: "I'm standing on a rooftop looking out over London . . . off to my left, far away in the distance, I can see just that faint red, angry snap of anti-aircraft

bursts against the steel blue sky, but the guns are so far away that it's impossible to hear them from this location . . . I think probably in a minute we shall have the sound of the guns in the immediate vicinity . . . you'll hear two explosions. There they are!"

Commercial radio's greatest achievements during World War II, however, were in the field of news and public affairs. Reporters began to use voice recording machines to record actual events for broadcast at a later time.

Special radio series combined journal-

ing of surrender documents aboard the U.S.S. Missouri in Tokyo Bay.

Radio suffered some bad times in the 1950s and the 1960s. But in 1959, about 156 million radio receivers were in working condition in the U.S., more than three times the number of TV sets. Twenty-six percent of these were in automobiles, and the rest were in homes—not necessarily in the living room, but scattered throughout the house from cellar to attic.

The place of radio journalism was by then well established. For news as it happened from where it happened, radio had no equal. It won its way into the public's ear as being conclusive and dependable.

The brilliant performances of news commentators such as Lowell Thomas, Eric Sevareid, Harry Reasoner, Walter Cronkite, Douglas Edwards, and Robert Trout all continued into the 1960s. During the War and in the post-war period, during Korea, during Vietnam, during Desert Storm, America got most of its news and information from the radio.

The next time a crisis arises, people will reach for their radios to hear the latest bulletins. No refinement in television or newspaper technology is ever likely to change that.

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James T. Wold is a free-lance writer based in Minnesota. He can be reached at 1106 South Seventh Street, Minneapolis, MN 55415.

INSIGHT ON RULES

A Guide to Frequency Tolerance Compliance

by Harold Hallikainen

SAN LUIS OBISPO, Calif. Before we get into this installment of *Insight on Rules*, I want to let you in on a resource available to station chief operators (that are members of NAB). By phoning the NAB HelpFax, you can get a list of documents on file printed on your fax machine. Documents can be requested from your DTMF phone and fax machine. For more info on HelpFax, call John Meril or Walt Wurfel at the NAB: 202-429-5350.

Continuing our review of the FCC's proposed AM self-inspection report, we get to the section on technical requirements. In the past 10 years, the FCC has reduced or eliminated many of the periodic inspection requirements on various parameters, but has not changed the limits on the parameters themselves. As an analogy, the highway patrol does not tell you how often to check (or log) your speedometer, but instead requires you to do whatever is necessary to ensure you comply with the speed limit.

Frequency tolerance

Part 73.1540 of the Rules requires the carrier frequency to be measured as often as necessary to ensure it stays within tolerance. Part 73.1545 specifies those limits.

The carrier frequency (or center frequency for AM stereo stations) must be within 20 Hz of the assigned frequency. The test equipment must, of course, have sufficient accuracy to be trusted. Part 73.1545(c) specifies that NIST stations

WWV, WWVB, WVVH and WWVL are the primary frequency standard.

The self-inspection report asks what method is used to ensure compliance with the frequency tolerance requirements. When was your frequency last checked? If you're using a frequency monitor or counter, when was it last calibrated?

If a private frequency measurement service is used, the self-inspection report asks the name of the company, the date of the last measurement and the results of the last measurement.

Modulation limits

Part 73.1570 limits negative peaks of frequent recurrence to 100 percent and prohibits positive peaks from exceeding 125 percent. Stations transmitting stereo are limited to the maximum modulation specifications for the particular system in use (because the FCC did not choose a standard). Finally, stations utilizing subaudible telemetry must keep the modulation no higher than necessary for reliable data transmission. In no case can the subaudible metering exceed six percent modulation.

The FCC deleted the rules requiring stations to have modulation monitors. At this point, they merely require stations to not overmodulate. This has caused some rule interpretation problems (especially for FM stations), because the FCC has said that monitors meeting the specifications set forth in rules that have been deleted are acceptable for determining compliance with the modulation limits.

continued on page 18 ►

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A Guide to Frequency Tolerance Limits

► continued from page 17

It certainly seems easier for a station to determine compliance if the measurement techniques are specified. In any case, the self-inspection report asks what method is used to ensure compliance with the modulation requirements of Part 73.1570. Do you have a modulation monitor? Has it been recently calibrated?

Spurious emissions

The self-inspection report asks what method your station uses to ensure compliance with the spurious/harmonic emission requirements of Part 73.44(b). Many

stations have taken advantage of the exemption from required annual measurements (as required by Part 73.1590(a)(6)) specified in Part 73.44(e).

This exemption allows stations that installed an NRSC audio filter prior to June 30, 1990 (or on initially going on the air) to not have to make the equipment performance measurements of §73.1590(a)(6) until June 30, 1994. The FCC may request stations to make these measurements prior to the end of the exemption period, however.

Years ago, equipment performance measurements (EPM) consisted of a series of audio tests (an "audio proof") and "evidence"

of compliance with the harmonic radiation requirements. There are currently no standards (other than the frequency response specifications of NRSC-1, which are not mandatory unless a station takes advantage of the EPM exemption) for audio performance.

Further, the required RF measurements are now much more detailed. The measurements must now demonstrate compliance with the occupied bandwidth limits. This will generally require the use of a spectrum monitor or a receiver designed specifically for these measurements.

One of the more interesting sections of Part 73.44 that few people seem to know about is 73.44(d), which describes *where* the EPM are to be performed.

For transmitter acceptance, the measurements are to be made into a dummy load. Measurements on an operating station are to be made at ground level about one kilometer from the center of the antenna system.

The "reference field strength" (the carrier level reference) for measurements is to be that level that would be present if the station were operating in a non-directional mode. If the measurements are made in the major lobe, and the major lobe has a field 6 dB above that of a non-directional antenna, then radiation between 10.2 kHz and 20 kHz would have to be 31 dB below the actual carrier level (25 dB below the non-directional carrier level).

I recently watched a transmitter manufacturer field service technician make the measurements while the station operated into a dummy load. Has anyone made measurements of a directional station in compliance with this section?

At this point, stations could possibly reply to this item on the self-inspection report with "As specified in Part 73.44(e), this station is considered to comply with paragraphs (a) and (b) of Part 73.44 absent any reason for the Commission to believe otherwise, since this station installed an NRSC-1 filter prior to 30 June 1990." Since this exemption expires in 1994, it would be worthwhile to begin considering how these measurements will be made. You may want to do a few practice runs ahead of time.

Next month, we'll continue our discussion of the FCC Self-Inspection Report. If you'd like a copy of a 46-page "compliance package," including the FCC Self-Inspection Report, an FAA Obstruction Light Outage form, some FCC correspondence regarding inspections and compliance, FCC broadcast inspection forms, and the FCC Denver Broadcast Inspection Summary, send \$5.00 to cover copying and postage to H&F, 141 Suburban Road, San Luis Obispo, CA 93401-7590.

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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 and is learning Contra dancing. He can be reached at 805 541 0200. He can also be reached on internet at ap621@cleveland.freenet.edu or hhallika@pan.calpoly.edu or through CompuServe at INTERNET: ap621@cleveland.freenet.edu.

Getting Loud On a Budget

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A good place to start is with the settings recommended by the manufacturer of your equipment. These settings will be on the conservative side with only modest trade-offs in loudness. Factory settings will give you a starting point from which you can jump off and try various new approaches to maximize your signal.

Listen carefully after each change and don't make too many changes at once. You must educate your ears to very small changes in competitive loudness and perceived distortion. After a while you will learn what to listen for and what each adjustment translates to on the air.

At this point you may want to return something to the chain that you previously removed. Be sure that you hear the desired improvement when you do this. If there is no improvement or perhaps some deterioration, then keep this unit out of your chain.

General rules of processing tell us that levelers and compressors act as gain riders to keep your audio in the right range for more aggressive processing. Multiband compression and/or limiting tends to increase perceived loudness because each band can be compressed optimally without taking the other bands into consideration.

Clipping is the most controversial element of processing. It unquestionably adds distortion but it is also the single most effective tool in increasing dominance. If done with the proper equipment and not overdone, it can make the difference between dial dominance and being buried in the mud.

You can clip at the audio level and/or at the composite level. The proper control of audio peaks through low distortion clipping is a very effective strategy in competitive situations.

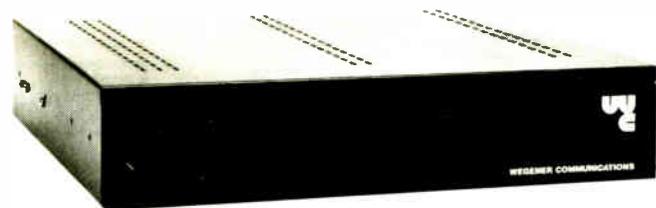
Next month we will explore the most controversial clipping of all: FM composite clipping. We will also discuss some low-cost modifications you can make to popular processing equipment to make your sound more competitive.

□□□

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



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Processing Tools for Competitive Broadcasters

FEEDLINE

How to Tell If That AM Is a Good Buy

by W.C. Alexander

DALLAS Cash flow is not the only factor that determines whether a radio station is a good buy or not. In this installment of *Feed Line*, we will take a look at some of the technical factors worth considering when purchasing an AM station.

When the boss asks you to take a look at a station he is considering for purchase, always start your examination with a study of the allocation. This is probably more important than the physical assets of the station, because it is what limits the performance, present and future, of the station.

Since AM frequencies exhibit distinctly different propagation characteristics day and night, you have to view each AM station as essentially two different stations—one that operates daytime, and one that operates at night. In some cases, there will be a critical hours facility to consider as well; we'll get to that later.

Start at the FCC

Start with a look at all the FCC database listings for the station. It contains the pertinent facts, including class of station, frequency, power, coordinates, tower height(s), and directional antenna parameters of the licensed facility as well as any outstanding construction permits and applications on file.

Sometimes you will have to dig a little further to answer questions raised by database listings. Recently, I looked at a station that had a 50 kW nighttime application pending since 1987. I had to get a paralegal in Washington to go to the FCC and ask what the story was. The answer gave me the insight I needed to understand the prospects for a grant.

It is a good idea, if you have time, to get a copy of the engineering portion of the FCC Form 301 and all exhibits for the existing mode of operation as well as any CPs and pending applications. These will contain daytime allocation studies, night limit studies, directional antenna patterns, and coverage maps.

The Downtown Copy Center in Washington as well as several other contractors (including your communications attorney) can dig these documents out and provide you with copies. If you are working through a broker, ask him to provide you with this information. He may not like it, but if he really wants to close the deal, he will come up with the requested paperwork.

Nighttime pattern

When I look at an AM station, I always start by looking at the nighttime situation. It is no secret that most AM stations have night coverage that is much less than desirable. This is the result of skywave interference from co- and adjacent-channel stations as well as reduced power/radiation required to protect other stations.

If the nighttime coverage is poor and there is no room to improve it, your boss may not want the property.

If you have the Form 301 engineering for the existing mode of operation in hand, you can use that to find the nighttime interference-free coverage area. Find the RSS night limit and use that as the nighttime interference-free contour. On the nighttime coverage map, this interference-free contour should be shown.

In the absence of the station's engineer-

ing file (or if it is very old), you will need to run a night limits study yourself. You can either do this by hand or you can run it on Dataworld, Broadcast Data Services (BDS), or have a consulting engineer do it for you.

The results of this study will give you a list of all the co- and first-adjacent channel stations, the distance and bearing to each, the calculated skywave field (multiplier) from each, the RSS night limit and required protection to each (including the station you are studying), and the maximum permissible radiation (MPR) toward each station.

From this, you can determine who is entitled to protection and how much signal may be radiated toward each. You can, therefore, determine whether there is room for improvement.

Nighttime directional

If the station uses a directional antenna at night, you should use the parameters, including augmentations if any, to calculate the standard pattern inverse distance field (IDF) on either 36 or 72 radials. You can do this by hand, you can use any of the public domain computer programs available for this pur-

pose, you can run it using the Dataworld or BDS antenna programs, or you can have your consulting engineer do it.

Compare the MPR values from the night limits study with the standard pattern IDF values for the night directional antenna. If the MPR values are considerably higher all around, there may be room for a power increase. If the MPR values are higher in some directions but not others, a modification of the directional pattern may yield better coverage.

If the MPR values are lower, it is likely continued on page 28 ►

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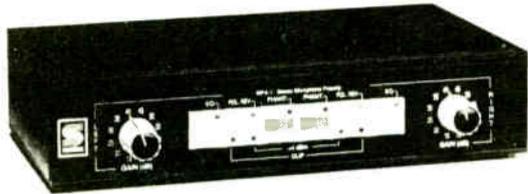
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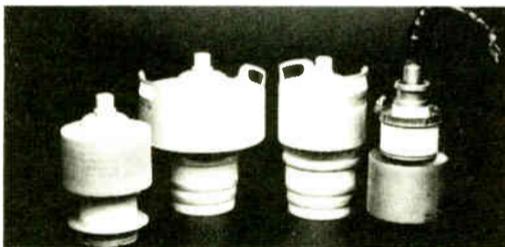
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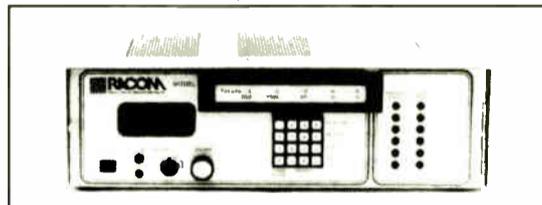
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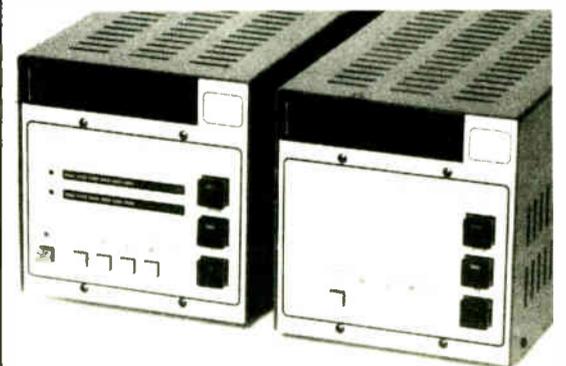
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ECLECTIC ENGINEER

Finding and Keeping a Good Station Engineer

by Barry Mishkind

TUCSON, Ariz. Engineers often speak a language that is incomprehensible to managers. And it seems that everything an engineer wants to do costs money, even though the engineering department doesn't generate revenue.

But there is no one else in the building that can ensure the station audio chain and transmitter are running in top form. A good engineer really is essential to a successful station, yet sometimes a visit to the shop may seem like a trip into "The Twilight Zone."

How can a station manager find a good engineer if he doesn't have a group chief to help? What should he look for in terms of qualifications? How can you keep a good engineer from moving on? In this column, I'll try to answer some of those questions.

Where to look

There aren't very many places where you can advertise in the afternoon paper and

Sometimes a visit to the shop may seem like a trip into "The Twilight Zone."

find an engineer. In fact, one of the major effects of the deregulation of broadcasting has been an exodus of engineers into computer and two-way operations.

In many places there is one local engineer taking care of most or all of the stations in a market. This can create some legitimate worries about confidential station business being carried across to competitors. For this reason, seeking an out-of-market engineer may seem like a good idea.

Several trade publications provide want ads, some professional groups have lists of jobs and lookers, and there are also the BBS nets where an opening or need can be posted (see RW's July 22, 1992 *Keyboard Connection*).

Depending on your location and salary offered, you'll usually find you have a choice of several engineers. You can try the traditional method of calling the engineer's former place of employment for a recommendation and confirmation of why the engineer wanted to move. Of course, if there was a communication problem, the recommendation may not be unbiased.

Take it outside

Another option is to hire a neutral engineer to interview the prospective employee and offer an opinion. Perhaps the engineer is well known in the technical community, and you'll discover a gem, or be saved from a dud. This process can be done by telephone so it won't cost too much, and it will give you great peace of mind.

The SBE (Society of Broadcast Engineers) would like you to use its certification program as a recommendation.

While generally a better program than the old FCC tests, the pool of SBE "certified" engineers is often limited to areas where there are active chapters. Consequently, many excellent engineers, well qualified and experienced in the smaller markets, may not have had the time or cash to take the SBE tests.

As you talk to your prospective engineer, find out something about his maintenance policies as well as his experience.

If he or she tells you before inspecting your plant that he can significantly reduce your technical budget, watch out. It's easy to put off needed maintenance for awhile, or stock fewer spare parts. While the budget does go down, so can your studio efficiency as key equipment always seems to be "out of service" waiting for parts.

Listen carefully

Instead, ask him to inspect the plant and offer his opinions. Don't be overly sensitive and try not to bristle at any suggestion of problems. After all, that may be why you're looking for a new engineer in the first place.

A good engineer will inspect the station logs and test reports, and check the paperwork on the various licenses. He'll want to know the condition of the physical plant, how the transmitter is tuned, what spare parts are in stock, and the relationship the station has with its suppliers.

If he doesn't ask about these things, be careful. Yes, there are those that will accept *any* challenge presented. But, there are also some who are just passing through and figure they can keep the station up until they find something better. And then there are the incompetents, who can damage your plant.

Danger signals warning you about certain contract engineers can come from various areas. For example, if he also sells replacement parts and tubes, there's a real temptation to sell you more than you need—or worse.

It's not unheard of for a contract engineer to sell the same set of tubes to several stations, or repeatedly change cart machine pressure rollers. A wise move in any event would be to consult an outside engineer for a second opinion of the normal maintenance cycles and parts costs.

Something else to watch out for is a tendency toward short stays at a lot of stations. This could be a red flag for incompetence, laziness, or other problems. With high voltages and currents floating around, you need to have someone with a clear mind and careful manner.

Finding such a concerned professional will bring some immediate benefits. Your down time will be reduced. There will be fewer commercial make-goods. Electrical and parts costs will become more moderate. The station will sound cleaner.

So now that you've got a good candidate ready to hire, how much do you have to pay him? And how to keep him happy? We'll zero in on this next time out.

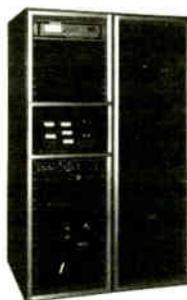
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Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant in Tucson. He can be reached at 602-296-3797, BMISHKIND on MCI Mail, or "barry@coyote.data-log.com" on Internet and CompuServe.



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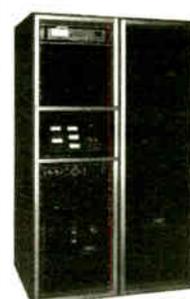
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LINE OUT

A Step-by-Step Approach To Installing a PC Editor

by **Bruce Bartlett**
with **Jenny Bartlett**

ELKHART, Ind. In the last few columns we've been looking at digital audio editors. Some are complete in a single chassis; some are components you use with your personal computer. What's it like to install a PC-based component system?

Let's describe how it's done with a typical system—the Turtle Beach 56K. At \$1,995 list, it's one of the least-expensive two-track digital editors. The company also sells complete workstations for \$5,000 and up, including a computer. For more information, contact Turtle Beach Systems at 717-843-6916; or circle **Reader Service 87**.

The 56K system includes a circuit card, connector box, cable, and software. Here's an explanation of the components:

- **56K-PC digital signal processor.** This is a circuit card that plugs into a slot in your computer. The card uses a Motorola 56001 DSP chip. Sample rates of 32K, 44.1K and 48K are supported.
- **56K-D Digital audio interface.** This is a box that includes connectors for SMPTE, MIDI, and digital audio: pro (AES/EBU) and consumer (S/PDIF). A cable connects the interface box to the circuit card.
- **SoundStage software.** This is for digital-audio editing.

The instruction manual is an important part of any high-tech system, and the one provided with the 56K system is excellent: easy to follow, friendly and even funny. A trouble-shooting guide and index add to the manual's usefulness. Plus, a helpful video is included that shows you how to install the hardware and run the software.

Basic needs

- The 56K system requires:
- ✓ An IBM-compatible 286, 386 or 486 computer running at 12 MHz or faster, with DOS 4.01 or later operating system.
 - ✓ 640 kilobytes (640K) of memory.
 - ✓ A Microsoft-compatible mouse.
 - ✓ A hard disk with 28 milliseconds (msec) or less random access time and at least 500K/sec data transfer rate (see last month's column on hard drives). The minimum recommended hard drive size is 100 megabytes (100MB). You'll need at least 11MB of disk space per minute of stereo audio.
 - ✓ A DAT recorder with digital inputs and outputs, or an analog/digital converter. According to Turtle Beach, the 56K system works with most DATs. The 56K will not work, however, with the AES/EBU port in the Panasonic SV-3700, even though the 3700 correctly implements the AES/EBU standard. 56K does work with the 3700's consumer port.
 - ✓ A graphics adapter (Hercules monochrome, EGA, VGA, MCGA, or resolutions up to 1024×768×16 supported through user-supplied GEM drivers).

You might also want to add a pair of small, powered monitor speakers near your computer.

The program runs with the Digital Research GEM 3.1 system, which is included. The GEM system is a GUI or Graphical User Interface like Microsoft Windows or

the Macintosh operating system, but is very economical of code. The GEM.EXE file requires only 55K of memory.

It shows up on your screen as pull-down windows, scroll bars, dialog boxes, and so on, which you access with your mouse. Anyone familiar with Macintosh or Windows will have no trouble with this intuitive interface.

The screens are uncluttered and colorful—very pleasant to work with.

Getting started

Anyone familiar with computers should be able to install and test the complete system in 20 minutes. Reading the manual

Anyone familiar with computers should be able to install and test the complete system in 20 minutes.

takes but a few hours, and the video tape supplied with the system shows you how to install and use it.

To install the system, follow these steps:

- Remove the cover from your computer. You might need to install a hard drive and its controller at this point.
- Plug the 56K-PC circuit card into an empty user slot (16 bit). Replace the computer cover.
- Connect the supplied cable between the 56K-card connector and the 56K-D digital interface.
- Connect digital audio cables, MIDI cables and SMPTE cables to the interface.
- Run the two supplied diagnostics programs to check your hardware.
- Partition and format your hard disk. The manual clearly explains how to do this. The disk must be partitioned with the FDISK command from DOS. Turtle Beach recommends that the soundfiles (recordings) be stored on a separate logical drive, say drive D.

If you don't, the soundfiles will become fragmented or spread in chunks around the disk. This can cause errors or data loss because the data transfer rate will become too slow.

- Use your computer's setup program to tell the computer that you've installed a new hard drive.
- Type SSSETUP A: C: (for example) to install the 56K software (SoundStage) onto your hard disk.

Some memory-resident programs and device drivers can cause memory conflicts if used with 56K. For this reason, it's best to boot off a floppy with very simple CONFIG.SYS and AUTOEXEC.BAT files.

To illustrate how such a system is used, next time we'll start recording and editing with the 56K system.

□□□□

Bruce Bartlett is a microphone engineer and technical writer for Crown International, and the author of Stereo Microphone Techniques, published by Focal Press. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.

DIGITAL DOMAIN

The Benefits of 18-Bit Digital Resolution

by Mel Lambert

STUDIO CITY, Calif. In the fledgling days of digital technology, the sonic advantages of digitized audio were pretty much taken for granted. For many applications, the ability to make multiple copies without noise build-up, coupled with a lack of HF roll-off at elevated recording levels, opened up a new era for compact, cost-effective recording, editing and mixing systems.

But it wasn't long before those earlier 16-bit pulse code modulation (PCM) systems came in for some criticism. Almost without exception, older 16-bit A-to-D converters can only offer dynamic range performance equivalent to (on a good day) 15 bits; normally their resolution is not much better than 13- to 14-plus bits.

Why is this the case, you might well ask? Simply stated, there will always be an inherent doubt in the value of the LSB ("least significant bit," the 16th) for a strictly 16-bit conversion system. If we then factor in less than optimal circuit design, plus power supply factors, clock instability/jitter and other physical parameters, we can then begin to see where squeezing full 90 dB and beyond performance become problematic.

Better days

These days, however, the situation is very much improved. The advent of full-resolution, 18-bit converters based on oversampling, sigma-delta techniques means that we can now convert analog signal to 16 bits of reliable data, simply by accurately truncating the two LSBs. Which is why some of the latest-generation DAT recorders, for example, together with the newer disk-based recorders and editors, sound so much better than hardware released just a couple of years ago.

For a growing number of applications, however, the demand for available dynamic range continues. There are, for example, a number of recorder/editors and workstations that utilize full 20- and even 24-bit internal bus architectures to mix, level adjust and otherwise process multiple signals.

If we can devise a way of retaining full 18-bit (and maybe more) resolution during the conversion process from analog waveform to digital bitstream, we can now gain-adjust the signal within the digital domain without compromising the upper (or lower) bit resolution. In other words, we can raise the level by up to 12 dB—roughly equivalent to two data bits—without rounding off the upper-level signals. Alternatively, we might elect to lower the overall level of a recording without losing the small signals to background noise.

There is another reason why we might prefer to master our basic tracks and/or final two-channel or multichannel mixes to 18-plus bits of digital resolution. In the not too distant future, it is conceivable that both commercial release media and transmission channels will offer greater than 16-bit dynamic ranges.

For example, there are strong rumors that an "enhanced" CD format is currently being considered—one that will offer possible 20-bit capabilities for reduced replay times. (Still being resolved are such matters as mastering formats, normal/enhanced compatibility for consumer systems and

other operational parameters.)

Also, the advent of wide-scale digital audio broadcasting (DAB) toward the end of this decade—not to mention High Definition Television—will almost certainly utilize enhanced bit capacities as a strong marketing focus. (After all, the compact disc is now 0010 years old; the accolade of "CD-quality audio" just doesn't have the same impact that it used to, mainly because we are accustomed to elegantly designed 16-bit record/replay technologies.)

Wider than 16-bit

Currently appearing on the market are a number of stand-alone A-to-D converters that offer outputs wider than 16 bits. Some designs use single 18/20-bit A-to-D chips to handle the conversion process—normally running as oversampled sigma-delta topologies (128- or 256-times the sample rate)—while others use tandem 18-bit converters.

In the latter designs, the intention is to shoot for full 20-bit resolution, and accept the limitations of analog front-ends, clock jitter, PCB layouts and the myriad of other technical problems of achieving 120 dB-plus dynamic range using current design techniques.

Instead of going for broke, such configurations of A-to-D converter will use one 18-bit chip for the upper range, and another for the lower. When the input signal is

high-level, A-to-D number one will be favored; when the input level drops below a median level, A-to-D number two takes over. The task of calculating the transition points, and then physically switching the converters is normally handled by a dedicated, high-speed DSP chip.

As a bonus, some newer designs utilize some spare DSP capacity to provide such useful functions as soft-knee digital limiting and compression, plus relatively simple equalization. Outputs are normally configured to standard AES/EBU (hopefully, the newer AES3-1992 Recommended Practice), S/P DIF and/or SDIF-2 formats.

Of equal importance in these newer, stand-alone designs is the provision of an external synchronization reference. As anybody that has tried to have multiple recorders, editors and workstations communicate within one another digitally can report, we stand a better chance of success—particularly in situations where several source are simultaneously feeding into a multi-channel system—if all of the various units are locked to a common bit-clock reference.

These sync references can either be a conventional square-wave word clock at the sample rate, SDIF-2 format word clock (from certain processors and workstations), or a correctly formatted AES-11 DARS (digital audio reference signal). By the way, there are certain A-to-D converters that,

with a muted input, can also serve double duty as a highly stable digital synchronization source for radio production facilities.

Next month I'll be back with specific details of some of the newer stand-alone A-to-D converters, plus details of a proprietary 16- to 20-bit truncation process.

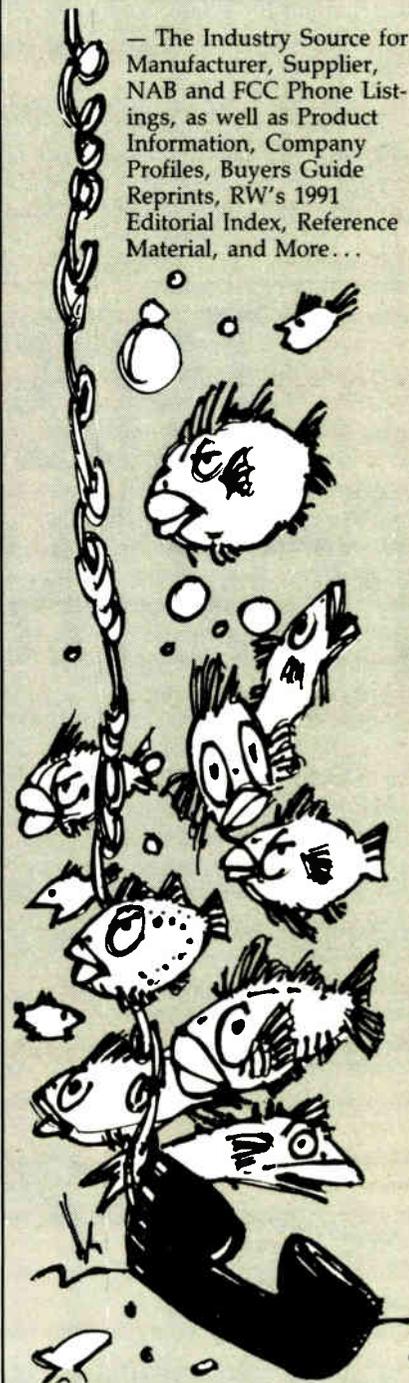
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Mel Lambert has been intimately involved with the production and broadcast industries on both sides of the Atlantic for many years. Now principal of Media&Marketing, a consulting service for the professional audio industry, he can be reached at 818-753-9510.

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WORKBENCH

Running a Marathon on Your Cart Gear

by John Bisset

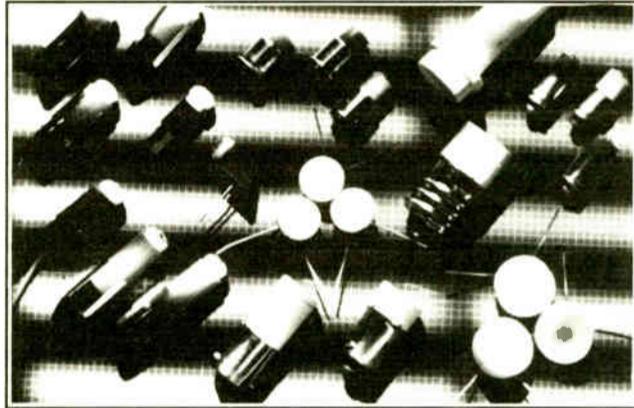
FALLS CHURCH, Va. I dropped by a station recently and saw a really slick cart tension gauge, manufactured by Marathon Products. The more seasoned among you will remember Marathon as the company that built carts with a rounded end. Although we may have standardized on rectangular carts, Marathon is still around, rebuilding carts and offering a supply of cart test accessories.

One such device is the "torque test cart." It sells for \$25 and is a torque test meter built into an NAB-style cartridge. The cart is slipped into a machine, and the start button is pushed. The built-in torque meter gauge displays the tape pulling force of the cart machine on a calibrated scale.

Dick Myers, president of Marathon, told me that comparable tension-measuring equipment rents for \$1,600. Such a deal! If you'd like to receive information, circle Reader Service 119.

During these hot summer months, cooling of transmitter sites can be an issue of paramount importance. A station recently called, complaining of poor tube life from an old 1 kW transmitter. Although the

transmitter shack had a window air conditioner, the exhaust air was routed through ductwork that was sealed to the top of the transmitter.



Put an end to changing burned out incandescent bulbs by converting to McLEDs.

The hot air was supposed to be exhausted into the attic, but a further inspection found the blower fan in the attic was not functioning. This exhaust blower was a squirrel cage design, which meant when it was not running, not much heat was being exhausted from the transmitter. The fan was replaced, and the ductwork was also modi-

fied to provide a "hood" above the transmitter, as shown in Figure 1.

The sheet metal hood provides several advantages: It directs the hot air into the attic where a blower is mounted; should the blower ever fail, the hot air can move around the hood and fill the room, rather than cause the hotbox conditions we found when the ductwork is sealed to the transmitter exhaust port.

If you decide to have some custom ductwork done, shop around for prices. The custom hood shown in Figure 1 ranged from \$25 to \$85.

Got a hankerin' for a McLED for only a buck? (Hold the onions!) Lumex Opto/Components outside Chicago has just released a family of multi-chip LEDs used to replace incandescent bulbs. (See Figure 2.) The new family is named "McLED" and is sold to end-users in single quantities.

Replacements for popular miniature and subminiature lamps are available, in prices ranging from \$1 to \$10 depending on quantity, color, and package. For more information on the new McLED family, circle Reader Service 136.

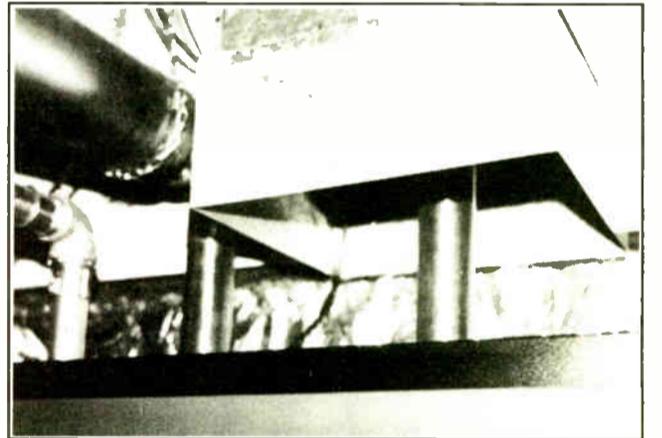
While we're on the subject of free items, you might want to pick up a copy of Sennheiser's "Speaking of Microphones" booklet. Whether you just need a refresher in

reading polar patterns or determining why there's a boost at 8K, this 12-page booklet will give you the answers.

Sennheiser supplies this booklet to high schools and colleges, too. So if you're moonlighting by teaching a course or two in electronics or broadcast engineering, consider these booklets for your lesson on mics.

Al Zang of Sennheiser was telling me how the company's commitment to customer service extended beyond publishing such informative booklets, to providing replacement parts for their products. For example, they'll provide a replacement set of headphone cushions for your HD-414, and charge your credit card or accept a personal check. In addition to the reasonable prices, there's no minimum order.

Repairs to mics are also provided. Before you send in your MD-421, though, consider upgrading to the new MD-422. This new mic provides a little more presence and is internally shock-mounted so there's no handling noise when used as a field mic. In the studio, a separate shock mount is not necessary. If you'd like a copy



A sheet metal exhaust hood placed over, but not sealed to the top of a transmitter prevents overheating.

of Sennheiser's "Speaking of Microphones" booklet, circle Reader Service 15.

If you want quantity copies for your student, circle Reader Service 15. continued on page 29 ▶

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OFFBEAT RADIO

MIDI Technology Brings Radio Game Show to Life

By Dee McVicker

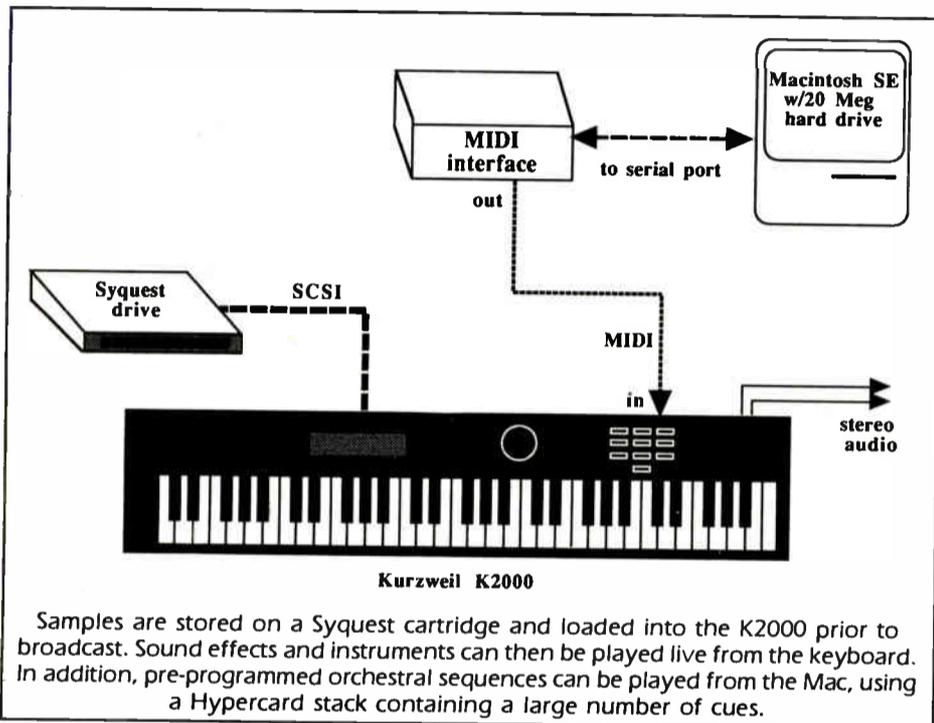
BOSTON Multimedia without the video. That's one way to describe the audio production of "What's the Score?", a music question-and-answer program that aired this spring on educational radio.

The quiz show was pilot-tested by WGBH-FM using MIDI equipment and a Macintosh computer—a setup bordering on multimedia, the buzzword for computerized audiovisual communications.

with performance artists. This project, however, enabled him to participate in the kind of radio show he had only dreamed of a decade ago.

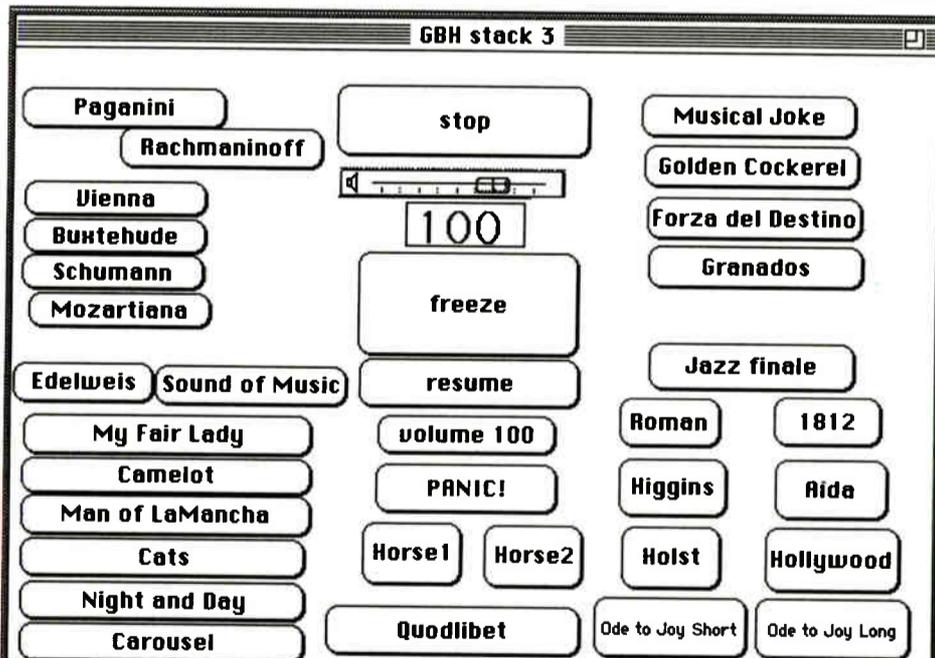
As it turned out, the wait was worth it. With technology that was vaporware 10 years ago, Lehrman was able to pull off a call-in quiz show that was as spontaneous with its sound effects and music segments as callers were with their responses.

The program's format consists of show hosts posing music-related questions to



According to Paul D. Lehrman, the musical mastermind behind the production, "What's the Score?" is one of the first productions to employ MIDI and interac-

callers. Questions range from: "Who lived longer, Mozart or Schubert?" to "Who wrote the lyrics to the Leonard Bernstein musical 'West Side Story'?" (Answers:



This Hypercard stack contains all of the cues for "What's the Score" show #3. The freeze button sets the playback tempo to 1% of normal, while "resume" button returns it to normal tempo.

tive computing for on-air radio broadcasting.

Dream radio

Lehrman is a veteran music composer, a board member of the MIDI Manufacturers Association, scores industrial and educational films and works extensively

Mozart and Stephen Sondheim.)

Lehrman's task was to accompany the questions and answers with appropriate orchestrated fragments of music. He also added the sound effects at impromptu times during the show and composed musical puzzles of various themes from

continued on page 31 ►

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January 1, 1992

The President
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Dear Sir:

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As we move into 1992, I assure you that I would not consider buying any other product than Collins or Continental. YOU BACK UP WHAT YOU SELL AND I CAN NEVER FORGET THAT!

I hope you will suggest that others call me. I have nothing to gain by recommending CONTINENTAL. I recommend you only because you are REAL 24 hrs. a day. Your response time has always been a LIFESAVER.

Thanks for Steve, Dave, and Ken who really care about me and my old 835G.

Yours Truly,
Bill
 William H. "Bill" Payne
 President & Chief Engineer
 Senior Broadcast Engineer

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January 9, 1992

Mr. Steve Claterbaugh,
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 75227

Dear Steve:

It is always nice to communicate with Continental and particularly when it is to say "Thank you!"

Christmas Day proved to be an eventful day for Sound Broadcasting when our client, CIFX, was suddenly in dire need of an exciter loading resistor. As you are aware this is a part that NEVER needs replacing and a spare was nowhere to be found in the immediate area. A phone call to your parts department put me in touch with Bill Cooke, who performed beyond the call of duty. Within hours he had the right component on a plane to us. A little fancy footwork with the customs office and we were back in business before Boxing Day was over.

I would appreciate you passing my personal thanks on to Bill, and of course a very Happy New Year to you and everyone at Continental.

Best regards,
Sheila R. East
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How to Tell If That AM Is a Good Buy

► continued from page 19

that there are existing overlaps or that the "ratchet clause" in the new AM rules has come into play. Whatever the case, it is best to let a reputable and qualified consulting engineer look at the situation before you decide that nighttime improvement is or isn't possible.

Next, using the M3 soil conductivity map from the FCC rules (or the M3 database available on-line from vendors mentioned above), get the conductivities and distances to the breaks for each of the 36 or 72 radials. Work the equivalent distance procedure on each radial, and using the IDF values obtained for the directional an-

tenna, compute the distance to the interference-free contour.

When I study a nighttime facility, I always compute the distance to the 50 percent interference-free contour as well. This contour will be 8 dB lower in value than the interference-free contour, so divide that figure by 2.512.

Showing the 50 percent interference-free contour as well as the 90 percent interference-free contour will give your boss a basis of comparison for the nighttime coverage area. It is likely that the entire 50 percent interference-free coverage area will be listenable much of the time.

Plot these contours on a map of suitable

scale. I like to use highway-type maps, because they are a medium that almost everyone can understand and interpret. I would caution you, however, to be aware of copyright laws. I have heard of such maps winding up in circulation as "sales maps," with the publisher of the map understandably upset that his product has been copied hundreds of times without his permission.

A hard day's night

Believe it or not, the nighttime allocation picture is usually easier to examine than the daytime. The reason is that everything can be easily calculated. Daytime, groundwave signals are what is used, and conductivities must be taken into consideration.

Start by finding the existing daytime coverage of the station you are studying. Find the conductivities and distances to the breaks on each of the 36 or 72 radials and work the equivalent distance procedure.

If the day site is the same as the night, you will already have done this. Compute the distance to the 0.5 mV/m contour on each radial. This is the daytime "interference-free" coverage, provided that there are no overlaps.

I like to show the 2.0 mV/m daytime contour on all the studies that I run in addition to the 0.5 mV/m contour. There is just enough signal at 2 mV/m to be mostly noise-free in an urban environment, and thus it is a good yardstick with which to measure daytime coverage.

Compute the distance to the 2 mV/m contour on each radial, and plot it along with the 0.5 mV/m contour on the map. Label everything, giving your map a professional, workman-like appearance.

If the daytime coverage is marginal, or if you think a power increase might be desirable, run a daytime allocation study (see *Feed Line*, RW March 11, 1992). As with the nighttime study, compare the existing IDF on each radial to the MPR to see if an increase is possible.

If the existing standard pattern IDF exceeds the MPR on any of the radials, an overlap exists. This in itself will not preclude improvement in a station's daytime facility, as long as there are not overlaps on all sides. The FCC rules permit existing overlaps to remain as long as the area of the overlap is not increased. In short, you can move the overlap area around, but you cannot increase its size.

The best thing to do is let a consulting engineer look the daytime allocation situation over. He can tell whether an increase is practical or not. Many times, increases are possible but would be too costly to implement. You certainly don't want your boss to buy a station based on the premise that he can up the power or improve the coverage when to do so would cost more than the station is worth!

Critical hours

Critical hours are the two hours after local sunrise and the two hours before local sunset, in which skywave fields at a distance begin to develop. There are a handful of stations around the country that have critical hours protection requirements that are lower than the normal daytime protection requirements toward co- and adjacent-channel stations.

In either of these cases, a power reduction or a different directional pattern is required during critical hours. This sometimes seriously reduces the coverage of a station for four hours every day, thus ef-

fectively shortening its broadcast day.

The 0.1 mV/m groundwave contour of each Class A station is entitled to interference protection from daytime skywave contours of co-channel Class B and D stations. To find the critical hours protection requirements, first calculate and plot the Class A station's 0.1 mV/m contour. Then calculate the required protection using the procedure outlined in 73.187(b) of the FCC rules.

Antennas

One other very important thing to look at is the directional antenna, if any. Each pattern should be looked at separately.

There are several computer programs around that can be used to give you the operating characteristics of a given directional array. MININEC is one of them, but there are others that are considerably easier to use. In addition, the data services offer such programs, or your consulting engineer can run one for you.

A few of the things to look for in a directional array's operating characteristics are efficiency, root sum squared/root mean squared (RSS/RMS) ratio and driving point impedances and currents.

The efficiency is determined from the one-ohm-loss calculated theoretical RMS. This figure should be greater than the value specified in 73.189(b)(6) of the FCC rules.

For the purposes of your study, it is better to look at the two- or three-ohm-loss values as being more representative of what is likely to exist in the "real world." A directional array with a three-ohm-loss RMS of less than 85 percent of the standard pattern RMS can be considered to be marginal. Such an array is inefficient and you could have trouble meeting the minimum RMS requirements during future measurements.

For the RSS/RMS ratio, a good rule to follow is: under 1.5 is good; over 1.5 is bad. This figure gives an indication of the likely stability and ease of adjustment of the array.

Finally, the driving point impedances and currents tell us a lot about the array. Things to look for are high currents in some towers with very small currents in others and driving point resistances close to zero (either side).

A good rule of thumb is to avoid driving point resistance ± 5 ohms from zero. Negative driving point resistances are perfectly OK as long as they are more than five ohms negative.

Again, it is a good idea to get a consulting engineer to examine and offer an opinion on the station's directional antenna(s). The antenna system is often the most costly part of the station, and a high-maintenance DA that is narrowband and prone to drift can be a real drain on finances and the engineering staff.

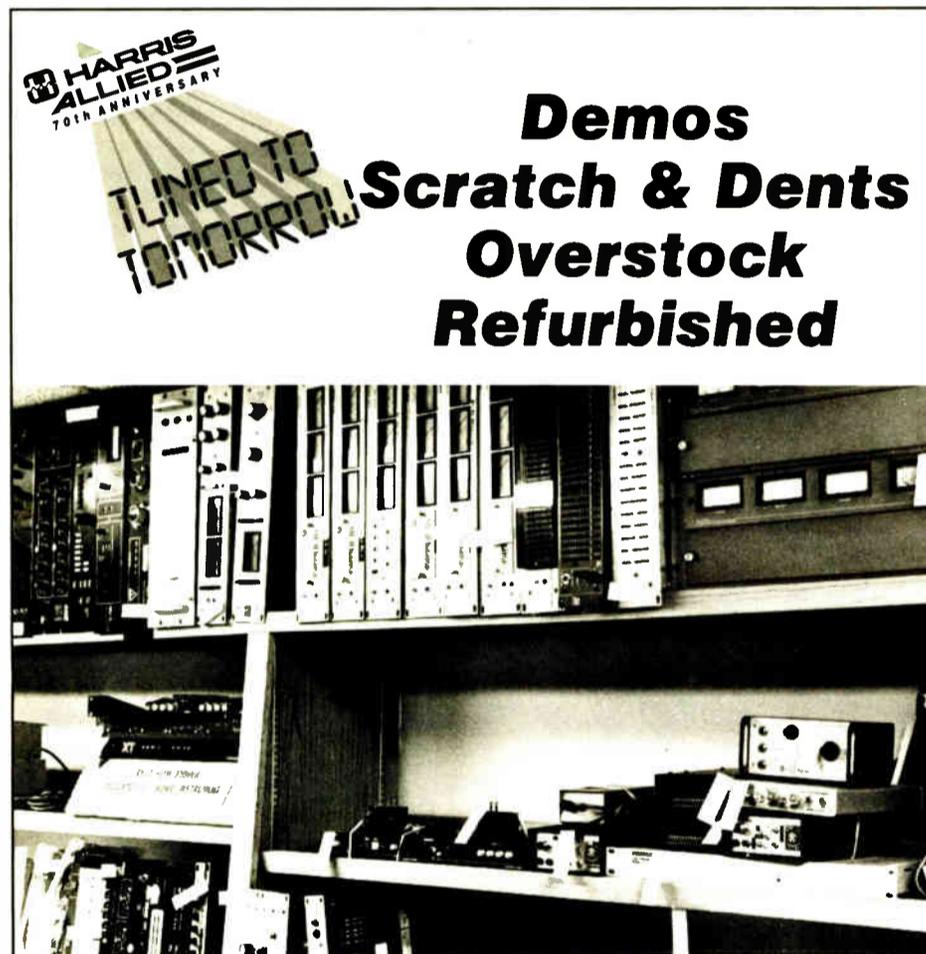
In the last two years, I have studied more than a hundred stations—most of them AM—from a buyer's perspective. These are the things that I looked for before any on-site inspections were made and certainly before any offers were tendered.

Many stations with hidden technical woes were weeded out up front, saving us countless dollars, hours, and frequent flier miles.

In the next *Feed Line*, we'll take a look at the things to look for when studying FM stations for possible purchase. In many ways, FMs are simpler and easier to study but, in many others, they are more difficult. Stay tuned.

□□□

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



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Q-TIPS

Tips for Coping with Election Fever

by John "Q" Shepler

ROCKFORD, Ill. Election fever has begun. Many stations will press their resources to the limit to sound top-rate during this exciting year. A little planning plus some elbow grease will assure successful election night coverage.

It's best for engineering and news people to get together some weeks before the election. Often, the news crew doesn't realize how easy it is to whip up extra mics, remote feeds, recorders, and interview setups. Easy, that is, if you're not trying to throw everything together on election eve.

There's really a lot you can do with limited resources. For instance, think in terms of having multiple remotes plus a studio crew. If you don't have a news staff that large, perhaps some of the air personalities can help out with interviews.

The bare necessities

Consider what equipment you really need. Many interviews can be taped. A standard cassette recorder works great as long as you feed it from a profes-

sional microphone. Any low impedance dynamic with a windscreen will do wonders compared to the tiny built-in mic. The rugged RE-15, EV 635A, and others will take a beating and provide a recorded sound almost as good as studio audio.

One of the most fun parts of election coverage is orchestrating a major election night broadcast.

Be sure not to skimp on inexpensive parts. Give everybody a new set of batteries and some extras. Build at least one spare mic cable for each interviewer. The best are made from regular mic cable with a female XLR connector on one end and a miniphone plug on the other. Don't forget that Pin 1 plus one of the other pins must be connected to the shield. Also try several layers of heat shrink tubing to protect that connection to the miniplug.

Another easy solution is to buy a pre-wired audio cable with a molded mini-plug. You hook up the XLR end.

On the key election nights you may want to go live from both parties' headquarters. You can do this with any combination of a standard telephone feed,

RPU transmitter, or cellular phone. You'll want an audio mixer at the broadcast desk with at least a couple of microphones, a line level connection to mix-in taped interviews, and perhaps a connection to the stage PA.

You can get a public-address feed by bridging one of the loudspeakers with a 600/600 transformer and feeding this to the mixer as line level. Pad it down for mic level.

Wireless microphones work well for wandering into crowded halls. Watch out for dead spots caused by reflections off metal or concrete walls. A diversity receiver can help this.

Use what you have

You'll need some way to get cues to and from the station. A second telephone is handy. Another method is to feed studio mic audio back down the remote line or over a two-way radio. This way the anchor can talk to the election remote off the air. Walkie-talkies may also have enough range close to the studio.

Over the air cues work well when pre-planned with a particular catch phrase. Everyone involved needs radio headphones or Walkman-type radios. The car radio will do for mobile reports.

continued on page 31 ▶

WORKBENCH

▶ continued from page 26

dents or radio club, contact Al Zang at 203-434-9190.

★★★

Plagued with erratic tape speed, or takeup/supply reel motor jerkiness on an MCI-JH-110? Before you replace the DC tachometers mounted under each reel mo-

ceive antenna, Clayton Creekmore, a contract engineer in California sends in a reminder to be sure to use black wire ties. The clear or white ties deteriorate when exposed to the sunlight, and will soon break off, meaning you'll have to climb up on the roof again!

□□□

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

...as the brushes wear down, an AC component becomes more apparent when viewed on a scope.

tor (at \$100-plus), purchase the DC tach replacement brush kit (for under \$25). These little tachometers are supposed to generate a DC signal as the motor turns, but as the brushes wear down, an AC component becomes more apparent when viewed on a scope.

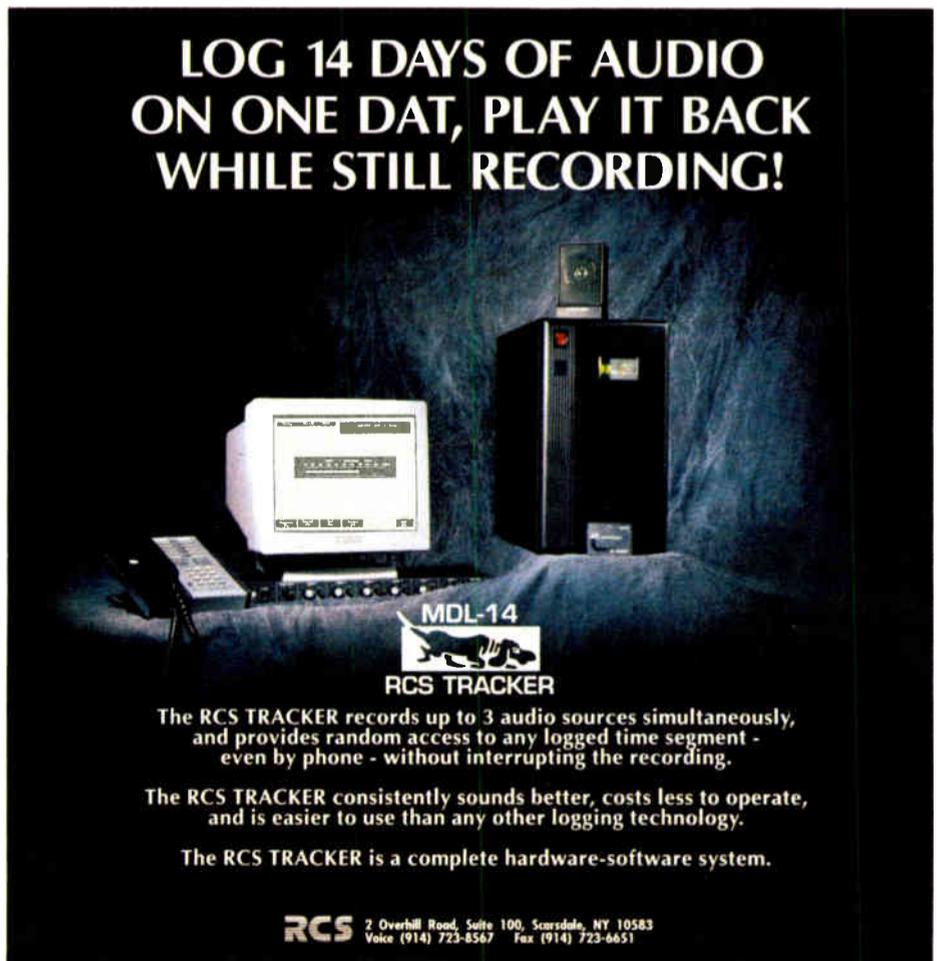
This AC drives the machine wild, causing no end of problems. If you have to maintain a lot of MCIs, contact Sony for a copy of the Modification Manual. This book contains every engineering change order and circuit modification concerning the JH-110 machines. There is a charge for the manual, but it's worth the money!

With remote season well underway, you may want to consider a P450VDG 450 MHz preamplifier from Advanced Receiver Research to help you in difficult receive situations. They have a complete line of RF preamps, and a catalog is free for the asking. Circle Reader Service 188 for your copy.

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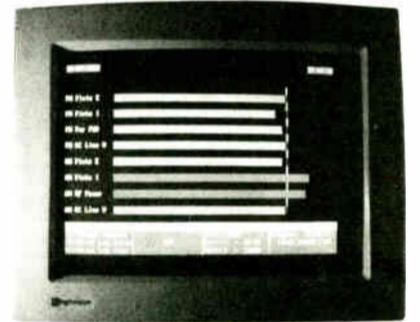
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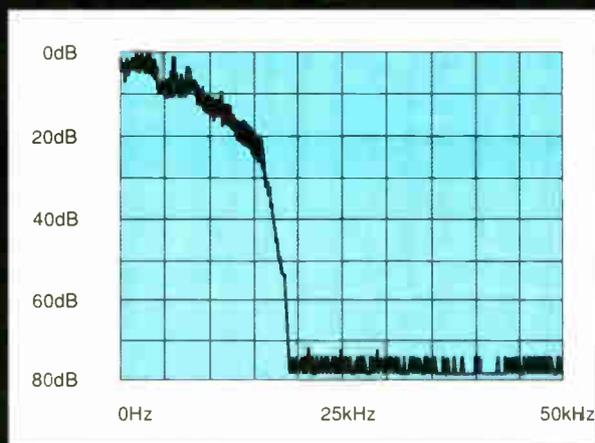
The 4000 provides transparent limiting with any source. Blind tests confirm that the sound of the Orban Transmission Limiter 4000 is virtually indistinguishable from the original source when driven as much as 15dB into limiting—even to trained listeners. Try it for yourself and hear what your facility can deliver when it is protected, not just restricted.

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Tips for Coping with Election Fever

► continued from page 29

Back at the station, set up the newsroom or production studio for interviews. Have a directional mic pointed at each person. If you run out of board pots, use an out-board mixer. No mixer? Wire two mic connectors in parallel to the same pot.

Provide each interview seat with headphones from air or board monitor. Guests are glad to wear them so they can respond to phone calls. Provide a volume control pot at each headphone location.

One of the most fun parts of election coverage is orchestrating a major election night broadcast. How much you can do depends on how many people you can round up to help plus your equipment inventory. Most stations can easily have a studio an-

chor with several guests plus telephone interviews plus a couple of remote sites.

Orchestrating it all

The news anchor at the station should be the boss. The other locations can be gathering candidates for interviews and recording for later broadcast. They go on the air when cued from the station. With everyone involved listening to an air feed, it isn't hard to get dialog going from both sides of town plus the studio. Done well, it sounds as good as anything the networks put out.

If you're lucky enough to have a major candidate passing through town there is extra stress involved. You'll have one chance to get the feed, so consider carrying along

two sets of equipment. Make sure your setup will work at the planned location. It's wise to have a local tape rolling just in case the phone line or RPU goes out.

You may be asked to provide feeds to other stations. Most stations have the ability to record from the phone line, but can you also feed the line? Your news studio and production studios should be set up to do this. It can be as simple as padding down the board output to 0 dBm maximum and switching this audio to drive a telco audio coupler.

If you're planning to host any press conferences, be sure to have line and mic level feeds available for other radio and TV sta-

tions. The standard way to do this is through a device called a *mult box*.

This is a suitcase device that takes line level audio and pads it down to a dozen or more microphone outputs with XLR connectors, and line-level feeds with quarter-inch phone jacks. Each output should be transformer- and preferably resistor-isolated from the others. That way, one station's malfunctioning or miswired equipment won't short out the feed for everybody.

Elections can be exhilarating if you're well prepared. If not, remember the universal law of election coverage: "The feed only cuts out when you interview the important candidates."

□□□

John Shepler is an engineering manager, writer, and longtime RW columnist. He can be reached at 5653 Weymouth Drive, Rockford, IL 61111.

MIDI Technology Brings a Radio Game Show to Life

► continued from page 27

famous tunes—which listeners were asked to solve during the following week's show.

Flexibility a must

System flexibility was critical to the quiz show's success. "We don't know what the people on the other end of the phone will do. We don't know if they will get the answer right, or struggle to get the answer right, so we have to keep things very flexible," said Lehrman.

Much of the system's flexibility Lehrman owes to a Kurzweil K2000 instrumental keyboard, which he played ad lib as required during the show. Lehrman's Macintosh computer, loaded with Apple's Hypercard software program, also helped with the spontaneous, on-line nature of the show.

The Macintosh system Lehrman designed for the task was laid out in sections representing major show categories (such as jazz and classical), with corresponding MIDI files of musical arrangements stored on hard drive and played back over MIDI through the Kurzweil.

MIDI files representative of an entire orchestra, including piano, guitar, wind, brass, string and percussion, were loaded onto a 44 megabyte (44MB) Microtech Syquest hard drive. To provide the necessary MIDI link between the keyboard and Mac computer, Lehrman interfaced the two through a Passport MIDI interface.

Sound effects

For congratulatory fanfare and other sound effects, Lehrman programmed the Kurzweil with as many effects as possible, which he could call up by tapping keys on the keyboard.

For many of the instrumental sound effects, such as drum rolls, sample files on hard drive supplied the Kurzweil with the needed sound (the keyboard also has floppy and internal memory for this purpose). For the more esoteric effects such as giggling and booing, Lehrman loaded the drive with audio snippets taken from WGBH-FM's CD sound effects library.

The sound effects were sampled at 44.1 kHz, monaural, taking up very little room on the hard drive even without bit rate reduction. The longest sound effect, according to Lehrman, was of an orchestra tuning up with a conductor making an entrance; it lasted 35 seconds and used

2.5MB of hard drive storage. All total, Lehrman used only 16MB of the 44MB available on the hard drive, a feat that he attributes mostly to MIDI.

"You can get a 30-second, fully-orchestrated waltz into about 10 kilobytes (10KB) of MIDI data. If you were to do that with strict audio data, it would take 5MB," informed Lehrman, stating that MIDI files—or the instruction set of musical arrangements—do not need the massive storage required of defined waveforms.

As of this writing, Lehrman is still waiting to find out if the pilot had successfully paved the way for regular broadcasts of "What's the Score?" But whether or not the quiz show does make the grade with funding, Lehrman was glad for the opportunity to be "back in radio, doing what I always wanted to do."

□□□

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

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Belar RFA-1 FM, RF; Russco preamps, many; Howe turntable preamps. E Hopseker, KBLF, POB 1490, Red Bluff CA 96080. 916-527-1490.

Harris/Gates 6169 bdcst stereo pre, \$55; Shure M-64, \$35. R Rushing, Rcdg Studio, 11710 Hoyt Ave, Tampa FL 33617. 813-988-0496.

Crown D150A pwr amp, \$250; DC300 pwr amp, \$350; Crest P-2501 amp, \$400. B Wilson, 502-789-1505.

Marantz 7T preamp, fair cond, \$125; Yamaha C3, new cond, \$150. J Parsons, 904-532-0192.

CLA-40A older, \$125. D Sorenson, Sorenson Bdcst, 604 N Kiwanis, Sioux Falls SD 57104. 605-334-1117.

Soundcraftsmen A5001 stereo 270 W @ 8 ohms, 385 W @ 4 ohms, \$500. B Keaton, 608-362-0086.

BTC B-300 300 W RF, broadband, solid state w/internal harmonic filter, 5-12 W drive needed, C Springer, KSEC, Box 890, Lamar CO 81052. 719-336-2206.

Marantz 8 McIntosh MC240 (2), \$1175 ea; MC40 (3), A116 (2), \$575 ea; MC2500, black, face sealed, \$3975; Krell Altair w/outboard ps, \$2750; Quicksilver MX-190, \$1975; Audio Rsrch D76A, \$1175/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Dyanco ST-120 (2) 60 W per chnl stereo pwr amps, gd cond, \$125 ea/BO. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

Ramko DA-6RS stereo dist, 2 inputs w/6 stereo/12 mono outputs, gd cond, \$135. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

New 250 W solid state amp, \$1800. Call for details. Bill Hoffman, 518-583-9490.

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

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Cetec JSLP2R 2-bay FM, tuned to 105.5 want, 1 1/4 coax conns & radomes, \$2800. M St John, WDLY, Box 4340, Sevierville TN 37864. 615-453-2845.

Andrews 465' of 4" air dielectric on spool, conn both ends; Andrews 1861 3 1/8"-1 5/8" reducer, mint; Cablewave, 160' of 1 5/8" air dielectric, conn one 1 end; Kreco SC-155AC VHF remote. C Frodsham, KYSV, E Hwy 24, Beloit KS 67420. 913-738-2206.

ERI 37CP6 6-bay FM tuned to 102.1 MHz w/deicers. J Church, WLUM, 2500 N Mayfair, Milwaukee WI 53226. 414-771-1021.

Gates/ERI CP239 3-bay w/deicers & twr brackets on chnl 240, will deliver close, \$1750. F Vobbe, 419-228-4199.

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INVITATION TO BID: Oklahoma State Univ offers for sale by sealed bid a 400' guyed tower, bdcst feedline, a 20'x12' concrete block bldg & 17 acres. Bids will be accepted for individual items or for all items total. For more information, contact Dan Schroeder, KOSU, 302 Paul Miller J/B Bldg, Stillwater OK 74078. 405-744-6352. Bid closes August 17, 1992 at 1:30p.m.

Kintronics 4-twr phasor; (4) ATUs, Gorman Redlich dig ant mon; (3) 300 Rohn 45 G twrs, 1 painted w/lights, all new; 1 RCA FI meter. R Meredith, 615-457-1380.

Rohde & Schwarz RBN 10 50-17 dummy load, 10000 W, air forced, cooled, \$400; (35) Cablewave ECC 158-50 1 5/8", \$400 ea. M Cournoyer, CHRD, 2070 St Georges, Drummondville, Quebec Canada J2C 5G6. 819-477-3077.

ERI 37CP8 hi-pwr, 8 bays tuned to 107.3, current mdl. K Reising, WRZQ, 825 Washington St, Columbus IN 47201. 812-378-1073.

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Shively 3-bay tuned to 99.5. T Yarbrough, WVIQ, POB 4409, Christianstad, St Croix US-VI 00822. 800-773-1180.

Antenna 7-8 bay tuned to 104.3. C Spencer, Radio Resources, 800-547-2346.

Guyed tower, 350-400'. C Spencer, Radio Resources, 800-547-2346.

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Elgin ESC 20721 phone coupler; Eventide H-3000B Harmonizer; Studio Tech AN-2 stereo simulator; Barcus Berry BBE 202R; Orban 111B reverb; CRL Dynafex DX2 noise reduction; dbx 942 Type II decoder cards. E Hopseker, KBLF, POB 1490, Red Bluff CA 96080. 916-527-1490.

JVC NR-20 (3) noise reduc units, \$250. D Curtis, Creative Sound, 2810 W 4th St, Appleton WI 54914. 414-733-2299.

Publison Infernal Machine 90 stereo in/out, stereo pitch shifting, dig delay, echo, .05 memory, excel cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

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PB2000 (2) & (1) OB3 boards for Arrakis SC consoles, never used, \$350 ea; Penny Giles 3210, 12 P+G slide ladders, new, \$720. F Konwinski, WSOY, 1100 E Pershing Rd, Decatur IL 62524. 217-877-5371.

UREI 545 (2) para EQs w/HP & LP filters, \$275 ea/BO; UREI 556 stereo HP/LP filter unit, rack mount, \$325/BO; (2) AMS DM-DDS/A, stereo 16-bit dig delay units, variable delay to 1.365 seconds, super quality, \$1900 ea/BO; Technics Pro SH-9010 pro stereo para EQ, very gd cond, \$250/BO; Sontec DRC-202 dynamic range controller, stereo comp/lim, \$1000; Sontec MEP-250A stereo para EQ, \$1100; Rantesteele/TAM HFL-1 stereo high freq lim ideal for de-essing & disk mastering, \$475/BO, all excel cond. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

API 312 (7), \$100 ea; (8) UA 1008 tube (8), \$165 ea; (10) UA 1108, \$100 ea; (12) UA 508 EQ, \$65 ea; (10) Neumann PV-176 preamps, \$100 ea; B&B EQF, 2 EQs, \$275 ea/\$500 pr; (2) API 553 EQs, \$165 ea; (3) API 559 graphic EQs, \$225 ea; (2) API 562 parametric EQs, \$200 ea. M Linett, 818-244-1909.

dbx 224X Type II encode/decode stereo noise reduc, -10 unbalance in/out, rack mount, for 7 1/2 ips, analog tape, new, \$115. Brian, 313-584-9201.

Studio Sound 305 vintage passive filter sets, matched pr, consec #, rackmount, \$175 ea/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

olby A301 stereo Dolby A noise reduc unit w/autochangeover panel, R/P, gd cond, \$275/BO; (2) Dolby 361 Type A R/P noise reduc units, gd cond, \$400 ea/BO; (1 pr) dbx K9-22 Type I noise reduc cards for Dolby 360 series card frames, excel cond, \$400/BO; dbx 167 rack mount Type I 4-chnl R/P noise reduc unit, gd cond, \$300/BO; Soundcraftsmen SG-2205-600 rack mount prof stereo graphic EQ, 10 bands per chnl, gd cond, \$150/BO; Sony Digital DAQ-1000 CD mastering PQ code editor w/DAE-3000 editor interface, excel cond, \$15000. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

Want to Buy

Crown EQ2 dbx 10/20, 20/20, 14/10; Yamaha REV5, REV7; Burwen TNE7000. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Orban/Eventide mic proc/spec effects prc, send descrip & asking price. T Heathwood, Heritage Radio, POB 16, Boston MA 02167. 617-969-9966.

Fairchild 600 conac or 602 Conex high freq limiters, J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

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IGM Basic A; SMC 350 Carousel; SMC 352 RSB Carousel; stereo instacart; mono instacart; SMC Mini-Pro controller. E Hopseker, KBLF, POB 1490, Red Bluff CA 96080. 916-527-1490.

SMC 250RS (3) cart Carousels w/front panels, mounting hdwe & documentation, parts each \$100/3 for \$300+s/h. J Schreck, 315-539-4240.

Format Sentry FS12C controller, excel cond; IGM Go-Carts, factory recond, \$4000 all. H Royse, WCLU, Box 1620, Glasgow KY 42142. 502-651-9149.

Schafer 903 encode center, 1 & 2 cards, Ifton computer, Extel printer, \$250; SMC 350 RS 24-cart Carousel, \$200; SMC 250 Carousel, extra cards, gd for parts, \$100. D Rose, KAAA, 2534 Huaiapai Mtn Rd, Kingman AZ 86401. 602-753-2537.

SMC 250 (3) 24-tray mono Carousel; Schafer 903 controller w/books & cables. D Bradsher, WRXO, POB 1176, Roxboro NC 27513. 919-599-0266.

Cetec 7000 & 5 Audiofiles w/Hazeltine kybd/screen, BO. A Harle, KTIJ, POB 640, Pendleton OR 97801. 503-278-2500.

MEI 100MP 48-chnl, 8 source sequencer w/custom wall cab w/4 Ampex AG445-B machines, preamps & tone detectors. H Kneller, WKII, 3151 Cooper St #56, Purta Gorge FL 33950. 813-639-1112.

Instacart (2) 48-hole w/Sentry firing systems & IBM-PC w/software; Otari R-R. 503-774-0459.

Cetec 7000 (4) ITC 7-70 R-R PBs, (2) 24-tray Carousels, (1) 48-tray Audiofile, (2) terminals batt backup, \$11000/BO. D Greene, WGMM, 3037 Palmer Rd, Big Flats NY 14814. 716-433-5944.

MEI 100-MP stereo live assist controller, 9 sources, remote, 25 Hz filter & sensor, new, \$2500. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

IGM 8513/9980 insvc system, (2) 48-tray mono instacarts, (2) ITC 770 w/AM, under \$10K. W Grabbe, KRSL, Box 666, Russell KS 67665.

SMC 250 (4) w/RS random selectors & manuals, \$750+s/h. G Walden, KHRP, POB 360, Hood River, OR 97031. 503-386-1511.

Harris 9002 (4) ARS 1000; (3) Carousels; (1) triple cart, (2) single carts, printer, live & net cards, control terminal, \$17000. B Torstenson, Fairchild Bdcst, 4200 W Main St, Kalamazoo MI 49006. 616-385-2757.

Want to Buy

Bdct Products AS-10S book for automation brain. M McCutchan, KERI, Box 82225, Bakersfield CA 93380. 805-324-6777.

TM Century Auto Seque gd cond, 21 system. J Amburn, KTUE, POB 1260, Tulia TX 79088. 806-995-3531.

MEI Digsound automation system. C Spencer, Radio Resources, 800-547-2346.

25Hz tone decoder. C Spencer, Radio Resources, 800-547-2346.

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CEI 287 (2) studio, new plumbicons, w/(2) CCU cables, large VF, (2) Verecon 10:1 lens. C Potoni, 215-945-3990.

Hitachi FP-1011BU & Ampex CC500-03 3-tube w/CCUs, cables, lens & RCA dual 9" rack mount monitors TC-1209-04, \$450; (2) Norelco PC-70 BDKS studio, 2 extra lenses, \$450. J Krepol, JVK Studios, 7 Dustin Dr, Claymont DE 19703. 302-798-4052.

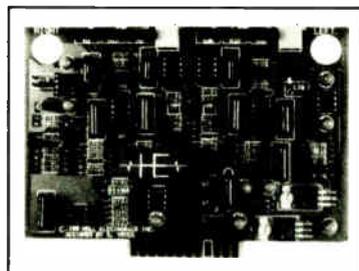
CART MACHINES

Want to Sell

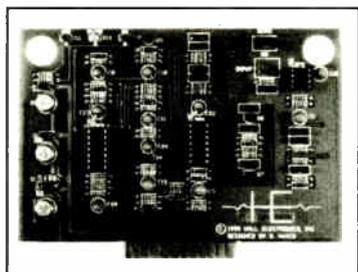
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Fidelipac CTR-12 (4) stereo players, excel cond, \$1100 ea. R Frisch, CERM Bdcst, 6300 Varlei Ave #D, Woodland Hills CA 91367. 818-867-4246.

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RCA RT-7D w/BA-7B rec elecs, \$100. D Davis, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

Gates ATC Criterion I (5) mono PB units, rack mount, some 3-tone, (1) rec amp avail, BO; UMC/Beaucart 110 (3), 3 tone mono, gd cond, BO. H Kneller, WKII, 3151 Cooper St #56, Purta Gorde FL 33950. 813-639-1112.

ITC SP (2), R/P, 1 set up w/3 heads for use as tape delay w/3 tones, \$250 ea; (4) ITC 3D triple play, mono w/tones, \$250 ea. S Karwan, KPSI, 2100 E Tahquitz Way, Palm Springs WA 92262. 619-325-2582.

ITC 3D mono w/record amp, 3 tones, excel cond, \$1500/BO; ITC R/P, mono, 3 tones, excel cond, \$1000; (4) RCA, \$250 ea, (2) rec amps, \$100 ea. R Mayhugh, KLOA, 731 N Balsam St, Ridgecrest CA 93555. 619-375-8888.

BE 5300C tripledeck, stereo, PB, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

ITC Delta stereo play, new, \$1450. Dennis/Michelle, Bext, 739 Fifth Ave, San Diego CA 92101. 619-239-8462.

ITC SP (2) stereo, later vintage, 3 cue tones, recently recapped, well maintained in VGC, new head & spare output board, \$1100. P Hess, WPPJ, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

Pacific Recorders (6) stereo-maxx, mint cond w/manuals, in rack mountable prs w/brackets, \$1600 pr/\$4500 3 prs. K Rosato, Sound Bdcg, 303 Webster Ave, New Rochelle NY 10801. 516-696-1172.

ITC SP (2) & (1) RP, stereo, 3-tone w/spare, new heads, accessories, gd cond, \$2000. P McManus, McManus Ent, 4011 Orchard Ave, San Diego CA 92107. 619-223-1730.

Tapecaster Type Stereo PB only w/custom elect, gd cond, \$225/BO; (1) Lot Bdcg Alignment tapes & head alignment jigs, gd cond, \$150/BO. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

Spotmaster 505 mono, gd cond, new black paint, lubed, aligned & recond, \$200. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Want to Buy

Spotmaster 400 series parts & motors. B Hoisington, FAX, 904-729-2744.

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RCA RT-21B (3), fair cond, \$200/BO; (6) Revox A77, 4 work, 2 need rbl/parts, \$1500 all. R Mayhugh, KLOA, 731 N Balsam St, Ridgecrest CA 93555. 619-375-8888.

ITC 750s. E Hopseker, KBLF, POB 1490, Red Bluff CA 96080. 916-527-1490.

Ampex 602 pro old in case, gd cond. L Wise, KNEO, POB 845, Neosho MO 64850. 417-451-5636.

Panasonic SV-3500 (2), new, DAT w/wire remote control, rack mount, balanced in & out, \$1000 ea. S Karwan, KPSI, 2100 E Tahquitz Way, Palm Springs CA 92262. 619-325-2582.

Ampex AG-440B 1" 8-trk, multi-trk in roll around console, gd cond, BO; Otari Mark II-IV 1/2" 4-trk, multi-trk, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

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ITC 750 P/B only, \$100 ea. S Karwan, KPSI, 2100 E Tahquitz Way, Palm Springs CA 92262. 619-325-2582.

TEAC 3340S 1/4-10 1/2" R-R 7.5-15 ips, 4-trk w/simul-sync, very gd cond w/manual, \$550/BO; TEAC 80-8 1/2", 8-trk, multi-trk rec, 15 ips, 1 chnl not working, \$700. B Miller, Grapevine, 250 N Cedar St, Imlay City MI 48444. 313-724-2011.

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Ampex 351 w/roll around cab, full-trk mono, tube elects w/manual. C Kimbrough, WRXO, POB 1176, Roxboro NC 27513. 919-599-0266.

Panasonic SV-255 port DAT recorder, pro mdl, \$1100; Technics SV-DA10 DAT recorder, \$500. G Kluger, 305-379-8391.

Ampex ATR 800 2-trk, parts only, BO. D Gaydos, NYU, 721 Broadway 11th Flr, NY NY 10003. 212-998-1665.

Pioneer RT701 w/3 new heads, like new, \$300; TEAC A3340SX 4-chnl, 4-trk, new cond, \$800; TEC A315, tube-type, gd shape, \$250; Ampex ATR 700, bdc type, gd cond, \$800; Akai GX77, gd shape, \$250. J Parsons, 904-532-0192.

Tascam 42 1/2-trk w/10 1/2" reels, 15 ips w/remote, perf cond, \$1000. K McCaleb, A/IO Video, 55 Elm St, Staten Island NY 10310. 718-720-0896.

Ampex ATR 800 2-trk for parts, BO. D Gaydos, NYU, 721 Broadway, NY NY 10003. 212-998-1665.

Tascam Porta One Ministudio 4-trk w/built in dbx noise reduc, excel cond, \$300. M Miller, Miller Audio Prods, Rt 3 Box 188A, Ironton OH 46536. 614-533-0636.

Studer/ReVox C-270 2-trk, excel cond, \$2875/BO/trade; HS77 MK IV full-trk mono, 10 hrs use, \$875/BO/trade; portable case for A77 w/mn spkrs & pwr amps, excel cond, \$375. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Scully 280 motors, cards; 8-trk 1" R/P combo head & erase head to match for Scully 100; Tascam Duplicators T-2640, 8 to 1 spd, 3 slaves, cass to cass, expandable. R Robinson, 203-269-4465.

Otari Mdl MX 7308 1" 8-trk, 15/30 ips, low hrs, excel cond w/remote, \$3900; Ampex 350/440 motors & parts, \$150 & under. L Wagner, Ardning Radio, POB 1788, Orlando FL 32802. 407-299-1299.

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Sony APR-5000 2-trk, roll-around console, gd cond, 7.5/15/30 ips, \$1700. T Price, Docci Corp, 1140 N LaBrea, Hollywood CA 90038. 213-462-4966.

Technics RS1500 2 trk; Sony/MCI JH110C on roll around metal cabinet, both excel cond. J Gelo, 813-642-6899.

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

Scully 100-16 w/8-trk heads, \$2900. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Otari MX-70 16-trk 1", mint cond, \$10,500. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Want to Buy

Tascam/TEAC solid state, 4-chnl, send descrip & asking price. T Heathwood, Heritage Video, POB 16, Boston MA 02167. 617-969-9966.

Studer/ReVox B215. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

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

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Marantz PMD-201 or 221 cassette deck. C Spencer, Radio Resouuces, 800-547-2346.

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Want to Buy

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RCA 76-C 1948 vintage 6-chnl bdc, \$500. L Wise, KNEO, POB 845, Neosho MO 64850. 417-451-5636.

Ramko DC3810S. E Hopseker, KBLF, POB 1490, Red Bluff CA 96080. 916-527-1490.

Collins Rock 10 10-chnl, similar to AC-10, remote start panel, \$3500; (2) RCA dual chnl, 5-pot, 15-input wextra mods, solid state, great cond, \$400 ea/BO. R Mayhugh, KLOA, 731 N Balsam St, Ridgecrest CA 93555. 619-375-8888.

Gates 31-A, mint, \$400. D Parsons, KLUH, POB 1313, Poplar Bluff MO 63901. 314-666-1663.

Audiotronics 110 A-4 10-input, \$1000. S Karwan, KPSI, 2100 E Tahquitz Way, Palm Springs CA 92262. 619-325-2582.

Neotek Series I 16x4x2 wpatch bay, \$3500. D Gaydos, NYU, 721 Broadway 11th Flr, NY NY 10003. 212-998-1665.

Ramko 5C-5M 6-chnl control board, solid state, mono, \$300. P Slatton, WBTC, POB 418, Sheffield AL 35610. 205-361-6800.

Ramko DC8MS 8-chnl, 18-input stereo, excel cond w/manuals, \$2500. R Trumbo, 800-397-4146.

Russco 505 mono, \$500+sh; BE 4M150 mono w/XLR conns, \$600+s/h. B Glenn, KOTY, 830 N Columbia Cir Blvd, Kennewick WA 99338. 509-783-0783.

Tascam 5-A 8 in, 4 out, like new, like new, \$800. D Curtis, Creative Sound, 2810 W 4th St, Appleton WI 54914. 414-733-2299.

Broadcast Audio System 16 series IV, stereo, w/most access, 18 mos old, excel cond, \$9000/BO. R Mayhugh, KLOA, 731 N Balsam St, Ridgecrest CA 93555. 619-375-8888.

Neotek Series I 16x4x2 wpatch bay, \$3500. D Gaydos, NYU, 721 Broadway, NY NY 10003. 212-998-1665.

Shure FP-42 4-chnl stereo, used twice, \$500. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Opamp Labs 2008-RS 20-input, 8 subs+stereo mix out, gd prod bd, \$2500. L Wagner, Ardning Radio, POB 1788, Orlando FL 32802. 407-299-1299.

Classic British Helios 24/16/24, c.1970s. many updates/mods w/doc, discrete mic preamps, (9) separate ps w/wood rack cab, mahogany desk, poor mans Neve, \$9500/BO/trade; Snake, 16 phantom-pwr inputs wext ps, 250' Belden 19-pr cable/mil conns/ss strain reliefs, 10' Neumann XLR snake mates w/box or Belden snake, top qual, excel cond, \$750/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Kelsey 24 24x8x4x2 prod mixer w/talkback, (2) effx send & rcvs, (4) stereo submixers, Anvil case, perf cond w/manual, \$2200. K McCaleb, A/IO Video, 55 Elm St, Staten Island NY 10310. 718-720-0896.

Altec 1220 10-chnl, mixing, \$350. S Russell, 616-782-9258.

Gates Gateway II mono, gd cond, many spare mods, together/separate. K Kenzie, KSLQ, 13 E 11th, Washington MO 63090. 314-239-0493.

TEAC 2A new cond, \$150; Sony MX16, 8 in, 4 out, \$200; (3) Altec 1567A, gd shape, \$100 ea; Pyramid PR8800, 8 in, 2 out, echo, new, \$400. J Parsons, 904-532-0192.

MCI 428 28x24, 336 pt patchbay, prod desk, \$7500. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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Want to Sell

Klipsch Lascalas horns in road cases, will handle 300 W per chnl, excel cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

Multivox Strings 'n' Grass keyboard, excel cond, \$85. B Miller, Grapevine, 250 N Cedar St, Imlay City MI 48444. 313-724-2011.

Century D-70 (2), \$250 both. D Curtis, Creative Sound, 2810 W 4th St, Appleton WI 54914. 414-733-2299.

Whirlwind 24-chnlx3 send snake, \$450; Altec 12" spkrs, \$75 ea; Rane RE27 EQ, analyzer, \$450. B Wilson, 502-789-1505.

Roland TR-909 studio drum machine, excel cond w/manual, \$250. B Miller, Grapevine, 250 N Cedar St, Imlay City MI 48444. 313-724-2011.

Community CSX 52 pair of 3-way sound reinforcement/PB loudspkrs w/15" woofer, 6 1/2" mid & piezo tweeter, 500 W, carpeted w/handles, \$700; Crown Micro-Tech 1200, 2-rack space stereo pwr amp, 320 wch 8 ohms, 495 wch 1 4 ohms, 1315 w/mono 4 ohms, new w/warranty, \$700. B Fisher, KPOK, Box 829, Bowman ND 58623. 701-523-3683.

Digitech IPS-33 Smartshift MIDI controllable intelligent pitch shifter & harmonizer, works great, \$350; Peavey PEP 4530 Prog Effects Proc w/MIDI, mint cond, \$200; Roland Jupiter 6 synthesizer w/MIDI, mint cond, \$700. M Miller, Miller Audio Prods, Rt 3 Box 188A, Ironton OH 45638. 614-533-0636.

Mastering Lab 604/5 1 pr spkr crossover units, very gd cond, \$300/BO; UREI 521 stereo elect crossover unit, rack mount, gd cond, \$150/BO. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

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

FINANCIAL SERVICES

Want to Sell

EQUIPMENT Financing, Lease Purchase Option. Need equipment for your radio, television or cable operation? New or Used. No down payment. Carpenter & Associates, Voice 504-764-6610 Fax 504-764-7170.

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LIMITERS

Want to Sell

Moseley TGR340; UREI BL-040; Pacific Modulimeter & Multilimeter S. E Hopseker, KBLF, POB 1490, Red Bluff CA 96080. 916-527-1490.

UREI 1176LN, \$100. J Morgan, 401-433-1000.

Orban 8100A1 current mdl Optimod, like new, \$3000. Dick, 512-333-0050.

CBS Labs 411 FM stereo Volumax modified for flat audio response, clean, \$150. H Kneller, WKII, 3151 Cooper St #56, Purta Gorde FL 33950. 813-639-1112.

Harris Solid State AM & Gates StaLevel AGC, \$200/BO. R Mayhugh, KLOA, 731 N Balsam St, Ridgecrest CA 93555. 619-375-8888.

Loft 410 2-chnl comp/lim/gate, \$225. R Robinson, 203-269-4465.

Collins 26U-1, \$50. D Davis, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

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LIMITERS . . . WTS

CBS 4110 FM Volumax; CBS 4450A Audimax; Inovonics Map II Processor. E Hopsker, KBLF, POB 1490, Red Bluff CA 96080. 916-527-1490.

DAP 310 new card, extra meters, spare cards, missing top; Gates Solid Statesman AGC, gd cond. K Kenzie, KSLQ, 13 E 11th, Washington MO 63090. 314-239-0493.

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

CBS Labs 411 (2) stereo Volumax, gd cond, \$200 ea/BO. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

Loft 410 2-chnl comp/lim/gate, \$225. R Robinson, 203-269-4465.

Harris/Gates M-6543 Solid Statesman FM w/manual, \$125. T Rosen, KBCC, 1129 Aca-cia, Bakersfield CA 93305. 805-871-6094.

CBS #400 solid state, excel cond, BO. T Heathwood, Heritage Radio, POB 16, Boston MA 02167. 617-969-9966.

UREI BL-40 EC w/manual, \$185; Neve 33314A w/meters & pwr sply, \$2600. M Linett, 818-244-1909.

Want to Buy

UREI LA3 & LA4 & dbx 165, pairs only. Dave, 212-956-0967.

Orban Optimod 9000 manual. P Hess, WPPJ, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

Drawmer 1960 comp w/mic preamps. C Spencer, Radio Resources, 800-547-2346.

Orban 422A mono comp/limiter. C Spencer, Radio Resources, 800-547-2346.

MICROPHONES

Want to Sell

Shure SM-81 condenser, \$350 pair; Shure SM-7, \$240; Sennheiser K2U w/cardiod capsule, condenser, \$300 pair. G Kluger, 305-379-8391.

AKG The Tube very gd cond, capsule, pwr sply, cable & holder, \$1100; John Hardy M1 preamp w/LED display & Jensen xfomer, \$1100. P Trembley, Downtown Sound, 23715 Via Rosa Linda, Valencia CA 91355. 805-254-5213.

Sony ECM 21 (7), \$100 ea; (7) ECM-22, \$150 ea; (2) C-22, \$150 ea; (6) ECM-33, new, \$200 ea; Fostex M55R8, new, \$300; (2) Peerless MB-520 w/pwr sply, \$500 pr w/sply; (5) AKG D2000E, new, \$125 ea. J Diamond, Blue Diamond, Box 102C Chubbick Rd RD 1, Canonsburg PA 15317. 412-746-3455.

AKG BX-10 reverb w/19" mount, like new, \$750; Sony ECM-50 condenser, new, \$195; Sycron S-10 for pipe organ only, \$300; EV 636 & 664 dynamic, \$35 ea. D Curtis, Creative Sound, 2810 W 4th St, Appleton WI 54914. 414-733-2299.

RCA 77DXs/44BXs ribbon, chrome/TV grey, gd cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

AKG D224E (2), dual transducer, mint cond, \$800. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Telefunken/Schoeps CM61 tube, rare, uses std 6AU6 plu-in tube, orig ps, new cable, mint cond, \$2475; CR-176 large diaphragm tube, new, \$1250. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

RCA BK-5A ribbon mic w/windscreen, shock mount, \$350/BO; RCA 74B bi-direc ribbon, \$150/BO; AKG D-25 vintage ribbon in case, \$350/BO; Sony C-535P uni-direc condenser, used 5 hrs, \$325/BO, all excel cond. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

EV RE-20 w/cord, \$275. S Russell, 616-782-9258.

RCA PB90 A1 late 30's, sim to 44-A in perf & appearance, different stand mounting, gd cond, recond, \$500; RCA VAIR Cusic poly direc ribbon, brown gloss finish, MI-6204-C, gd cond, \$180. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Desk mics (hiZ), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books #8 & #6; RCA tube manual; Sony head demagnetizer (new); jack fernal connectors; EV 502 transformer primary/secondary. Mr. Oliver, 212-874-7660/0274. Call afternoons till 10PM.

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

Want to Buy

AKG C24. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Neumann M-49 or U-47 in good condition. Willing to pay top dollars for right mic. Contact Ken Gold 403-264-0107.

MISCELLANEOUS

Want to Sell

UTC LS-33 20 W line to line xfomers, \$120 pair. R Robinson, 203-269-4465.

Atlas MS-25-C (2) stands, \$110; 300' mic cable w/XLR conn, \$75. D Curtis, Creative Sound, 2810 W 4th St, Appleton WI 54914. 414-733-2299.

Rack, 6', black, \$140. J Morgan, 401-433-1000.

AM864U Army 1954 peak limiting amp, mint cond, never used w/manual, \$50+s/h. J Schreck, 315-539-4240.

Teletypes: 15RO, 15KSR, 28KSR, 33ASR, BO. D Davis, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

Tellabs 4008 line EQs, (2) w/housings, \$100 ea. A Garren, 503-231-7800.

Aphex Compellor 300 less than 2 yrs old, perf cond, \$800. R Reeves, Voice at Large, 5080 Bainbridge Ct, Lilburn GA 30247. 404-925-8868.

Shallco 820Q-2B3-10K (7) rotary faders, (2) 10K, (5) 600 ohm, all w/cue detents, excel cond, \$50 ea. P Hess, WPPJ, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

Lyrec TIM 1/4" 15 IPS tape timer, gd cond, \$60/BO. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

Duntech Sovereign 2001 loudspkr, light oak, gd cond, \$6000. 305-866-6048.

Antique mics, turntables, consoles, remote amps, mons, xmtrs, etc., list, \$2. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Lafayette LF-725 AM/FM/SCA stereo tuner, just tweaked, \$100; JVC 4DD-5 CD-4 quadrasonic disc demod, new, \$75. D Pulwers, Price Audio Prods, 310 N Howard #103, Alexandria VA 22304. 703-751-9346.

Avcom EBS-100 encoder/decoder w/Motorla DS-9660 tube type AM rcvr w/crystals for 1460, 1280, 1240 & 640, gd cond, \$350. D Heinen, KBBO, 2120 Riverside Rd, Yakima WA 98901. 509-248-1390.

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

Mag film/videotape degausser, (2) lge matching studio audio spkrs; alum Pole-cat set; mag film rec/PB amps; various TV shows; instruc manuals, etc. B Howard, Academy Film, 3918 W Estes, Lincolnwood IL 60645. 708-674-2122.

Western Electric 169D xfomers, \$35 pair; UTC LS-141 Hybrid xfomer, new, \$50; UTC LS-33 20 W line to line xfomers, \$120 pair; Cinema Engrg #64266 (Aerovox 170387) xfomers, \$30 pair. R Robinson, 203-269-4465.

Want to Buy

UTC LS-10 & 10X xfomers; Western Electro-acoustic Labs Cond, Mic PS#120A. R Robinson, 203-269-4465.

Xfer of wire recordings to cass tape. J Coney, Christian Financing, 601 Brad St SE, Gainesville GA 30501. 404-534-1000.

Dynair Dyna-Mod II TX-4B modulator instruction manual, chnls 6/7/8. J Powley, WILM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

JBL D130 15" spkrs; 8-10 EV 635A mics; Eventide 1745M dig delay lines; EV horns & drivers; Sentry IV. S Russell, 616-782-9258.

Rock music historian/ bdcter seeks Westwood One Radio Ntwk 1992 Memorial Day Pink Floyd radio show. R Strawn, 1900 SW 1st Ave, Fruitland ID 83619. 208-452-3149.

Fairchild 740/750, amps, limiters, 16" stereo tonearms & carts. Neumann/Westrex studio disc recorders, McIntosh hi-fi tube equip, 45/78 records. K Gutzka, Custom Rcdg, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

Altec 15095 47ss, 4588 B & plug ins. J Parsons, 904-532-0192.

Radio transformers by Chicago, UTC, Triad, Peerless, Freed, Sola, send list. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

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

MONITORS

Want to Sell

Mod Sciences Sidekick SCA-186; McMartin TMB-2000B SCA freq/mod monitor. J Michaels, WCOW, 113 W Oak St, Sparta WI 54656. 608-269-3307.

ACTION-GRAM

Equipment Listings

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

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Address: _____

City _____ State _____ Zip _____

Phone Number: _____

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| B. Commercial FM station | H. Consultant/ind engineer |
| C. Educational FM station | I. Mfg, distributor or dealer |
| E. Network/group owner | J. Other _____ |

II. Job Function

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

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

Price: _____

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

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

Broadcast Equipment Exchange

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

EMPLOYMENT

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

POSITIONS WANTED

Air talent w/7 yrs exper seeking pos country, AC, oldies, C/R CHR, west/northern states, responsible team plyr. J Edwards, 802-215-1039.

DJ/trainee/volunteer seeks pos in AZ/CA/CO/AL, any format except news, any shift. J Benjamin, 602-280-9070.

Recent college grad BS/EE, looking for techengrg opportunity, hardworking, motivated, computer lit, eager to be involved w/bdctg/prod, will relocate. Dan, 617-729-0828.

Engr w/22 yrs exper seeks FT perm pos w/stable, well managed organization. Engr, POB 17502, Colorado Springs CO 80935.

Major mkt CE w/mgmt skills & business savvy seeking CE pos at large mkt AM/FM w/solid group owner. 708-369-8483.

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

DJ/AMD in modern rock, looking for warmer climate, will bring 3000 alternative titles as well as exper w/multi-trk prod, computers & bdctg. Patrick, 815-338-0448.

HELP WANTED

CCA ELECTRONICS

Manufacturer of AM, FM & Shortwave Commercial Broadcast Transmitters is expanding and looking for Sales Engineers. Person must have good RF background, able to communicate effectively, and really love working in radio. A successful sales background is a plus. Must be willing to relocate to Metro Atlanta, Georgia area. Send resume to:

Steve McElroy, VP Sales
CCA Electronics
Box 426,
Fairburn, GA 30213

Engineer w/25 yrs major market experience in AM/FM radio. Seeking stable, long term employment. For resume write: Radio World, POB 1214, Falls Church VA 22041. Attn: 08-05-01RW.

Recent grad, Media Comms major, seeking radio pos, exper in commercial, college, on-air, prod & prog, will relocate. A Mills, 617-545-9036.

Exper personality seeks all AC formats/classic rock/oldies/gold/AOR & Country for possible drive shift, all offers considered. Jack, 919-671-1162.

28 yrs installed studios, xmtrs, built gadgets, prefer gospel station in Midwest/South, PA. 614-947-8675.

Exper AT seeks all ACs/oldies/classic rock/country/ AOR outlet in rated mkt, prefer drive shift. Jack, 414-242-4357.

Seeking responsible, challenging position w/company or association that can provide opportunities to match my qualifications & experience as Corporate/Association Exhibit Manager or Marketing Events Meeting Planner. With 20 yrs exper, my strongest assets are interpreting work situations, coordinating effectively w/all levels of mgmt, organizing & guiding projects to completion & providing team leadership. Will relocate if necessary. Robert Schwartz, 10934 Woodchuck Ct, Penn Valley CA 95946. 916-432-4722.

HELP WANTED

Sales Representative

PACIFIC RECORDERS & ENGINEERING CORP. is increasing sales staffing, providing a career opportunity for an experienced broadcast salesperson. This factory based person will be responsible for sales of our systems including audio consoles, cartridge machines, digital workstations, cabinetry and other associated products, to broadcast customers within a defined territory.

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- A solid technical background, permitting intelligent communications at both an engineering level and operational level, regarding our products and system design concepts.
- Broadcast engineering experience a plus.
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- Expand our existing market base by knowledgeable presentation of PR&E's capabilities.

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Please submit resumes, including references and salary history, to:

Ms. Patti Watson, Personnel Manager
Pacific Recorders & Engineering Corporation
2070 Las Palmas Drive
Carlsbad, California 92009

MONITORS . . . WTS

McMartin AMR1 FM, 1 each, K Kenzie, KSLQ, 13 E 11th, Washington MO 63090. 314-239-0493.

Want to Buy

AM mono mod meter tuned to 1570 kHz, working cond, Belar pref; EBS rcvr/one gener, pref TFT 7604/equiv, AM, working cond. R Miller, KUAI, POB 575, Lahaina HI 96767. 808-572-5534.

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

MOVIE PROD EQUIP

Want to Sell

B&H 16mm 202 opt/mag proj w/sync motor; M-H 816 hot splicer; Beaulieu R16E camera s/Ang 12-120 zoom lens; Bolex 3-D taking & proj lenses, glasses; screens, light stands, rewinds, sound readers, split/solid reels, etc. B Howard, Academy Film, 3918 W Estes, Lincolnwood IL 60645. 708-674-2122.

RECEIVERS & TRANSCEIVERS

Want to Sell

GE MVP (11) 4-chnl freq boards for MVP mobile, works on LB, HB & UHF, \$10. P Russell, Bowdoin Col, Sills Hall, Brunswick ME 04011.

Gorman Redlich CEB EBS encoder/decoder, excel cond w/manual. Dick, 512-333-0050.

AM STEREO RECEIVERS
Portable, Home/Studio, Auto
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708-513-1386

SCA decoder, high quality micro-miniature 67/92 kHz, prewired & ready to install, \$15. D Jackway, Background Music Eng, 5742 Fair oak, Springfield MO 65810. 417-881-8401.

Magnum/Dynalab FT-101 FM tuner for rack mounting, modified for super sensitivity w/Toko 110, 150 kHz ceramic filters. \$425 + \$8 s/h; GE 7-2885 portable Superaudio. \$58.50, can be special ordered w/SCS circ to hera your 67/92 kHz signal. \$90.50.

AFI AFI-55 67 kHz, new. \$75. D Sorenson, Sorenson Bdcg, 604 N Kiwanis, Sioux Falls SD 57104. 605-334-1117.

SCA RECEIVERS—ALL TYPES

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4411 Bee Ridge Rd. #319
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Tel: 813 378 5425 FAX: 3394

Want to Buy

1936 Zenith Stratosphere radio, top dollar, serious buyer. D Hauff, Box 16351, Minneapolis MN 55416.

ICOM R-71A mint cond. J Glass, 815-784-2179.

Marti CR 10/similar broadband, rack mounted rcvr w/dual freq capability, need 161.7 & 161.64. G Walden, KHR, POB 360, Hood River, OR 97031. 503-386-1511.

REMOTE & MICROWAVE EQUIP

Want to Sell

Comrex LX-T & LX-R extender system, BO. J Michaels, WCOW, 113 W Oak St, Sparta WI 54656. 608-269-3307.

Moseley MRC 10T 10-chnl remote, relays built-in, gd cond, \$400/BO. R Mayhugh, KLOA, 731 N Balsam St, Ridgecrest CA 93555. 619-375-8888.

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Silver Lake Audio
(516) 623-6114

Collins 212H-1 mixer, \$100. C Ratcliffe, WADE, 1 Radio St, Wadesboro NC 28170. 704-694-2175.

Rust RC 1000 w/manuals, \$100. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Gentner VRC-2000 complete VRC-2000 pkg w/relay interface & bait backup, \$3000. Dick, 512-333-0050.

Marti MT/MR 30 RPU xmtr & rcvr, old tube-type, hybrid, working when removed w/yagis, line, 150-170 band, BO. M Friend, WTJU, Box 711 Newcomb Hall St, Charlottesville VA 22904. 804-924-0885.

Moseley 303 (3), 1 nds work, spare f-nals/parts/xmtr/rcvr. K Kenzie, KSLQ, 13 E 11th, Washington MO 63090. 314-239-0493.

TFT 7610-C & R w/chnl expander & spare parts, \$1100. G McClintock, WNQM, 1300 WWCR Ave, Nashville TN 37218. 615-255-1300.

Marti dual STL8 on 949.875 & 950.125 w/combiner, gd cond, \$3000. D Heinen, KBBO, 2120 Riverside Rd, Yakima WA 98901. 509-248-1390.

RENTALS RENTALS RENTALS
COMREX
3-line extender
Frank Grundstein 215-668-6434
Audio/Video Consultants 215-642-0978

Want to Buy

Rust OC & 1C system. J Sassak, WXEE, Box 1340, Welch WV 24801. 304-436-4191.

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Everex Vision 16 board, 16-bit frame grabber, Targa clone w/Colorscheme software, new, \$900/BO. R Mayhugh, KLOA, 731 N Balsam St, Ridgecrest CA 93555. 619-375-8888.

Sony LDP-1000 laser disc plyr w/CAV & CLV int/ext drive, gen lock, RS232 port, remote, manual & cables, \$350; 3M NTSC encoders, RGB in composite, video out, \$200. J Krepol, JVK Studios, 7 Dustin Dr, Claymont DE 19703. 302-798-4052.

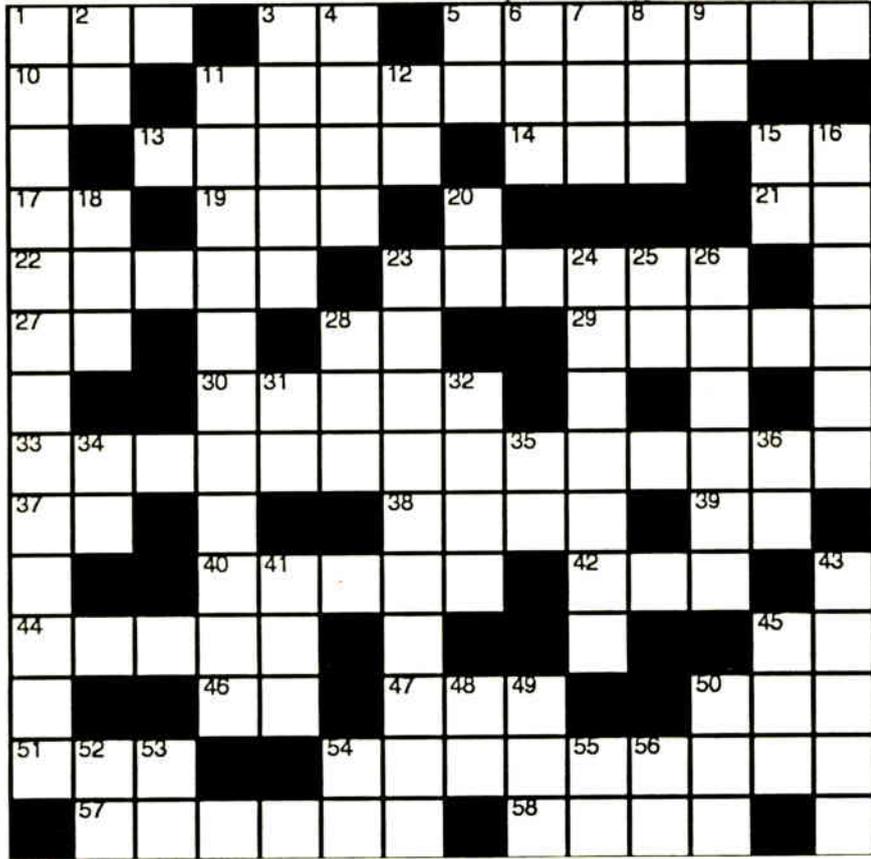
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Sony BVUU-200B nds minor repairs, \$350/BO; RM-500 remote control unit, new cond, \$40/BO; ESE ES-261 SMPTE time code gen, rack mount, excel cond, \$250/BO; ESE ES-254 SMPTE time code reader, gd cond, \$175/BO. T Steele, WMOO, POB 92, Derby VT 05829. 802-766-9236.

This Month's Crossword
by Steve Walker



Solution in next issue of RW

ACROSS

1. BASIC instruction
3. First state to abolish slavery
5. Have more volume than verbosity
10. Okefenokee Swamp state
11. "World leaders in rebuilt transmitters"
13. Remarks, often sarcastic
14. Keep records
15. Shot
17. Evening
19. "See Spots Run"
21. In regards to
22. Scary or spooky
23. Book of Bible
27. Type of transmission
28. Typographical measure
29. Stay away from
30. Connected
33. "Proofs improved"
37. Platter-like object with small hole in center
38. "Jail," 17th century
39. Digital platter
40. _____ radical, a hydrocarbon radical
42. Exclamation
43. Instrumental song beginning
45. Do, re, mi, _____
46. SPL measure
47. Open mesh woven of cord
50. Cooling device
51. Hot tub
54. The Management's box
57. Refrigerator
58. Horsie

DOWN

1. 
2. Spanish article
3. Cost
4. Electrical measure
5. Place
6. Audio Signature
7. Also
8. Participle ending
9. Biblical king
11. "Magical"
12. Third Reich special police abbv.
15. Junior Samples' exchange (___-549)
16. Cooper wire/cable
18. Animal sound
20. Prescription
23. "The Transmitter People"
24. 4CX35000C special thru 9/30
25. Part of light spectrum
26. "Loudness with Quality"
28. Power output
31. input/output
32. Contract
34. Direction
35. Company
36. Take too much
41. Throw
43. Stringed instrument
45. Passing fancy
48. For example
49. Gratuity
50. Light fishing lure
52. Important math number
53. Current
54. Take action
55. Toward
56. Article



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SP-44/4-Track

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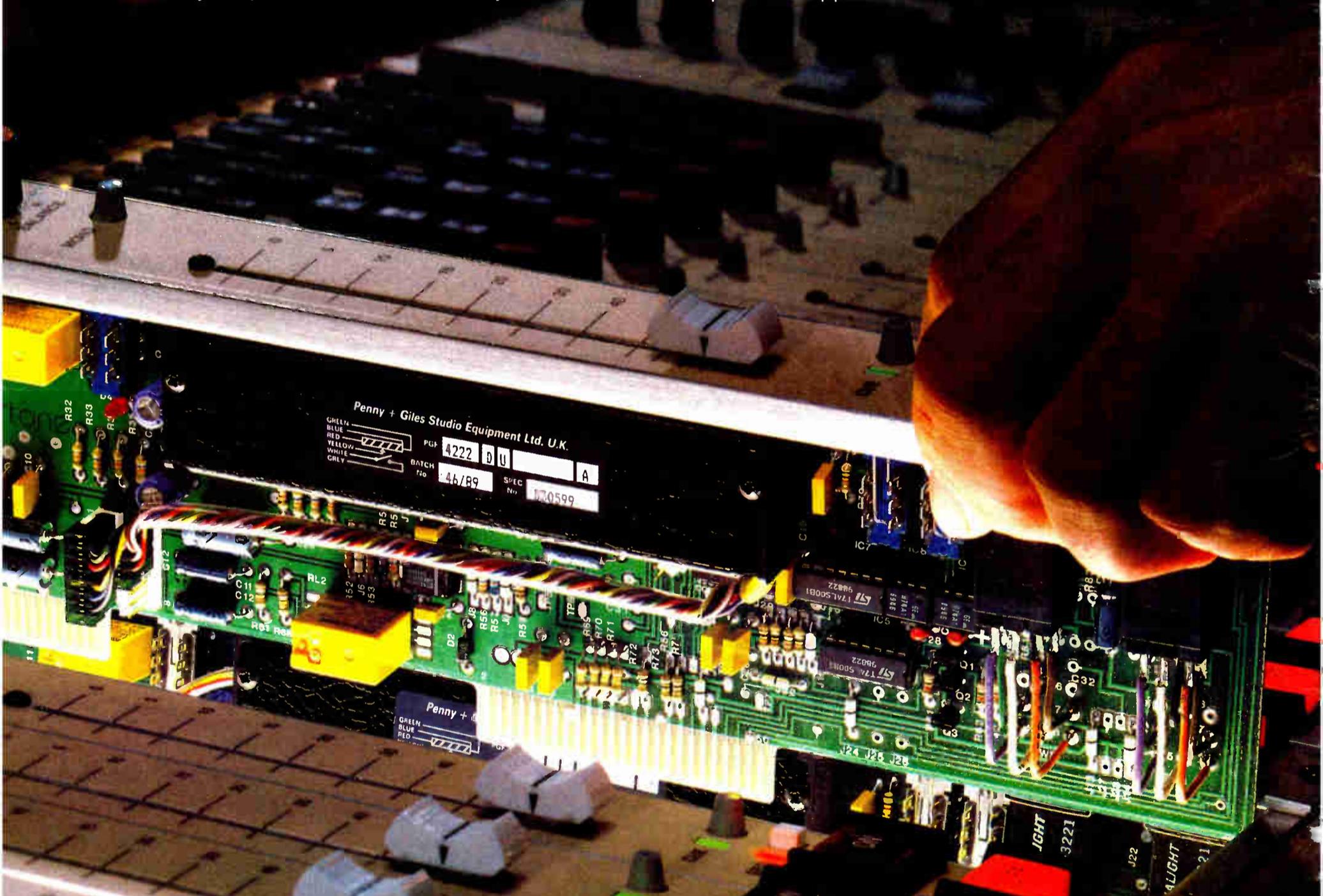
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