NAB Convention Wrap-up!
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Radio World®

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Radio Nets Shun NAB Show

by John Gatski

Washington DC With the opinion that the NAB annual convention focuses more on TV than radio, major radio networks pulled their lavish hospitality suites from this year's convention.

CBS, Westwood One and Capital Cities/ABC radio officials said they decided to devote this year's resources to hospitality suites for the fall Radio '89 show in New Orleans. They claimed the spring show has taken on a TV and engineering perspective with less emphasis on radio management.

The decline of radio?

The NAB has denied the annual convention is becoming a TV and engineering show, but the association is discussing several options to renew radio network interest, according to Senior Radio VP Lynn Christian.

Of the radio hospitality suites at previous NAB spring conventions, the network setups were considered the most elaborate with numerous parties and amenities.

The suites helped the networks maintain a high profile for their affiliates attending the convention, but in recent years all the networks maintained there have been declining numbers of their affiliates' management and programming personnel at the show.

"We sent our affiliate relations staff (to Las Vegas), but we are going to be putting most of our effort into the hospitality suite at Radio '89 in September," CBS Media Relations Director Helene Blieberg said.

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Squeeze is on in Atlanta

by John Gatski

Washington DC Although the NAB said radio exhibitors will get about the same amount of space at the 1990 spring convention in Atlanta as they did this year in Las Vegas, some manufacturers believe they have been squeezed off the main radio exhibit hall in favor of TV.

Some companies said that by the time they made their 1990 space choices during this year's show, based on the NAB's preference system, the only remaining space was in areas that TV companies will exhibit.

With only one of six halls reserved exclusively for radio/audio exhibitors at Atlanta's Georgia World Congress Center, some companies privately voiced a concern that the NAB spring convention is fast becoming a TV/video show, with radio taking a back seat.

Concern, not anger

Most manufacturers are not angry about the space allotments in Atlanta, but there is some concern, one said.

"We are very unhappy about it," Gentner Electronics Marketing Coordinator Kelli Maag said. "For us, we will not even be in the radio area; we will be in TV. They (NAB) kind of backed radio into a corner."

Also, at least one company feels it may have to miss the fall radio show to keep its exhibit costs in line due to the move

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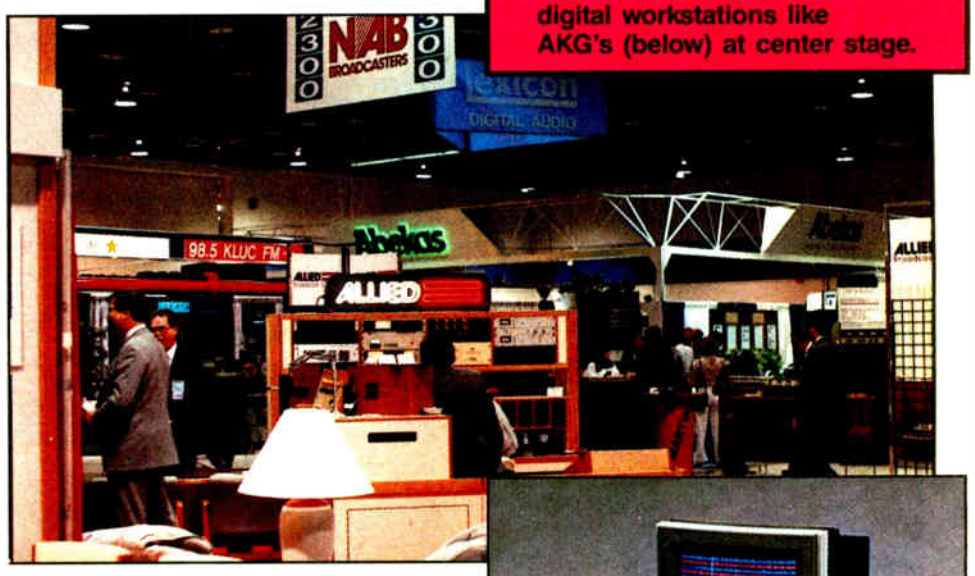
NAB show dazzles with digital workstations like AKG's (below) at center stage.



Workstations Break Ground In Audio Arena

by Frank Beacham

Las Vegas NV Recognizing the radio station market as fertile ground for a new generation of digital editing workstation, AKG Acoustics unveiled a new desktop system at NAB that, at under $30,000, breaks new ground in price and performance.

However, AKG was not the only competitor in the audio workstation arena, as the battle for dominance in the market heated up the NAB trade show floor.

RAM-based workstation

The AKG DSE 7000 is a RAM-based digital workstation incorporating the equivalent of an eight-track recorder, an editing system and a mixer. It is designed for the preparation of commercials, promos and other short duration recordings. AKG officials said the unit is specifically targeted for sale to radio stations.

The standalone system offers "word processing"-style editing, copying, punch-ins and moving and slipping of single or multiple tracks. Its-eight track capability allows digital track bouncing without degradation in audio quality.

The integral digital mixer has ten inputs, including level, pan, echo send/return, track bounce and solo functions. For ease of operation, the user interface preserves many aspects of current analog working practices such as traditional mixer controls and tape motion buttons.

The workstation, which is about the size of a console analog recorder, offers digital audio in the 16-bit linear PCM format, 20 kHz bandwidth at 44.1/48 kHz sampling rate. A 15 kHz bandwidth at 32 kHz sampling rate is optional.

The standard RAM memory is capable of 4.4 minutes of audio, and may be freely allocated from one to eight tracks. Additional memory cards allow expan-

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80-90 Stations' Futures Appear Secure

by Charles Taylor

Washington DC It appears that most of the 684 new FM channels created as a result of docket 80-90 are secure following a recent federal court ruling that declared the FCC violated requirements of the Administrative Procedures Act in handling the docket, an FCC official said.

But it is conceivable that specific channels could be affected, where complaints against an allotment had been filed years ago according to Commission procedures, said Karl Kensinger, chief of the FCC's allocations branch.

"One of our primary concerns is avoiding any kind of effect" from the court decision on allocated channels, he maintained.

Reeder vs. the FCC

The case was filed in a Washington federal appeals court under "Reeder vs. the FCC" and specified several arguments against the Commission's procedures in allocating frequencies within three new station classes.

The classes, established in docket 84-231, were prompted by the action in 80-90, and led to the 684 allocations.

The court ruled that the Commission violated legal notice and comments requirements, and it granted specific appeals, according to James Bayes, a partner with Wiley, Rein & Fielding, which represented two of the petitioning parties.

In response, the Commission is preparing a document to address the court's concerns, Kensinger said. No fines or penalties are imposed by the ruling, only recommendations of compliance, he said.

Still, concern has arisen that because of the success of the Reeder appeal, allocated stations may be delayed or challenged.

However Kensinger has attested that because parties were given ample time in previous comment periods, such a backlash is unlikely.

An extreme example

"You're talking about an extreme example where someone has been sitting back for a few years, when they were free to raise those arguments in 1984 or 1985," he said. "A person who had no part in the process up to this point has waived any rights they may have had."

The principles of administrative finality foreclose people from simply sitting back and then filing at a later date when they had a perfect opportunity to participate in the proceeding at an earlier time, he added.

All of the 684 frequencies were allocated by October 1988, when the final filing window closed, according to Larry Eads, chief of the FCC's audio services division. However, it is unclear just how many have actually gone on air.

FCC officials said that a list of station assignments does not exist and would be difficult to assess because each was allocated in a separate filing.

"We just don't have the manpower to figure something like that," Eads said.

Rothschild Broadcasting's WVAY-FM in Mount Snow, VT, one of the 80-90 allocations, was scheduled to go on the air 26 May, and according to President Robin Rothschild, hit no unusual snags in the FCC process.

"I'm the only station in a 20-mile radius," near a major ski resort, Rothschild said.

Other stations allocated under the 80-90 docket have received CPs and many are also in the process of station construction, although it may be years before the full impact of the 684 new allotments are felt.

For information, contact Karl Kensinger at 202-634-6530, or James Bayes at 202-429-7000.

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Air Force Jet Crashes, Causes Tower Collapse

by Charles Taylor

Panama City FL An Air Force pilot flying an F-15 jet here clipped the guy wires of a broadcast tower, causing the 1500' structure to collapse.

Radio station WPAP-FM, which broadcast from an antenna on the tower, was knocked off the air overnight following the mid- afternoon collapse 18 May and lost its main transmitter when part of the tower landed on the station's transmission building. Also knocked off the air were TV stations WMBB, which owned the tower, and WFSG.

The pilot was forced to crash land at nearby Tyndall Air Force base when the plane's left main landing gear failed to deploy, but no injuries resulted from the accident.

"For what it was worth, we were back on the air the next morning with about 30 watts," said WPAP GM Bo Bowman. "We used an exciter out of the back room, which gives us maybe a three-mile coverage."

The country-format station normally covers 290 miles.

New equipment was expected to be on-line by the beginning of June, Bowman said. The station ordered a Continental 35 kW transmitter and an eight-bay antenna, which it will place on a 1000' tower leased from a local radio competitor. The station previously operated with a Gates 20 kW transmitter and 14-bay antenna.

Bowman said comparable coverage is expected with the new set-up.

TV also restored service

WMBB-TV was off the air for several hours, but was able to restore service to most of its coverage area through a hook-up with the local cable television company.

"For what it was worth, we were back on the air the next morning with about 30 watts."

The station intended to switch transmission by the end of May to its microwave station 12 miles from its studios, broadcasting from a 300' tower on a 6 kW transmitter. Afterward, it will determine where a new tower will be built, according to WMBB-TV GM David Jernigan.

WPAP's transmitter building after the tower collapsed on top of it.

"We asked our consulting engineer to look at it as a new station and find the very best place to put a tower," he said.

Details of the actual accident remain sketchy, but officials at the stations said the pilot was a Japanese exchange flier who had years of experience with the F-15 and was training pilots at Tyndall.

"There was an eyewitness in the area who said she saw the aircraft (after it hit the tower) and it was very erratic in flying," Bowman said. "She thought the pilot would lose it, but he really must have been quite good to not crash into a populated area and to have landed the aircraft after the damage he had sustained."

Ironically, WMBB's assistant and chief engineers had been scheduled to be at the transmitter site replacing a part when the accident occurred, but cancelled the visit when the part was delayed.

Said Jernigan, "I told them he should send roses thanking the company for their inefficiency. It saved their lives."

For more information, contact WPAP at 904-769-1408; or WMBB-TV at 904-769-2313.

Cream of the Convention Crop

by Judith Gross

Falls Church VA All right, now that we've all had at least a little time to kick back from the **NAB show** . . .

What exactly were the memorable **new toys** that will be setting the industry on fire over the coming year?

First of all, you have to divide the answer to that question into two categories.

Category One would be the new high tech, the innovations that are not yet actual products but stand to change the technology—for the better.

In this corner are **digital workstations**, which are growing in number. Having seen the New England Digital and Integrated Media's Dyaxis offerings at previous shows, I'd have to give a special mention this time around to **AKG**.

The company featured an impressive, user-friendly demo aimed with the broadcaster firmly in mind, of its **DSE 7000 digital sound editor**.

In DAT, the big news was editing capability, with a not-yet-ready-for-market demo of a **DAT editor from Panasonic**. DAT is still a touchy subject, but Panasonic showed that it could be done.

And you had to fight your way through to **QEI's booth** to see the **CAT/LINK** digital stereo link. It lets you use T-1 lines for STL, and interest is running high in areas where microwave hops are not feasible.

My **Category Two** is for offerings that are indeed products for sale, and there are a number of noteworthy mentions. **Harris'** 50 kW digital transmitter, the **DX-50**, wowed 'em at the show.

Also drawing high marks was **Broadcast Electronic's** new digital **FM exciter**. **TFT** deserves kudos both for its **FM synchronous transmitter** and its **EBS receiver**. **Delta's new noise generator** lets you test compliance with the NRSC standard, now that it's going to be mandatory.

It would be hard to single out one **new console** from the wave of new boards unveiled at the show. Nearly every major player had a new product, and they all seem to be aiming for maximum performance, ease of maintenance and cost savings.

If I had to cite just one new console, I guess it'd have to be the **Radiomixer from Pacific Recorders & Engineering**. Not only is the price range below what most

would associate with this high-end company, but it includes even more features than the company's bigger and costlier BMX consoles.

To round out my show picks, there are two additional products which are really opposite sides of the same coin.

Tascam unveiled a **CD player** and controller which is tailor-made to a broadcast environment. In addition to two remote options it features a proprietary clamping system designed to **eliminate CD skipping**. The new model even looks a little like a cart machine.

And proving that the market for cart machines is far from comatose, **Broadcast Electronics** introduced a new version of its phase-correcting PhaseTrak 90, called the **DuraTrak**.

In addition to being lower in cost, it is designed to be field-convertible from mono to stereo and from player to recorder.

The NAB show is not usually a place one would associate with the solemn occasion of someone's nuptials. However, two **Delta Electronics** employees took advantage of the expediency of Vegas laws to tie the knot at none other than Circus Circus.

Design engineer **Chris Wilk** and his bride **Michelle**, who met at Delta, took the plunge at the **Chapel of the Fountains** the day before the convention officially opened. Manager of broadcast sales **John Bisset** brought along the prerequisite champagne for toasting.

Then Chris spent the next four days manning Delta's booth on the exhibit floor. How's that for a fantasy honeymoon? No truth to the rumor, by the way, that instead of "Just Married" the couple's car sported Delta's slogan "Splatter Matters."

Something like about half of the radio stations in the country apparently took part in the **NAB-RAB Futures Committee** campaign which had been endearingly dubbed "30 seconds of dead air."

"Hey honey, let's get married. At the NAB Show!" "OK . . . we'll honeymoon at the Delta booth and . . ."

Listeners who may not have been clever enough to figure out that things would be a little too quiet if Marconi had never done his thing got to hear their favorite station **go silent** for a half a minute.

Actually, as far as some of the usual tasteless banter on the shock-jock morning menageries are concerned, 30 seconds of silence wasn't nearly enough.

Having given you my product picks of the show, here are the first (and maybe the last) annual *Earwaves* NAB exhibit booth awards. Congrats (I think) to all the lucky winners:

Yummiest booth goes to Radio Systems, for its Tastykakes, with honorable mention, as always to Eventide for its ever-present chocolate bars. *Niftiest freebie* award goes to Burk Technology for its "matchbook" which was really a touch-pad calculator when you looked inside.

Most aesthetic booth design goes to Wheatstone, highlighting its new furniture line with some classy art deco lines and neon.

Thickest carpet goes to Pacific Recorders & Engineering—my feet thank you.

Largest/most spread out booth goes to Harris, and even more so when you count Harris-Allied together. Allied wins for the home-i-est looking booth, too, with its soft couches and glowing lamps.

Most crowded (with attendees) booth was Broadcast Electronics, right near the entrance as always, and a place to see and be seen.

Best *booth with a view* was the bi-level structure at Varian/Continental—thanks for the great vantage point.

Most *unnecessary-but-nice* was the shoeshine special at Satellite Music Network booth's in the Hilton Center.

Best *away-from-the-show respite* goes to Studer for its wine tasting at the Sahara. Good wines with a great "nose," Tore, especially the cabernet. And the view of the strip was pretty spectacular.

And next time we're in Vegas, why doesn't someone have a press conference at that **water slide** which looked like a real blast from the Studer suite. (Or was that merely the effects of the Chardonnay?) It would have made for a real "cool" show.

Heard something interesting? Spill your guts to **Earwaves**. *Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted 1989 edition* **Radio World** *mug.*

FM Class A1 Architect Details His AM Concept

by Richard Arsenault

Millville NJ AMs are facing increasing advertising revenue losses due to the audience shift from the AM to FM radio band. The majority of AM broadcast stations without a co-located FM station has an urgent need to correct this situation or many of these stations are unlikely to survive in the highly competitive radio marketplace.

Most of these AMs have served their local communities effectively for 30 years or more, in many cases with only daytime service, or in other cases on a fulltime basis with less than adequate nighttime coverage. The AM radio rule changes adopted this decade have provided insignificant solutions to the problems of standalone AMs and in some situations have even hurt AM. Attempts to draw listeners from FM back to AM radio have generally failed.

GUEST EDITORIAL

Accordingly, we must find a way to permit AM standalones the opportunity somehow to join the listeners on FM, or accept the harsh fact that a large number of AMs will cease to exist in the 1990s. Contrary to the public interest, many smaller communities may lose the only real local radio service they now have.

A method for the majority of AM only operations to simulcast on the FM band with reduced power and without interference to existing FM stations must be adopted by the Federal Communications Commission. Accordingly, I have submitted a Petition for Rule Making to the FCC, requesting rule changes by creating a new FM Class A1 facility for the purpose of simulcasting programs of existing standalone AMs.

Class A1 FM secondary assignments as proposed would be made available "only" to standalone AMs, would not require amendment to the FM Table of Allotments as currently required for other commercial FM facilities and would be made available only upon proper showing that no interference would be caused to the primary coverage area of each and every existing FM authorization.

This same assignment method has been used now for about a decade by (secondary) Class D educationals FMs, which elected to operate on commercial FM channels. An effective radiated power of up to 1000 watts with antenna 100 meters (328 feet) above average terrain is proposed, allowing primary 1 mV/m FM (60 dBu) coverage of up to approximately 10 miles from the transmitter site.

AMs could take advantage of FM Class A1 for a relatively small investment. This plan would permit most AM daytime and fulltime stations the opportunity to take advantage of such a proposal and provide clear FM coverage on a fulltime basis to their local communitities and surrounding areas. Numerous communities nationwide could receive a local fulltime interference-free radio service for the first time.

As a result of this petition, I've received responses from broadcasters nationwide, all strongly in favor. Success of this petition will depend upon the active support of a large number of broadcasters. Respond in writing to: Chief of the Mass Media Bureau, Federal Communications Commission, Washington, DC 20554.

■ ■ ■

Richard F. Arsenault is a member of the Institute of Electrical and Electronic Engineers (IEEE), an SBE senior member and Certified Senior Broadcast Engineer. Mr. Arsenault, a telecommunications consultant, can be reached at 609-825-0124.

FM Class A1 Eligibility Requirements (as proposed)

Any party requesting authorization to construct and operate an FM Class A1 station must meet the following requirements:

1. Class A1 stations will only be granted to licensees of AM standard broadcast stations.
2. The Class A1 stations must simulcast the programs of the AM station with which it is authorized.
3. The Class A1 station will only be licensed to the same community as the AM standard broadcast station with which it simulcasts.
4. Only one Class A1 station will be authorized to each eligible AM standard broadcast station.
5. Class A1 FM broadcast station licenses will not be issued to any party (including all parties under common control) if such party directly or indirectly owns, operates, or controls one or more FM broadcast stations and the grant of a Class A1 license will result in any overlap of the predicted 1 mV/m contours of the existing FM station and the proposed Class A1 station, computed in accordance with part 73.313.

Time For Separate Shows

It's time for NAB to give serious thought to splitting radio off from its spring convention.

The size to which the yearly gathering has grown, the clamoring for booth space and the increasing emphasis on TV issues make this a logical move for both the association and the industry.

The radio networks have already taken a stand by diverting their money and focus away from the spring convention in favor of the fall radio-only gathering.

Their action could be a bellweather of growing sentiment in favor of radio building a stronger fall convention.

Instead of having to develop engineering, management and programming sessions for a radio audience twice, NAB could put all of its efforts into building up the sessions at the fall show, thereby attracting more attendees to that convention.

It would also be an assurance to the association's radio members that their interests are being well-served.

Many companies already bear the expense of attending both shows each year. As the TV side of the industry continues to grow some radio exhibitors are feeling the squeeze in the exhibit hall.

Those who wish to reach both TV and radio attendees would still be able to exhibit at both shows, or put the majority of their efforts into one show and maintain a suite or other more modest effort at the other show.

It will be hard for NAB to relinquish the certain dollars of having radio companies exit the spring show. And it will be equally as difficult for radio vendors and manufacturers to take the bold first step and wait out the spring show in favor of the fall convention.

But after some initial shuffling and jockeying for position the smoke will clear and the broadcast industry will be left with the benefits:

A more manageable spring show which can focus entirely on such weighty TV issues as a high definition standard, and the world's greatest radio show each autumn with increased attendance and attention to all aspects of radio.

—RW

Errata

The 10 May **RW** *story on Richard Arsenault's petition to the FCC unfortunately contained several inaccurate statements which need to be corrected.*

The proposal is aimed at helping **all** *standalone AMs, not just daytimers. It asks that the current rule requiring the maximum to minimum radiation in the horizontal plane of 15 dB be waived for the proposed class of stations and there is no limitation on antenna height stated in the petition; only a proposed ERP of 1000 W at antenna height 100 meters HAAT.*

FM channels 201-300 actually refer to the entire FM band and WCTR was misidentified as an FM station—it's AM.

RW *regrets the errors.*

READERS FORUM

Maintenance and common sense

Dear **RW**:

Your 8 February article, "Towers Brought Down in SC, MD" was a bit ironic. Being a radio tower contractor, I have to believe that a little common sense would have prevented this crumpled heap of metal trash.

It is my understanding that the location of the dumpsters were too close to a guy point. Persons entering and leaving the premises are not aware of existing overhead wires (workmen rarely look over the tops of the vehicles for clearance).

Only human error is to blame for this misfortune. Maybe after the new tower is erected, the garbage dumpsters can be relocated to avoid future tragedies.

As for the WGMS-AM in Maryland incident where an 80 mph wind brought one of its four towers down, I would like to know if this system was on a regularly-scheduled maintenance program. If so, why didn't the remaining tower suffer from the winds?

I have been in the tower erection business all of my life. I have seen systems fall to the neglect of poorly maintained stations. Most towers are engineered to meet wind loading of 80 mph and greater, but how can a tower be expected to survive the "element of man?"

I think it is time to put the blame where it belongs, on people and not on nature. After reading this article, I have come to the conclusion that a little common sense and maintenance can go a long way.

Robert Wood
Nationwide Communication Specialists
Tempe, AZ

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Editorial
Editor: Judith Gross
Assistant Editor: Alex Zavistovich
Buyers Guide: Richard Farrell
News Dept.: Alan Carter, Editor
Charles Taylor
John Gatski
Frank Beacham/L.A.

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NAB WRAP-UP

Console Products Emphasize Variety

by Thomas McGinley

Las Vegas NV Console manufacturers introduced a full smorgasbord of new models at this year's NAB convention. Not in my recent memory have so many companies shown so many new designs at one show.

The menu specialized in budget-priced consoles in the $4K to $10K class with features usually found in more expensive units.

Even Pacific Recorders & Engineering, widely regarded as a top-of-the-line company, unveiled a new BMX look-alike priced substantially lower than any studio console it previously produced. "Radiomixer" is a full-featured radio control room console with two mainframe sizes accommodating up to 12 and 20 input positions.

To cut costs, PR&E designed a new mainframe which eliminates most of the labor-intensive umbilical wiring harnesses. Plus the channel modules use a new Aphex VCA control with Penny and Giles (P&G) faders.

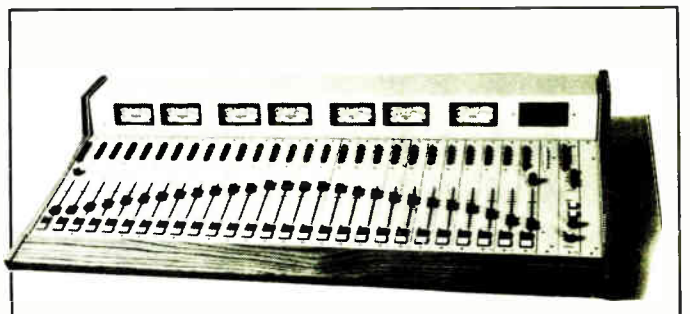
While the BMX and ABX consoles achieve better noise and distortion performance without the VCA architecture, Radiomixer's SNR is still very respectable at −82 dB below +8 dB reference output. All other features in the Radiomixer are cloned from the BMX design, including logic, control, tally, cueing, and intercom.

A typically configured 20 channel mainframe lists for about $16,000, which makes Radiomixer an affordable control console for stations previously priced out of the upper end of the market.

Battle of the budget

The battle for the budget line console market was launched last year when Radio Systems introduced the RS-series linear fader broadcast console. Using a non-modular motherboard layout in six, 12, and 18 channels, the RS family made a real breakthrough in performance and features at very low prices.

Hot on the heels of Radio System's RS effort is Arrakis Systems with its 12000 series consoles. Based on three mainframe sizes of eight, 18, and 28 channels, this series uses modular construction like its popular 5000 series, enabling input modules to be added or relocated.



Arrakis' new 12000 series console

Standard features include three output busses, P&G faders with VCA control, ITT Schadow switches, gold-plated connectors and a comprehensive logic system for remote start, tally, muting, timer reset, and talkback.

Prices are almost identical to the comparably equipped Radio Systems RS line, making the Arrakis 12000 series lots of console for the money. Performance specifications were not available.

Arrakis also showed its new Turbo-SC series. The model SC-T consoles incorporate numerous changes, improvements, and additions to the popular SC series, including lower distortion, prefader patch points, built-in mic preamp, digital clock and timer and new expanded manuals.

Arrakis has also expanded into the prefabricated modular console furniture business with an exclusive deal with Allied. Each Modulux cabinet can be shipped separately via UPS and assembled on-site into a completed system.

Autogram Corporation, makers of the forever popular and durable IC series consoles, introduced its new Pacemaker transformerless series. Three non-modular mainframe sizes of six, eight, and 10 channels use P&G faders, VCA control, electronic switching, no audio transformers, modular preamp cards and shadow selector switches.

The 648 six-channel Pacemaker features eight inputs per channel. All three models accommodate up to eight mic ininputs. Three output busses are standard—including mix-minus—and all input levels are trimmable. Prices range from $5500 to $7200.

New from RAM is the SX series console, featuring a modular design which is expandable upon station growth by adding modules. There are three mainframe

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Is Radio Lagging in Digital?

by Frank Beacham

Las Vegas NV At NAB 1989, radio and television equipment manufacturers were separated into booths at opposite ends of the huge convention center exhibition hall. Though both camps have a common interest of delivering high quality audio to their audiences, one end of the hall was clearly on a fast track to the future while the other seemed glued to the past.

On the TV side, the crowd around Sony's new 16-channel digital audio mixer was so large it was hard even to get a peek. The packed throng around Panasonic's R-DAT editing system reminded one of the scene at a rock concert. There was the buzz of excitement in the air that comes when the envelope of technology has been pushed to a new limit.

On the radio side, it was a different story. Crowds were much thinner. That buzz of excitement was missing. Sort of business-as-usual.

Why, a novice observer asked, are the big advancements in audio coming from the video people? Since radio only has one product—sound—why doesn't radio, instead of TV, lead the way in developing things like digital consoles?

In search of an answer, **Radio**

(continued on page 20)

Disc, DAT and D'Other

by Ty Ford

Las Vegas NV Like it or not, digital audio has arrived. It was in full bloom at the Las Vegas NAB convention. The two days I had allotted to prowl the exhibit floors were not enough.

Panasonic showed not only its studio and portable versions of DAT, neither of which are yet actual products for sale, but also a DAT editing system which closely resembles the videotape editing systems Panasonic has been handling for years on the video side of the business.

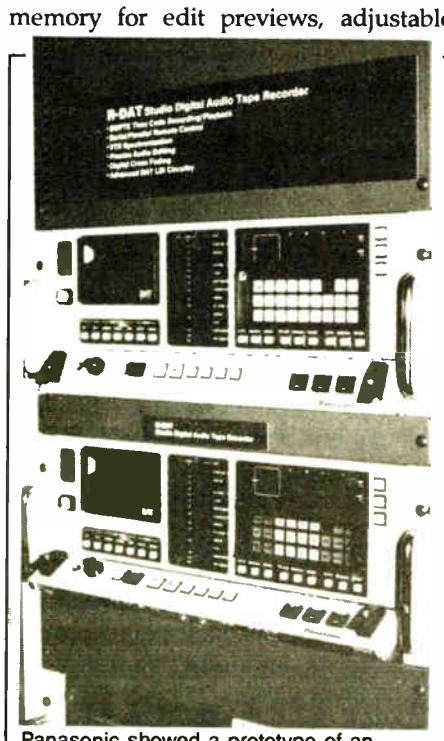
At last, an editor

Chris Foreman, marketing manager for Panasonic's professional audio department, prefaced his explanation of the Panasonic DAT controller by saying,"We have a technology demonstration going on. These are not products. They are not for sale, and they're not in production."

With that as a disclaimer, what we're talking about are Panasonic's concept of a portable DAT, a rack mount DAT, and an edit controller. The machines are expected to be SMPTE compatible. DAT time code will be via the NHK- and other manufacturer-backed new timecode standard.

Both rack mount and portable will be designed to operate at the AES/EBU digital standard. Sample rates of 32 kHz, 44.1 kHz and 48 kHz will be available in record and play back.

The editor will control two machines and will allow video-style assemble editing or simultaneous operation of both machines via timecode lock. The editor also has five seconds of audio RAM memory for edit previews, adjustable ramp in and ramp out.



Panasonic showed a prototype of an R-DAT editing system.

Macintosh users will be interested in the new computer interface which allows the Panasonic SV 3500 DAT machine to be controlled by on-screen commands from a Mac. Using a third-party developer "black box," you can sequence the selections on the tape for automation.

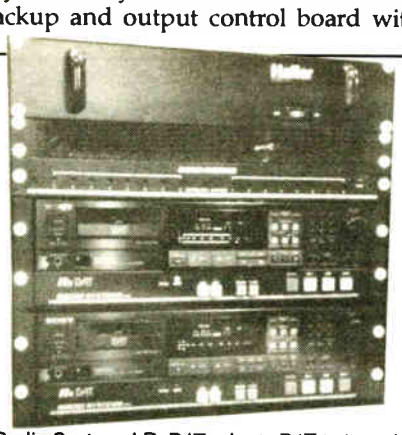
A stack of DATs to go, please

If rumors about hard disk crashes make you feel a bit nervous about placing all of your audio in one system, consider the CAPS I or CAPS II from Concept Productions, or the Schafer World system.

According to Dick Wagner of Concept Productions, both CAPS I and CAPS II are designed for live-assist or various amounts of automation.

The CAPS I computer aided programming system uses a rack of 10 DAT machines and either an IBM XT or AT computer. The Sony DTC-1000 or the Harris XD-001UH DAT offered in this package go for $1750 each.

The CAPS I basic system includes a 640K PC compatible computer with dual disk drives, monochrome monitor and keyboard, system clock with battery backup and output control board with code generators and silence sensor.


Radio Systems' RsDAT adapts DAT to broadcasters' needs.

The CAPS II system includes everything in the CAPS I system plus a 20 megabyte hard drive and a tape loader and power supply. The CAPS II system, I was told, allows up to 62 DAT cassettes to be shelved and moved to any one of the machines.

Schafer World's Bob Dix at the Schafer World booth was also showing DAT, CD and cart-based automation systems, in addition to console and power backup and filtering systems.

The standard cart, 30-tray random access Schafer Ready Spot costs $17,000. Expansion to a total of 90 trays is possible using a single controlling source. Schafer uses the Century 21 programmed CDs and the Sony CDK-0006 "jukebox" for its CD-based automation.

For $10,900 you get the 7000 RAM based controller with micro-floppy backup, real-time clock with 66,000 events for a seven-day clock, plus 3600 sequential program events. More RAM is available to raise the sequential events to 10,000 events.

The Century 21 Digital Studio System includes two Sony CD changers, cables, AutoFaders, on-air studio software and interface cards, spot start and EOM interfaces all for $10,995.

With 120 CDs with 150 hours with an excess of 3000 usable titles, the cost per cut is lower than any other hardware system. The music selections come already programmed and ready to go.

Studer's production workhorse

Although $3500 may at first seem a lot to pay for a CD player, Dave Bowman of Studer/Revox explained ther is a lot going on inside the company's A730.

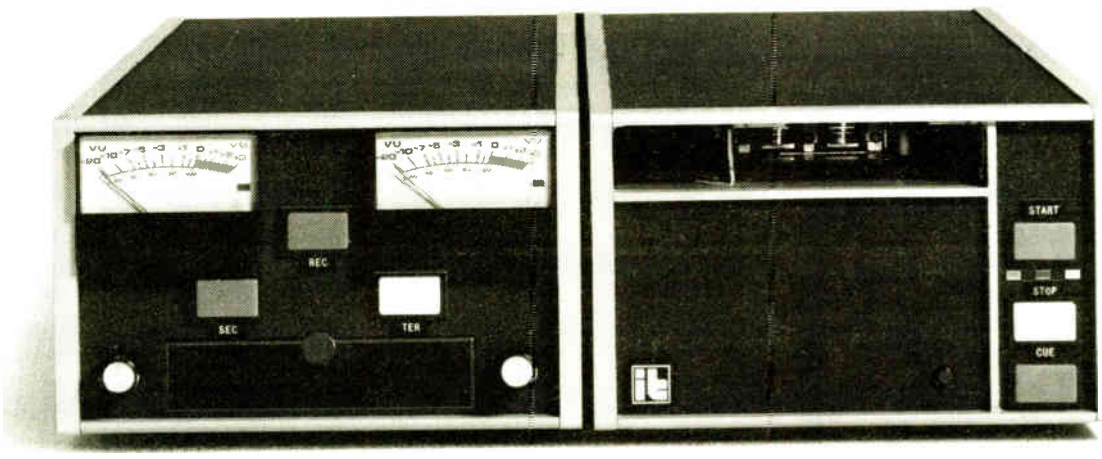
The A730 comes with cue wheel, consumer format digital audio output, analog output via fixed and variable RCA jacks, fixed XLR outputs, ±10 percent varispeed, monitor speaker and headphone jack, cue by time, memory for up to three cues per disc for up to 100 discs and 25 pin parallel remote connector.

A SMPTE/EBU bus via RS422 is planned for video controllers. Bowman expects a translator soon which will convert CD time code into SMPTE time code. The A730 is a top loading machine which makes cleaning of the lens easy.

I later spoke to Phil Blyveis at Studer/Revox who offered that one of the

(continued on page 34)

This is one reason we sell more cart machines than anyone else.



The 99B series Master Recorder features a patented erase, splice-locate and azimuth-adjust system (ELSA).

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Circle 82 On Reader Service Card

Digital Interface Debate

by Frank Beacham

Las Vegas NV The newly formed NAB Digital Interface Committee, meeting during the NAB convention, has decided to assist the Audio Engineering Society in completing a standard for the interconnection of digital audio equipment, rather than writing its own.

Despite NAB's commitment to help complete the digital interface standard, which was implemented in 1985, some company representatives said it is too late to have a universal standard because too much equipment is already being developed.

Nonetheless, the committee decided to assist in completing technical documentation to remove ambiguity surrounding the existing standard (AES3-1985).

According to NAB Staff Engineer Stan Salek, the NAB panel will also help establish, along with an AES subgroup, a special appendix to the AES standard for broadcasters and form a working group to investigate RF problems affecting digital audio.

Interface problems

With regard to the AES/EBU standard appendix that NAB will help write, AES recognized there have been digital interfacing difficulties for broadcasters in such areas as patching. The appendix will attempt to reduce vague interpretations of the existing standard, according to NAB.

The NAB's Stan Salek (far right) helps coordinate the first attempt to set a digital interface standard.

Overall, Salek said the committee's objective is to come up with a more universal standard that is compatible with most digital audio equipment.

The committee also plans to take a look at other types of interfaces including optical formats and multichannel audio formats.

Because of the confusion over digital interface standards, Salek said the NAB soon will began education efforts to alert broadcasters of the differences between consumer and professional equipment interface formats, which can cause such problems as a loss of synchronization.

He said many broadcasters mistakenly believe the consumer equipment, which mostly uses the Sony/Philips format, will interface with the AES/EBU format.

To generate discussion on the digital interface issue, Salek conducted what he termed "a fishing expedition" among those in attendance to gauge their concerns.

Panelists skeptical

There was some skepticism as to whether the committee could have any impact at this late stage of digital equipment development.

"I don't think a general interface will happen," said panel member Bart Locanthi of BNL Research Associates.

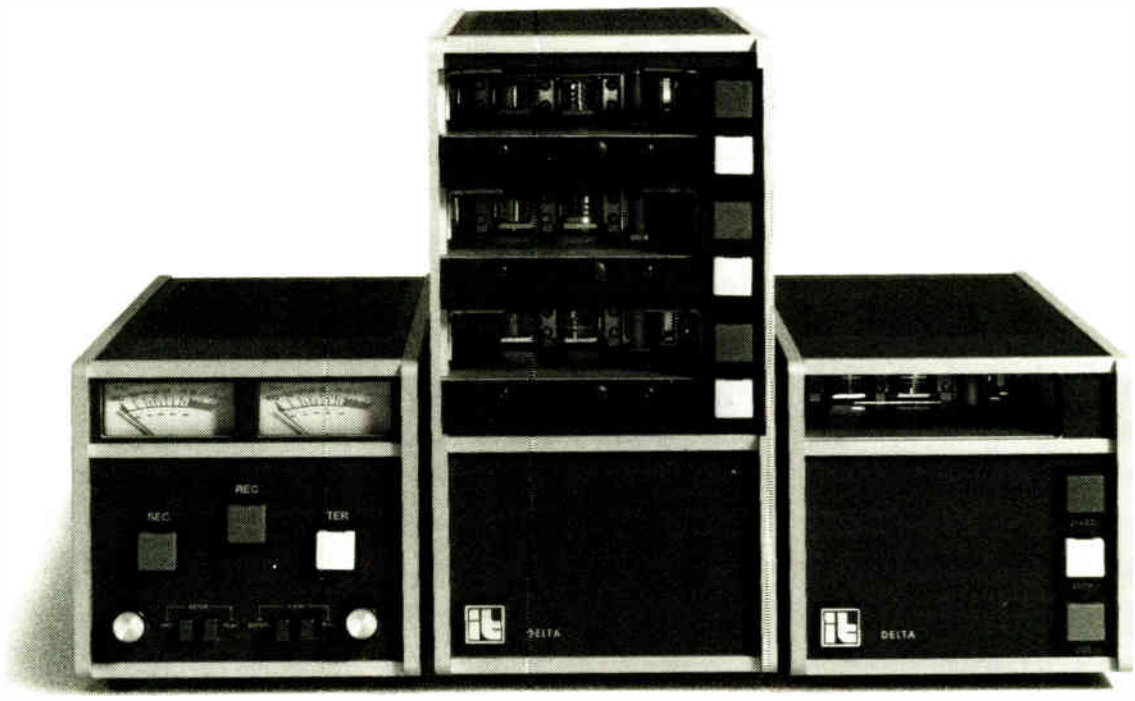
Others in attendance agreed. "It's naive to think so," said Bob Finger of Matsushita Electric.

Noting that some broadcasters are using consumer digital equipment in their facilities, Locanthi pointed out that consumer models have interfaces which are deliberately different from professional models to prevent the unauthorized duplication of software by consumers.

Even in developing professional models of digital equipment, manufacturers sometimes interpret the AES/EBU specification differently, said Finger. He said part of the interface problem is a general lack of understanding of how digital interfaces work.

Another committee meeting will be scheduled for this summer, according to the NAB.

Here's another reason we sell more cart machines than anyone else.



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Firms Pushed from Radio Hall?

(continued from page 1)
to Atlanta.

Other companies also had to choose exhibit space outside the convention center's radio hall.

"We wanted into the more general radio hall, but we couldn't get in," Allied Broadcast Equipment National Marketing Manager Dave Burns said.

"I don't think there is a general displeasure (among radio exhibitors), but we could have been happier," Burns added.

QEI Inc. Marketing Senior VP William Hoelzel said his company was forced to buy a larger-than-needed space, because his first choice was not available.

Although the company has not been to the NAB radio-only show, this year in New Orleans, for a few years, the company was considering that option, Hoelzel explained.

But with the extra money needed for the Atlanta space, QEI may skip the fall show again, he added.

NAB Exhibits and Associate Membership Director Rick Dobson maintained that many companies' concerns are based on their uneasiness about going to a different facility in Atlanta.

More space than Vegas

He said there is actually more overall space in Atlanta than in the Las Vegas Convention Center, which is not available for the 1990 convention because of a planned renovation.

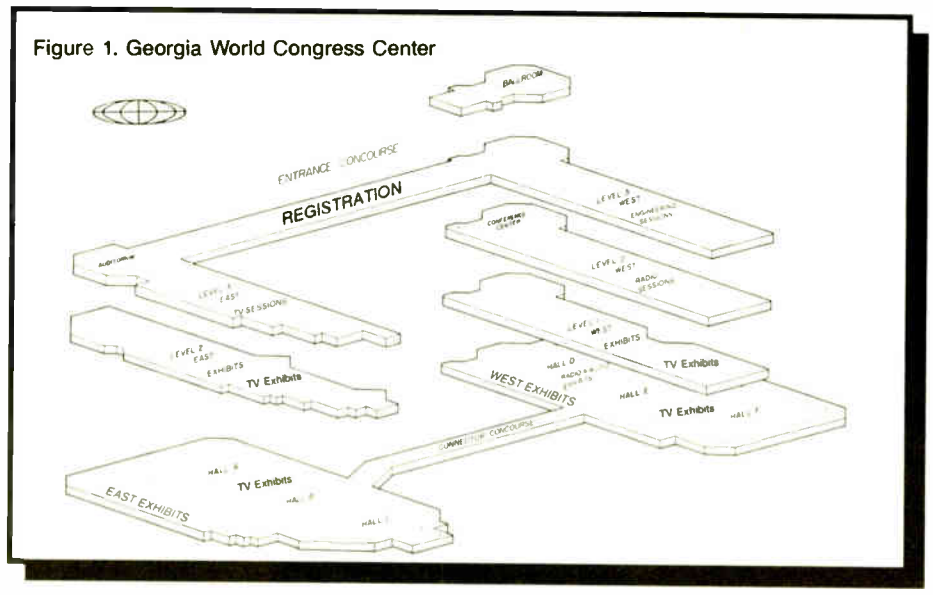
Dobson noted, however, the Georgia World Congress Center does not have the spill-over advantage that radio exhibitors are used to in Las Vegas, which made the radio exhibit space seem larger.

At the Las Vegas Convention Center, the main radio/audio exhibit area was located in the north hall, Dobson explained. The adjacent south hall, initially slated for TV, had become a spill-over area for radio companies because TV and video exhibitors mostly avoided it in order to be closer to the main TV area in the east hall.

In Atlanta, there are six halls. Hall D is reserved for radio/audio.

Halls A, B, C, E and F will be filled by mostly TV/video exhibitors and those that did not get into the radio hall, he added.

Figure 1. Georgia World Congress Center



"If you can't get in the main radio hall, you may have to move further out," Dobson said. "But if you exhibit at NAB, those who want to find you will seek you out."

Pacific Recorders & Engineering Sales and Marketing Manager Anders Madsen said PR&E is in Hall D, but he understood the concern of those who are not.

Because there are few cities that can handle a convention of this size and hardware, Madsen said, "I don't know what the alternative is for these folks," he said. "Atlanta is not going to be that bad."

Most exhibitors agreed that Las Vegas is ideal for the NAB convention and most other cities are going to compare unfavorably.

"Atlanta is going to be a little more difficult than Las Vegas," Dobson said.

But once exhibitors become familiar with Atlanta and the Georgia World Congress Center, Dobson said he thinks they will like it.

Those attending NAB in Atlanta may experience a traffic crunch, he noted, because the Georgia World Congress Center is located in a more congested area than the Las Vegas Convention Center.

He said the center has a central core of hotels near it, but when those hotels reach their capacity, NAB convention attendees will have to use accommodations further out from the convention center.

Despite the rumblings of discontent over the space and general worry about the convention being held in Atlanta, most exhibitors had high praise for Dobson's convention space preference system.

The system gives companies a preference based on a point total, which takes into consideration the number of previous years and the amounts of space purchased in those years.

"Dobson has done a fantastic job," Hoelzel said. "You must give some advantage to people who have been here year in and year out," he said.

For more information, contact Kelli Maag at 801-975-7200, Dave Burns at 317-962-8596, William Hoelzel III at 609-728-2020, Anders Madsen at 619-438-3911 or Rick Dobson at 202-429-5335.

Networks Pull NAB Suites

(continued from page 1)
She said the affiliate relations staff had a small suite in Las Vegas, but its function was limited to business meetings and it was not open to general attendance, as the larger suites have been in past years.

Blieberg said the decision to put its efforts into the fall show was based on the evaluation of prior spring conventions where suite traffic has been declining.

"The overall radio attendance is higher at the fall show. You have to put your dollars where they will do the most good," Blieberg said.

Westwood One, owner of NBC Radio Network and Mutual Broadcasting, also is shifting its emphasis to the radio-only show where it will have two hospitality suites.

More TV

Although the network had an affiliate relations staff at NAB, Westwood One said the decision to have a hospitality suite only at the fall show was based on the spring show's perceived television emphasis.

"It (the spring show) has become TV-oriented," Westwood One Public Relations Director Katie Garber said. "We consider the fall show more of a radio show."

Garber said NBC Radio will consider setting up a hospitality suite at the NAB spring convention in Atlanta, but that the decision has not yet been made.

Capital Cities/ABC plans to have a hospitality suite and a large party at Radio '89, according to ABC Radio Network Advertising/Publicity Director Susan Storms.

She said the network decided to opt out of the spring convention because it has become more of a TV and engineering show.

"We felt the spring show was not profitable. We are interested in seeing our network affiliate program directors at the suites, but we felt there were not enough (over the past few years) to warrant coming back to the (spring) show."

Could return to spring show

Storms said the decision to have suites at the various shows and conventions is made each year and the network could return to the spring show in Atlanta.

Christian said the NAB is discussing some ideas to get radio networks' hospitality suites back to the spring show.

The options include setting up a large room at the convention, similar to the press room, so the network officials can meet with the affiliates.

Christian said he is not "super alarmed" at the networks decision to reduce their presence at the spring show.

"The networks really have cut back on all their shows," he said.

Christian denied the de-emphasis of radio at the spring show, saying thousands of radio people still come to the convention and there are still many radio exhibits and sessions.

"I don't find anyone saying it's a TV show," he said.

For information, contact Helene Blieberg at 212-975-3771, Katie Garber at 213-840-4383, Susan Storms at 212-887-5508 or Lynn Christian at 202-429-5417.

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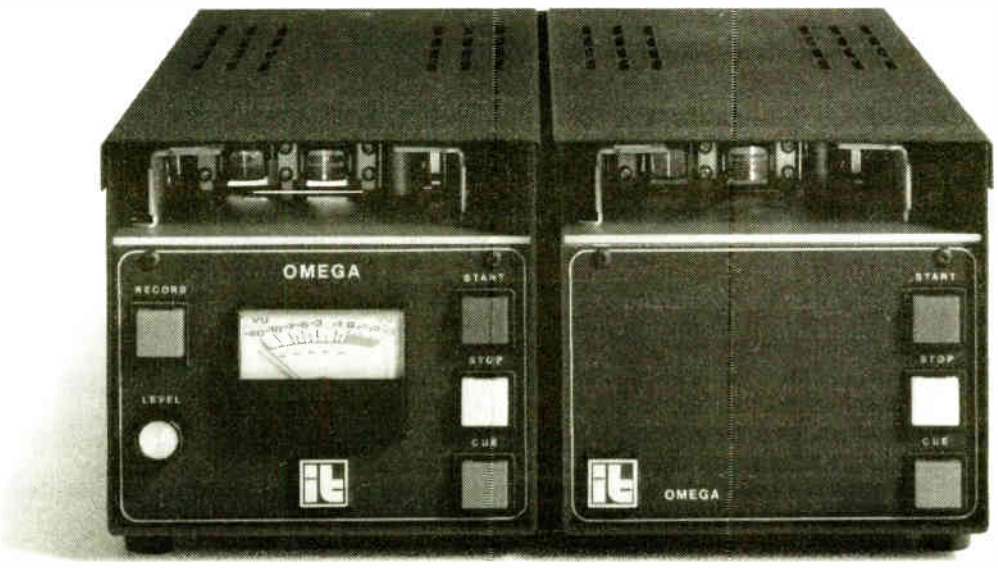

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Circle 42 On Reader Service Card

Gannett's Paul Donahue Analyzes Today's Radio

Editor's Note: Paul Donahue is engineering VP for the radio division of Gannett Broadcasting that owns seven AMs and nine FMs. During the NAB Convention, for which Donahue served on the engineering conference committee, he talked with News Editor Alan Carter about some issues important to radio in the US today.

RW: *With a trend toward heavy modulation and clipping, do you see any concern about giving up quality for loudness?*
Donahue: There's no question that extreme amounts of clipping, whether it's baseband clipping on a composite level or whether it's audio clipping, gives up some quality for loudness. There seems to be a trend toward more clipping with little consideration for the consequences.

As consumers buy better equipment for their homes and automobiles, FM broadcasting has become a secondary source for quality music.

It's interesting to consider audio processing and the loudness quality tradeoff. This deals with a significant issue, which may be out of the hands of engineers.

Processing, as it has evolved today, is substantially more art than science, which means design of a system from a purely engineering perspective does not necessarily meet the needs of a programmer. There are probably a handful of people in this country—literally one handful—who understand the ramifications of processing as it is today. And those people are people in the field, not necessarily manufacturers.

RW: *What is the ramification of art versus science in audio processing?*
Donahue: I think the gap is going to widen between what engineers do at the station and what programmers do. I'm not sure what the answer is or even if there is an answer. Virtually every broadcast group has some customized version of a standard piece of processing equipment or it "daisy-chains" multiple boxes together. Almost no one in a major market buys exclusively one box.

Personally, I believe the industry has gone in a direction where we risk impairing our ability to reach listeners. Other radio stations are not our toughest competition.

As consumers buy better equipment for their homes and automobiles, FM broadcasting becomes a secondary source for quality music. If we degrade it to the point where it is no longer listenable or tolerable, people will switch to alternatives, which are cassettes, CDs.

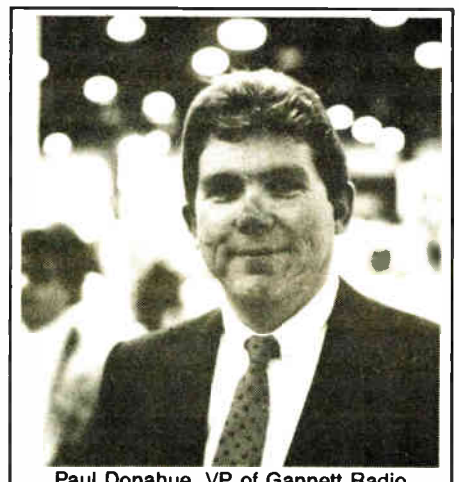
FM has taken a direction which may be counterproductive. Fortunately, none of it is irreversible. It's reversible just like that. (Finger snap.)

RW: *The NRSC standard is on the books for AM, and the Committee now is moving on FM issues, including multipath. How does its work rate?*
Donahue:NRSC for AM is overwhelmingly necessary. The FCC allowed too many AM stations, with inadequate interference criteria.

That's part of the problem. The FCC created a situation where there are so many AM stations without the foresight that cities might outgrow their coverage boundaries and allowed so much interference that NRSC is actually the best Band-Aid out there.

The NRSC preemphasis and filter is on all the Gannett AMs, and we've noted a dramatic improvement. It is not an improvement to our stations' audio quality, per se; the real improvement has been from the RF mask. We're not creating interference to others, which generally makes the AM band better all the way around.

What's good about what the NRSC is doing and why did we do it? Because we want something that the receiver manufacturers can build on.


Paul Donahue, VP of Gannett Radio and KIIS-FM

As for FM, multipath has been a problem, apart from the issue of whether too much clipping exists right now. Excessive clipping is an immediately reversible situation. What is not immediately reversible are standarized preemphasis curves, standards for digital systems and multipath reduction techniques. These standards take time and energy to develop.

RW: *What do you say to broadcasters who do not comply with the standard?*
Donahue: It's like running old tires; you run the risk of hitting a nail and being stranded. Why would you not adopt something that is clearly beneficial to your industry?

At Gannett, we've gone to stations where we have second adjacent interference and we asked them to install it. We've even paid for them to install it because it benefits us. It benefits the whole industry.

RW: *On another issue under serious debate at the FCC, what will be the effect of using directional antennas in short-spaced FM situations?*
Donahue: There are some major issues that need to be addressed. I have no concerns about directional antennas. Directional antennas can work.

But, what you have is a Commission that is using outdated FM interference standards. It is not dealing with the real world. Without further input, we risk destroying the FM band.

RW: *Do you think the FCC has gone too far in using the marketplace philosophy?*
Donahue: Yes, the marketplace does not have a clue on technical issues. Ask consumers how much they have been bothered by multipath. I'll guarantee that most probably don't even know what multipath is.

There are certain things the marketplace can determine, and I think it already has, but we're not listening to the clues on an FCC level.

The marketplace has determined, by consumers' buying habits, that it likes better quality, but how does better quality translate to more stations with more interference? There's no correlation to me. The FCC is not listening to the true clues from the marketplace.

The decisions the marketplace is making is that consumers are saying they want better quality and they are willing to pay what it takes to get it.

The FCC that's suppose to protect broadcasters from interference and direct technical standards needs to re-evaluate its current marketplace position.

RW: *There's another controversial issue for FM: FMX stereo extension. Does it work?*
Donahue: I've heard stories both ways.

RW: *Do you use it in any of your stations?*
Donahue: Not currently.

RW: *Have you tested it?*
Donahue: No.

RW: *Will you?*
Donahue: We may. Remember the commercial, "We'll drink no wine before its time." We feel that way about a lot of things.

We don't mind being innovators in some areas that are not going to have the potential of negatively impacting us.

(continued on page 27)

Radio's All-Terrain Vehicle

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Circle 6B On Reader Service Card

AKG Joins In The Desktop Audio Craze

(continued from page 1)

sion to 17.5 minutes of storage time. A hard disk for additional storage is a planned option. Other expansion options include digital EQ, reverb, effects, time compression and amplitude compression.

NED stays in the fight

Undeterred by new competition, New England Digital (NED) unleashed new software enhancements for its existing systems and touted the recently-introduced PostPro system as the ideal workstation for radio broadcasters.

The PostPro, which starts at $80,000 and can exceed $300,000 in a fully-expanded Synclavier system, is an eight-track direct-to-disk workstation specially configured for broadcast applications.

NED made it clear to broadcasters that development for the completely tapeless radio station is on the fast track. The company announced radio station sales of $1.5 million in audio products in less than a year.

ABC Watermark, NED revealed, is now using the PostPro to produce "America's Top 40 with Shadoe Stevens," "American Country Countdown with Bob Kingsley" and other national programming.

According to NED, ABC Watermark's PostPro, with 800 track minutes, is the audio industry's most powerful disk-based digital recording system.

NED courted radio broadcasters with special NAB demonstrations and stressed that it now offers hard disk storage capacity enabling continuous stereo recording and playback times of up to ten hours for automation of entire air-shifts.

Other offerings included two gigabyte optical disk sound data bases that provide on-line access to 5.5 hours of sound effects and other program elements; and up to 200 track recording for production in the digital domain with no generation loss.

The new NED product lineup for NAB included the DESC, a new system controller that simplifies editing functions and MaxTrax, an enhancement that doubles the number of available recording tracks in existing NED systems.

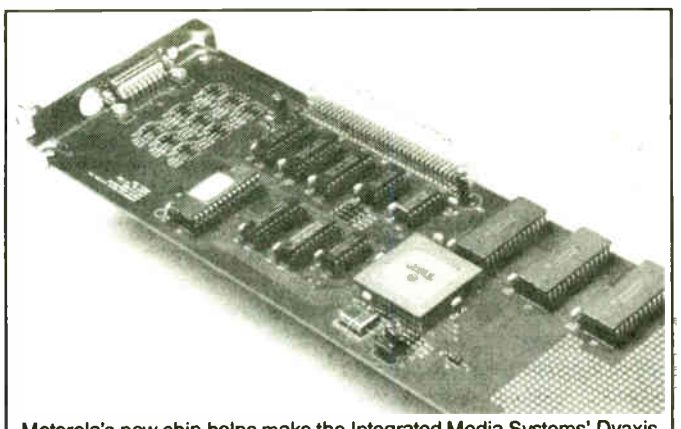
Also new from NED was MIDInet, an enhancement which enables Synclavier series systems to become the master controller/processor in a MIDI-based studio and a new optical disk for quick storage and retrieval of sound effects by PostPro systems.

IMS stakes its claim

Not to be left out of the workstation war, Integrated Media Systems (IMS) firmly staked claim to the low end of the market with enhancements to its Dyaxis system.

Designed to work with an Apple Macintosh computer, the Dyaxis offers random-access two-track recording and playback and multitrack offline sound file assembly. Without computer, the price begins at about $10,000.

IMS announced new radio station sales to The Legacy/Metropolitan Group and Gannett Broadcasting. A Dyaxis system equipped with a 640-megabyte hard disk drive, capable of holding up to 60 minutes of stereo audio, will be installed at Legacy's KDWB in Minneapolis.



Motorola's new chip helps make the Integrated Media Systems' Dyaxis workstation a reality.

Gannett ordered IMS systems for KIIS-FM in Los Angeles and KSDO in San Diego, the company said, bringing Gannett's total Dyaxis ownership to four units.

New Dyaxis features unveiled at NAB include a direct digital interface, a high-speed DSP processing card, MacMix Version 2.1 controller software and an Abekas digital videodisc interface. The digital interface allows the Dyaxis system to be directly connected to Yamaha's DMP7D digital mixer and processing gear. The same interface can be utilized with the Mitsubishi and Otari digital multitrack recorders.

The DSP card provides extended mixing and real-time digital signal processing and the new controller software offers enhanced digital mixing functions, time code slaving with dynamic offset control, full-function scrub editing and custom keyboard macros for dialog editing and radio production.

Several other manufacturers offered digital workstations at NAB, but most were high-end units aimed at the film and video post-production industries.

■ ■ ■

Frank Beacham is **RW***'s west coast editor.*

NAB SHOW STOPPERS

New England Digital's tapeless studio.

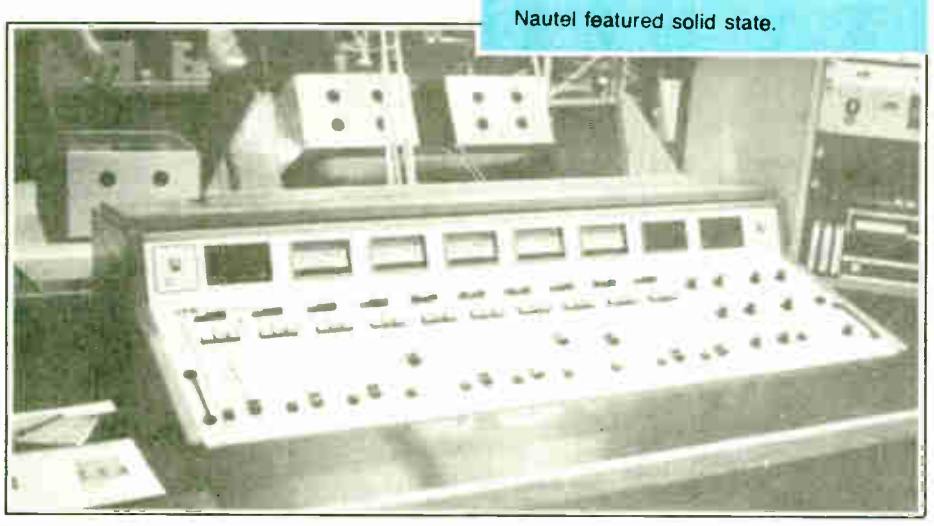
Wheatstone unveiled a sleek furniture line.

Ram showed one of many new consoles.

Nautel featured solid state.

QEI broke ground with its CATLINK.

TFT introduced its synchronous FM exciter.



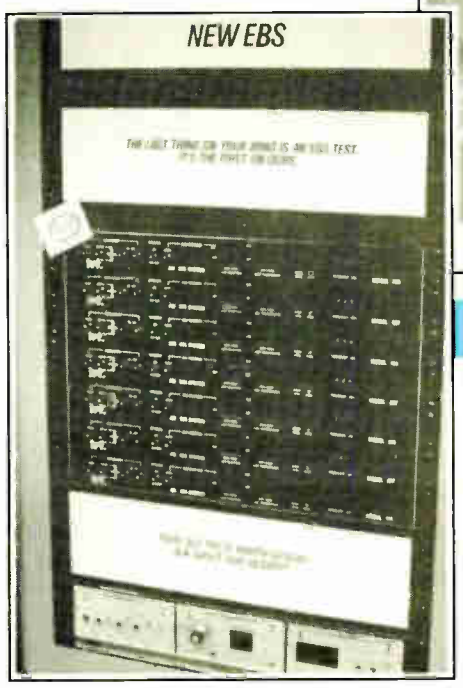
The new LPB Citation II console.

BSW featured the new Autogram console.

Media Touch Touchstone workstations added features.

A look at the hot products which had convention-goers "buzzing!"

Dolby showed SR for cart machines.

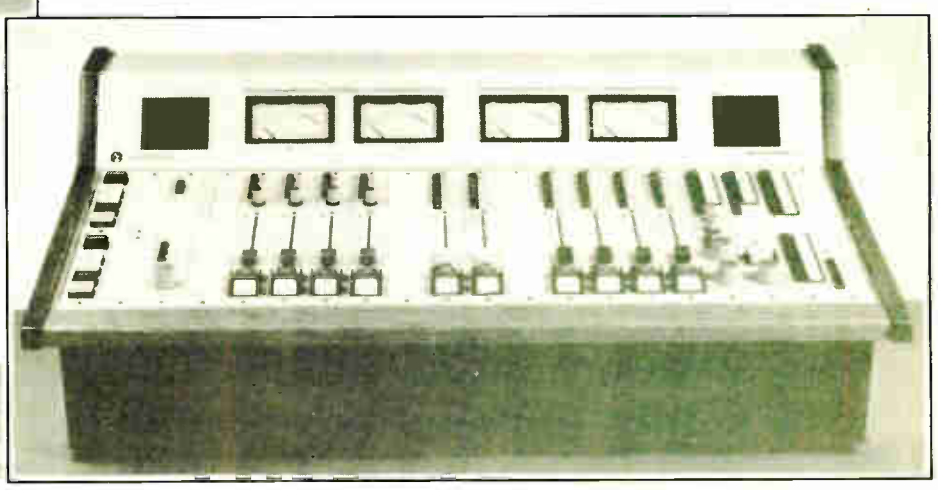


TFT unveiled an EBS monitor.

Legacy's Doug Howland works with the Dyaxis from Integrated Media Systems.

The CRM remote mixer from Gentner.

There were many new products at the Arrakis booth.



The new Radiomixer from Pacific Recorders & Engineering

Jim Woods features his Inovonics FMX generator.

Orban, sold to AKG, featured its full line of processors.

C-QUAM the Standard, Quello Says

by John Gatski

Las Vegas NV If the FCC were to reconsider the adoption of an AM stereo standard, at least one commissioner said he would vote for Motorola's C-QUAM system.

In remarks made at an FCC/Congressional staff breakfast at the NAB convention, Commissioner James Quello responded to the AM stereo issue after being queried by a broadcaster.

"As far as having a standard, I've always believed in it. I was on a panel here two or three years ago . . . and I said if I were a practical broadcaster, I would probably wait and see what standard of stereo General Motors accepts and puts in its cars," Quello said.

"It (GM) took Motorola. That is pretty much the standard," he continued. "I would vote for it and codify it immediately. I assure you that you wouldn't have too much trouble getting that through the Commission."

The FCC declined in 1981 and 1988 to choose one of the proposed technologies for the national AM stereo standard. By 1988 the decision had boiled down to two of the original five: Motorla's C-QUAM system or the ISB system, invented by Leonard Kahn.

The defacto standard

As Quello noted, many broadcasters already consider C-QUAM the unofficial standard, with about 700 stations using C-QUAM worldwide; some 500 in the US. Kahn claims 100 stations are using the ISB system, but counts by others place the number at substantially less—Motorola maintained there are only 32 remaining Kahn-ISB stations.

Many analysts believe the FCC did not choose a standard because of a fear of litigation from the side not chosen.

Motorola and Kahn are embroiled in a lawsuit and counter lawsuit involving patent claims on the technologies and there are fears that if the FCC were to choose a standard now, the Commission would end up in a legal battle, too.

Acknowledging there could be even more legal battles if the Commission chooses C-QUAM as the standard, a Motorola official had mixed feelings about Quello's comments.

"We would like to see it," Motorola AM Stereo Engineering/Broadcast Equipment Manager Donald Wilson said. "But the threat of tying it up for five more years is what we are afraid of."

Remain unofficial

Since so many more stations are already using C-QUAM, "Being the unofficial standard might be the best way to settle it right now," Wilson said.

He said AM stereo also is facing other problems, including AM stations' reluctance to adopt it.

The broadcasters are saying there is no demand for AM stereo because manufacturers are not building any AM stereo-equipped radios, he explained.

Wilson said, however, that many auto manufacturers and radio manufacturers are making AM stereo radios.

He said about 35% of cars built since 1985 have an AM stereo radio. "Chrysler does not make an AM mono radio any longer," he said.

Wilson said stations are only hurting themselves by delaying installation of AM stereo because the longer they wait, the more listeners will switch to FM.

"They (broadcasters) are the ones that have to make the improvements," he said. "The broadcasters are going to have to start pulling. We have pushed as much as we can."

For information, contact Donald Wilson at 312-576-0554.

FCC Commission James Quello makes a point about AM Stereo at a convention discussion.

Radio's Digital Deficit

(continued from page 7)

World broached the question to four leading manufacturers of audio consoles for radio stations. Their answers, quite candid, reflected more the state of radio in the marketplace than the state of technology in radio.

Write a check today

"You can write a check today and buy a digital console," said Jack Williams, president of Pacific Recorders & Engineering Corp. "You can write a check today and buy a tapeless studio. You write a check today and do digital editing. It's not a matter of technology. It's a matter of market.

"Currently, the industry is operating quite profitably and quite successfully producing and putting stuff on the air pretty much the way they have for the past several years," Williams said.

"Do radio stations view these digital systems as something they can use to bring more to the bottom line? Managers look for cost justification when they start writing checks for any pieces of capital hardware. So, it's not a matter of availability, it's a matter of 'Is it a tool the radio industry is looking for?'"

Radio Systems President Dan Braverman said his company serves the middle and low-end user in the radio station marketplace. "Many of these users are just upgrading from tube consoles to solid state," Braverman said. "We've got enough trouble trying to convince them that DC-controlled technology is the way to go—leave alone digital."

Wheatstone President Gary Snow said, cost aside, current state-of-the-art analog consoles are better than current digital consoles anyway. "The performance of our analog board is clearly superior in terms of noise, distortion and overload characteristics to digital boards using 16-bit conversion," Snow said.

"Digital audio is now limited practically to about 90 dB of dynamic range," Snow said. "Whereas, an analog console like we make is nearer to 114 dB dynamic range."

Digital overload

A digital console used in a live situation is apt to be put into an overload situation, Snow said. "Digital overload is pretty horrendous. It's so bad that you'll need to run your digital console considerably below that overload point and then you'll run into quantization noise problems and the grittiness people have complained of. In this situation what you're really experiencing is something like 12-bit quality, which is not too hot," he said.

When will Wheatstone build a digital console for radio stations? "I see a time we'll build one when we get 20-bit conversion. Then we'll think it's a console worth building," Snow said.

Steve Sage, president of Auditronics, predicted it will be three to five years before a digital console appears for radio stations. "The technology exists now but the price is prohibitive," Sage said. "And the consoles we see today, as far as distortion and noise and so forth, are pretty good. Is the radio station going to buy something just so they can say it's digital? Does digital help you sell your station time for any more money?"

Braverman said most radio stations simply won't pay for a digital console. "If I owned a radio station, even one with a high budget, I don't think I would go into the digital domain," he said. "A good CD or R-DAT system into a fine console—even our boards, which are very economical—I would challenge anyone in a good transmission chain to hear the difference between that and what would end up being a hundred thousand dollar console by the time you are done."

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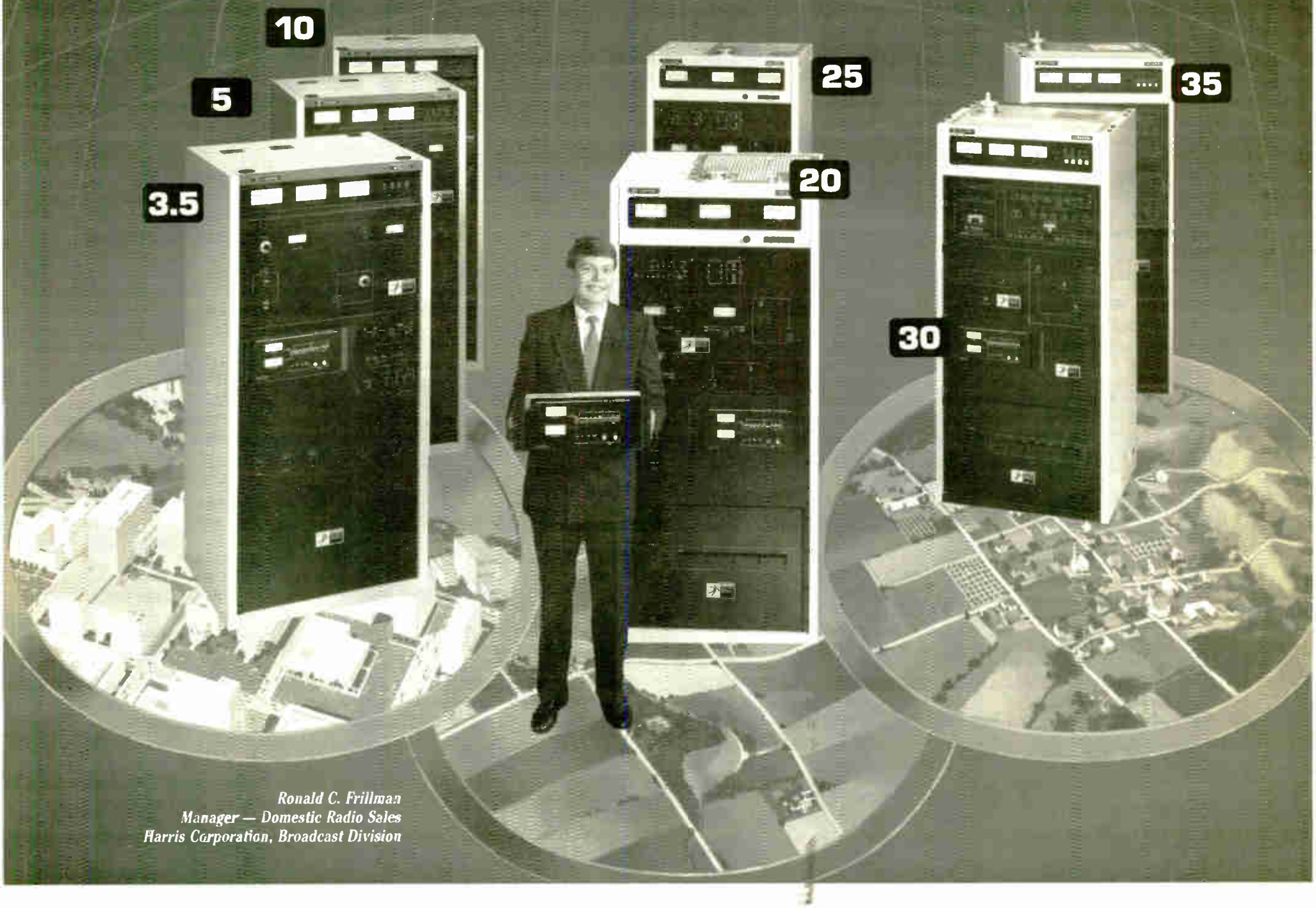

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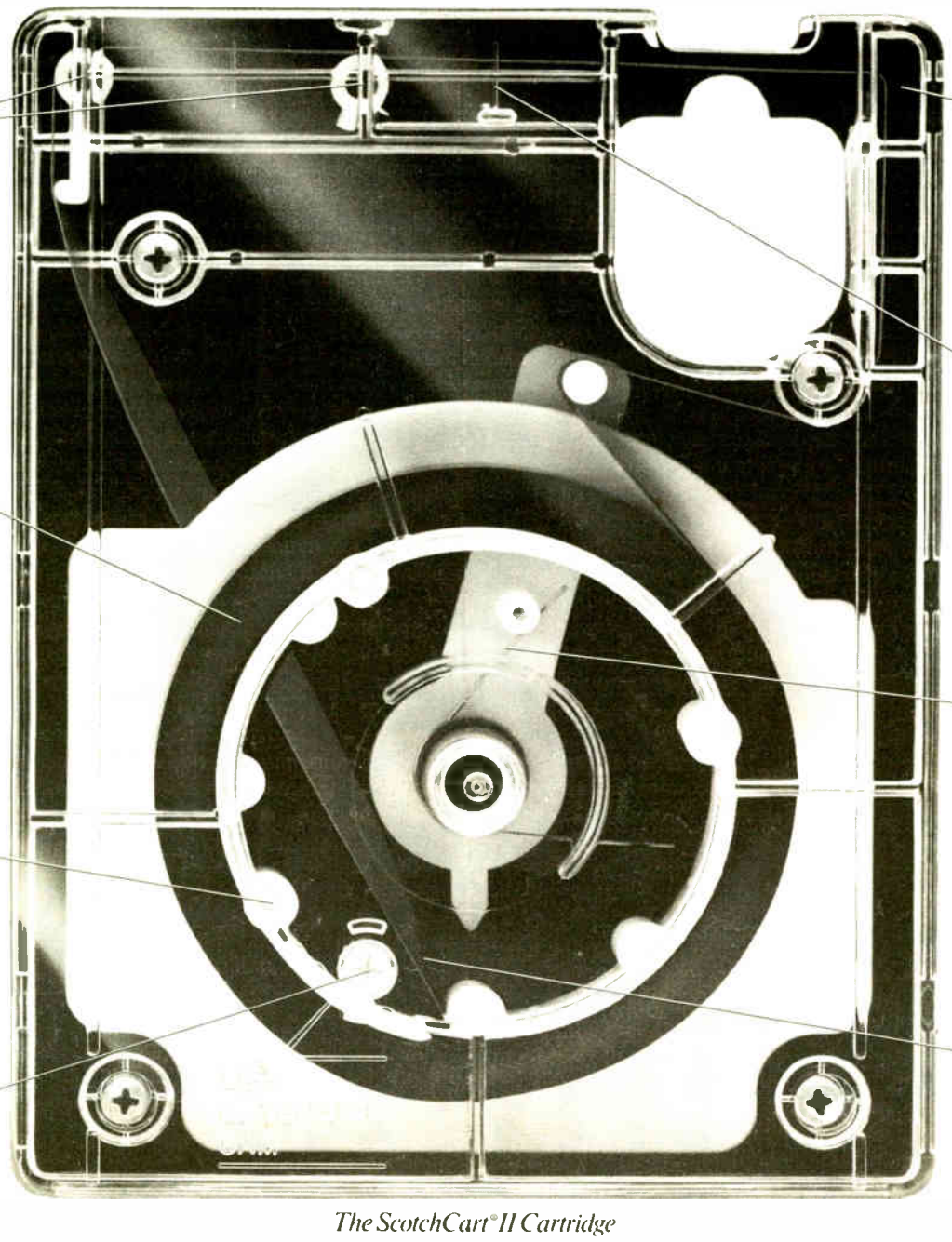

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The reason most broadcast cartridges quickly become unreliable and self-destruct isn't because they're overused. Poor designs that create too much friction and tape stress can cause more headaches than anything. But as you can see, the revolutionary design of ScotchCart® II cartridges makes them noticeably superior to other carts.

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3M

Circle 36 On Reader Service Card

Solid State RF Products Proliferate

by Dee McVicker

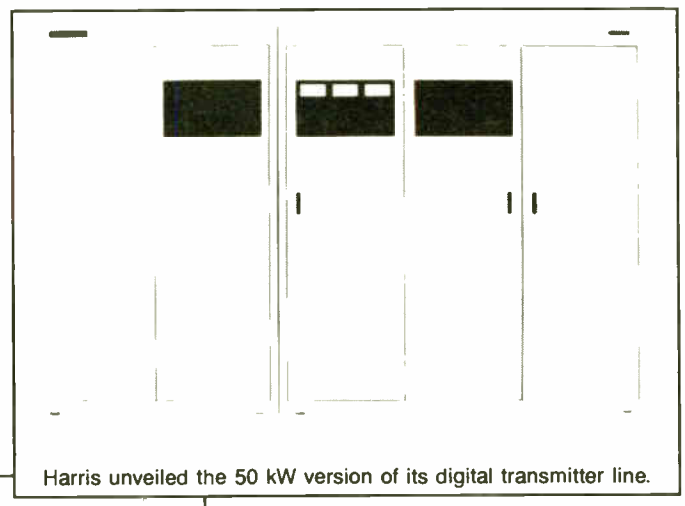
Las Vegas NV NAB '89 revealed advancements in solid state transmission. Following AM's lead, FM transmission reached new solid state power levels and benefited its predominantly analog designs with digital technology.

AM transmission, meanwhile, continued along the path of digital modulation.

AM transmission

Harris Corp. brought its solid state DX series up to a new power level with the showing of its DX-50. According to reports from Harris, the DX-50 sets a new precedent at the 50 kW level with 85% efficiency AC to RF.

Harris also repackaged the DX-25 member of the series, now called the DX-25U, for in-field upgrading to 50kW power. Now in production, the DX-25U and DX-50 list for $127,500 and $192,500 respectively.



Harris unveiled the 50 kW version of its digital transmitter line.

Broadcast Electronics' new FX50 FM exciter

Continental Electronics announced a new 10 kW solid state transmitter, the XL-310, that uses a phase coherent digital RF pulse width modulation technique.

The company also plans to expand the series with a 5 kW version, also to be available at the end of the year.

Nautel showcased a new generation of its solid state 5 kW model, the AMPFET ND5. Packaged smaller than its predecessor, the AMPFET ND5 features on-air serviceability.

Said Sales Manager Jorgen Jensen, "The new ND5 has more headroom than its predecessor, and it can run 5.6 kW and still give you an easy 125 % positive modulation." In production now, the AMPFET ND5 lists for $39,950.

CCA Electronics, now manufacturing the CSI line of transmitters, introduced the AM-25000 FHF transmitter, a 25 kW model which uses a solid state frequency synthesizer with established technology. Said Ronald Baker, president of CCA, "Efficiency runs 80%." The new AM-25000 FHF transmitter is in production now, and lists for approximately $118,000.

Energy-Onix announced plans to begin production of AM solid state transmitters of up to 1 kW power. President Bernard Wise expects the new line to be available soon after the show, along with a new high-level, plate-modulated 50 kW unit.

FM transmission

Broadcast Electronics featured a new 50 W exciter, the FX-50, that rates at less than 0.003% THD and IMD with typically 93 dB SNR. According to Domestic Sales Manager Bill Harland, the new exciter's performance specifications were made possible by using a computer-designed, linear-modulated oscillator. The FX-50 lists for $6,100 and is available off the shelf.

Broadcast Electronics also displayed its new "B" series transmitters. Covering a power range from 100 W to 35 kW, the "B" series is a single tube design using a folded half-wave cavity technique to reduce maintenance costs. The new series is now in production.

Continental Electronics presented its new 10 kW single-tube transmitter, the 816A-1. To be available this fall at a list price of $41,995, the new 816A-1 uses a dual stage solid state intermediate power amplifier.

NAB '89 marked the first showing of Harris's full HT transmitter families. Available in power levels from 3.5 kW to 35 kW, the HT transmitters feature a single tetrode tube with a fifth generation solid state FM exciter, the THE-1. HT transmitters range in price from $28,600 to $69,300.

QEI Corp. displayed a member of the FMQ "B" line. The FMQ-20000B and FMQ-30000B, reduced in size and priced comparably with their predecessors, are single tubes and have a new plug-in 600 W IPA design with the RF circuitry and the power supply in separate cabinetry.

According to VP of Marketing Bill Hoetzel, "If you have a module or power supply failure, you can re-cable from the front panel." The QEI "B" line is available for $47,500 and $52,500 (20 kW and 30 kW, respectively), which includes a spare parts kit and on-site inspection.

New arrivals, old friends

A new arrival, CTE (from Italy), introduced its solid state exciter and line of solid state transmitters to NAB visitors for the first time.

Available now in 250 W to 5 kW power levels, with unrivaled solid state 10 kW and 20 kW powers to be available next year, the new VL transmitter series rates at 52% efficiency AC to RF. The CTE S20 exciter and VL series are available through CTE's representative, Rob Meuser with IBSS.

Television Technology Corp. (TTC) displayed similar success with solid state technology. The new 4 kW FMS-4000 presents solid state transmission in 1 kW amplifier modules and is available in June for a list price of approximately $20,000.

A new 8 kW version, the FMS-8000, is also expected to be delivered in June with a retail price of approximately

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Familiar Faces Grace the Tape, Cartridge Arenas

by George Riggins

Las Vegas NV There was a strange mix of CD players, DAT, standard endless loop cartridge machines and reel-to-reel recorders on hand at the NAB. Everything from a Tapecaster to a $10,000 Nakamichi DAT system was on display.

Audicord was displaying the "DL" and "S" series machines that have been the mainstay of the line for several years. The listed features of Audicord emphasize ease of service and the ability to add the listed options in the field if the desire arises.

The "DL" series comes standard with two tones and the "S" series is standard with all three tones. No fast forward was listed for any model.

Broadcast Electronics introduced two additions to its cart machine line. The Trak series of machines was expanded to include the new Dura Trak 90 cart model.

The second introduction by BE was a splice finder/eraser called Splice Trak 90 (to maintain the Trak continuity). It uses erase heads for degaussing rather than a coil under the deck.

The premium Phase Trak 90 line by BE featured the noise reduction and phase correction circuits in play and the learning functions for the recorder section. By using the microprocessor learn section of the recorder, each cartridge can be optimized for tape wear.

Alternatively, cartridges can be optimized by lot numbers and the parameters of bias and equalization can be placed in memory and recalled as needed.

Fidelipac's contributions

Fidelipac was showing the 10, 30 and 100 series cart recorders/players. The 30 series three deck machine made its NAB debut. The drive motor for the 30 series seems to have standardized with a hysteresis AC motor.

The main feature of the 100 series machines is still the "Cart Scan" system. By using this feature, several things can be done to individualize a cartridge. Elevated levels, matrixing and/or auxiliary functions can be controlled by affixing a label to the right side of the cartridge.

The Aux function can be used for any number of external functions through a collector-to-ground output at the remote plug. Also included in the 100 series recorders is a splice finder.

The 10 series and the 30 series (three deck) units are standard machines with the normal features of three cue tones, fast forward (in the 10 series only) and flashing lamps to alert the operator to the fact that a cart has already been played.

Fidelipac also had the ESD 10 splice finder/eraser on display. The ESD 10 is built on the same chassis as the 10 series machines, and uses erase heads rather than an under-the-deck coil for degaussing the tape. Typical erasure levels are listed as being down 85 dB.

Had to go looking for ITC. Seems 3M put the cart machines and audio switcher in with the tape and video display.

ITC had the 99B with the ELSA splce finder and head azimuth adjustment on display. This series machines has been a reliable workhorse over the past several years. Auxiliary function switches are hidden behind a swing-down front panel to help eliminate front panel clutter and yet make them available for easy access and adjustment.

Broadcast Electronics new Dura Trak 90 is a medium-priced version of its phase-correcting cart machine.

As with other premium lines, the 99 series features a DC servo motor and three cue tones standard.

The "Omega" series also has the DC servo motor and the high speed cue. Secondary cue tone is standard with no provision for the tertiary tone. Something interesting has been added to the Omega series. The circuit boards are now listed as "swing-out" with no need for extender cards. I don't know how this is being accomplished, but its certainly a plus for servicing in the field.

The ESL V is a proven splice finder/eraser. The only real difference between the ESL V and the competition is the way the tape is erased. The ESL V uses a degaussing coil mounted beneath the deck, rather than erase heads.

An overlooked product

The one cartridge machine we sometimes overlook is the Tomcat by Pacific Recorders & Engineering. The two main features that differentiate the Tomcat from the others are the head format and the pressure roller engagement system.

The Tomcat uses the Maxtrax™ head with the program tracks; it has an .080 track width and the cue track uses a narrow pole piece. The rationale behind the wider program width is to give better SNR and less susceptibility to tape dropouts.

The heads are placed in a precision head/guide assembly to provide a repeatable cartridge insertion/tape path from cartridge to cartridge. The other major departure from the rest of the herd is the method by which the pressure roller is activated. PR&E uses a rotary solenoid and a specially designed cam to apply the engagement torque for fast lifting of the roller.

A slower final engagement also is employed so as not to damage or displace the tape at moment of contact between the roller and the capstan. In addition, the capstan motor and the pressure roller engagement system are manufactured as one integral unit.

As with most other premium machines, the main functions are controlled by a microprocessor rather than by relays or other discrete devices.

Otari perseveres

The newest entry to the field of cartridge machines has been Otari. Otari is selling the CTM-10 series cart machines. The series consists of the CTM-10SR stereo record/play deck, the CTM-10MR mono record/play deck, and the CTM-10 mono/stereo playback-only deck (field convertible to record/play).

The CTR-10R record module provides metering, level control and electronics for the record decks. The NAB head config-

(continued on next page)

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uration is standard; Maxtrax™ heads are an option.

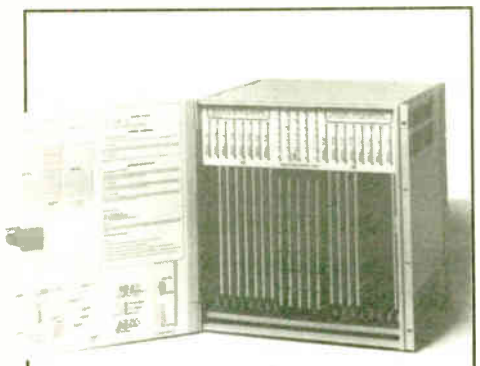
One departure from other machines is an operator accessible control on the front panel to allow a six percent plus/minus speed variation. The machines also have built in azimuth alignment controls available on the front panel.

The auxiliary controls are supposed to be hidden behind a front panel door held in place with an Allen head screw, but that will not stop most of the operators from getting into the controls. A way to get in will be found.

As for the play and record electronics, Otari is a well-known manufacturer. Over the years the company has proven that it knows how to make tape recorders and players. There should be no surprises in the electronics.

Tape cartridges

Three major entries in the cartridge tape business were represented. Audiopak was promoting the AA-4 cartridge loaded with #614 tape (formerly Capitol SGS-4).



3M's Series H 128 × 32 routing switcher

The features of the Audiopak tape are listed as a premium oxide, superior high frequency saturation headroom and a low friction binder to reduce running tension. The tape travel is stabilized by using a side mounted foam pad to give holdback tension as the tape goes around the left front corner post.

Audiopak still manufactures the A-2 and the AA-3 cartridges. The AA-3 is loaded with 613 (formerly Capitol HOLN tape) and the A-2 is loaded with 605 (formerly Capitol Q-17).

The major change at Audiopak is the change of ownership that took place at about NAB time last year. The new plant is up and running in Winchester, VA and turning out product with many of the same people that were associated with the former Capitol endeavor.

Fidelipac was showing the Master Cart AA (red base) loaded with series 400X standard tape and the Dynamax base loaded with the Dynamax DYN 1000X COBALT tape. The DYN 1000X tape is a high output cobalt doped tape that is suggested for recording with elevated levels.

3M/ITC, the other major player in the NAB tape cartridge race, was demonstrating ScotchCart II with the adjustable cam to control the tape tension for maximum life and minimum wow and flutter.

Reel-to-reels, cassettes

As far as the AM or FM radio studio and ¼" or ½" recorders are concerned, the three companies that produce the majority of the machines used today were present at Las Vegas.

Otari, Studer Revox and Tascam were all represented with both ¼" and ½" machines. There were differences, but they will all do the work requested.

All three are capable of working with SMPTE time code and/or synching to other outside timing codes.

One item that still seems to be present in most of the reel-to-reel machines is a microphone pre-amp. Do we really need a mic pre-amp in machines intended for use in either production studios or broadcast studios where we are mixing several channels of audio before we put the result on tape?

Accurate Sound has been missing from NAB for a year or so. Ron Newdoll is now manufacturing a tape conditioner to go along with the AS220-A high speed audio duplicator. The AS-6000 Tape Conditioner is intended for cleaning and properly packing the tape prior to use. The stated benefits include better tension control and fewer drop-out problems.

Accurate Sound is also manufacturing a logging recorder. The AS-4000 series data recording system is built around the Philips cassette deck. As manufactured, the system will record 25 hours of data using a C96 cassette.

And Tascam, whose single cassette deck has become a virtual standard in most stations' studios, unveiled a dual cassete deck this year.

The 202WR features sync dubbing capability and is aimed at the professional recording market.

The company also unveiled a new ½" 8-track recorder which has many of the features found on its MSR-16 introduced last summer.

Heads

Where would we be without heads for tape machines? Two companies were present with information on heads.

Sprague Magnetics showed a development in head manufacture that allows the replacement of either the part housing the pole pieces or the surface that contacts the tape.

Sprague reports that the cost of either part of the head is about half the cost of a new head. That is, half the cost of a new Sprague head. All I could think of was the way we replaced the pole piece in the PT-6 Magnacorder heads many years ago. Perhaps the old "Maggie" was really ahead of time in some ways.

Saki Magnetics has now developed ferrite heads for cart machines as well as for

(continued on page 48)

Advances Made in STL, RPU Gear

by Geary Morrill

Las Vegas NV Advances in technology, and in the instance of one manufacturer, a retreat in the price of that technology dominated the STL/RPU/remote control/telco news at NAB '89.

These advances appeared as a proliferation of multiple line frequency extenders, new STL techniques using telco T1 data lines and innovations in the remote control and RPU arena. The developments are sure to make life easier in the congested spectrum that broadcasters call "home."

One "leap" in technology came from QEI Corporation, which ventured forth from its usual area of FM transmitters to address STL needs. In doing so, the company is making the cost effective T1 telephone service accessible to broadcasters who, for whatever reason, opt not to use STL via standard microwave.

QEI debuted the CAT/LINK T1 compatible STL system capable of utilizing existing telco data links, or "direct linked" using up to a mile of twisted pair, two miles of fiber optic cable, or 23 GHz microwave channels with full duplex communications possible in any configuration.

You can, for example, send composite signal, SCAs control channels, voice communications and RS 232 to the transmitter, and backhaul transmitter readings and satellite and remote feeds simultaneously.

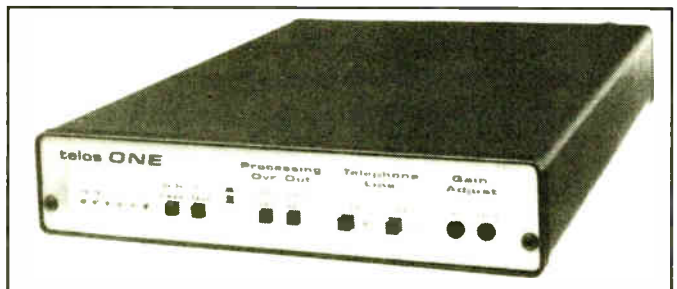
QEI claims performance in the −86 dB noise range and distortion figures of 0.01 percent nominal. System pricing is expected between $6500-$12,000 depending on application.

One real surprise, however, was the introduction of a new product from Cleveland-based Telos Systems that's sure to put a smile on the face of any engineer choosing between hybrid performance and cost.

The new Telos 1 digital telephone interface has broken the $1000 barrier in this technology ($985), without sacrificing a great deal of performance. It was featured in the Bradley Broadcast booth and is available from that distributor.

When compared with the Telos 100, distortion rises to 0.8 percent from 0.25, and S/N of −56, down from −67 in the 100.

The Telos 1 actually outperforms the original Telos 10 in many areas. The unit will also support the full family of peripherals, including a 1A2 interface and new Direct Interface (actually a small PABX designed and optimized for broadcast on-air use).



Bradley Broadcast showed the latest in digital hybrids: the Telos One.

Frequency extenders, hybrids

Gentner Electronics and Comrex both showed three line frequency extenders at the show, with the Gentner passing 50 to 7.5 kHz, and the Comrex doing 50 to 10 kHz on three lines (utilizing a frequency compression scheme at the high end to gain bandwidth specs).

Both systems utilize totally automatic setup of the extenders complete with autodialer and group delay and equalization adjustment to insure proper operation of the equipment by non-technical station personnel.

Once again, Comrex was also showing its line extender/cellular phone combo and a new combination hybrid/extender.

Gentner, meanwhile, showed an enhanced version of its Digital Hybrid that utilizes a retro-fittable Advanced Nulling Algorithm, giving dynamic improvement of the differential null in a "transmit only" (no caller) mode of 49 dB by reducing the caller output level.

Gentner also had further enhancements to the DRC 2000 Remote control, including a software upgrade kit for retrofit into older DRC 2000s and a new software package to reduce the number of keystrokes needed to set up the 2000 (which will run on any IBM compatible PC).

Symetrix was showing its new Model 111 adaptive hybrid that operates in the DSP domain, as well as the T1 101 and SH 203 telephone interfaces. The Model 111 has a trans-hybrid loss of some 46 dB.

PC-friendly remote control

Burk Technology (formerly Advanced Microdynamics Inc) showed enhancements for the popular ARC 16 remote control, including an IBM-PC interface for logging and display, and a DSU telephone/speech unit to allow full function control from any touch tone phone, as well as callout alarms.

The ARC 16 also supports multisite operations with either a direct connect to each, or a "daisy chain" configuration. Alarms are reported no matter which site the control is monitoring.

Moseley Associates was also making its remote controls more PC friendly, with a system allowing monitoring of multiple sites equipped with an intermixture of MRC 1620s and MRC 2s.

The 1620 is the "son" of the 1600, with enhancements such as an RS 232 port, and a dial access system with software designed to take the place of a control terminal. The system has the added ability to log status and telemetry direct to disk for archive purposes.

There's also an option that utilizes a pocket size PC/modem for display of status or telemetry and issuing commands available for $595. The RPL 4000 Remote Programming Link (with built-in companding) and CL 100 Communications Link hardware were also displayed.

Marti Electronics was showing a new audio companding option for its RPU line that can be ordered as a factory option or retrofitted into existing RPT-2, RPT-15 and RPT-30 transmitters and AR-10, CR-10 and DR-10 receivers.

The company also has a trade-in policy for factory-direct sales that may help you modernize your APU gear and radically improve its range too, by offering a 12 dB improvement in S/N figures on a 25 kHz channel with 1 mV at the receiver.

Other innovations

Elsewhere on the RPU front, TFT was showing its Model 8888 UHF system improvements. The Model 8888 unit, introduced last year, has frequency agile transmitter and receiver, complete with DTMF control at the transmitter end that allows the remote operator to switch frequencies and/or bandwidths without operator intervention at the receive site.

Full front panel diagnostics and three mic/line inputs are standard on the TFT system. The Model 8300 STL was also on display, as well as a new Model 886/887 second-generation EBS system that even keeps track of the number of days since last transmission and receipt

(continued on page 40)

Donahue on the Record

(continued from page 14)

If there is potential, we want it to be thoroughly tested. I'm not convinced that it has been. I'd like to support a better FM service.

RW: *Looking at AM technology, is it too late for AM stereo?*
Donahue: Unfortunately. I think the FCC was the problem there (when it did not select a standard but opted to let the marketplace choose). I don't think it's dead long term. For the immediate future, it's not viable. It's in most of our AMs and sounds good.

RW: *What system do you use?*
Donahue: C-QUAM.

RW: *Do you advertise your stations as being stereo?*
Donahue: Yes, but we probably don't do as good of a job as we should. I don't have a good excuse for that.

AM stereo is another example where consumers are incapable of making a technical decision, other than they would have liked better quality, but we weren't able to give it to them. Now, manufacturers have no momentum, broadcasters have no momentum.

RW: *How is the sale of stations for the exorbitant amounts we're seeing today going to affect radio?*
Donahue: Many of these investors have gotten in on the concept that they would own the stations for the short term and spin them off for a higher price. This is the core of their business plans.

You can only accomplish these turnarounds by reducing capital purchases, cutting staff, emphasizing programming and putting massive sales staffs on the street. The broadcasting station of the future, if this trend continues, is one of a minimally staffed operation.

RW: *What does this mean engineering-wise?*
Donahue: I don't know because it's still a technology intensive business. There's a shortage of good engineers, and we're in a business that is clearly going digital, which is more technological involved.

RW: *Where are tomorrow's engineers being trained?*
Donahue: They aren't. Schools aren't addressing the issue, because in their viewpoint, growth in broadcasting is not going to be as high as in other areas. It's becoming a niche market.

It is an issue that is ill-defined because personnel requirements are changing. The typical broadcast engineer who came out of ham radio or had an interest in computers isn't there anymore.

RW: *Do you have trouble hiring engineers?*
Donahue: Yes, and I would say this problem is echoed by virtually everyone I know. The good people's salaries are going higher and higher.

We are facing issues that have to be reviewed. I don't think the groups and broadcast owners are doing it.

RW: *What does the debate over state licensing for broadcast engineers mean?*
Donahue: This is an an issue exclusively for consulting engineers. Anybody that is hired by a company can be called an engineer. The fact that the professional engineers' licenses don't include information required for a broadcast engineer, to me, makes its obvious that there is no similarity.

If professional and state registering organizations want jurisdiction over broadcasting, I believe they should incorporate a method that allows for accurate testing of the field's requirements and license people based on that similar to effort conducted by the SBE.

RW: *Looking ahead, what is the importance of digital to the radio industry?*
Donahue: It is clearly the future in every area throughout the broadcast system.

RW: *Will radio have a tapeless studio?*
Donahue: Without question. It is a matter of timing.

RW: *Will transmission be digital?*
Donahue: No question about it.

Digital is the future of radio for many, many reasons. If data compression algorithms work the way they're supposed to, digital audio will fit in your standard STL bandwidth now. For T1 carriers, it will work on your phone lines cheaper than on your analog phone lines.

When you see people editing in the digital domain, you realize that analog tape is history.

Is it there yet? No, it's too expensive.

RW: *How will the average station be different by 2000?*
Donahue: To get an idea, you need to look at where the computer industry is. Broadcasting lags the computer industry by 18 months to two years.

The best way to see what the radio station of the future is going to look like is to look at the office of the future because they mimic each other. Linked secretaries with laser printers are an example.

In radio, there is certainly going to be a massive digital storage system that stores commercials and music and is driven by computer initiated and stored logs. The DJ will probably have some futuristic version of a Media Touch screen where his entire system is laid out on a screen, with perhaps a light pen to move commercials and music.

SBE Takes Stand on Licensing Issue

by Charles Taylor

Las Vegas NV The Society of Broadcast Engineers (SBE) announced at the NAB show an official stand on the professional licensing of broadcast engineers by individual states, after laying low on the issue for months.

The society took a middle-of-the-road approach, avoiding a strong stand either in favor of professional licensing of broadcast engineers or direct opposition to it.

The policy was formulated and approved the day before an engineering session on the licensing controversy.

Double-edged stand

Essentially, the document took a double-edged stand. First, SBE declared that the dispute surrounding what engineers can legally be called is "semantic" and, thus, should not be of concern to states.

Ample room exists for the use of the title "broadcast engineer" because "engineering is a generic term with a rich history in the broadcast industry. It doesn't matter what you're called—it matters what you do," said Chris Imlay, SBE's attorney and one of the panelists.

SBE also said it will petition the FCC for a declaratory ruling that state licensing of "technical operators" is federally pre-empted by guidelines of the Communications Act of 1934 and thus not subject to state regulatory control.

That action excludes the more controversial "consulting engineer" title, which can refer to the growing number of contract enginners being used in the field, but Imlay said SBE is taking the matter one step at a time.

The SBE also said it studied actual instances where states had attempted to enforce regulations on engineers. "I hope it will have a bit of a calming influence on people because we didn't find much," Imlay said.

". . . engineering is a generic term with a rich history in the broadcast industry. It doesn't matter what you're called—it matters what you do . . ."

Issue having an effect

But Ray Thrower, president of the National Association of Radio and Telecommunications Engineers (NARTE), which has been the most vocal opponent of state licensing, said the issue was indeed affecting engineers.

"This is not a 'Chicken Little' situation," he said.

NARTE's firmer stand, for one, recommends obtaining at the federal level "state preemption of all radio and telecommunications engineers and technicians as far as the states are concerned," Thrower said.

Response to the policy by other panelists was generally positive, though Randy Stover, a contract engineer in Fresno, CA, worried that it wasn't strong enough.

"This issue can hurt us in our tenderest spot—the pocketbook," he said.

The remainder of the session on state licensing primarily reviewed the history and potential ramifications of the issue, which have circulated through the industry since November, when NARTE alerted broadcasters to increasing efforts in certain states to enforce the controversial regulations.

The primary foe to NARTE's outcry has been the National Society for Professional Engineers, which declared that testing not only will place broadcast engineers under the same scrutiny as counterparts in other engineering disciplines, but also will set a necessary and overdue standard for minimum competence within the broadcast industry.

Federal legislation has been drafted by the office of Rep. Matthew Rinaldo (R-NJ), focusing on the argument that broad state engineering statutes are not applicable to telecommunications engineers, though no bill has yet been introduced to Congress.

The issue has been presented in smaller state forums in Michigan and the state of Washington similar to the NAB panel.

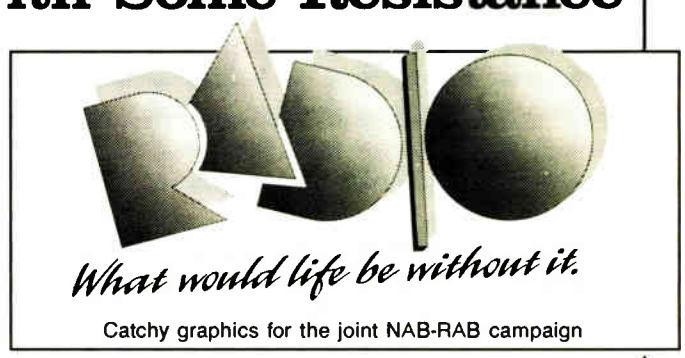
Said Charles Morris, CE at KIRO Radio/TV in Seattle, where a panel was held in November, "This is a subject that's getting controversial in the sense that you can be on the register-everybody group or the let-the-market-decide group and be right in both cases and wrong in both cases. There's no right answer."

RAB Begins Ad Campaign, Meets with Some Resistance

by Charles Taylor

Las Vegas NV What would life be without radio?

That's the question the NAB and Radio Advertising Bureau (RAB) are posing before listeners nationwide through a $100 million advertising campaign: "Radio: What would life be without it."



Catchy graphics for the joint NAB-RAB campaign

Not readily accepted

Scheduled to have begun 26 May, the promotion was announced at a gala NAB Radio luncheon, which included induction of Hispanic broadcasting pioneer Nathan Safir and sportscaster Red Barber into the NAB Radio Hall of Fame.

Launching the campaign was a two-minute spot narrated by James Earl Jones that included, "Imagine if all your days sounded like this," followed by 30 seconds of silence.

All radio stations nationwide had been urged to air the spot in unison at 7:42 AM 26 May.

But the spot was not being readily accepted by some radio stations and DJs that questioned "dead air." Even an industry newsletter encouraged stations to not participate, which brought a heated response from NAB in the form of a letter.

Calling the letter a private correspondence, an NAB spokesperson declined to comment. She maintained that the association had received a lot of support for the promotion.

"It's a totally voluntary effort," she said. But when questioned about stations that were concerned they would lose listeners during the dead air segment to those not participating, she commented, "This is a chance for radio stations to cooperate rather than compete."

On-air variations of the promotion, which is slated to be year-long, include celebrity testimonials by teenage singer Debbie Gibson and media star Willard Scott.

The campaign is aimed at increasing awareness and appreciation of radio's role among opinion leaders and the general public, raising professional commitment within the radio industry and increasing radio's share of overall advertising dollars, according to RAB.

Unprecedented action

It "marks an unprecedented collective action by commercial radio stations," noted Eddie Fritts, president and CEO of NAB. "Our plan is based on . . . research which shows that radio is a vital part of people's daily lives that they take for granted."

He added that 228 million Americans listen to radio an average of three hours and seven minutes each day. "That substantial relationship is what we hope to merchandise on Capitol Hill, Madison Avenue and Main Street."

The promotion is the first industry-wide concerted effort to promote radio since 1922, RAB said.

Fritts Advocates Reforms in Radio

by John Gatski

Las Vegas NV Radio-only and license renewal reform legislation should be a high priority within the radio industry, NAB President and CEO Eddie Fritts told the NAB during opening ceremonies.

Fritts addressed a variety of topics including radio reform, technical problems and public perception of radio.

"We are beginning to get through the message that radio's needs and economic realities are different from those of televison . . . and the abuses in the radio renewal process must be reformed," Fritts said.

He praised a radio-only bill, introduced in Congress this spring, that would enact a two-step licensing process and eliminate third party buyouts during radio renewals.

He said broadcasters and the industry need to get behind the bill to assure its passage.

"Talk to your own local members of Congress back home. Ask them to cosponsor HR 1136 and to vote for it when it comes to the floor later on," Fritts said.

In addressing the state of the radio industry, Fritts said it is very competitive and despite its successes, there are problems.

He noted that technical and regulatory goals must be achieved to reduce radio interference.

"AM radio, in particular, has suffered. But is FM next? We are now working to assure that new policies . . . do not spread the virus of interference on the FM band," Fritts said.

He said AM interference problems and overall sound quality are being addressed by the FCC including revised RF emission standards for electrical products and the move to require AM stations to adopt the NRSC-2 standard.

To preserve and enhance radio's overall position in the broadcasting world, Fritts called upon the industry to help move the medium from "back-of-the mind" status to daily recognition by the public.

Fritts warned that complacency can be injurious to radio.

"Radio has served this nation extremely well for nearly 70 years. It is too valuable a resource not to preserve and promote. But the public, and even some in the radio industry, all too often take radio for granted," Fritts said.

He said the industry and NAB are working to keep radio in the forefront of the public eye with such efforts as the Radio Futures Campaign, a national campaign designed to promote radio nationwide.

Perception is Reality in the Workplace

by Charles Taylor

Las Vegas NV The traditional stereotype of a broadcast engineer—in particular, the person with pen and calculator in pocket—could keep management from taking engineers seriously and even stall deserved advancement.

That was one message of an NAB session on "Professional Development," which alerted the engineering community that a grasp of a professional image and mature communication skills make a difference in the workplace, especially when working toward management.

"It is paramount that we prepare ourselves as carefully for management as we do for technology," said Sim Kolliner, an engineer at WHIO-TV and a speaker at the session. "We must constantly be aware of our image and how we're perceived."

To prepare for a management position, Kolliner recommended a polished appearance, a professional attitude and developed communication skills.

"You must develop communication skills and work past engineering jargon," he said. "You need to be able to talk about technical issues in layman's terms."

Kolliner also suggested that ambitious engineers take management courses that promote an understanding of how they present themselves along with ways to improve that image.

Perception is 90% "bull," but 100% important, he said.

Kolliner warned, however, that "taking accepted practice and applying it categorically without making it fit your own situation makes your managing a sterile, rigid and ineffective burden."

Judith Sheets, a speaker from Calumet Group, which focuses on organizational and human resources development, added that it often is particularly difficult for engineers to make the transition from the transmission room to a supervisor's office.

"The difficulty with it is that the tools you had that made you good and comfortable and secure in the job you were doing are not the same tools that you will need to even survive as a manager," Sheets said.

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Circle 89 On Reader Service Card

Test Sets See Product Introductions

by Mike Starling

Las Vegas NV As radio source material becomes decidedly better, the task of documenting and maintaining this magnitude of audio improvement is increasingly more demanding on engineering time and test equipment.

The sun is setting fast on the days when the venerable HP-334/332 test set did the whole job.

As last month's NAB exhibit floor shows, test equipment manufacturers are responding rapidly to the challenge with a host of incremental product improvements and an increasing emphasis on automated testing.

Few engineers have the luxury of an extra control room to bump work into while we "PM" a room; more engineers are opting to get the complete performance picture in mere minutes with automated test gear.

Audio Precision unveiled a major advance with the debut of a digital signal processor (DSP) for its System One automated test line.

Currently dubbed Dual-Domain System One, this test set is the first to offer 16-bit resolution analysis via AES/EBU serial and parallel ports.

Thus the new breed of digital audio equipment can now be tested in the digital domain without the A/D and D/A converters in line.

For existing System Ones, the addition of a factory installed DSP module is available.

Networks and major market stations have plans to include the Dual-Domain System One among their near-term purchases.

Amber displayed the Total Solution 5500 series programmable Audio Measurement Systems and Audio Check II menu driven software.

System performance specifies THD below .0001% and noise at −120 dBm and up to +30 dBm balanced outputs.

The Audio Check II software is really impressive. The enhanced graphics, effortless user interfacing and ability to generate full color real time graphs are a real plus.

Delta Electronics introduced the SNG-1 Stereo Noise Generator.

The system can be readily configured for anything from a simple pass/fail screen to a sophisticated multi-page hard copy report with most any form of monitor, dot matrix or pen plotter output.

The ever popular portable 3501 audio measurement system was also on display. If you haven't seen the 3501 and are in the market for a full-featured portable unit, the automatic servos for fast, accurate auto set and null, plus superior RFI immunity make this unit a must-see.

AM chiefs will be interested in Delta Electronics' latest addition to the array of test and transmissions related equipment: the SNG-1 Stereo Noise Generator.

Priced at $495 retail, the unit meets the requirements of both NRSC standards 1 and 2 in mono and stereo modes.

The SNG-1 generates a pulsed noise source which closely simulates program dynamics. Six combinations of left and right channel noise handle a variety of crosstalk, separation and alignment tasks.

Dynamic alignment of audio processing, auditorium reverberation and frequency response tests are additional uses.

Sound Technology's 3200B programmable transmission/audio test system can be either FSK programmed or computer controlled via the RS-232 or GBIP port.

The advantage of FSK programmability is that the 3200B can be remotely controlled via the audio path of the system under test by Sound Technology's companion ST3100A audio generator.

Thus any telco or microwave link can be fully tested without the need for a modem or engineer at the other end. For hard copy printout only a dot matrix printer is required or the data can be stored in the 3200B's memory for later display or printout in either graphic or tabular format.

Potomac Instruments' QA-100 Quant Aural audio program analyzer was on display alongside its well established line of test sets and field strength meters.

This unit displays an array of simultaneous functions that CEs and PDs in highly competitive markets will value.

Maximum peaks, averages, density spectral balance, stereo image width and even "punch" (the aural intensity mode) are available. Many engineers will appreciate the assistance of visual display of subtle processing tradeoffs for themselves and their competition. The unit can be fed from any audio source and is priced at $3650 retail.

Also display test equipment was Radio Design Labs, whose popular ACM-1 AM synchronous noise metter has become a must for many FM operators running a subcarrier.

(continued on page 48)

Stereo Mics Make Debut

by Frank Beacham

Las Vegas NV A new generation of stereo microphones was introduced at NAB which will allow radio broadcasters to offer listeners highly realistic ambient stereo sound at a low cost.

Making its debut at NAB was Crown's new SASS™ (Stereo Ambient Sampling System) microphone. Utilizing boundary microphone technology in a newly-patented near-coincident array, SASS is designed to give highly localized stereo imaging for loudspeaker and headphone reproduction.

Its broadcast applications are sports ambience and crowd reaction, stereo electronic news gathering, music events and stereo sound effects.

Resembling a shoe box in size and weighing about two pounds, the SASS microphone will be available in August in a PZM capsule configuration for $849 and in a version with Bruel and Kjaer 4006 microphones for about $4000. SASS requires no external matrix and is mono compatible.

Sony also entered the broadcast stereo microphone arena with its new ECM-MS5 electret condenser M/S microphone. The company said the mic is ideally suited for the rigorous demands of electronic news gathering, sports broadcasting and sound effects production.

M/S microphones are based on a matrix combining a forward-facing capsule (the Mid or Mono signal) with a side facing figure-8 capsule (the Side or Stereo signal). By matrixing the two microphones, sound perspectives ranging from mono to wide angle stereo can be achieved.

Responding to increasing interest

"Today's broadcaster has exhibited an increasing interest in many aspects of audio production, most notably stereo sound," said Osamu Tamura, VP of Sony Professional Audio. "The ECM-MS5 microphone, with its adjustable stereo imaging, mono compatibility and phantom or battery operation, meets this market demand."

The new Sony mic weighs less than eight ounces and is about eight inches in length. It can operate on a single AA battery or can draw phantom power. A built-in stereo image selector allows the opening angle between the left and right directional axes to be varied electronically with no performance deterioration.

The selector has click-stop positions ranging from 0 to 127 degrees. The ECM-MS5 will be available in June for $1250.

Also showing new stereo microphones for studio applications were AKG and AMS/Calrec.

Other debuts

Shure Brothers showed its new Beta 58 high performance dynamic microphone, a new design hailed by Shure as "a very significant advancement in dynamic transducer design and a real breakthrough in microphone performance."

Beyerdynamics' new M58 microphone

"The Beta 58's most significant advancement is a true supercardioid directional pattern that provides excellent isolation and rejection of background noise," said Shure's John Phelan. He called the Beta 58 an ideal microphone for radio applications.

Shure also featured its voice-activated automatic mic switching system. Michael Petterson, director of mixer products for Shure, explained the design behind the company's system, which has gained acceptance in radio stations for talk shows and public affairs programming.

Sennheiser continued to expand its MKH series of ultra low noise microphones by introducing the "super cardioid" MKH 50 and demonstrating the recently introduced MKH 70 shotgun. Both new microphones, Sennheiser claims, have an inherent low noise level virtually imperceptible even by modern digital recording equipment.

Neumann's new KM100 microphone system got its NAB send-off from Gotham Audio. Utilizing the company's

(continued on page 34)

AKG Acoustics Buys Orban

by Charles Taylor

Las Vegas NV The assets of Orban Associates have been acquired by AKG Acoustics, it was announced at the NAB show.

In a related move, AKG issued a letter of intent to purchase the dbx Professional Products Division, according to Jacques Robinson, president of Carillon Technology, which owns dbx. dbx Professional Products manufactures signal processing equipment for broadcast and recording studio markets.

Carillon also announced the sale of dbx OEM Products to a company headed by former dbx officials, THAT Corp. THAT will continue OEM operations, including supplying components such as voltage control amplifiers, RMS detectors, circuit boards and modules.

The deals would complete Carillon's move to focus on consumer electronics.

Orban, which manufactures broadcast and pro audio products distributed worldwide, will become an operating division of AKG. The company will continue to operate from its base in San Francisco.

AKG, headquartered in Stamford, Conn., manufactures through its parent company in Vienna, Austria, microphones, headphones and acoustic products.

The acquisition, according to AKG Acoustics President Richard Ravich, will expand the company's presence in the US. In the past, AKG has been known as an importing and distribution company.

"With our expansion into the design of digital audio products through our Boston-based digital products R&D division, domestic manufacturing capabilities are a must," he said. The association "will also serve to broaden AKG's product mix outside its traditional acoustic products."

Orban's general manager John Delantoni said, "we're very pleased to be joining AKG because we don't compete with each other and we have complementary product lines. We think we can benefit each other."

Delantoni will maintain his position with the Orban division at AKG, and Bob Orban will continue to head the company's engineering "for a considerable amount of time," Delantoni said.

Few operating changes are expected for Orban as a result of the transaction, he added. "Customers should see no change at all except sooner or later the AKG name will appear in our advertising."

The company will maintain its current representative distribution network, he noted.

Orban also expects to take advantage of AKG's overseas contacts: "In particular, they have a factory in India . . . . With that connection, we think Orban products will be much more marketable there."

For information, contact AKG at 203-348-2121 or Carillon through a spokeswoman at 212-661-5300.

A Look at Digital Audio

(continued from page 8)
big problems with the now discontinued A725 CD player was keeping the lens clean. Check this if you've had any problems with yours.

Tascam's new design

Tascam continued to break ground in the area of professional CD products. The company unveiled the CD-401, which features 18-bit, four times over sampling and the company's ZD (zero distortion) circuitry. The optional remote can be wired or wireless.

Also from Tascam, the CD-701/RC-701 features instant start-up, automatic cueing and an optional RAM buffer for immediate play performance. It's proprietary clamping system is designed to eliminate tracking errors, and the RC-701 control unit can control up to four CD player units.

It's kind of hard to say exactly where the Media Touch systems fit, category-wise.

The Touchscreen products act as automation systems, workstations, switchers and interface to digital sources.

This year the company unveiled two additions to its line. The ARC-2000 Router Management System handles audio routing and machine control.

Some features include router control, project time shifting, automation and simultaneous air/record capabilities. It's designed to stand alone or enhance other systems.

Media Touch also introduced the Search 'N Sync workstations, a family of computer based systems aimed at post production.

DAT's a nice Fostex

While there are still some grumblings about DAT's impact on the bootleg market, the fact is the machines are out there. Many of them are capable of recording at 44.1 kHz.

Topping the list price is the Fostex D-20 at $8000. The only DAT in the company's line, the D-20 locks to SMPTE, records and plays back both 44.1 and 48k Hz, offers off-tape monitoring while in record, pre and post stripes SMPTE without destroying the audio or other data tracks, video composite sync port to run on a field or frame, 16 bit resolution with 20 bit internal operation, and claims gapless punch in and out capability.

The D-20 will synchronize, chase and function as an analog machine. It features front panel switchable copy guard and pre-emphasis.

Search for a sampler

If you've been reading the *Producer's File* column for a while, you know I've been looking for the perfect digital sampler to consider as a replacement for a stereo cart machine.

My criteria have been that the device be easy to operate, capable of 20 kHz bandwidth in stereo or mono for a minimum sample time of 64 seconds, expandable and priced competitively.

The Akai S1000 digital sampler comes closer to filling the bill than anything I've seen so far. Although I have had very little hands-on experience with the S1000, the result of my information hunts have led me back to the unit more times than not.

Unlike its predecessors the Akai S900 and S950 which are mono and have 17 kHz-18 kHz audio bandwidths, the S1000 is stereo or mono and operates at a 44.1 kHz sample rate which offers a 20 kHz audio bandwidth. For less critical applications, the S1000 also samples at 22.05 kHz which almost doubles the sample length at a 10 kHz audio bandwidth.

A fully loaded S1000 at 44.1 kHz sample rate for a 20 kHz frequency response will give you 96 seconds in mono, 48 seconds of stereo, and lists for $10,050.

A new AES/EBU standard digital I/O board for the S1000 is expected in July that will allow direct digital transfer from other AES/EBU devices.

Also on hand at the Akai booth, I a saw the A-DAM digital audio multitrack format recording system you may have heard about late last year. In a nutshell, the recorder uses tape cassettes in a DAT-like format for 12 channel digital recording. A CTL track and an AUX channel for SMPTE allows you to lock three transports together for up to 36 channel digital recording.

AUDISK

The DHK Group showed its Audisk digital recorder/player/sequencer. Visually one of the more "bare bones" systems, it uses an IBM computer to store 15 kHz or 7 kHz bandwidth audio in mono or stereo on magnetic or optical disks. The 12 bit audio processing, S/N ratio of better than 62 dB and dynamic range figures were chosen to allow for increased storage time.

■ ■ ■

Ty Ford, audio production consultant and voice talent can be reached at 301-889-6201 or by MCI mail #347-6635.

New Microphone Models Introduced

(continued from page 33)
FET 100 circuitry for the first time in a miniature microphone, the KM100 series offers performance similar to Neumann's TLM 170 studio condenser microphone in a thumb-sized microphone capsule.

Neumann offers a wide range of mounting options which allows the microphone to be easily hidden.

Audio-Technica showed two new microphones. The Model RD303 "TriPoint" microphone is actually three miniature condenser microphones in a single, inconspicuous case. Separate feeds—such as broadcast, house PA and back-up—are easily accomplished with a single microphone.

The ATM25 is touted by the company as being "perfect" for broadcast dialogue. A wide-range, moving coil dynamic with hyper-cardioid pickup pattern, the microphone features exceptional low frequency handling for speech pickup and musical instruments which generate high sound pressure levels.

Beyerdynamic demonstrated two of its new broadcast microphones. The MCE 86 is one of the lightest, most compact condenser shotgun microphones on the market and the M58 omnidirectional dynamic is designed for rugged remote and news gathering applications.

Bruel and Kjaer, a veteran manufacturer of very high performance microphones for recording applicatons, aimed its Type 4006 omnidirectional and Type 4011 cardioid microphones directly at broadcasters this NAB. The company announced that BBC Radio had taken delivery of over 40 of the microphones in 1988 for radio broadcast applications.

Other audio products

New professional broadcast headphones were introduced by Audio-Technica and Sennheiser. Audio-Technica bowed its new 900 Series studiophones for critical monitoring applications.

Sennheiser showed the HD 25 studio monitoring headphone which utilizes dynamic drivers in a closed supraural design.

New broadcast studio monitors were unveiled at NAB by JBL Professional. The Control 10, a 12-inch three-way speaker, and Control 12, a 12-inch two-way speaker, have applications for remote broadcasts, production rooms or portable applications where quality and size are important.

ATI premiered two new amplifier products. The M100 Ultimike is a quiet, servo-controlled microphone amplifier with excellent hum and RF rejection. It features switchable gain and low cut filter, 48 volt phantom power, a phase reverse switch, DC remote gain trimmer and switchable output limiter. Price is $299.

ATI's multiple amplifier arrays offer four or eight channels of high gain microphone inputs or lower gain line level inputs amplified to 600 ohm line level active or transformer balanced outputs. Channels can be combined to form sum and difference networks, a simple mixer, or press box.

■ ■ ■

Frank Beacham is **RW**'s west coast news editor.

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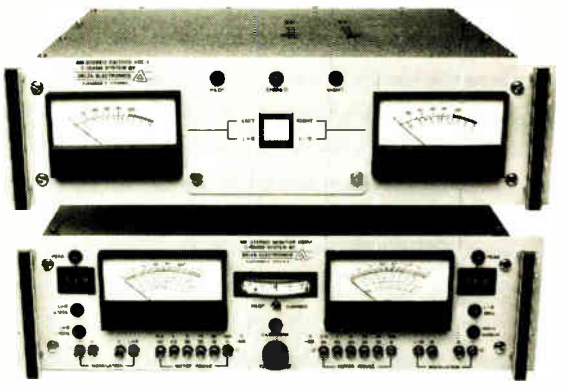
Every day, all over the world, Delta's full line of products make sure the most important broadcasting standard of all is met—your total satisfaction.

AM Splatter Monitor—Spectrum analyzer performance at a significantly reduced price! An inexpensive means of verifying FCC and NRSC spectral compliance. This frequency agile instrument tunes from 1700 kHz down to 450 kHz, with 9 or 10 kHz channel spacing. The monitor also measures incidental phase modulation (IPM). Designed to be rack-mounted or operated from a vehicle's 12 volt supply using an optional antenna.



C-QUAM® AM Stereo—The Above Standard Industry Standard is easy to install and maintain with its modular design and construction. Offers standard features other manufacturers charge as options. A sound value, built to last.

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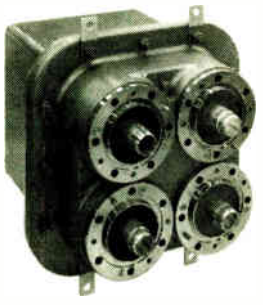
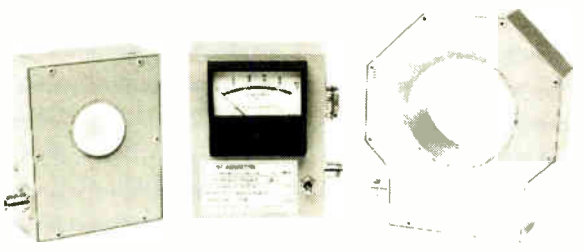
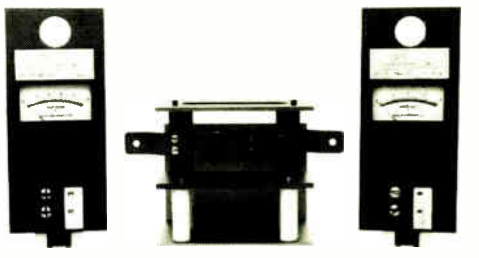


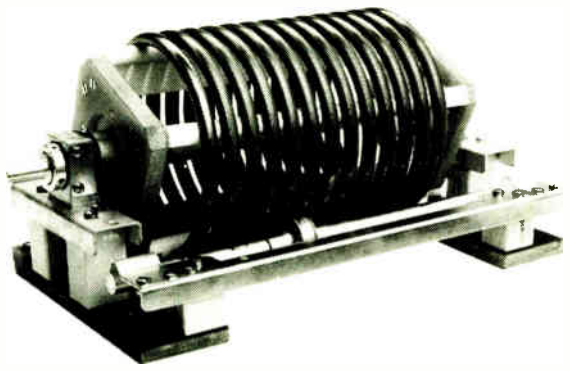
Coaxial Transfer Switches—These 1⅝" and 3⅛" motorized four port switches are designed to switch between antennas, transmitters, or dummy loads both quickly and efficiently. The switches can also be operated manually and are fully interlocked.



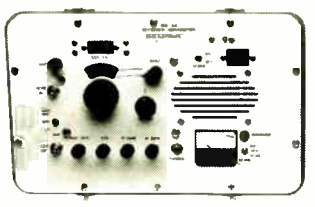
RF Ammeters and Sampling Toroids—Precision toroidal current transformers (TCTs) provide stable antenna monitor sampling while eliminating the problems associated with loops. TCTs also work well in supplying additional modulation monitor or test sample RF outputs. The transformer coupled ammeter (TCA) offers stable base or common point current readings, independent of modulation. The dual and single scale meters also provide remote DC outputs.

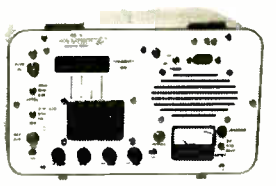


Low Power RF Ammeters—When every milliamp of current counts, depend on the accuracy of the TCA-Jr. This portable RF ammeter is designed to plug into either a Delta MJ-50 Meter Jack (pictured above), or a standard J-plug jack. Two current ranges are available: 0.2 to 1.0 Ampere, or 0.4 to 2.0 Amperes.

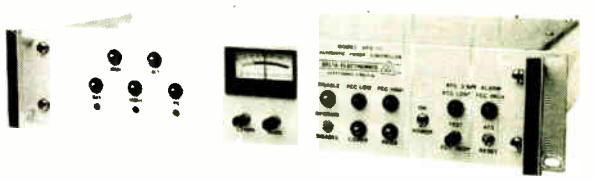


Rotary Variable Inductor—Where long life and high reliability are required, specify the RVI. Designed to provide long life, even under continuous rotation, the RVI is available in either 12 μH or 10 μH versions (maximum inductance). Other values by special order.





RF Receiver/Generator—A rugged, high output (2 watts) generator and correlation detector receiver virtually eliminate false nulls caused by interfering signals. The RG-3A operates from 0.5 to 1.65 MHz, and the expanded range of the RG-4 generates signals from 100 kHz to 30 MHz.



Transmitter Power Controller—Your insurance against over- and under-power citations. Continuously monitors transmitter power levels, compensating for AC power line sag by adjusting the transmitter to 100% power.

Digital Controlled Processor—This inexpensive, stereo tri-band processor boasts user-friendly controls and an aggressive sound. Mono stations can take a step toward AM Stereo, at a price that won't break the budget.

Impedance Bridges—At last, a means of measuring your impedance under full power. Both portable and in-line bridges are available, with a variety of features, for both AM broadcast and HF applications. The in-line Common Point Bridge can be supplied with a TCA RF Ammeter to permit precise current and impedance measurements.

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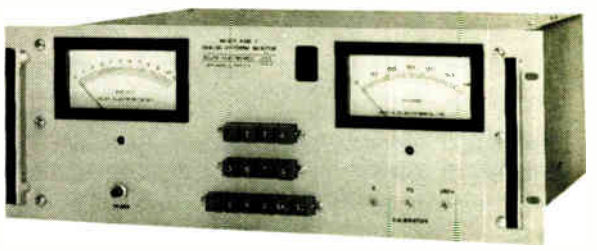

AM Antenna Monitors—These are true ratio monitors which deliver a ratio reading without the need to continually reset the reference tower to 1.000. This simple operation reduces errors by non-technical personnel and makes tuning an array easier.

WE RESERVED this space for manufacturers of digital hybrids who could match or outperform Gentner's new Digital Hybrid ANA...

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Cornucopia of Consoles

(continued from page 7)

sizes, up to 26 input channels and a "mother-boardless" design.

Other features include two stereo program busses and two mono utility busses.

After completing a recent financial reorganization, Harrison Systems of Nashville (now GLW Enterprises) showcased its new AP100 console. Styled like its feature-laden model 790 big brother, the AP100 borrows many of the exclusive design concepts Harrison has engineered into its more expensive program origination and broadcast consoles.

Harrison's exclusive DCA technology (digital control) solves the non-linear problems associated with VCA-based designs. The AP100 is configured for up to 16 channels in four modules of four channels each. The most innovative feature in this console is the new logic control and setup system based in non-volatile RAM.

Broadcast Audio of Sacramento brought a completely redesigned family of consoles to the NAB. Known as the series VI, modular based mainframes of eight, 12, 16, 20, and 24 channels are available. Double-sided ground plane motherboards are used to assure minimum noise, cross-talk, and best RFI immunity.

Audio levels on the Broadcast Audio board are controlled by P&G faders but low-noise IC op-amps are used for attenuation instead of VCAs. A digital timer, peak indicator, equalized headphone monitor, and Hall effect switches are all standard. Multiple stereo busses and a mono mix-minus buss make telephone interfacing easy.

Prices range from $6000 for the system 8-VI to $16,000 for the system 24-VI, typically equipped.

Improvements and options

Other major console manufacturers did offer some notable improvements and new options for existing equipment.

Wheatstone Corp. of Syracuse decided to expand its popular A-20 ten channel air console into the A-32, 16 channel version.

The company also offers a telephone module for the A-500 console which can handle four hybrids plus an intercom module designed for up to seven stations.

The other big news from Wheatstone can be summed up in one word: furniture. Like many companies which have ventured forth into the studio cabinetry line, Wheatstone is offering not only the products but surrounding support structures and studio furniture.

The Wheatstone line was represented in a colorful display featuring a sleek, clean design in modular console furniture.

. . . console manufacturers did offer some notable improvements and new options.

Broadcast Electronics introduced the Mixtrak 90 broadcast console in 16 and 18 channels last year. The company now offers two EQ modules for production applications, including parametric and three-band. A remote control module for the programmable Orban mic processor is also now available.

Auditronics of Memphis featured its broadcast consoles and also showed the 1900 series mix-minus system—a modular, eight output multiple feed unit designed for talk shows, sports events, elections, and other field events needing mix-minus feeds.

Auditronics also showed the new 1200 series stereo distribution amplifiers for multiple stereo/mono outputs in a high density configuration.

Low profile premiere

LPB Incorporated premiered its brand new ten-channel Citation II low profile audio console. Combining the proven performance of its popular Citation I, this second generation offers an extensive list of standard features compiled over ten years of user feedback.

Included as standard in the Citation are three inputs per channel, two stereo output busses, mix-minus capability, two four-position aux selectors, programmable monitor and cue muting, remote starts for all inputs via relays, and a digital clock and timer.

The Citation II also features plug-in preamps for each channel for either line or mic with gain select switches. All inputs and outputs are transformer balanced, accessible via barrier strip terminals. The price for Citation II lists for about $13,000 complete.

Amek/Tac of Nottingham England unveiled a nice little ten channel remote mixer named the Bullet. Available through its US operations in North Hollywood, the Bullet is free standing or rack mountable with four stereo returns and two stereo outputs. All ten modular mic/line inputs are balanced and include four band EQ with HP filter.

A subgroup aux/return module, and the monitor and master output modules are all standard on the Bullet. The 7×15 segment LED metering looks very nice—in fact, the whole unit looks and feels considerably more expensive than its modest $4250 pricetag.

Bucking the trend

Howe Technologies of Boulder, Colorado (formerly Howe Audio) bucked the trend toward budget-line consoles and introduced instead an intensively engineered top-of-the-line model known as series 10K.

Four mainframe sizes from 14 to 32 channels with four stereo outputs use totally interchangeable modules, allowing a specific configuration to be optimized for any broadcast or production application. Billed as a "wireless" audio console, the series 10K uses a universal multilayer backplane motherboard which eliminates all wires between modules.

The "virtual coax" design provides balanced shielded paths for all audio signals. Each path is actually surrounded by backplane in three dimensions, greatly reducing noise, crosstalk, and RFI susceptibility. Audio control is handled by a symmetrical Class A distortion cancelling VCA topology.

Mic preamps are of ultra low noise active instrumentation amp design, which deliver typical THD below .002%. High slew rate active output amplifiers can drive 65 volts p-p at less than .003% THD.

Each Howe series 10K console is supplied with a remote I/O chassis for easy interfacing to the outside world. The US Army helped develop the sterling specifications for the series 10K and ordered the first 32 units. Such performance does command a premium, though. A loaded 20 channel series 10K will cost around $25,000.

■ ■ ■

Tom McGinley is director of engineering for Cook Inlet Radio Partners and CE of WPGC, Morningside, MD. He is also **RW**'s *technical advisor and he can be reached at 301-982-0981.*

RF Designs Turn to Solid State

(continued from page 23)
$49,000. TTC also announced its 1 kW FMS version, to be available in July for approximately $21,000.

Energy-Onix introduced its expansion into FM solid state with its new 1 kW and 2 kW transmitters, and solid state exciter. The company also announced the new MK-50 50 kW transmitter, in production now.

Comad Communication disclosed that it will begin North American distribution of the TEM 7A transmitter series late this year. The 7A series is solid state and will be available in power levels from 20 W to 2 kW.

The Italian company Itelco, manufacturer of a 2 kW solid state transmitter and an FM exciter, displayed its 30 kW single-tube T254 transmitter.

Low power transmission and more

TFT Inc. introduced its synchronous FM exciter Model 8900, expected to be available late this year for approximately $9000.

The 8900, with a 19 kHz reference signal for stereo pilot and frequency synchronization as well as frequency translators to avoid group delay, consists of a composite STL receiver, phase-locked loops, and a 15 W amplifier.

TFT also premiered AM receiver 886 and FM receiver 887 EBS systems, now in production and priced at $1950; and its RPU transmitter and receiver system, models 8888 and 8889 respectively. Designed for unprecedented audio response, the new RPU system lists for approximately $4000 (receiver and transmitter) and is in production now.

Inovonics demonstrated its new model 706 FMX stereo generator, which retails for $3670 with the FMX card and will be available early next year.

Motorola/AM Stereo displayed its C-QUAM AM stereo exciter Model 1400 and C-QUAM modulation monitor, Model 1410.

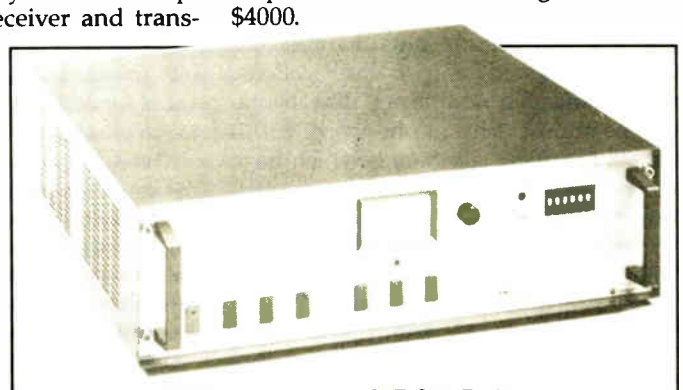
J.R. Hill Co., known for consulting engineering, announced its plans to begin manufacturing a modular interface system, which includes dual 12 V power supply, 4PDT relay assembly, and opto-isolator assembly.

MCI exhibited its line of rectangular and circular waveguide transmission line systems, as well as combiners and diplexers.

LPB Inc. demonstrated its low power AM transmitters and carrier current transmitting equipment.

Econco showed its low wattage reflex klystron with new performance and extended life specifications, available now.

Vector Technology featured its new 1¾" rack mount exciter, the FMT-03, now in production and retailing for under $4000.


IBSS introduced the CTE S20 Exciter

McMartin demonstrated a live, local radio station feed for its SCA generator, card adaptable for frequency and format.

EEV Inc. showed its RF broadcast tetrode tubes, including the 4CX35000C, which incorporates built-in thermal fuse type MA85F, and the air-cooled 4CX15000A.

Richardson Electronics, Ltd., displayed its new acquisition of Philips transmitting tubes.

Altronics introduced new additions to its Omegaline dummy loads for 50 ohm coaxial transmission lines, including power ratings of 100 kW, 125 kW and 200 kW not available elsewhere; as well as air-cooled terminators with power ratings of 5 kW, 10 kW, 15 kW, and 50 kW.

Cablewave Systems announced its new 5", 6 1/8" and 8" semi-flex high powered cables in continuous lengths.

Canare Cable Inc. showed its AVPI video and audio remote cable and microphone cable, including the established L-4E and the L-4E3 and L-4E4 Star Quad 4 conductor with braided shield and individual channel jackets.

Andrew Corp. showed its 3 1/8" and 6 1/8" sizes of its MACXLine, as well as a new 2¼" diameter HELIAX coaxial cable with two new 3 1/8" EIA flange connectors.

Neutrik presented the new PROFI phono connector, available in gold and nickel with strain relief.

And Dielectric Communications showed its compacted 18" cavity FM multiplexer.

■ ■ ■

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

STLs, RPU & Telco Gear

(continued from page 26)
of EBS tests.

In the ever-increasing congestion of auxiliary spectrum, the innovations and enhancements at NAB '89 will help broadcasters caught between the proverbial "rock and hard place" deliver the quality audio and control from remote sites that a sophisticated listening public has come to expect.

■ ■ ■

Geary Morrill is the director of engineering for Mid-West Family Stations. He can be reached at 608-271-1743.

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Analyzing Transistor Design

This is the fifth in a 12-part series titled Introduction to Active Devices. *Readers who have registered with Northern Virginia Community College can receive continuing education credits from the college upon successful completion of an examination administered at the end of this series. To register, contact the Director of Continuing Education, Annadale Campus, 8333 Little River Turnpike, Annadale, VA 22003, or call 703-323-3159. The fee for the course is $20.*

by Ed Montgomery

Part V of XII

Annandale VA Up to this point, we have been examining the fundamental properties of semiconductors and PN junctions. With this installment, we turn our investigation to the transistor.

The transistor is an outgrowth of the development of the PN junction. It was developed at Bell Laboratories in 1947 in response to the need for a device that could act as a remote switch operating at low power.

The word transistor was derived from the term "transferring current across a resistor." The component is "grown" in one crystal but is "doped" to have three separate sections.

Partitioned crystals

Figure 1 illustrates how the crystal is partitioned and the schematic symbols for a transistor. The device can be made two ways, as illustrated in the figure: either PNP or NPN. Note the differences in markings on the schematic diagrams.

Figure 1.

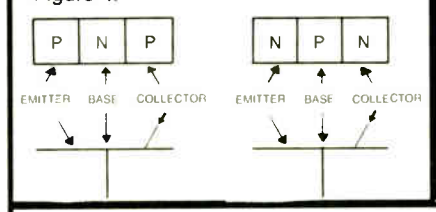
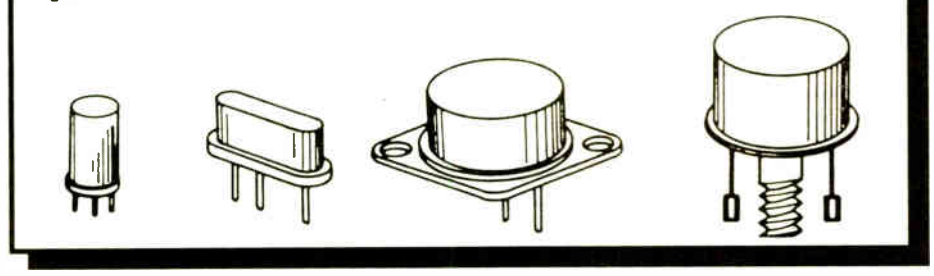


Figure 2.



The transistor's sections are identified as the emitter, base, and collector, regardless of whether it is a PNP or an NPN. The emitter is always the lead with the arrow, the base is in the middle and the third lead is the collector.

Transistors come in numerous shapes and sizes (see Figure 2). There is somewhat of a standard in determining which lead is the emitter, base or collector but before installing the component in a circuit it is best to determine this by checking the manufacturer's diagram or a cross-referenced guide.

Although the transistor appears to have the characteristics of a diode with one section of the crystal doped one way and the two other sections doped another, the device will not operate if the emitter and collector are reversed in a circuit.

Junction transistors

Figure 3 is an illustration of the physical construction of a junction transistor. Note the different sizes of the emitter, base and collector.

In order to make the transistor operate, the three components of the crystal must be biased. The emitter-base junction is forward-biased and the based-collector junction is reverse-biased. The reverse-biased collector-base junction is a much higher voltage than the forward-bias voltage on the emitter-base junction.

When the current begins to flow in the emitter-base junction, the current carriers, either electrons or holes, will be attracted to the much higher opposite voltage on the collector.

About 99% of all the current carriers that enter the emitter are passed on to the collector. This is known as transistor action.

If the emitter-base junction is reverse biased, or the emitter-base voltage is shut off, all current to the emitter ceases to flow. Thus the transistor is a device that can act as a switch, with a very small emitter-base current flow controlling a much larger emitter-collector current.

Figure 3.

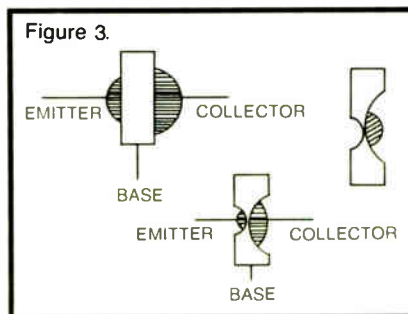


Figure four illustrates the proper biasing of an NPN transistor.

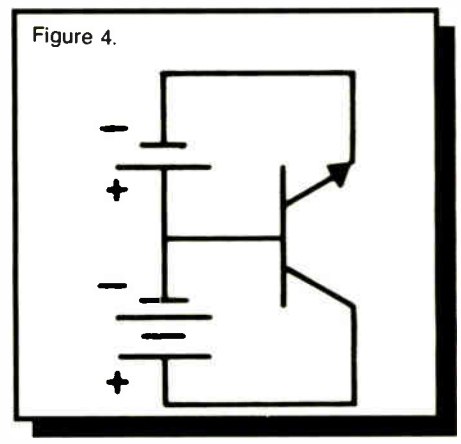
The collector base voltage can be 10 times that of the emitter-base voltage. One should check the specifications of the individual device to determine actual operating parameters.

For more information about transistor operation, read Chapter 5 of *Electronics, Principles and Applications,* Shuler, McGraw-Hill, 1989; or "Solid State Basics" in the ARRL Handbook.

■ ■ ■

Ed Montgomery currently is an electronics teacher at Thomas A. Edison High School in Fairfax County, VA. He has taught broadcast engineering at Northern Virginia Community College and worked as a broadcast engineer for several radio stations.

Figure 4.



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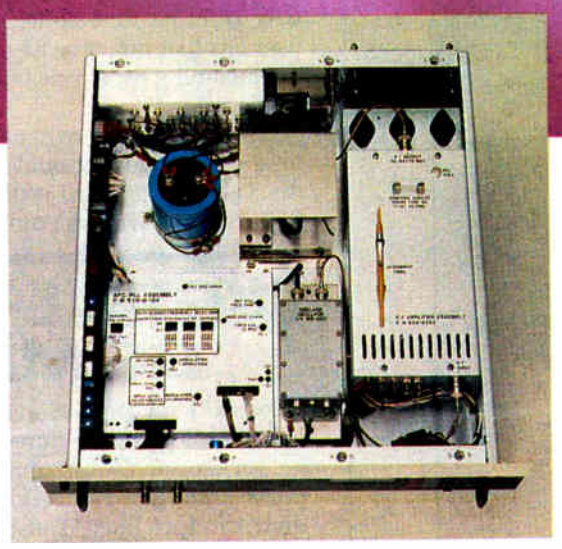

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*Typical

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Circle 34 On Reader Service Card

Defending DAT's Durability

by Mel Lambert

Studio City CA Of the various digital recording and processing technologies that have caught the interest of radio broadcasters during the past several months, digital audio tape (DAT) looks set to overturn a goodly number of apple carts.

Launched originally as a consumer format—Japan, Inc. decides years in advance what new technical delights will be offered from its R&D tables in Tokyo—DAT soon began to attract a wider audience.

Always on the lookout for a high-quality (and hopefully, cost-effective) alternative to the ubiquitous ¼" reel-to-reel and cassette portables favored by reporters and radio producers, early travelers to Oriental shores returned with battery-powered DAT machines. Soon speculation began about the possibility of using the mains-powered decks in production or air studios.

Rapid growth

As I have reported in previous columns, DAT is now gaining ground very rapidly. At least two companies, Fostex and Panasonic, have demonstrated time code-capable machines, with others to follow.

Panasonic also showed a two-machine, DAT time code-based editing system at the recent NAB convention. Insert and assembly edits were made between a pair of "Technology Prototype" transports that formed part of the display area.

By the way, neither the eight-pound battery portable or studio DAT machines being demonstrated to information-hungry crowds during the NAB gathering necessarily will be made available in those package designs.

Sources close to Panasonic tell me that the firm is at least nine months away from a marketable product, although pre-production versions may be made available for evaluation by the major networks within a shorter time period.

Meanwhile, Fostex is shipping its time code-capable D-20 Digital Master Recorder, which uses the firm's proprietary technique for converting conventional SMPTE/EBU time code into a digitized format that can be recorded into the subcode area of the DAT helical-scan tracks.

The Panasonic portables and studio machines displayed at the NAB show are based, not surprisingly, on the proposed NHK/Matsushita/Sony DAT time code format.

This, you may recall, involves a very elegant process of translating the hours, minutes, seconds and video frames of an input time code stream into a "universal" DAT timing reference—referred to these days as "running time code."

The running time code is expressed in terms of DAT frames of 20.8 μseconds duration. If that weren't enough to blow your socks off, the proposed format involves recording additional data bits within the subcode area that identify the source of time code used to produce the DAT running time code, and also any user bits that might be flagged as part of the incoming time code bitstream. Neat stuff, indeed!

My sources tell me that a ratified DAT time code format should emerge from the various standard-setting organizations some time this summer.

DIGITAL DOMAIN

Fostex, Panasonic, Sony and various other firms currently pursuing the technology reportedly are committed to supporting the agreed-upon format through their product lines. I also understand that existing machines can be easily retrofitted with replacement EPROMs, to handle any new standard that emerges.

Reliability of the DAT format

All this new technology aside—and these new models certainly incorporate some extremely interesting operational features—there still seems to remain a negative factor in many users' minds about DAT.

On more than one occasion recently, I have heard rumors of Digital Audio Tape being an unreliable medium, with stories of cassettes that shed oxide, jammed and became generally unplayable after just a couple of dozen passes through a DAT machine.

It would seem that similar stories have been reaching the ears of Panasonic's marketing department, because Panasonic asked me to develop a technique demonstrating the robustness of the DAT format. The demonstration was to take place during the NAB convention.

As fate would have it, I had already written an Apple HyperCard program for the Macintosh that was being used in Panasonic's demo suite to demonstrate full-function remote control of its SV-3500 studio DAT machine.

If you know anything about HyperCard, suffice it to say that various on-

(continued on page 49)

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FEATURE	A727	A730	"Brand X" Player
Fader Start	▼	▼	
Parallel Remote w/Tallies	▼	▼	
Start & End Review	▼	▼	
End of Track Alarm	▼	▼	
RS422 Serial Control	▼	▼	
System Clock in/out	▼	▼	
Digital Output	▼	▼	
Die-cast CD Drive	▼	▼	
Cue Memories		3	

FEATURE	A727	A730	"Brand X" Player
Disc Recognition		100 discs	
Varispeed Built-in		▼	
End of Modulation Sense		▼	
Monitor Speaker		▼	
Separate PGM & Monitor Outputs		▼	
Remote Monitor Speaker Mute		▼	
Audio Channel Reset		▼	
Rack Mounts Standard	▼		
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Circle 41 On Readers Service Card

NAB Show: From the '20s to Today

by Dee McVicker

Tempe AZ It's hard to say if our forefathers knew what they were getting us into when they sat down to the first NAB convention on 11 October 1923.

These grandfathers of electronic media were still referring to radio as the "wireless telephone" and no doubt had their hands full explaining that precarious term to the public.

OFFBEAT RADIO

Of course, no one remembers those early NAB conventions. At least no one will admit to it. But there are those that will confess to an NAB attendance record several pages long.

Equipment representative Wally Warren admits to attending all but seven NABs since 1946. "I'm not sure if I should complain or brag," quipped Warren, who assured that even the mid-century NAB show had its share of imposing characters, new equipment boasts and technical disagreements.

The roaring '40s

The first show Warren attended, in 1946, was what he described as being "stuffed" into a crowded hotel.

"They took great pains to put equipment into every nook and cranny they could find," recalled Warren, who at the time had just returned from a hiatus with the US Navy and was about to build one of the first FM stations on the 88 to 108 MHz band.

"Western Electric was there, General Electric was there with its equipment, RCA was there—I had to take a look at one of its transmitters . . . "

Warren described his first NAB much like a conventioneer returning from the April '89 show. Except for a few company names that have long been erased from broadcast history, Warren's '46 NAB could have easily been a narration from a show held only one month ago!

When did the NAB convention open the first exhibit floor? By most historical accounts, Warren and the other visitors to that 1946 show could have very well seen the debut of NAB equipment exhibits. Which would explain why the hotel appeared to be ill-prepared for the equipment painstakingly stuffed into every nook and cranny.

Of course, there could be another reason why the hotel and the NAB were so ill-prepared. History buffs will recall that World War II ended in 1945, and that after limited travel during the war years by order of the US government, the 1946 show was the first full-fledged NAB convention since the onset of war. And attendance showed it.

Post-war times brought in new companies, new faces and, as Warren put it, more things that broadcasters could agree to disagree on. "FM was just beginning to be of interest to people, and there was a lot of innovation, and new companies were trying to make a reputation," he recalled.

All of this was being fueled by the plethora of AM and FM licenses being granted, and an occasional spat over whether or not newspaper companies could join in the electronic mania.

The first largest ever

In 1947, NAB convention attendance was tallied at 2000, with exhibits of equipment in full swing.

The NAB member newsletter sums up the '47 September show in Atlantic City as the largest exhibition of broadcasting equipment ever assembled under one roof. That record of standing has stayed with the NAB convention year after year in the approximately 40 years since.

The 1947 show held other landmarks in broadcasting history. The engineering conference came into its own during that year, under the auspices of the National Association of Broadcasters.

Also, a report in the NAB membership newsletter stated that radio program executives branched off into a grassroots discussion of programming policies and ideas. The 1947 NAB show, it seems, heralded engineering and programming as two separate and distinct faculties of radio.

NARTB joint board chairman Justin Miller and TV board chairman Robert Swezey (seated) and TV department VP Thad Brown Jr. and NARTB president Harold Fellows at the NARTB convention in Chicago April-May 1952.

The TV/radio NAB wars

Warren missed the '47 show, and several shows after. But in 1952, Warren was back at the NAB convention; this time he was employed by Gates Radio Company, now the Harris Corp.

He noticed several changes. Some of the big names that he saw at the '46 show had dropped out of sight, like General Electric and Western Electric, and in their place was the hint of a shift in broadcast politics.

NAB history indicates that the Television Broadcasters Association, an organization on behalf of the up and coming medium, merged with the National Association of Broadcasting during the '50s to form the short-lived NARTB (National Association of Radio and Television Broadcasting).

National Association of Radio and Television Broadcasters TV Board Vice Chairman Clair McCollough welcomed Desi Arnaz and Lucy to NARTB 31st convention in Los Angeles April-May 1953.

The NARTB name had less than a ten year stint. In the late '50s, the acronym NAB showed up again and one can only assume that television had become—much to the displeasure of radio people—an accepted broadcasting medium.

Still, the '50s proved to be a long, hard decade for broadcasters of the television persuasion. Warren recalled that there wasn't much of a television showing at his second NAB in 1952, although it is very possible he was standing around in an NARTB booth, not an NAB booth!

Not surprising. Television might have appeared to be up and coming in '52 from our dim view in the '80s, but television had in fact been held back by a

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A History of the NAB Show

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grant freeze in the early to mid '50s.

When television finally did arrive at the NAB conventions in full force, its presence was unmistakable. According to Warren, that's when the real show business began, along with a few other sidekicks to this glitz and glitter.

"One big fiasco," remembered Warren, "was the year the television people let the show business people in. It was a mess morally and spiritually."

The big business of show business wasn't invited back, according to Warren's recollection, until a year or two later.

But the television influence didn't stop there. By the late '50s and early '60s, radio had declared an all-out programming war against television, and automation was coming into play as more and more radio station owners looked at bottom line profits.

Mirroring Reality

The NAB convention, an annual looking glass into the industry's problems and triumphs, reflected these changes.

Large automation systems dominated the convention floor during these years. Companies sprang up under this new programming guise and died by it as well. And FM, as history dictates, would continue to thrive in part because of automation.

Edwin H. Armstrong, although one of the most imposing figures in this century, did not frequent the NAB shows, according to Warren's recollection. Even so, Armstrong's FM standards were the subject of more than one NAB debate.

The bantering back and forth over new technical standards—and prior to the '70s there were plenty to choose from—was more likely to take place between large network groups. Networks as well as large turnkey companies, it seems, were weighty opponents up until the more recent NAB gatherings.

Booth exhibits were also likely to be visited by network engineering groups instead of individual engineers. Mike Dorrough, president of Dorrough Electronics, remembers well the Cap Cities, Taft, ABC and NBC crowds that traveled the show in groups.

Of course, large engineering groups still roam the convention halls at today's NAB. And large turnkey companies still set the pace, and someone is always setting the industry ablaze with a new standard. This is what our forefathers have gotten us into—along with a comfortable pair of shoes each year!

■ ■ ■

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

RCA's NAB Booth at the 1965 convention in Washington, DC.

Tape, Carts Still Strong

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all the more popular reel-to-reel recorders. We can replace those old worn heads with the Saki Ferrite heads. We have the choice of replacing the cart machine heads with the OEM head, or trying one of the new longer life heads from either Saki or Sprague.

Patch panels/audio switchers

ADC seems to be looking for additional studio business with its line of pre-wired patch bays. The company had a couple of display racks with pre-wired patch bays in a number of configurations. Of course, the manual patch bay now must compete with audio switchers.

The 3M/ITC audio switcher takes the place of patch bays and distribution amps. The switcher can be remotely controlled and is expandable.

3M/ITC's audio switcher can be set to switch feeds automatically and switch configuration at preset times. This helps reduce the possibility of an inexperienced person plugging in the wrong feed from either an interior studio or from a remote location.

The 3M/ITC audio switcher summing module is one rack unit high. The basic audio switcher summing module allows the selection of up to 16 audio inputs. This will then allow simultaneous summing of up to four outputs per module.

The audio switcher and summing module can be configured for almost any size requirement or complexity.

■ ■ ■

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

Test Gear

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The ACM-1 is now ground isolated and considered by many a modest investment in transmission system integrity.

Since AM noise rises dramatically as natural shifts in transmitter tuning, tube aging and interstage coupling occur, constant monitoring is a real plus for maximizing baseband performance.

Dorrough Electronics' new model 1200 stereo signal test set boasts a better than 110 dB (−90 to +20)dynamic range with a measurement range of 96 dB (−76 to +20).

The set contains a precision 30 dB step attenuator with 1 dB resolution, two B scale meters and two buffered monitor outputs for oscilloscope, headphones or monitor amp. Separation can be measured with the flip of a front-panel sum/difference switch.

■ ■ ■

Mike Starling is senior engineer at National Public Radio and can be reached at 202-822-2484.

Testing DAT's Ruggedness in Use

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screen buttons were issuing single-character ASCII commands to the SV-3500 via a custom-developed serial interface box that connected between the Mac and the DAT machine.

On a companion page, I had laid out a simple sequencing mode, which enabled a series of cuts to be selected from a menu of the titles recorded onto a sample DAT tape.

This information then was uploaded into the SV-3500 as a Master Play Sequence. Think of the typical applications for semi-automated stations that want to replay music, promos, IDs and commercials from pre-recorded DAT tapes.

A new program

Within about an hour, I had developed a new HyperCard program that enabled a 30-second section of tape to be looped continuously for the duration of the four-day convention. The source material was dubbed digitally from a Technics CD player, and comprised some delicate harpsichord music that would allow subjective assessments to be made during the evaluation process.

Japan, Inc. decides years in advance what new technical delights will be offered from its R&D tables . . .

A little-known feature of the SV-3500 (mainly because it isn't mentioned in the operator's manual) is the unit's ability to display error correction rates on the front panel LCD window.

For the uninitiated, the the rate may be displayed by setting the front panel time switch to "Play" and then, while holding down the "Recall" button, pressing the power on/off switch. The error rate will now be displayed as a four-digit number by pressing the "Recall" button.

Values of between 50 and 100 interpolated errors are considered normal. Consistent values above 400-500 indicate a clogged tape head, worn tape, mechanical or electrical misadjustment.

At the beginning of the tests, we experienced regular levels of 25-65 errors—perfectly acceptable values for a new tape, and indicative of a well-aligned transport. By the beginning of the second day—after some 1900 repeat playings of the same 30-second sequence—the error rate was up in the 300-500 range, where it pretty much remained during the second day and into the third.

After some 4200 passes, we rewound the tape to the head using the cue/rewind mode—which keeps the tape in contact with the spinning drum head—and listened to the taped sequence from the start through the looped section and on into "untortured" tape. Nobody involved in the evaluation process could detect any noticeable sonic differences between the three sections.

The error rates were observed to have fallen to between 100 and 200, where they pretty much stayed throughout the remainder of the trial. This was a total of 6800 looped passes over the same 30-second section of tape, at an average looping rate of just over 100 play/rewind cycles per hour.

How many replay cycles of your NAB cartridges would you specify as representing a reasonable lifetime before they need rebuilding, I wonder? Between 750 and 1000, maybe? And yes, the position of the Start ID used to tag the beginning of the test section stayed exactly where it had been at the start of our experiments.

Nothing up our sleeves

No special tape was selected for the trial, simply a 120-minute DAT cassette one, was extremely impressed with the results, and would suggest that we now might more usefully consider DAT to be a proven medium, and one that withstands the various types of physical, in-machine abuse that can be expected in any major-market radio station.

Just to show that we had nothing to hide, that self-same tape used in the destruction tests was further subjected to careful scrutiny by being replayed in a variety of other DAT machines, to demonstrate the full compatibility of digital audio tape.

Having replayed the DAT cassette in several Sony, JVC, Pioneer and Akai decks, we could detect no audible difference between the tape recorded on the Panasonic SV-3500.

When additional time allows—and this report is being written just one week after the close of the 1989 NAB convention— the test DAT cassette will be replayed in other machines, and might even be subjected to further replay cycles, if only to provide our industry with verifiable and objective data about the robustness of DAT technology. I'll get back to you with the final analysis in a subsequent installment of this column.

■ ■ ■

Mel Lambert has been intimately involved with the production and broadcast industries on both sides of the Atlantic for the past decade, and for seven years served as editor of Recording Engineer/Producer *magazine. Currently, he is president of Media & Marketing, a consulting service for the profes-*

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AMPLIFIERS

Want to Sell

Vital AA-1A (11) audio distribution amps w/rack mount main frame, one input by 6 output. G Mundkowsky, WDAF, 3030 Summit, Kansas City MO 64108. 816-966-0731.

Sansui TU7700 tuner/AU 7700 amp, $125/both or BO. P Wolf, 813-574-5548.

Quad II amp, tube amp, excel cond, sell pair, $150 ea. C Richardson, Richardson Recdg, 1938 Balt. Annap. Blvd., Annapolis MD 21401. 301-757-3733.

Dynaco 70, tube power amp, 35W per chnl, untested, looks clean, $50/BO. M Gottesman, KSGT, POB 100, Jackson WY 83001. 307-733-2120.

Preston 92B record amp w/161A EQ diameter w/slider & mount, output 4-807 in PP parallel, $100; Presto record feedscrews, 112 IO, 120 IO, 224 OI for 6N recorder or 66G, $20. ER Arn, Film Assoc., 7240 Paragon Rd, Dayton OH 45459.

Bozak CMA-150-2 rack mt pwr amps (4), 150/150 into 8, rebuilt, new PS condensers, excel cond, $450 ea; Marantz 240 power amp, $200. Pat Appleson Stds, 305-625-4435.

Russco Fidelity Pro mono & stereo phono preamps. excel cond, balanced outputs, $50/mono, $75/stereo. T Devine, WVLK, Box 1559, Lexington KY 40592. 606-253-5900.

Altec 1568, 1569A tube audio pwr amps, need help, $150 ea. J Vengrouskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Bogen CHB-35A, $50; Bogen CHB-10A, $25. B Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

Altec & Eastern Electric 1570B & AM-34 8 tube amps, gd to poor cond, $75-$200. C Elmasian, Tri-Core Rec., 27503 Five Mile Rd, Livonia MI 48154. 313-427-8784.

Sparta 1020 program amp for A-15, AS-30, etc. w/Sparta documentation, $45. M Ferguson, N AZ Bdctg, POB 1990, Prescott AZ 86302. 602-776-2810.

Dynaco Stereo 70 tube power amp, clean, original owner, $100/BO; Dynaco PAT-4 stereo hi-fi preamp, excel cond, $100/BO. P Keogh, 2511 Memorial, Green Bay WI 54303. 414-499-1336.

Straight Wire Audio UA-2 amp DA cards, $125 ea. G Wachter, KKRF, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Crown D-60 low hrs, excel cond. G Fippinger, Rainbow Program, 150 Crossways Pk Dr, Woodbury NY 11797. 516-364-2222.

Carver 1.0t, will sell for $550 or trade for Peavey CS800 or CS1200. E Nichols, KMCR, POB 189, Montgomery City MO 63361. 314-564-2275.

Want to Buy

Dynaco Stereo 70, any age, any cond. P Hons, Mainline Comm, Poplar St, Portese PA 15946. 814-736-3883.

Symetrix TI-101 telephone amp/EQ, new or used. R Fess, WLRB, 119 W Carroll, Macomb IL 61455. 309-833-5561.

RCA old amps or boosters or pre-amps. W Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

Crown D-75 wanted in gd cond for fair price. M Bejarano, Falcon Comm., 6923 Forbes, Seabrook MD 20706. 301-794-5754.

ANTENNAS & TOWERS

Want to Sell

Cablewave heliax, 30' of 3" cable, $2700; RCA steatite coax line, type MI-19314, 1180' rigid copper transmission line, 51.5 ohms impedance, $600 per section; UTC solid rod tower w/guys & hardware, 500' standing, galv steel, hot dipped, code painted, 380' 36" & 120' 24" face, $25000/BO. T Snider Jr, KIPR, 955 Plaza West Bldg, Little Rock AR 72205. 501-661-7501.

RCA 20' rigid section, 3-1/8" line w/RF wattmeter connection. 50 ohm rated 10kW for UHF, $150. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

E.F. Johnson 17 K.V. DPDT RF contactor, brand new, $250 plus frt; EF Johnson 5 kW ATU, complete but old, $150 plus frt. D Gilliam, 1555 W Pampa, Mesa AZ 85202. 602-639-1901.

RCA 20' rigid section, 3-1/8" line w/RF wattmeter connection. 50 ohm rated 10kW for UHF, $150. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

Celwave CFM-LP1 one bay Fm antenna, 4 yrs old, $750. L Blakeney, WBBN, Rte 2, Box 273B, Taylorsville MS 39168. 601-729-8100.

Andrew 3" transmission line, about 375' w/end & hangers; about 236' of Cablewave 3" line w/ends; numerous hangers for 3-1/8" rigid transmission line. A Wortmann, WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

Phelps Dodge CP1000-4, 4 bay antenna, needs work at 89.7 w/3 radomes, BO. M Black, 315-789-8970.

ERI FML3E 3 bay in crates (10), $3000; Andrew, misc 1-5/8" connectors, all new. J Phillips, WZOM, 414 Washington, Defiance OH 43512. 419-782-8591.

Celwave CFM-LP-2 & 3, 2 bay antenna on 106.3 & 3 bay antenna, w/heaters on 95.3 MHz, $800/2 bay, $1200/3 bay. H Cochran, KITX, Box 886, Hugo OK. 405-564-3043.

RCA BFB-2A 2 bay panel antenna, needs work, 6 panels from 7' tower, BO. Edd Monskie, Hall Comm, 24 S Queen, Lancaster PA 17603. 717-397-0333.

Andrew 1db 50 coax, short lengths, 20', new, $20. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

CSP 5 kW antenna tuning unit, new components, ready to use, $400. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Phelps Dodge CP-1000-4 FM antenna, 89.7 MHz w/3 radomes, phasing harness & harness for use w/2 bays. M Black, WEOS, Geneva NY 14956. 315-789-8970.

Rohn 45B, 300' tower, lighting & guys, 6 yrs old. H Cochran, KITX, Box 886, Hugo OK. 405-564-3043.

UTC 500' tower, 36" face up to 380', 24" face 120', $25 000; Cablewave heliax, 300' 3", $9 per foot; RCA MI-19314 (59) 20' sections, rigid 51.5 ohms coaxial line, $600 per section. J Newtop, KIPR, 4021 W 8th St, Little Rock AR 72214. 501-661-7500.

RCA MI-19089-2C 3-1/8" flanged, 50 ohms, never used (8). B Matta, 6052 Bunker Hill, Pittsburgh PA 15206. 412-661-2020.

Jampro JSCP-5 currently on air, 99.3 MHz, includes mounting brackets, 1-5/8" flange, $3100. Jeff Sigmon, WBZK, 803-684-4241.

Co-ax elbows, Andrew, Celwave, both like new, $275 ea or $500 for both. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

Gates FMC-6 6 bay, 10 kW antenna at 92.9 MHz wide-icers, BO. B Williams, KRWN, POB 1047, Farmington NM 87401. 505-237-4449.

Andrew & mics, 1-5/8 connector, adaptors, relays, all new. J Phillips, WZOM, 414 Wash, Defiance OH 43512. 419-782-8591.

RCA BCF 12B 93.9 FM 100 kW ERP, needs cleaning up, BO. J Miller, KGNO, 908 Frontview, Dodge City KS 67801. 316-227-4444.

ERI FMH Series 10 bay centerfed, Rototiller at 92.3 MHz, 8 yrs old, vgc, $9950. G Wachter, KKFR, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Andrew HJ9-50 5" air heliax, 444' w/gas pass connectors attached, 15' w/one gas pass & one gas barrier, (2) 6" miter elbows, hangers included. M Gideon, KIX 104, 111 W Port Plaza Ste 1000, St Louis MO 63146. 314-878-1040.

Mounting brackets, complete set for 18" tower face, for ERI FML-3E 3-bay CP antennas, $250. R Miller, WRVI, 815 W Dean, Virden IL 62690. 617-965-3388.

Cablewave FCC 78-50 J Series, 78" heliax foam type, approx 1300' in (3) 375' runs & a 350' run, all w/N female connectors attached, $250/ft. J Kosobucki, KLDA, 5161 Maple, Des Moines IA 50317. 515-266-6060.

Harris (ERI) FM antenna, 10 bay FM HA series, excel cond, $13,000; Phelps Dodge 3-1/8" rigid transmission line, 21 sections, 20' long, w/spring hangers hardware, excel cond. B Umberger, WNLT, 51 S Main, Clearwater FL 34625. 813-446-0957.

Shively 6811-3 FM 2 bay tuned 99.3, $2000. J Cannaday, 919-473-1993.

Andrew motorized coax transfer switch, 4 port, 3-1/8", $1200. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Mark P-9A72GRN (2) 6' grid STL dishes, 3 yrs old & 7/8" line, consider trade; Myat, various unused x-mission line elbows, flanges, adapters, both 4" & 3" rigid, consider trade. P Kessler, KHUM, 1237 SE 37th, Topeka KS 66605. 913-267-0960.

Lightning Elimination MB-60 heavy duty power surge eliminator 120/240V, 60 Amp single phase, in water proof cabinet, like new, $450; Square D 82254 double throw nonfuseable 200 Amp, 250V, single phase switch used w/standby power, almost new, $175. A Fuchs, POB 311, Hobart OK 73651. 405-726-5656.

Beacon w/red filters, 300mm plus Crouse-Hinds mech flasher & photocell, $1200. J Clarke, WRKU, 4531 Belmont Ste C, Youngstown OH 44505. 216-759-0579.

Want to Buy

Dismantled, steel or tubular tower, 500-550', contact immediately. KOLM/KWWK, 1220 4th Ave SW, Rochester MN 55902. 507-288-1971.

UHF antennas & splitter & 100W or 1kW UHF video xmtr. R Destesfano, AACP, 156 Lezelle, Worthington OH 43235. 614-846-9234.

One bay FM educational antenna for 91.1 MHz. D Walkden, KFGG, Rt 3 Box 440-F, Corpus Christi TX 78415. 512-265-9600.

Utility tower mdl 340, 300', 18" guyed & hardware on the ground. D Barton, KMTI, POB K, Monti UT 84642. 801-835-7391.

TV transmission line, 4", 950' vertical, plus 50' horizontal. No 6' line please. Mounting hardware a plus. A Ezekiel, 215-848-4501.

Guyed FM tower, 340-400' in vg or excel cond, no scrap metal. R Weaver, WPGW, POB 1440, Portland IN 47371. 219-726-8780.

Rohn 55-G, need 10' sections, new or vgc used. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

FM Antenna 2-Bay, 107.7 MHz. Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

FM antenna, 8 bay, tuned to 105.7 freq.; Tower 300' to hold 8 bay, 18-24" face. T Callahan, Interstate Tower Srvs, 5913 Bermuda, Boise ID 83709. 208-365-0896.

Utility/World 540, need 200', 10 sections of 42" face tower. CS Fitch, 45 Sarah Dr, Avon CT 06001. 203-673-7260.

RF contactor; used 111C repeat coils. D Williams, KLLV, 14780 Hwy 140, Breen CO 81326. 303-259-5558.

FM tower, 100'-150', must be able to mount other antenna such as Marti Yagi, 2-way, repeater. L Maierhofer, WTGC, 101 Armory Blvd, Lewisburg PA 17837. 717-523-3271.

Six bay FM for 104.3 MHz. B Bundgaard, KLKS, POB 300, Breezy Point MN 66472. 218-562-4884.

AUDIO PRODUCTION

Want to Sell

Shure M610 (2) feedback controller, 8 band EQ, BO. G Mundkowsky, WDAF, 3030 Summit, Kansas City MO 64108. 816-966-0731.

Midi post prod MacIntosh Tascam 8x4 mix, (2) FB-01 modules, TR-505 Roland/SDR-1000 reverb, analog delay, dbx, compression/limiter, Mac software, $2300.R Sanchez, KUCV, POB 83111, Lincoln NE 68506. 402-472-3611.

Orban 516EC 3 chnl sibilance controller, excel cond, $275. P Smith, Summit Recdg Std, 10639 W Warren, Lakewood CO 80227. 303-985-1993.

Orban 9100A2 stereo, has NRSC update, excel cond, $2500/BO. P Delaney, WLXR, 201 S Main, LaCross WI 54601. 608-782-8335.

Dorrough DAP310 mono, works, $275. F Laverman, WMAM, POB 609, Marinett WI 54143. 715-735-6631.

Orban Optimod 8000A, factory refurbished, $1700. J McDermott, KCVO, POB 800, Camdenton MO 65020. 314-346-2763.

Sono-Mag 250 (3) stereo Carousels, working when system updated, includes manual, spare cards, rack mounted, $450 ea or $1200/all or make offer. R Dammon, WKIL, POB 278, Albany OR 97321. 503-926-2233.

Thompson vocal eliminator VE-1 the singers dream, excel cond, $295. M Stran, Ron Rose Prod, 4309 W Lemon, Tampa FL 33609. 813-873-7700.

Orban 11B dual reverb, $200. M Legner, 7807 Suffolk Ct, Alexandria VA 22310. 703-971-7069.

AUDIO . . . WTS

dbx 900 noise reduction mainframe w/(2) type I cards & (2) Type II cards, BO; Spotmaster CLE-FM stereo audio processor, BO. K Stokes, WKJN, 3029 S Sherwood Forest Blvd, Baton Rouge LA 70816. 504-295-1832.

Audio Digital TC-4 digital delay unit, excel cond. B O'Connor, KDES, 821-N Palm Cnyn, Palm Springs CA 92262. 619-325-1211.

dbx 900 noise reduction mainframe w/(2) type I cards & (2) Type II cards, BO; Spotmaster CLE-FM stereo audio processor, BO. K Stokes, WKJN, 3029 S Sherwood Forest Blvd, Baton Rouge LA 70816. 504-295-1832.

dbx 140 noise reduction unit, Type II, $200. F Grundstein, WEGX, 3 Bala Plaza Ste 580E, Bala Cynwyd PA 19004. 215-667-3939.

dbx 222 Type II, 6 mos old, stereo; dbx 222 NR unit, $100/BO or will swap for EFX unit, 1/2" tape or mics. B Miller, Grapevine Stds, 2525 Imlay City, Lapeer MI 48446. 313-664-1995.

Eventide H910 Harmonizer, recently factory refurbished, gd cond, w/manual, $400. D Davis, KMBA, 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

Micro-Trak Ditty Desk 6454-B w/manual, 4 chnl mono, w/Russco 2-speed tables, Micro-Trak 303 arms, BO plus shpg. S Delahoyde, Box 33063, Phoenix AZ 85067. 602-937-9088.

Orban 111B reverb, like new, $275. K Thomas, Rebel Recdg, POB 207, Atlantic Beach FL 32233. 904-388-7711.

Orban 245F stereo synthesizer, $200; Shure M67 mixer. G Robinson, 603-722-7611.

Orban 642B parametric EQ/notch filter, like new w/manual & box, still under warranty, $800. R Hernandez, FAZ Bdctg, 903 E Cortinas, Del Rio TX 78840. 512-775-3544.

ATI Disc Patcher DP100 Hi Z to 600 ohms balanced interface, $100. K Thomas, Rebel Recdg, POB 207, Atlantic Beach FL 32233. 904-388-7711.

Gates M-5136 remote bdct mixer, unknown cond, $25/you ship. P Mueller, KUTA, Hwy 191 N, Blansing UT 84511. 601-678-2261.

Yamaha SPX90II like new, only 8 mos old, $555. K Thomas, POB 207, Atlantic Beach FL 32233. 904-388-7711.

dbx 157 Pro 4 chnls simultaneous play record, rack-mountable, (2) 8 chnls, $500/4 chnls. H Fenster, Universal Rehearsal Recdg, 17 W 20th St, NYNY 10011. 212-929-3277.

Want to Buy

W A N T E D
PULTEC EQ'S

We will pay $1000.00 for almost any Pultec program EQ models EQP1/EQP1A/EQP1A3.
We will pay $1500.00 for any Fairchild 660 and $3000.00 for any Fairchild 670.
Also wanted:
EQH2/EQH3/MEQ5/MAVEC/MB1/ITI & SONTEC EQ any S/tube or ribbon mics and limiting amps.

CALL OR WRITE TO:
Dan Alexander Audio
2944 San Pablo Ave.
Berkley, CA 94702
(415) 644-2363
FAX: 415-644-1848

Texar audio prisms. J Bahr, WVIS, Box 487, Frederiksted, St Croix, US Virgin Islands, 00841. 609-778-5199.

API Instrument 361/561 meters. call after 5 PM EDT. 502-459-9488.

Yamaha REV5 or 7 effects outboard unit. B Ranes, DIR, 32 E 57 St, 6th FL, NYNY 10022. 212-371-6850

Shure M267 wanted in gd cond, for fair price. M Bejarano, Falcon Comm., 6923 Forbes, Seabrook MD 20706. 301-794-5754.

Henry Engineering Logiconverter interface unit, call after 5 PM EDT. 502-459-9488.

AUTOMATION EQUIP

Want to Sell

Harris control system from an older Harris automation system, working when removed, make offer. R Dammon, WKIL, POB 278, Albany OR 97321. 503-926-2233.

SMC DP-1 automation system, including 5 stereo Carousels matrixed for mono, 4 Scully 270 bi-directional R-R, logging electr, in five racks, excel cond. D Englehardt, KSAL, 913-823-1111.

IGM stereo instacard 48 trays no wear on any heads, looks new. D Roden, 1701 Monte Sano, Huntsville AL 35801. 205-533-3676.

MEI MP100 automation controller w/remote control, $3000; MEI Control 3 (2) Carousel & controller, $1000 ea. T Sheen, KWNA, POB 591, Winnemucca NV 89445. 702-623-5203.

IGM Instacarts, (2) in use, avail 3/1/89, rebuilt 1 yr ago, $7000 ea. S Rush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 601-264-8250.

IGM automation system, complete, includes sequencer & master terminal, (3) Instacarts, (3) Scully 255 PB machines, Visitar cart encoder, Extel teleprinter, CBS Labs stereo peak controller 411, CBS Labs automatic level control Mdl III, (2) Marti CLA40H compressor limiters, $9500; also Spotmaster stereo 5 chnl board, $950. G. Teaney, KQXY, 117 Nederland, Nederland TX 77627. 407-724-1292.

IGM stereo Instacarts (2) each w/IGM EC interfaces, re-built 1 yr ago, $7500 ea or $14 000 for both. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 601-284-8250.

Cetec 7000 GLS main carriage w/Hazeltine computer terminal & printer, works, BO. J DiNunzio, WDOM, 401-865-2460.

Schaefer GLS-7000, (2) audiofiles, 48 tray, racks, all manuals, spare parts, Hazeltine controller, cables, complete, $12 500. E Nichols, KMCR, POB 189, Montgomery City MO 63361. 314-564-2275.

Schaefer GLS-7000, (2) audiofiles, 48 tray, racks, all manuals, spare parts, Hazeltine controller, cables, complete, $12 500. E Nichols, KMCR, POB 189, Montgomery City MO 63361. 314-564-2275.

SMC 252RS Carousels, 3 or 4 complete, excel cond; Control Design Corp CD28M P A X, CD12C, 25S, 28X, will handle 12 or more sources, working when removed, 8 spare PC cards; ITC R-R, working when removed. J King, WROB, POB 1336, W Point MS 39773. 601-494-1450.

Revox PR99 PBs (3), new, PB w/25 cycle switching tone sensors built in, sell together, $1500 ea firm. B Coleman Jr, WIST, Box 460, Lobelville TN 37097. 615-593-2294.

SMC Mini Pro satellite system w/programmer, (3) Carousels, (2) RSC-100 programmers, (2) racks, excel cond, on air. 916-686-6613.

Broadcast Systems complete stereo automation system, excel cond, $20 000. K Sleeman, WMMJ, 400 H St NE, Washington DC 20002.

SMC automation system, $7000. J Denison, Esprit Comm, 4510-A S 14th, Abilene TX 79005. 915-691-9292.

BE 16X w/(4) Revox PR99's, (2) Carousels, (2) time announce, triple deck, delay, recorder, live assist & more, 2 yrs old. D Remy, KKLI, POB 17360, Colorado Springs CO 80935. 719-636-1000

Schafer 903, (4) R-R, (2) 78 tray stereo GoCrts, full logging, time announce, BO; Broadcast Products AR2000B, (4) Revox R-R, (3) stereo Carousels, single play, full logging & schedule load, BO; SMC 352RS stereo Carousel, excel cond, BO. R Mayhugh, KLOA, Box 938, Ridgecrest CA 93555. 619-375-8888.

MEI Satmaster 1000 event automation controller w/(2) go-carts & cabinet, mint cond. See at KLSZ, Van Buren, Ark. Contact Don Jones 501-474-3422 for appointment/info, $8000 cash.

Schafer 7000GLS brain, power supply, Esprit controller, (2) Audiofiles, mono, stereo, cables & lots of spare parts. E Nichols, KMCR, POB 189, Montgomery City MO 63361. 314-564-2275.

Harris 9000 (2) Instacarts, (2) CRTs, (5) Scully R-R w/(3) back-ups, time announce, printer, complete & running now, $18,000. B Harmon, WPLA, PO Drawer J, Plant City FL 34209. 813-754-9191.

IGM Instacart 48 tray stereo w/Harris automation interface, $6000 or trades. D Roden, WAHR, 1701 Monte Sand Blvd, Huntsville AL 35801. 205-533-3676.

Harris System 90 automation unit, w/(5) 750 Series R-R, (4) 24 bay Carousel cart machines, 48 bay Insta-cart machine, encoder, logger, printer & control panel, (4) racks w/doors. Bill Burt, 505-434-1414.

IGM 700 automation system w/network joiner, time & temp announcer, program logger, 4 stack instacart, includes 3 equip racks, you pick up, BO. M Meyer, KLQP, POB 70, Madison MN 56256. 612-598-7301.

Gates/Harris older system, w/252-RS Carousel, (2) Scully 270's, SC-48 programmer, ACC-2 audio controller & much more. C Knapp, KUMR, G-6 Library UMR, Rolla MO 65401. 314-341-4388.

SMC ESP-1 fully equipped, (4) Carousels, 24 tray Instacart, (4) Revox R-R's, (2) dual cart players, delay recorder for network, 7 day clock, color monitor, spare parts, complete manuals. R Monroe, KKTX, Kilgore, Kilgore TX. 214-984-2001.

Want to Buy

SMC 350 Carousel, compatible w/SMC mini-pro automation; also SMC-Otari ARS1000 reproducer. L Amstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8368.

SMC TS-25 PCB, interested in other SMC boards. V Thompson KTOT, Box 2810, 575 Pine Knot, Big Bear Lake CA 92315. 714-866-3434.

Looking for complete automation system equipment, prefer cart system. B Carr, WRED, 1201 Freemont Pk, Woodville OH 43469. 419-837-9696.

SMC DP-1 Brain, 219 memory retention card, PN 53806, negotiable. K Klaas, KEZJ, POB 346, Twin Falls ID 83303. 208-733-7512.

SMC DF-1 with a memory retention #218 card from SMC DP-1 Brain. K Klaas, KEZJ, POB 346, Twin Falls ID 83303. 208-733-7512.

Tone encoder 25 Hz, for reel production needed. D Davis, KMBA, 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

Go-cart any size or Instacart, also BE 16 brain or complete automation system, Satellite Music Network slave station. L Maierhofer, WTGC, 101 Armory Blvd, Lewisburg PA 17837. 717-523-3271.

SMC Carousel 250 random, fixer uppers; Metro-Tech 500 Series parts for Metro Tech 10.5 PB deck. D Kohn, KESM, 200 Radio La, El Dorado Spgs MO 64744. 417-876-2741.

CAMERAS (VIDEO)

Want to Sell

Panasonic WV-1410 2/3" B&W vidicon camera (2), no lens, 120 volts AC, $75 ea; Onyx 1000 super small B&W chip camera w/lens & pwr supply, $175. P Russell, WBOR, Sills Hall, Brunswick ME 04011. 207-725-3066.

RCA PK-701 color studio camera, $200; Noreico PCP-90 color camera, $150. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

Sony DXC-5000B color camera w/CCU, 33' cable, zoom lens, NTSC & RGB output, BO. M Cramer, WGBA, 1391 N Rd, Green Bay WI 54307. 414-494-2626.

JVC KY 310 camera w/12-1 lens, 2x extender, AC adapter, battery, case, $2995; Betacam YIQ component back for KY310, 210, $695; package price $3295. Also JVC CR6600 3/4" VCR w/RM 70U remote controles, $995. All in gd cond. D Brennan, Custom Video labs, 205-823-0088.

Sony DXC1600 color camera w/camera control unit, lens, & pwr supply, as is, $150. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Panasonic WV 200CLE 3CCD chip cameras (3), less than 30 hrs, 12:1 lens, mic, case, $5000 ea; Thomson MC301 camera, excel cond, 14:1 Fuji lens, shipping case w/RS2000 CCU, $2000 pkg; Norelco PC72 cameras (3), 15:1 Angenieux lens, gd cond, fair tubes, spare CCU, lots of parts, Sr video remote controls, various Norelco PC70, PCP70, PCP90 modules, yokes, parts, BO. H Larson, Matrix Mobile TV, POB 536, San Luis Obispo CA 93406. 605-544-5657.

Sony DXC-M3A 3 tube saticon, Fujinon 12/1 w/2X ext zoom, ENG VF, 5" VF, rem lens/200 ohm control kit, AC-PS, 6' cable, $6500. S Christian, Masterpiece Video Prod, 715 Cornwall, Silver Spring MD 20901. 301-439-5731.

Ikegami HL35 two piece, circa 1974, complete & operational w/manual, $500; JVC KY2000 camera extender board & manual. J Cochran, Gateway Video, 225 Ross, Pittsburgh PA 15219. 412-471-3333.

Want to Buy

Viewfinder for Sony DXC-1210. Also need gd used Trinicon pick-up tube MF CT-1122, cabinet parts for DXC-1600, will consider entire cameras for parts if reasonable. C Lund. 203-756-7761 aft 4PM.

RCA TK1, TK10, T-K-30, TK-20 & accessories; RCA Houston-Fearless studio pedestal or tripod & dolly; Sony DXC-5000, DXC1600 color cameras; RCA TK-41 parts for a restoration. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

Hitachi SK80 breakout box & service manual & schematic desperately needed. K Storm, POB 40554, Washington DC 20016. 301-953-0855/0747.

CRT Type 7TP4 for RCA TK II or TK 31 camera viewfinder or control unit. C Harper, 2081 Harmony Court, Lexington KY 40502. 606-268-8549.

Sony CCU-1800; Sony CMA-6 (2). F Haynes, 1718 N 79 Terr, Kansas City KS 66112. 816-654-2407.

CART MACHINES

Want to Sell

Gates/Harris Criterion Compact III triple deck in gd cond, $800. B Howard, KOFO, Box 16, Ottawa KS 66067. 913-242-1220.

ITC 99B motors SALT2-2, ITC PN 455-0002-000 24V DC brushless servo type w/ceramic shaft. Includes 831-0258B servo card, (10), $50 ea. W Bevis, WING, 717 E David, Dayton OH 45429. 513-292-5858.

ITC premium record-play (6) mint cond, low hrs, 2 delay w/manuals, 3-PDII, $1295/BO. J Phillips, WZOM, 414 Washington, Defiance OH 43512. 419-782-8591.

Spotmaster 400A broadcast reel/play cart machine, works, $250. F Laverman, WMAM, POB 609, Marinett WI 54143. 715-735-6631.

ITC playback only, checked in very gd cond, $650. F Laverman, WMAM, POB 609, Marinett WI 54143. 715-735-6631.

ITC RP (2) mono excel cond, rec/play, rack mount or table top case, $900 ea. F Laverman, WMAM, POB 609, Marinett WI 54143. 715-735-6631.

ITC Delta III stereo trpl deck R/P, excellent condition, new control logic board; ITC Series 99 play only (2), good condition in service, prices negotiable/BO. M Bostic, WKLX, 259 Monroe, Rochester NY 14607. 716-454-3040.

ITC WP series mono R/P (2), $750 ea, play only (2), $500 ea; Harris Mono cart machine R/P (2), $500 ea. Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

Tapecaster 700P PB, gd cond, $300; ITC Premium mono R/P, mint cond, $1000. J Phillips, WZOM, 414 Wash, Defiance OH 43512. 419-782-8591.

Rapid Q dual cart, dual stereo PB, fast FWD, working, BO/trade. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

Telex MC-PRIII R/P audio cart machine, like new cond, all cables & instruction manuals, $1100. L Chatman Jr, 609-768-5006.

Tapecaster 700 RP w/extra motor, great cond, $375. J Klauck, KFM Bdctg, 118 Bay, Glens Falls NY 12601. 518-792-9290.

Audicord type S-26 stereo, record & PB w/digital timer option, current model, excel cond, $1000/BO. R Isenstein, WMEX, 107 Blossomcrest, Lexington MA 02173. 617-862-5705.

ITC 3D mono, all tones, vgc, $1200; ITC SP, gd cond, one ea stereo & mono, $650/stereo, $600/mono; ITC RP stereo, $1250. M Brown, 3740 SW Comus, Portland OR 97219. 503-245-4889.

Pacific Recorders Tomcat PB (3), 19" rack, Maxtrax format, current revision, $3875. M Bailey, Word Bdctg, 1846 Roseneade Pkwy Ste 250, Dallas TX 75007. 214-601-1294.

Fidelipac zenith & height gages for aligning heads, never used, $50. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

ITC 3 deck mono PB (2) w/1 kHz & 500 Hz detectors, all w/manuals, call for details, $700-800; ITC RP mono record/PB w/manual, $700. P Little, KIEV, 104 N Glendale, Glendale CA 91206. 213-245-2388.

Harris Criterion III, gd cond, $750. B Howard, KOFO, Box 16, Ottawa KS 66-67. 913-242-1220.

BE 3200 R/P stereo, 3100 play stereo, mint cond, original heads w/manuals, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625.

ATC PB-190 w/record amp, used, repairable cond, BO pls shp. M Ferguson, N AZ Bdctg, POB 1990, Prescott AZ 86302. 602-776-2810.

RCA RT-27 BA-27 (3) PB, mono w/tones, (2) R/P w/tones, vgc, BO. R Mayhugh, KLOA, Box 938, Ridgecrest CA 93555. 619-375-8888.

Ramko Research cart rewinder, $150. E Nichols, KMCR, POB 189, Montgomery City MO 63361. 314-564-2275.

Tapecaster 700P fair cond, need rollers & cleaning, $50 ea; BE 5301, needs motor & bearings, $750; BE 2100 R/P, mono, gd cond, $900; Spotmaster 1070 R/P, needs cleaning, gd cond, $400. J McMahan, WAMD, POB 970, Aberdeen MD 21001. 301-272-4400.

ITC PD-II mono R/P cart deck (2), $600 ea or $1000/both; BE 5100 triple deck mono PB, low hrs, clean, $1500 or trades. D Roden, WAAR, 1701 Monte Sand Blvd, Huntsville AL 35801. 205-533-3676.

Tapecaster 700RP mono, gd cond. G Fippinger, Rainbow Program, 150 Crossways Pk Dr, Woodbury NY 11797. 516-384-2222.

Gates Criterion (2), one works, one does not, w/manuals, BO. B Keaton, WGEZ, POB 416, Beloit WI 53511. 608-365-8865.

Tapecaster 700 RP recorders in gd cond (2), in use, w/manual, $250; Tapecaster 700P players in gd cond (2), in use, w/manual, $150 ea. D Davis, KMBA, 1217 Valencia Dr, NE, Albuquerque NM 87110. 505-255-2431.

Spotmaster Ten Spot 19" rack style w/2 play units, room for 3 more below these, works OK. $30 pls shpg. J Cunningham, Rt 2 Box 113B, Stonewall OK 74671. 405-265-4496.

Tapecaster P-700 mono gd cond, new heads, recently refurbished, in use, $300/BO; Tapecaster RP-700 mono, new heads, recently refurbished, in use, $350/BO. T Murray, WROI, 100 W 9th, Ste 306, Rochester IN 46975. 219-223-6059.

Tapecaster 700RP, $300; Tapecaster 700P, $200; BE cartwinder, $50. J Clarke, WRKU, 4531 Belmont Ave Ste C, Youngstown OH 44505. 216-759-0579.

BE 3000, one R/P & one play only; Harris Phase Fixer encoder & decoder. M Seguin, WVMT, POB 620, Colchester VT 05446. 602-655-1620.

Want to Buy

ITC cart machines wanted. condition no matter. Parts & other brand machines seriously considered, cash paid. Jon Hall, Hall Electronics, POB 7732, Charlottesville VA 22906. 804-977-1100.

BE 1070 RPD schematic of delay circuit. R Delius, WFXC, 2515 Apex Hwy, Durham NC 27713. 919-596-2000.

Motor for ITC triple deck. P Anderson, KZBQ, Box 97, Pocatello ID 83204. 208-234-1290.

ITC Series 99 record/play, stereo, plus Delta I and/or Delta III Stereo PB decks. Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

ITC Delta IV record amp for a Delta III, triple play machine. J Nichols, KZZU, South 5505 Regal, Spokane WA 99223. 509-448-5555.

ITC 99, Omega, Premium line, gd used mono or stereo recorder. T Murray, WROI, 100 W 9th, Ste 306, Rochester IN 46975. 219-223-6059.

RCA RT-126 VU meter; RCA RT-126 60 Hz motor in exchange for 50 Hz motor. M Anderson, 1469 3rd Ave, New Brighton PA 15066. 412-847-0111.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Schematics & service manual for Dokorder 4 trk R-R model 1140, need desperately. C Caldwell, 508 N 29, Boise ID 83702. 208-384-1129.

Ampex ATR100 2 trk stereo in cabinet on pedestal w/manuals, $1500; Scully 280B 4 trk in Rusland roll around stand w/manuals, $1200. B Carr, WRED, 1201 Fremont Pike, Woodville OH 43469. 419-837-9696.

Magnasync MR-416, $1500; Ampex 440C 4 trk w/2 head assemblies, remote, no servo, $1900; Echoplate reverb, fair cond, $200/BO. D Green, Waves Snd Recds, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Teac RC 70/71 remote control for Teac/Tascam recorders, gd cond w/carton, $40; Revox B710mk2 service manual, $10; Revox B710 rack adapters, $10. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

CASSETTES . . . WTS

Teac 3440A 4 trk R-R, excel cond, $600/BO; Teac M2A mixer w/MB20 4 meter bridge, $200/BO. T Johnson, WVLJ, 8 Wilscn TrPk, Urbana IL 61801. 217-762-2588.

Telex 300 cassette duplicator, reel & cassette masters, 6 slaves, $1000. D Harns, Design Stds Teleprod, 216 Commercial, Waterloo IA 50701. 319-232-5604.

Sony TC800 1-7/8-7-1/2 R-R portable, $100. C Erway, 3450 SE Martinique Trace, Stuart FL 43997. 407-283-6871.

Schematics & service manual for Dokorder 4 trk R-R model 1140, need desperately. C Caldwell, 508 N 29, Boise ID 83702. 208-384-1129.

Ampex 351 FT 7.5-15 ips in console, gd cond, $325. P Smith, Summit Recdg Std, 10639 W Warren, Lakewood CO 80227. 303-985-1993.

Pioneer Rt-1050, perfect deck, freshly rebuilt, no transport controls, gd motors, brakes, hds, $200. D Fihn, Motive Media, 1615 Hamill, Chattanooga TN 37343. 615-875-2632.

Telex Series 300 tape duplicating system, R-R & (3) cass. slaves. w/manuals, $800. B Carr, WRED, 1201 Fremont Pike, Woodville OH 43469. 419-837-9696.

Ampex AG-440B 1" 8 trk, multitrack, test tape, manual, gd cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625.

Ampex/ASC 351 2 trk, 7.5-15 ips in console, w/remote & manual, vgc, $700; Teac CX210, $50. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Uher Mdl A124 stereo mix 500, new, 5 in 2 out, tone gen, 9V power, portable. $125; Uher 550 teaching machine, 2 trks w/mic & phone for teacher, 3.75 speed synchronous 1/4 tape, new, $300. ER Arn, Film Assoc., 7240 Paragon Rd, Dayton OH 45459.

Teac 3440 4 trk w/remote control & RX-9 NR unit, $700. M Legner, 7807 Suffolk Ct, Alexandria VA 22310. 703-971-7069.

Crown RT701 play only, partially converted to stereo, w/Shure M64 preamp. 10.5 reels. Warren Arnett, 317-664-2411, evenings.

Crown 844CX 4 trk, TrakSync, full bal CX w/mods, travel case, needs calib.; Brown 824, 844, parts, $250/all; Uher Report 4000-L (2), 2 mics, cases, some access, $400/all. J Vengrouskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Otari MKII/4 4 chnl 1/2" deck, new uncrated, $5000/BO. B Ardis, VoiceWorks, 4160 W 182nd #208, Torrance CA 90504. 213-214-2642.

Uher 4000IC new in box w/hard case, 4 speeds extremely portable 1/4" FT, $450; Uher 4000S w/leather case & mike, 4 speed, 1/4", gd cond, send for list of cables & access., $150. ER Arn, Film Assoc., 7240 Paragon Rd, Dayton OH 45459.

Ampex AG-600 w/carrying case, $150; (2) UMC Beaucart II, $500 ea. B Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

Tascam 32-3, excel cond, 7.5-15 ips, 10" reel cup w/RC-71 remote control, $1100. F Grundstein, WEGX, 3 Bala Plaza Ste 580E, Bala Cynwyd PA 19004. 215-667-3939.

Pentagon 1100 high speed duplicator, RR & cassette, (2) cassette master units, CM1140; (2) dual position slave units CS1140; RR master unit RM1140; RR slave unit RS1140, manuals & spare parts, $2250/BO. M Gellos, Pensacola Christian College, 904-478-8480 X5041.

Ampex 440B electronics 1 ch, $200 or trade for Tascam 122. L Beigel, On-cue Recdg, POB 85042, L.A. CA 90072. 213-466-3595.

Tascam 70-4 1/2" 4 trk with Russ Lang walnut cabinet, complete w/audio electr in overbridge & service manual, excel cond, $1995. M Stram, Ron Rose Prod, 4309 W Lemon, Tampa FL 33609. 813-873-7700.

Ampex 440 transport w/4 trk head stack, 2 decks, $300 ea. C Elmasian, Tri-Core Rec., 27503 Five Mile Rd, Livonia MI 48154. 313-427-8784, before 2PM.

3M 56 16 trk 2", $7000. K Fox, Fox Farm Recdg, 1431 Saudersville Ferry, Mt Juliet TN 37122. 615-754-2444.

Ampex ATR-104 4 trk 1/2" mastering machine in mint cond. Servo, autolocate, 4 speed padnets. B Matta, 6053 Bunker Hill, Pittsburgh PA 15206. 412-661-2020.

Otari 5050B-II's (5), $1600 ea; (3) Technics RS-1520's, $950 ea; (3) Studer A700's, $950 ea, free alignment to your favorite tape emulsion. Pat Appleson Stds, 305-625-4435.

Metrotech 500A reproducers (7), $200 ea/BO. M Gellos, Pensacola Christian College. 904-478-8480 X5041.

Rack mount adaptor for Ampex AG600 stereo. F Konwinski, WSOY, 1100 E Pershing Rd, Decatur IL 62526. 217-877-5371.

Nagra III w/single preamp & sync, 3.75, 7.5 & 15 ips, mint cond w/manual. $900; Nagra IV-L w/single preamp & sync, 3.75, 7.5 & 15 ips, mint cond w/manual. $2400. R Sumner, CAVU Comm, 3322 Applegate Ct. Annandale VA 22003. 703-560-0233.

Scully 270 reproducers (2), gd cond. $200 ea. M Meyer, KLQP, POB 70, Madison MN 56256. 612-598-7301.

Uher 4000 Report L, in great shape, $150. P Andrus, POB 261, Chimacum WA 98325. 206-732-4085.

Pioneer RT701 3 motors, 3.75-7.5 ips 1/4 trk stereo, very low hrs, excel cond w/manuals, $250 ea. D Davis, KMBA, 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

Ampex AG-440B 3.75 & 7.5 ips, needs work. G Fippinger, Rainbow Program, 150 Crossways Pk Dr, Woodbury NY 11797. 516-364-2222.

Revox B77, 7.5-15 ips, 1/2 trk, excel cond, shipping case, $1000. JA Theodore, 1175 Brockton, El Cajon CA 92020. 619-448-4444.

Otari MX 5050 excel cond, 1/2 trk stereo R/P & 1/4 trk play utility, $2000. T O'Malley, Citynet, POB 29341, Oakland CA 94604. 415-223-6757.

Pioneer RT-701 2 trk, has speed problem. BO. B Keaton, WGEZ, POB 416, Beloit WI 53511. 608-365-8865.

Pioneer RT-1050 (2) gd cond w/manuals, $350 ea. L Vollmar, WOBT, POB 738. Rhinelander WI 54501. 715-362-6140.

Otari MX 5050-B 8 trk, like new, less than 15 hrs, w/full factory remote control, roll around rack & all manuals, $4000. J Belik, KIKX, Colorado Springs. 719-632-5800.

Revox A-77 R/P, Crown 800 R/P, Ampex 612 PB, all OK motors, used, repairable cond, BO pls shpg. M Ferguson, N AZ Bdcts, POB 1990, Prescott AZ 86302. 602-776-2810.

Teac A-2300-S 7" w/full function wired remote, original manuals, cables, etc, stereo 1/4 trk, $285. E Kovacs, 14269 Jackson, Taylor MI 48180. 313-285-9710.

Studer A80 Mark I 1" 8 trk, 7.5-15 ips, $7500. Call 212-645-6319.

Teac/Tascam 3340 4 trk 1/4", gd cond, $499. C Swack, Sweetwater Snd, 4821 Bass, Ft Wayne IN 46808. 219-432-8176.

Revox A700 rack mount or table, 3 speeds stereo 2 trk, gd cond, $550. G Ernst, Bayside Snd Std, POB 166, Lincoln City OR 97367. 503-996-6020.

Teac/Tascam 235 4 trk, excel cond, 6 mos old, $450. B Brinitzer, WDCG, POB 2126, Durham NC 27702. 919-682-0318.

Ampex 602-2 w/manual, portable case, operates but needs some work, looks gd, BO, plus shpg. S Delahoyde, Box 33063, Phoenix AZ 85067. 602-937-9088.

Ampex AG-440 mono R-R (2), $500 ea. J Cannaday, 919-473-1993.

Metrotech 543R stereo Rec/repro (2); Metrotech 531R mono rec/repro (2). C Knapp, KUMR, G-6 Library UMR, Rolla MO 65401. 314-341-4388.

Sansui DM-350 cassette player, recorder rack mountable, gd cond, $200/BO; Lazy Susan type cart rack, holds 96 carts, $75/BO. R Price, KWIK, 259 E Center St, Pocatello ID 83204. 208-233-1133.

Teac 6010 4 trk w/auto reverse, 4 heads, 2 chnl erase, record, forward PB & reverse PB, access include dust cover, remote time control, pause control, etc. FOB Chicago, $400/BO. 312-444-2066.

Ampex 440B, $500. K Thomas, POB 207, Atlantic Beach FL 32233. 904-388-7711.

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

Want to Buy

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

Pioneer RT-1050, need transport controls/relays. D Fihn, Motive Media, 1615 Hamill, Chattanooga TN 37343. 615-875-2632.

Head covers for Tapesonic 70-TRS tape decks, one cast metal lower & one sheet metal upper cover; also a Magnecord PT6-V amp, the no speaker version. C Lund. 203-756-7761 aft 4PM.

Otari DP2700 cassette tape loader/winder. Also interested in other manual loaders or salvage or parts for same. J Calloway. 214-272-8726.

Magnafax 1/4" R-R duplicator or Magnafax 1/4" reel to cassette bin loop, consider any cond, also buy manuals or copies for same. J Calloway. 214-272-8726.

Wollensak 2770 or 2780 cassette tape duplicators or slave units. Will consider units in any cond or salvage/surplus parts for same. J Calloway, 214-272-8726.

Teac Tascam 80-8 unit & vari-speed motor, spare parts also considered. M Sokol, JMS Prod., 121 E Baltimore St, Hagerstown MD 21740. 301-791-2562.

Scully 280 1/4" headstack, hardware, etc; Inovonics 355 & 900 dual chnl R/P electronics w/pwr supply circa 1974. L Beigel, On-cue Recdg, POB 85042, L.A. CA 90072.

Technics RSM85 capstan motor, part number QXK2010. Robin McDaniel, KJRG, Box 567, Newton KS 67114. 316-283-5150.

Manual & parts for Ampex 354. P Andrus, POB 261, Chimacum WA 98325. 206-732-4085.

Ampex 350-351 or AG440 or MR 70 w/both record & plaback functions, 7.5 & 15 ips, mono. P Hons, Mailine Comm, 100 Poplor, Portage PA 15946. 814-736-3883.

CONSOLES

Want to Sell

Gates Gatesway mono console, working when removed, BO. D Tabor, WHCK, Box 158, Scottsville KY 42164. 502-237-3149.

Gates Yard recently solid-stated, works OK but needs a little TLC, $150 plus frt; Gates President, works OK, needs a little work, $350 plus frt. S Sibulsky/J Bjornstad, KVNI, 208-664-9271.

Vintage Ampex-Sigma 3761 4 chnl mic mixers (2), powered by Ampex 300, 350, 400 recorders, excel cond, separate power supply avail, $60 ea or both for $100 pls UPS shpg. B Leslie, Pro Recdg Srvs, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435.

Spotmaster 8BES100 8 chnl stereo board w/spare cards/parts, $1750. G Hill, 2809 Camulos Way, Redding CA 96002. 916-222-0345.

Harris Stereo 80 console board, w/eight stereo chnls in fair cond, $1000/BO. Jim, Audiocom, 8100 Oak Ln#401, Miami Lakes FL 33016. 305-825-4653.

Arrakis 2100SC, 12 chnl, 34 balanced inputs, brand new, $5000/BO. B Ardis, VoiceWorks, 4160 W 182nd #208, Torrance CA 90504. 213-214-2642.

Harris/Gatesway 80 Solid State mono 8 chnl, clean sound, $600. G Sive, POB 239, Bonsall CA 92003. 619-749-7662.

Auditronics Grandson 110 Series two mono/mic inputs & stereo line inputs, 8 position remote line selectors, all p & g faders, $3000. M Phelps, WLTI, 20300 Civic Ctr, Southfield MI 48076. 313-354-9300.

BE 4M50 4 channel mono console, vgc, $500. D Moudy, WHLY, 7925 Bayside View Dr, Orlando FL 32819. 407-363-1739.

Shure Pro Master 6 chnl stereo mixer, great cond, $500. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Broadcast Audio System 20, 12 stereo inputs, tone osc, full range EQ on ea chnl, 3 stereo outputs, assignable, redund, P.S., like new cond, 5 remote controls incl, BO. M Graziano, Catholic Comm, 1089 Elm St, Springfield MA 01089. 413-732-4546.

Harris Stereo-5, working when removed, modified w/5534's, no documentation, $800/BO. J Claybrook, WMJJ, 530 Beacon Pkwy W Ste 600, Birmingham AL 35209. 305-942-9600.

Harris Mono-5 gd cond, as is, $600; Harris Gatesway-80 (9944-6699-00-4 6413), vgc, as is, $800; Altec 250-SU, 10 ch split stereo tube console w/535A pwr sply, some tube cards, no tubes, $2500. J Vengrouskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Yamaha 916 prof mixer, 32 chnls in, 6 subs in, 2 effects in/out, 2 echo in/out, 1 cue, 6 master out, mic or line input xlr or line in phono, talkback, $2500. M Legner, 7807 Suffolk Ct, Alexandria VA 22310. 703-971-7069.

RCA BC7 (2), 10 chnl 3 inputs per chnl, dual chnl mono or can be used in stereo, working when removed, w/spare modules, $1550/both. S Engelke, WWDJ, POB 970, Hackensack NJ 07602. 201-343-5097.

Clover System 24×16 transformerless, $3000. K Fox, Fox Farm Recording, 1431 Saundersville Ferry, Mt Juliet TN 37122. 615-754-2444.

LPB Signature III 8 chnl mono, clean & excel cond, $2750/BO. A Sutton, WMGA, POB 1380. Moultrie GA 31776. 912-985-1130.

Yamaha 1000 16 mixing console. 2 volume controls, call for price. HL Sewell, Oakridge Studio, 2001 Elton, Ft Worth TX 76117. 817-838-8001.

RCA BC-7 mono dual chnl, 8 pots in gd cond. $500. G Arroyo, WDNQ, 2483 John Young Pkwy, Orlando FL 32804. 407-290-2020.

Gates Dualux dual chnl mono, 20+ inputs. power supply needs work, BO, you ship. 9-5 EDT. 717-489-0005.

McMartin B-801 mono 8 chnl, minor power supply problem, $250. B Keaton, WGEZ, POB 416, Beloit WI 53511. 608-365-8865.

Teac 5A 8 chnl mixer w/4 assignable submasters, EQ, echo sends & returns, mint cond, w/manuals & schematics, $600. M Bejarano, Falcon Comm., 6923 Forbes, Seabrook MD 20706. 301-794-5754.

Quantum Labs 12P 12 slider, 22 input full stereo w/program & auditape/4-trk busses, in service, gd cond, $2500. K Thomas, POB 207, Atlantic Beach FL 32233. 904-388-7711.

Ramsa WR 8112 18×4 production & PA console, almost new, $2000. B Ranes, DIR, 32 E 57 St, 6th FL, NYNY 10022. 212-371-6850

Gates stereo Executive, excel cond, fully operational, $1000. B Brinitzer, WDCG, POB 2126, Durham NC 27702. 919-682-0318.

McMartin B801 console. B Umberger, 51 S Main, Clearwater FL 34625. 813-446-0957.

Quantum Labs 12P 12 pot, 18 input stereo, in use, gd cond, $2500. K Thomas, Rebel Recdg, POB 207, Atlantic Beach FL 32233. 904-388-7711.

Tascam M520 20 chnl, excel cond, $3750. D Solinske, WWRM, POB 22000, St Petersburg FL 33702. 813-576-1073.

Collins 212T-1 audio control system, 28 inputs, 2 wkg chan outputs, 2 aux outputs. 2 mon outputs, mint cond w/manual, $595. R Sumner, CAVU Comm, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

BE 4 chnl mono board, $500. J Clarke, WRKU, 4531 Belmont Ave Ste C, Youngstown OH 44505. 216-759-0579.

Gates/Harris Diplomat mono, 6 pots in gd cond, needs VU meter, $375. G Arroyo, WDNQ, 2483 John Young Pkwy, Orlando FL 32804. 407-290-2020.

Ramsa WR-8112 12×4×2 w/send & return, L.E.D. bargraph meters, $1500. P Black, KMEL, 55 Francisco St, San Francisco CA 94133. 415-391-1061.

McMartin B-802 8 chnl stereo console presently in service, needs some work, several spare parts, $500. M Meyer, KLQP, POB 70, Madison MN 56256. 612-598-7301.

Tascam 16 mixing board, 16×8×16 console in 24 input mainframe, 4 band semi-parametric EQ on all chnls, (2) stereo aux sends, perfect for 16 or 8 track studio, trades considered, $5995. C Swack, Sweetwater Snd, 4821 Bass Rd, Ft Wayne IN 46808. 219-432-8176.

Gates Yard II audio console, $500. J Cannaday, 919-473-1993.

Ramko DC-5M mono 5 ch 12 input, gd cond, w/manual, $895. L Vollmar, WOBT, POB 738, Rhinelander WI 54501. 715-362-6140.

Gates/Harris 994-5564-003 Ambassador 5 pot console, spare line/mic cards, gd cond. G Fippinger, Rainbow Program, 150 Crossways Pk Dr, Woodbury NY 11797. 516-364-2222.

Want to Buy

LPB Signature II, looking for gd, clean used 8 chnl stereo console, will consider anything in LPB line less than 5 yrs old. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Autogram IC-10 & AC-8, Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

Collins/Autogram 8 chnl stereo Mark 8 or IC-8 console in gd cond. J Boyd Ingram, WBLE, POB 73, Batesville MS 38606. 601-563-4664.

Stereo console needed for NCE station, reasonable. D Van Zandt, Cornerstone Radio, 2596 State Road 44, New Smyrna Beach FL 32069. 904-427-9000.

Auditronics 11B-IME module, need (4) for Auditronics 110B console, clean, reasonably priced, will consider other modules for Auditronics 110-B, reasonable. J Lotspeich, KHEY, 2419 N Piedras St, El Paso TX 79930. 915-566-9301.

Collins 212S1 (2), 356V1 high level input cards for 212S1 console, call after 5 PM EDT. 502-459-9488.

Continental Rock Ten 10 chnl stereo & Mark VII 8 chnl stereo console, must be in excel cond, will consider other such as LPB or Harris. C Phillips, WYSH, POB 329, Clinton TN 37716. 615-457-2697.

Harris Stereo 80 8 chnl 18 input complete in gd cond. Todd, WBOM, 291 Barrett, Berea OH 44017. 216-234-7721.

DISCO & SOUND EQUIPMENT

Want to Sell

Klipsch La Scala's 2 horns, road case, exterior horn speakers, excel cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625.

UREI elec crossover, frame, (4) 518-L & (2) 518-H cards, w/PS, $400; Orban/Parasound 621 parametric EQ, $425. Pat Appleson Stds, 305-625-4435.

Altec H-803 theater horns, throats & mdl 288 drivers, $500/pr; Altec 1215A (2), bass cabinets, folded horn, 406 drivers, handles & casters, $800/pr. J Vengrouskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Altec 604C 15" duplex speaker w/crossover. F Konwinski, WSOY, 1100 E Pershing Rd, Decatur IL 62526. 217-677-5371.

Bose 802 speakers, great for medium size, w/hard plastic covers & mounting hardward, & controller, $850. G Brown, KGLO, 2360 Hampton, St Louis MO 63139. 314-844-1380.

LIMITERS

Want to Sell

CRL FM-4 Sys SPP-800, SEP-800, SMP-800 & SG-800 w/mans & orig perf measrmnts, $4000. K George, WUSY, POB 8799, Chattanooga TN. 615-892-3333, Fax: 615-899-7224.

Ramko portable mixer PM-42, $450; Thomson-CSF 4500 Presence EQ, never used, $595; CBS-Labs 400 Volumax, good buy, $100. H.M. Dyer Electronics, 2982 Wixom Rd, Milford MI 48042. 313-685-2560.

Orban 8000A & 8100A/XT. Pat Martin, PMA Marketing. 414-482-2638.

BE AM-400 compressor-limiter. wrkg, $150; Orban Optimod-FM 8000A. $1200. L Albert, WKMS, POB 2266, Murray KY 42071. 502-762-4664.

Orban 8100A, 2 yrs old & perfect, $3900. P Anderson, KZBQ, Box 97, Pocatello ID 83204. 208-234-1290.

DAP 310 AGC limiter, $125. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

DAP 310 AGC limiter, $125. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

Gates Solid Statesman AGC (2). BO; Gates Solid Statesman FM (2). BO; CBS Volumax 4000A, BO. B Wilson, WYNA, POB 1407. Whiteville NC 28472. 919-642-9131

Orban 8000A plus studio ST from 8100 w/cards. BO. J Phillips, WZOM, 414 Washington, Defiance OH 43512. 419-782-8591.

Orban Optimod 9000A/1 AM processor. NRSC ready, manual, excel. $1800/BO. D Willey, Life Bdctg, POB 96. John Day OR 97845. 503-575-1840.

EXR Corp EX-IV exciter, gd cond. $500; Valley People Dyna-Mite mic processor, dual, desk top case, excel cond, $500. J Claybrook. WMJJ, 530 Beacon Pkwy W Ste 600, Birmingham AL 35209. 305-942-9600.

CRL-FM-4 System, SMP-800. SEP 400. SPP-800 w/Aphex aural exciter w/CRL-FM-4, perf cond, 2½ yrs w/mans, $5000. G Gray, WRQR, POB 1546, Grnville NC 27835. 919-830-0944.

LIMITERS . . . WTS

Orban 8000A optimod, perf cond, $2000. J Phillips, WZOM, 414 Wash, Defiance OH 43512. 419-782-8591.

UREI LA-3A, prod compressor/limiters (2), ultra mint cond w/manual & rack mount kit, new T4B's, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625.

Gates Solid Statesman, gd working cond, $300. S Engelke, WWDJ, POB 970, Hackensack NJ 07602. 201-343-5097.

Texar Audioprism w/AM limiter, excel cond, includes xmtr phase corrector, $1500. K Storm, POB 40554, Washington DC 20016. 301-953-0855/0747.

Home made stereo comp/limiter, $135. J Klauck, KFM Bdctg, 118 Bay, Glens Falls NY 12801. 518-792-9290.

Orban 8000A factory upgrade & realigned, $1800; Gates Solid Statesman FM (2), $150. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Orban XT-2 Chassis, excel cond, approx 4 yrs old, $900. J Hartmeyer, WCLT, POB 880, Newark OH 43055. 614-345-4004.

DAP 310, works great, clean, $300; UREI LA-4, excel cond, $250. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Harris MSP-90, MSP-95 FM audio processor/stereo generator, triband AGC, FM peak limiter, stereo, BO. G Nicholas, KXIC, I-80 at N DuBuque St, Iowa City IA 52241. 319-354-9500.

Gates M-5167 w/manual, working when removed, $30/you ship. P Mueller, KUTA, Hwy 191 N, Blansing UT 84511. 801-678-2261.

Wilkinson LGC-1 AGC/limiter, w/manual, perfect for export, gd spare, $275 pls shpg. L Spivey, WLLS, Hwy 231 South, Hartford KY 42347. 502-298-3268.

CRL FM 3 SEP400 (2) SPP800, excel cond, fully operational, will sell separately, $1250. B Brinitzer, WDCG, POB 2126. Durham NC 27702. 919-682-0318.

CBS 444 Audimax III, gd cond, $125. R Sumner, CAVU Comm, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

Orban 8000A just overhauled at factory, w/all documentation, $1500. P Black, KMEL, 55 Francisco St, San Francisco CA 94133. 415-391-1061.

Harris MSP-90 gd cond, single band w/manual, $495; Dorrough DAP-310 Discriminate Audio Processor, gd cond, w/manual, $395; CBS 4450A Audiomax FM stereo, automatic level control w/manual, $295. L Vollmar, WOBT, POB 738, Rhinelander WI 54501. 715-362-6140.

RCA MI-34654 older style neg peak limiter, gd cond, $25 pls shpg. J Cunningham, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Orban FM Optimod 8000A, vgc, $1500. J Denison, Esprit Comm, 4510-A S 14th, Abilene TX 79005. 915-691-9292.

CBS 4110 Volumax, 4450 Audimax, working when removed. C Knapp, KUMR, G-6 Library UMR, Rolla MO 65401. 314-341-4388.

Gates M-6543 Solid Statesman, works gd, $200. R Hernandez, FAZ Bdctg, 903 E Cortinas, Del Rio TX 78840. 512-775-3544.

Gates M6631 Solid Statesman FM's (2), $150; Orban 8000A, factory upgrade & realigned, $1600. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

ESP WBL-11 worked perfect when removed, $90/BO; Volumax CBS 400, 4000 & 4400 AM limiters, all worked when removed, BO. M Cooney, KBRK, 227 22nd Ave, Brooking SD 57006. 605-672-1430.

Valley People 610 compressor/expander, like new, $750/BO. M Cooney, KBRK, 227 22nd Ave, Brooking SD 57006. 605-672-1430.

CBS Labs 4100 Volumax FM, single chnl, no manual, $100. J Cochran, Gateway Video, 225 Ross, Pittsburgh PA 15219. 412-471-3333.

MICROPHONES

Want to Sell

RCA HK-111 w/cable, $250; EV 911 Sound Spot w/cable, $50; EV 649B w/sealed amp, $25; Altec 639A needs a gd cleaning, otherwise OK, $50. S Sibulsky/J Bjornstad, KVNI, 208-664-9271.

Sennheiser MKH 416 P48 shotgun mic, new, mint, 48 V phantom, $450; AKG CK-4 bidirectl capsule, new, mint, $195. C Richardson, Richardson Recdg, 1938 Balt. Annap. Blvd., Annapolis MD 21401. 301-757-3733.

Yamaha T760, digital AM/FM tuner, 10 station presets, local & DX modes, excel cond, carton & manuals, $125. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

RCA 77DX in original box, unused TV model, for collectors w/card, cover & used desk stand, $1000. G Hill, 2809 Camulos Way, Redding CA 96002. 916-222-0345.

RCA BK-5A in gd cond. F Grundstein, WEGX, 3 Bala Plaza Ste 580E, Bala Cynwyd PA 19004. 215-667-3939.

WE 600A dbl button carbon mic, $500. W Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

EV 651, $50; EV 635A, $45. Jim Klauck, KFM Bdctg, 118 Bay, Glens Falls NY 12801. 518-792-9290.

RCA 77-DX, gd cond w/desk stand & manual. J Claybrook, WMJJ, 530 Beacon Pkwy W Ste 600, Birmingham AL 35209. 205-942-9600.

Vega Pro 63 wireless mic receiver, no mics or manual, clean, works when signal applied to inputs, BO. B Hawkins, WENS, 1099 N Meridian Ste 1197, Indianapolis IN 46204. 317-266-9700.

EV RE-16, EV 664, 646, 676, gd cond, $75 ea. C Elmasian, Tri-Core Rec., 27503 Five Mile Rd, Livonia MI 48154. 313-427-8784, before 2PM.

Sony C37A tube condensors (2) w/cases & power supplies, mint cond, $500 ea. G Ernst, Bayside Snd Std, POB 166, Lincoln City OR 97367. 503-996-6020.

EV RE16 microphone, $185; AKG D-1000E, $70. G Robinson. 803-722-7611.

RCA 50A, BK1A, 88A, WE 633A, working cond mics; 6 RCA 19605 equip catalogs, BO. E Rider, Box 1405, Rancho Santa Fe CA 92067. 619-756-4523.

EV RE-20, new in box, $315. K Thomas, POB 207, Atlantic Beach FL 32233. 904-388-7711.

Want to Buy

Fairchild-Syncron F-22-AU-7, need not work but must be complete. C Elmasian, Tri-Core Rec, 27503 Five Mile Rd, Livonia MI 48154. 313-427-8784.

RCA or **WE 77** or 44 or 639, etc. working or not. W Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

WE 630 Eight Ball dynamic. RL McDonald, Mission Recordings, 5231 Horton, Mission KS 66202. 913-722-2677.

Serious Collector will buy or trade for a RCA 4AA, BK-10, 30A lapel ribbon, 6225A carbon, PD-31, SK-39, BK6A model only, American D-44 & DR330. J Webb, 15117 Hamlin, Van Nuys CA 91411. 818-769-6738.

RCA 44 or other old ribbon or condenser mic, have RCA 77 to trade. R Van Dyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

Good used mics for recording purposes, esp. EV, Shure, Sennheiser, AKG. B Miller, Grapevine Stds, 2525 Imlay City, Lapeer MI 48446. 313-664-1995.

EV 666 w/matching desk stand, C-clamp & connector, paying $50. D Sites, 5809-K Cambridge, Springfield VA 22152.

MISCELLANEOUS

Want to Sell

Lorain rack-mount telephone repeaters, will fix line loss in dial-up lines (7) w/shelf, as new, $200 plus frt; Universal data systems (Motorola) 202T data modem, RS-232 to RJ-11C, $100 plus frt. D Gilliam, 1555 W Pampa, Mesa AZ 85202. 602-839-1901.

Saft SPS400A uninterruptable power supply, 400VA, internal battery, terminals for external 24Vdc, $350. F Portnoy. 603-267-7331.

Cart rack, walnut formica, holds 60 carts, new, $60/BO. P Wolf, 813-574-5548.

Cannon UA Series, assorted male, female, cable & panel microphone connectors, BO. B Humpherys, Utah State Univ, Logan UT 89322. 801-750-3133.

Christie Reflex 20 mdl D6A06 battery pulsing charger for Christie eng battery packs, make offer. M Garrett, WCIA, 509 S Neil St, Champaign IL 61820. 217-356-8333.

Collins P/N 662-0213-000, $270. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

LP's & 45's, A/C, top 40, 60's, 70's, & 80's, mint cond, $2/45's & $6/LP's. P Wolf, 813-574-5548.

Battery chargers, electronically regulated for 24 volt storage batteries (2), one 25 amp, $150, one 30 amp, $175. F Portnoy. 603-267-7331.

Time & Temperature System, digital, 5 line ready, but expandable, gd money maker or PR vehicle, hear on line at 605-343-7300. D Grant, Willow Creek Bdctg, 8601 Woodland Dr, Black Hawk SD 57718. 605-787-4805.

Regulated power supplies (3), 2 ea Lamda plus/minus 12-15 volts at 1.4 amps. One needs minor repair, $20 & $10; (1) Lambda tube type model 0-324, 230-300 volts at 150ma, works OK, rack mount, $50/BO. M Gottesman, KSGT, POB 100, Jackson WY 83001. 307-733-2120.

Enterprise Elect 7900 color weather radar system to use w/data from Natl Weather Srvs, BO. L Dupree, KSKL, 1115 Texas Ave, Alexandria LA 71301. 318-445-1234.

Regulated power supplies (3), 2 ea Lamda plus/minus 12-15 volts at 1.4 amps. One needs minor repair, $20 & $10; (1) Lambda tube type model 0-324, 230-300 volts at 150ma, works OK, rack mount, $50/BO. M Gottesman, KSGT, POB 100, Jackson WY 83001. 307-733-2120.

Henry Syncro Start, never used, $100; LEL IF611 timer interface for cart machines & turntables; Extel printer mdl AH11R, needs head & belt; 16" turntable; 10" R-R tapes, $.50 ea; (2) Hazeltine 1500 terminals mdl 4DT155207. A Wortmann, WJAG, 309 Braasch, Norfolk NE 68701. 402-371-0780.

Kintronics RFC40-20 RF contactor, never used, $450. D Tabor, WHCK, Box 150, Scottsville KY 42164. 502-237-3149.

150/300 & 600/600 Daven or Shallco stereo attenuators out of non-operating equipment; Surplus programs for Tandy 6000 computer, 8" TRS-DOS or Xenix, very reasonable. Q Morrison, KUAD, 600 Main, Windsor CO 80550. 303-686-2791.

Large quantity of equipment: Neumann, Scully turntables; BGW, Haeco, Dynaco amplifiers; Soundcraftsman, Dolby, dbx audio production gear; MCI, Sony, Inovonics, Ampex, Sankyo, Scully cassette & R-R recorders; test equipment; disco & sound equipment and more miscellaneous pieces to numerous to print. Call for information & prices. Tom Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NYNY 10019. 212-265-5563.

Ten line rotary telephones, w/intercom, connector, $15 ea. M Black, 315-789-8970.

Teledyne thermoelectric generator, new 70 watt for remote power source, BO. D Barton, KMTI, POB K, Monti UT 84642. 801-835-7301.

150/300 & 600/600 Daven or Shallco stereo attenuators out of non-operating equipment; Surplus programs for Tandy 6000 computer, 8" TRS-DOS or Xenix, very reasonable. Q Morrison, KUAD, 600 Main, Windsor CO 80550. 303-686-2791.

Stencord 83 18 dictators w/microphones & 6' pedals, uses mini-cassette, vgc, $95PP. L Graziplene, Macrotel, 3532 N Main, N Java NY 14113. 716-535-7251.

ABC Radio Network pulse receiver, never used w/manual, $200. B Wittnebel, KRIB, POB 1568, Mason City IA 50401. 515-424-1490.

1976 Chrysler mobile studio, custom, all Lexan bdct mobile studio, incredible visability, $12 500. M Esberg, WVMT, Box 620 Malletts Bay Ave, Colchester VT 05446.

Tandy mdl II computer, keyboard, 3-drive expansion bay, BO over $700; 1975 Coachman 22' camping trailer converted to mobile unit, tandem axle, (2) TT's, console, internal & external sockets, AM/FM monitor, heat/air cond, range, refrigerator, BO/$3300. Jeff Sigmon, WBZK, 803-684-4241.

Info on doing freq searches (the old way) w/maps, table, etc., for AM & FM; Info on tower erection, guying etc, anything dealing w/tower structures; old engineering proceedings, both NAB & SBE. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Switchcraft (10) new 48 input patch bay, $30 ea. C Elmasian, Tri-Core Rec., 27503 Five Mile Rd, Livonia MI 48154. 313-427-8784, before 2PM.

Manuals for McMartin TBM 2500 RF amp, McMartin TBM 3500 mod mon, Gates CB77 turntables, Gates Level Devil agc amp, Garron STE-100 stereo phase enhancer. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Eico ST-70, $150. J Vengrouskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Executone K21000 electronic phone system, $1000. G Jacques, KSLX, POB 1827, Scottsdale AZ 85252.

Wegener cards for SMN Starstation format; program card only for SMN Country. $500 per card. J Buffington, WWZQ, POD 1240, Aberdeen MS 39730. 601-369-4561.

LEL/Dale 200 splitters/combiners for stereo/mono (10), $20/all; Apple IIE, new system w/2 bal disc drivers, 80 column card, RCA 9" monitor, $400. P Russell, Boudoin College, AV Services Sills Hall, Brunswick ME 04011. 207-725-3066.

Aerovox 9205 large degausser, $100/BO; (2) VU meters, gd cond, $30 ea. HL Sewell, Oakridge Studio, 2001 Elton, Ft Worth TX 76117. 817-838-8001.

Manual for CBS Mdl 450 dynamic presence EQ; junk FM xmtr, prefer 1 kW or less; junk STL xmtr or rcvr; 6th edition of NAB engineering handbook. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

John Wiley & Sons, Inc, Pub: Frequency Modulation Engineering by CE Tibbs & CG Johnstone; McGraw-Hill: Modulation, Noise & Spectral Analysis by PF Panter. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

Tandy TRS-4P computer w/2 disk drives, software & manuals, now in use on automation system, ready to sell, $350/BO. C Springer, KLMR, POB 890. Lamar CO 81052. 719-330-2206.

Unique collection of used bdct equip, for sale or trade, list to large to publish but includes: Gates xmtrs, Sparta console, Revox 77's, cart machines, turntables, EQ, racks, unipole tower, and much more all items being used at present in Class IV AM stations in N Central FL, station gear & property w/residence also available. E.A. Slimak, POB 1195, Hawthorne FL 32640. 904-481-2310.

Radio Shack 100 lap top computer, virtually unused, mint cond, 24K RAM, $300; Extel Teletype printer AH11R, $50. B Umberger, 51 S Main, Clearwater FL 34625. 813-446-0957.

WE 2565 HKM telephones (4), new, $20 ea/BO. R Price, KWIK, 259 E Center St, Pocatello ID 83204. 208-233-1133.

RCA racks (2), 82", BO. J Miller, KGNO, 908 Frontview, Dodge City KS 67801. 316-227-4444.

Broadcast operators handbook by Harold Ennes, original 1947 copy from Rider Publishing, BO. P Keogh, 2511 Memorial, Green Bay WI 54303. 414-499-1336.

Luxo mic arm 1/12" riser, new, $40. G Robinson, 803-722-7611.

Dial phones (6), some multiline type, $30/all pls shpg. J Cunningham, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Keith Monks Mark II record cleaning system. C Knapp, KUMR, G-6 Library UMR, Rolla MO 65401. 314-341-4388.

Tandy-Radio Shack TRS 80 model II line printer V, 2 disk drive, full manuals, 4 programs, $425/package. P Mueller, KUTA, Hwy 191 N, Blansing UT 84511. 801-678-1161.

Want to Buy

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

Floppy drive for an Apple 2E & 80 col cd (extended). J Schloss, KICD, 2600 Hiway, Spencer IA 51301. 712-262-1240.

WE 310B copy of schematic or any information. R Delius, WFXC, 2515 Apex Hwy, Durham NC 27713. 919-596-2000.

Early mono Hi-Fi equipment, Fisher, MacIntosh, Scott, etc. Looking for Scott 121-Series preamp, also related literature and/or Audio Engineering & Hi-Fidelity magazines. B Leslie, Pro Recdg Srvs, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435.

Broadcast pins or buttons, network, olympic, etc. M Black, 315-789-8970.

Bulk tape eraser suitable for 1/4" audio tape in all reel sizes. RL McDonald, Mission Recdgs, 5231 Horton, Mission KS 66202. 913-722-2677.

Schematic for DuMont 347 oscillator. P Robillard, Highway 79 N, Haynesville LA 71038.

New Class A FM at Lake Tahoe needs everything! Consoles, cart machines, Optimod, remote control, STL & xmtr. Kidd Communications, 4096 Bridge St, Ste 4, Fair Oaks CA 95628. 916-961-6411.

Broadcast pins, Olympic, network insignia, station logos, etc, for collection. M Black, WEOS, Geneva NY 14956. 315-789-8970.

Computer w/complete hardware & software for small radio station combo. L Maierhofer, WTGC, 101 Armory Blvd, Lewisburg PA 17837. 717-523-3271.

Old Broadcasting Yearbooks & Gates catalogs. P Hunn, WZZZ, Lakeshore Rd, Fulton NY 13069. 315-593-1313.

MONITORS

Want to Sell

McMartin 4500A stereo mod monitor, excel cond; rack mt fixed freq AM rcvr; TBM-3500, TBM3000 & RF amp, $1500/BO. J Phillips, WZOM, 313 Washington, Defiance OH 43512. 419-782-6986.

TFT 760, new caps, works fine, EBS system, $500 firm. L Albert, WKMS, POB 2266, Murray KY 42071. 502-762-4664.

FM receiver module for TFT-760 EBS unit, tuned to 102.9 MHz, $275. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

QEI 691 calibrated 3/89 by QEI, $3500. M Phelps, WLTI, 20300 Civic Ctr, Southfield MI 48076. 313-354-9300.

RCA (Belar AM-1), works great, has lights for 100 & 125 percent peaks, $500. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Parts for McMartin TBM 2200 stereo mod mon; McMartin TBM 3500 mod mon; Gates Diplomat console; McMartin TBM 4000 mod mon; RCA BTE10C exciter, crystal oven; RCA BTS 1A stereo generator, low pass filters. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Potomac PM112 3 tower antenna monitor BO; Collins 900F-1, 900C-1 FM mod mon & 67 kHz SCA monitor, BO. K Stokes. WKJN, 3029 S Sherwood Forest Blvd, Baton Rouge LA 70816. 504-295-1832.

Gates M-5693, needs freq coil, gd for pts. w/tubes & man, $50. A Wilkerson, WLIL, POB 340, Lenoir City TN 37771. 615-986-7561.

DISTRIBUTOR DIRECTORY

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

MONITORS . . . WTS

McMartin TDM-2000B on 92.1 MHz, works perfect, BO. M Cooney, KBRK, 227 22nd Ave, Brooking SD 57006. 605-672-1430.

TFT 760 EBS unit w/gen, decoder & AM rcvr, just rebuilt by factory, $800/BO. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Gates GTM 88S stereo FM mod monitor, gd cond. F Konwinski, WSOY, 1100 E Pershing Rd, Decatur IL 62526. 217-877-5371.

Belar AMM-2A AM mod mon, excel cond, $750. J McMahan, WAMD, POB 970, Aberdeen MD 21001. 301-272-4400.

McMartin TBM-4500A FM/stereo mod monitor, $800. G Wachter, KKFR, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

McMartin TBM-3700, TBM-2200, TBM-2000A FM stereo monitors & SCA monitor, all in gd cond. C Knapp, KUMR, G-6 Library UMR, Rolla MO 65401. 314-341-4388.

Motorola Conelrad-EBS monitor, tube type, BO; General Radio mod monitor, BO. P Mueller, KUTA, Hwy 191 N, Blansing UT 84511. 801-678-2261.

Want to Buy

FM stereo mod meter, any brand in gd cond. L Amstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8366.

Stereo monitor needed for NCE station, reasonable. D Van Zandt, Cornerstone Radio, 2596 State Road 44, New Smyrna Beach FL 32069. 904-427-9000.

MOVIE PROD EQUIP

Want to Sell

Kodak 7231, 7291, 7292, 5247, 5294 film stock, 16mm & 35mm in 100', 400', 1000'; KEM universal 8 plate 16mm & 35mm film editing table w/heads & screen. J Workman, Maritz, 600 W Lafayette, Detroit MI 48226. 313-963-1200 X501.

DeVrys PH-405 (2), mint 35mm portable projectors, ext tube amps & spkrs, reels, lamps, access., $1800/ea or $3200/pr. J Vengrouskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Chinon 7000 Super 8mm sound projector, record & PB sound, excel, $199; Bolex 8mm H8 3 lens, 8mm projector, viewer rewinds & splicer, excel, $99; 16mm sound feature films several titles, nice color, $99 ea. H Deans, 170 Grand St, White Plains NY 10601. 914-949-5920.

Bolex 16mm movie camera, 3 lens turret, excel, $300; Eiki 16mm, ST/M snd projector, mint cond. $399; Bolex EBM power grip, ESM motor w/NiCad & charger, $399. H Deans, 170 Grand St, White Plains NY 10601. 914-949-5920.

Arriflex 16-BL w/12-120mm Angenieux lens, matte box, Cine 60 battery belt, 2-400' mags, Miller FH tripod w/Cine 60 Snap-Loc, Spectra light meter, Arri shoulder pod, B & S dolly, changing bag & many filters, 12 yrs old, light use, well maintained. North Star A/V Corp. Bid via FAX 203-322-4993.

Want to Buy

Bolex H-16 16mm movie camera, detachable view finder wanted, also other accessories. L Mertz Jr. 1660 Stoke Park, Bethlehem PA 18017. 215-694-0521.

Non-profit organization needs donations of movie cameras & equipment for missionary outreach ministry. J Cunningham, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

RECEIVERS & TRANSCEIVERS

Want to Sell

Aircraft Skyphone, $300; mobile VHF power amp, max 30 watts in, 80 watts out. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

Motorola Pulsar II VHF, IMTS/Bell phone w/MACS option & antenna, Pulsar II head, manuals, $675. J Thornton, KZSC, 2336 Webster, Berkeley CA 94705. 415-540-5236.

CSI Private Patch III simplex, semi duplex phone interconnect, like new, $200. P Russell, Boudoin College, AV Services Sills Hall, Brunswick ME 04011. 207-725-3066.

Motorola TLD 1220A 20 watt IMTS mobile phone w/all crystals control head, antenna & cables w/manual, $400. D Bailey, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

TFT 760 EBS rcvr, AM rcvr module 760-01, FM rcvr module 760-02. V Thompson, KTOT, Box 2810, Big Bear Lake CA 92315. 714-866-3434.

Harris mdl 6550, satellite rcvr chassis, excel cond, w/manuals, $1000/BO. R Fess, WLRB, 119 W Carroll, Macomb IL 61455. 309-833-5561.

EF Johnson Radio 8700 mobile radio, like new, 800 MHz trunked, gd unit, w/antenna & speaker, BO. R Price, KWIK, 259 E Center St, Pocatello ID 83204. 208-233-1133.

Regency HX-1000 30 ch hand-held scanner w/access, excel cond, $175. B Hoover, Colorburst Comm, Box 39, Valier PA 15780. 814-938-7237.

Avcom EBS-100 system, $120; Micro-Control telco DC-9 remote control; studio & xmtr units, 9 chnl, gd cond, $1500. J Clarke, WRKU, 4531 Belmont Ste C, Youngstown OH 44505. 216-759-0579.

Motorola T1878C Pulsar II mobile radio telephone, $550. D Woodcock, WNWC, 5606 Medical Circle, Madison WI 53719. 608-271-1025.

Sony ICF-Pro 80 150 kHz-223 MHz MW/SW, VHF, FM portable receiver w/VHF convertor, 40 memories, new, $175; Johnson PPL 6000, 20 W UHF, 2 chnl transceivers, 467.675 MHz, 462.675 rptr & 462.675 talk around (2), $60 ea. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Wegener 1600 w/1622, 1645, 1646, 1606-01, 1605-03 cards, SMN country, BO. J Miller, KGNO, 908 Frontview, Dodge City KS 67801. 316-227-4444.

McKay/Dymak AM-10 wideband Am tuner, $195. G Wachter, KKFR, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Tonmeister TRE-3N NBC hotline receiver; ITC/3M FB-1 telco interface. M Seguin, WVMT, POB 620, Colchester VT 05446. 802-655-1620.

REMOTE & MICROWAVE EQUIP

Want to Sell

Moseley PBR-21 remote control system, $800. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

Moseley PCL-303 STL on 947.0, $2000; Moseley SCA generators (2) & demod, $450/all. M Ripley, KOZE, 2560 Snake River. 208-743-2502.

Marti SCG-8 sub carrier generator tuned to 67 KHz, can be retuned, $350. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Belar remote frequency, modulation & peak flasker panel, $75/BO. P Russell, WBOR, Sills Hall, Brunswick ME 04011. 207-725-3066.

Marti RPT-25 xmtr on 450.75/450.65, new cond, $1300/BO. M Black, WEOG, Geneva NY 14456. 315-789-1929.

Enterprise WR-100-5 weather radar w/digital NTSC colorizer, 8' steerable antenna w/radome, 550 kW peak output, with/without 100' self supporting tower. D Roden, 1701 Monte Sano, Huntsville AL 35801. 205-533-3676.

Marti SCG-8 sub carrier generator tuned to 67 KHz, can be retuned, $350. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Moseley PCL-505, (2) xmtrs, (2) rcvrs, gd cond on 947.875/948.125, no combiner, $2500. P Baumgartner, WMBD, 3131 N University, Peoria IL 61604. 309-688-3131.

TFT 7610-C digital telemetry remote digital remote, wireless, remote control, needs work, BO. J Bahr, WVIS, Box 487, Frederiksted, St Croix, US Virgin Islands, 00841. 809-778-5199.

Telefax 131A mixer w/all access in new cond, $450; Scientific Atlanta 7.5 kHz dual audio decoder, new, $1200; Marti 30/150 RPU rcvr on 161.70 MHz, BO. KA Lancaster, WRFS, POB 5523, Falmouth VA 22403. 703-373-4640.

Marti RPT-2S, 25 watt RPU xmtr, new cond, $1200/BO; Comrex LXR single line freq extension decode, $350/BO; WE KS-20159L4 line EQ, gd cond w/cases (2). M Black, WEOS, Geneva NY 14956. 315-789-8970.

Scala Miniflector STL antennas (2), very little use, $500. S Callahan, WFTI, 1120 Pinellas Bayway #103, Tierra Verde FL 33715. 813-866-3544.

Moseley PCL-505/C composite STL rcvr & xmtr, gd cond, tuned to 947.0 MHz, approx 12 yrs old, w/manuals, $3800/BO. J Knudsen, KWDJ, 7351 Lincoln, Riverside CA 92504. 714-688-1570.

Moseley PCL-303 STL xmtr & rcvr, $2000; Moseley SCA generators (2) & a demodulator, $450. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Wegener/Satellite Music Network complete sat rcvr for SMN oldies chnl, perfect cond, $2000; Elgin, W-E auto answer couplers for telephone line (12) type 20271 & 19522, work & snd cond, $65 ea. G Nicholas, KXIC, I-80 at N DuBuque St, Iowa City IA 52241. 319-354-9500.

Merrimac MS-1 satellite tracking controller, Z-80 based micro processor, call for info, $1500; Realistic 32-1221 complete 2 piece FM wireless mic system, $40 ea. P Russell, Bowdoin College, Sills Halls, Brunswick ME 04011. 207-725-3066.

Moseley 1600 like new, 92 kHz subcarrier card & Belar SCA monitor, $4300. B Poole, WTHP, 1607 Country Club, High Point NC 27260. 919-887-0983.

Moseley PCL 505-C STL, BO; Scala PR 450U 4' grid dishes (2), BO. J Kosobucki, KLDA, 5161 Maple, Des Moines IA 50317. 515-266-6060.

Moseley TRC-15A studio end of remote control, BO cash or trade for Moseley PCL-505C receiver. P Parks, KYKR, 27 Sawyer, Beaumont TX 77702. 409-838-3911.

Moseley DRS-1 20 chnl expandable digital remote control system w/extra spare parts & boards, $1250; Comrex single line PLX II transmit & RLX receive unit, $1250/system. G Wachter, KKFR, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Moseley PBR-30A, working when removed from service. C Knapp, KUMR, G-6 Library UMR, Rolla MO 65401. 314-341-4388.

Complete satellite reception system for Transtar oldies channel, w/Wegener 1601 mainframe & all equip needed for automated operation, like new, used 1 yr, BO. B Belz, WCCZ, New Smyrna Beach FL 32069. 904-427-1550.

Enterprise Elec WR-100-5 color weather radar w/NTSC output, 550 kW/8' parabolic antenna in fiberglass dome, BO with or without 80' self support tower. D Roden, WHNT, 1701 Monte Sand Blvd, Huntsville AL 35801. 205-533-3676.

Moseley TRC-15, worked when removed, BO. M Cooney, KBRK, 227 22nd Ave, Brooking SD 57006. 605-672-1430.

Moseley PCL-505C composite STL system, gd cond, w/manuals, tuned to 947.000 MHz, receiver & xmtr, $3500/BO. J Knudsen, KWDJ, 7351 Lincoln, Riverside CA 92504. 714-688-1570.

Wegener 1601 receiver, extra cards for SMN-1621, 1645, 1646, perfect, $1700; Scientific Atlanta 6603 video receiver down converter, excel cond, $700. J McMahan, WAMD, POB 970, Aberdeen MD 21001. 301-272-4400.

M/A Com 23VFM microwave system, video plus 1 audio chnl, 2 chnl capability, rebuilt by M/A Com 1/89, 23.925 GHz, $4250/BO. S Kafka, K61CU-TV, Ste 902, 941 O St, Lincoln NE 68508. 402-476-6115.

Marti MR-30 tube receiver on 161.64 MHz w/manual, $250; Moseley WRC 10T phone line remote control, 10 chnls w/manuals & at least 5 relays, $250. B Keaton, WGEZ, POB 416, Beloit WI 53511. 608-365-8865.

M/A Com 23 GHz video microwave system, one audio ch & video 2 ch capability, rebuilt by M/A Com 10/88, $4250/BO. K61CU TV, 941 'O', Ste 902, Lincoln NE 68508. 402-476-6115.

Harris 10' dish w/stand; Harris SCPC receiver, BO. D Agnew, 5601 So 27th, Lincoln NE 68512. 402-421-2223.

Moseley PCL505 composite stereo microwave system on 945.0 MHz, gd cond, just removed from service, $2500. B McCann, KKWY, 5 Triad Ctr, Ste 480, SLC UT 84180. 801-328-9800.

Want to Buy

Moseley PBR-15 w/110KHz SCA return, must be in gd working & cosmetic cond. J Bahr, WVIS, Box 487, Frederiksted, St Croix, US Virgin Islands, 00841. 809-778-5199.

Strapping diagram for WE & KS20159-L4 EQs. M Black, 315-789-8970.

Marti RPT-15 450 MHz, also need matching rcvr. J Davis, WGRD, 38 W Fulton, Grand Rapids MI 49503. 616-459-4111.

CONSULTANTS

REMOTE . . . WTB

Working VHF RPU & STL equip needed for 169 & 217 MHz bands. L Arnstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8366.

Remote control for Am 1000W, telephone lines only. J Foust, WXEE, POB 1340, Welch WV 24801. 304-436-4191.

Composite type microwave system for 949 MHz band & for stereo operation, need everything from antennas to xmtr/rcvrs. B Coleman Jr, WIST, Box 460, Lobelville TN 37097. 615-593-2294.

Symetrix TI-101 telephone amp/EQ, new or used. R Fess, WLRB, 119 W Carroll, Macomb IL 61455. 309-833-5561.

Stereo 950 MHz STL system & (2) Scala paraflector STL antennas. B Rathman, KRVM, 200 N Monroe, Eugene OR 97402. 503-687-3370.

Moseley PBR 15AR PC boards: TU, sub aud mtr proc 51A5327, sib carr demod 51A5331, sub carr gen 51A5320, alarm xmt 51A5335; SU: sub aud up conv 51A5315, sub carr gen 51A5320 (110 Kc pref), alarm det 51A5322. V Thompson, KTOT, Box 2810, 575 Pine Knott, Big Bear Lake CA 92315. 714-866-3434.

Harris/Farinon FP12MP parabolic antenna for portable microwave on 12 GHz. D Dain, WKSU, Kent State Univ, Kent OH 44242. 216-672-2135.

STATIONS

Want to Sell

FM near Augusta ME. Excel market of over 65K, area is No.1 in retail sales, amazing signal at 980' ASL, more power soon, $295K cash. D Tallyn, Dark Comm, 300 N Fig Tree Ln, Plantation FL 33317.

Current station owner looking to acquire high power AM at a gd price. Turnarounds, daytimers, & dark stations OK. Must include FCC city grade coverage map. Mr. Stevens, POB 732, Langley SC 29834.

Class A FM stereo station, priced right, cash or terms. Box 780, Cleveland MS 38732. 601-843-4091.

Class A FM, Montana, ski resort area, can upgrade to class C1, cheap, joint venture, $10,000 minimum, only $50,000 full price. M Gottesman, POB 761, Laramie WY 82070.

Full time AM CP, 5000 W non-directional days, 500 W directional nights, in county adjacent to a top 50 market, can move to that county border & increase power to 50 kW. Serious inquiries only to POB 40333, Nashville TN 37220.

AM station on 1580 kHz, new studio & ofc bldg at xmtr site, in So Middle TN, Satellite news, dish incld, outstanding local, sports coverage, $200K cash. A Wilkerson, WLIL, POB 340, Lenoir City TN 37771. 615-986-7561.

Want to Buy

Looking for AM, FM or CP in east for right price and terms. H Kozlowski, 703-631-0197.

AM construc permit, pref non-directl 1 kW or less. P Hunn, WZZZ, Lakeshore Rd, Fulton NY 13069. 315-593-1313.

LPTV stations in GA, AL or FL, will purchase w/100% owner financing. N Davis, POB 5180, Defuniak Springs FL 32433. 904-892-4038.

STEREO GENERATORS

Want to Sell

Onan 15RJC-4R8/5700 P, 15 kW standby/18.75 kVA AC 120/208 3 phase 60 Hz 1800 rpm natrl gas, $2000. L Vidoli, WEEI, 4450 Prudential Twr, Boston MA 02199. 800-654-6038.

Wilkinson SG1E, Collins 786M-1 solid state generator, $750 & $400 respectively. J Bahr, WVIS, Box 487, Frederiksted, St Croix, US Virgin Islands, 00841. 809-778-5199.

Orban 8000A processor/generator, $1200. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

Harris stereo generator for MS-15 exciter. B O'Connor, KDES, 821-N Palm Cnyn, Palm Springs CA 92262. 619-325-1211.

Wilkinson SG-1, working when removed, BO/trade. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

Harris MS-15R gd cond, w/manual, $495. L Vollmar, WOBT, POB 738, Rhinelander WI 54501. 715-362-6140.

Moseley SCG-4T sub-carrier generator, $300/BO. M Cooney, KBRK, 227 22nd Ave, Brooking SD 57006. 605-672-1430.

Moseley SCG-3T working when removed. C Knapp, KUMR, G-6 Library UMR, Rolla MO 65401. 314-341-4388.

SWITCHERS (VIDEO)

Want to Sell

EchoLab SE2 video switcher w/sync generator, gd cond, $800. D Harns, Design Stds Teleprod, 216 Commercial, Waterloo IA 50701. 319-232-5604.

Routing switcher, 100 in, 96 out. GE TS301A recently retired from service, gd working order w/all cables, manuals, racks, BO. A Ezekiel, 215-848-4501.

Cohu 9501 8 input SEG, w/6 wipes, int-ext keyer, mix function, w/manual; Telemation TSG-300GL genlocking color sync gen, $500/both. TFG, Box 9, Wethersfield CT 06109. 203-527-2972.

Grass Valley 1600-4S master control switcher w/stereo audio, M202 preroll machine control, downstream keyer, 15 m cables, $30 000. R Rickly, WUAB, 8443 Day Drive, Cleveland OH 44129. 216-845-6043.

ISI 902 10 inputs, 2 ME, 8 rotary wipes positioner, pgm & preview outs, gd cond, $1100. D Lahey, Pathfinder Prod, 10794 McGuffie, Salinas CA 93907. 408-663-5192.

Grass Valley 1600-4S master control switcher, stereo, machine control, excel, BO. R Rickly, WUAB, 8443 Day Dr, Parma OH 44129. 216-845-6043.

TAPES, CARTS & REELS

Want to Sell

Record collection of 59's, 60's & 70's. Over 10-thousand 45's, 1200 albums. Mostly top 100-hits '55 to early '80's, $9500. M Fuller, 8 Anderson Circle, Auburn NY 13021. 315-253-4024.

Ampex VPR-1C (2) 1" tape machines w/TBC2, excel cond. D Roden, 1701 Monte Sano, Huntsville AL 35801. 205-533-3676.

Fidelipac Master carts (1000) useable, 2.50 & 3.50 min in length, .60¢ct ea, add $3 per 100 carts for shpg. D Peluso, KFM, POB 15223, Las Vegas NV 89114. 702-732-7753.

Metal reels, (129) 10.5" w/2780 cuts of Big Band/Nostalgia music, includes 10 reels of Big Band Era christmas music, comes w/extensive documentation, all reels w/artist & title separation, all cuts in stereo, $30 per reel or will trade for equip. S Callahan, WFTI, 1120 Pinellas Bayway #103, Tierra Verde FL 33715. 813-866-3544.

Fidelipac & Audiopak, over 150, misc lengths, gd cond, $1 ea. M Gellos, Pensacola Christian College, 904-478-8480.

ABCO 500 lazy susan cartridge rack, holds 500 carts, 6' high 21" diameter, gd cond, (2), $400 ea. E Swanson, WZTR, 520 W Capitol, Milwaukee WI 53212. 414-964-8300.

Several hundred 7" & 10" metal & plastic reels, boxed & unboxed, make offer. M Gellos, Pensacola Christian College, 904-478-8480, X5041.

Fidelipac Mdl 300, 40's-70's-100's, etc, over 500 carts, most like new, $2 ea pls shpg. WCMT, POB 378, Martin TN 38237. 901-587-9526.

Sound Ideas Sound Effects Library, 13 000 sounds, 125 boxed reels, catalogue w/locator nos., 15 ips, new, $700/BO. B Ardis, VoiceWorks, 4160 W 182nd #208, Torrance CA 90504. 213-214-2642.

Audiopak AA-3 carts, hundreds, music lengths, some only one pass thru, others unopened, call for details, $1.25 ea. D Solinske, WWRM, POB 22000, St Petersburg FL 33702. 813-576-1073.

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

Engineer, mature, extensive exper in AM/FM, shortwave & TV. General phone, NARTE, BSBA degree. Prefer sunbelt, consider all areas including overseas & equipment mfgrs. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-89-1RW.

AM, FM, TV Chief, 30 yrs exper seeking responsible position in broadcast engineering management. D Larsen, 4554 S 35th West, Idaho Falls ID 83402. 208-524-7260.

Program Director/announcer w/B.A. in Communications, 6 yrs exper, have done engineering. James, 608 College Ave, Bluefield WV 24701. 304-327-5651.

Voice talent wants stable east, west, gulf coast college fine arts radio position. 20 yrs classical, commercial exper. Joel Newman, Box 7703, Atlanta GA 30357.

FT radio CE position wanted. Exper in AM/FM radio, professional audio systems, computers; design, installation, maintenance. B.S. degree in engineering; FCC license. midwest or south preferred. Call Andy at 508-393-5753, evenings before 10PM.

Take charge VP/GM available for your radio station. NE, Oklahoma area. Stable, professional, creative. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-89-3RW.

Chief w/20+ yrs in radio seeks new challenges. Exper to 50K AM, 100K FM, DA, construction, maint & more. K Bass, Osage Bdctg, 2819 N Orchard, Roswell NM 88201. 505-622-4713.

SD air personality seeks position on air. Preferably in 5 state area of FL, 5+ yrs exper, dependable & reliable. BC Songradi, Box 75, Revillo SD 57259. 605-623-4543.

CE NBN, NJ College radio station, FCC, NARTE, NABER, general radio license seeks FT/PT employment. M Rakoff, 11441 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

Experienced combo ENG/Anchor, user friendly school of hard knocks, trained bottom line orient. Aggressive audio, Texas AM/FM TV entry level. P McKaig, Rt 4 Box 18299 # 29, Alice TX 78332. 512-664-1106.

Engineer w/20+ yrs exper, all phases of radio, excel references. For more information & references call Cecil, 817-656-1318.

Morning Team w/zest ready to do the best, call Sam for demo tape, 501-225-8529.

Engineering FT, RF, video, audio, solar. FCC genrl, SBE Cert., Ham, Educ or Com'l. Sunbelt, Chgo?, Manu?, Sales? 312-890-9246.

Sm Mkt announcer looking to move up, 2-1/2 yrs experience as PD, production manager & DJ (AC, top 40 & newstalk), Prefer Southern California but will relocate. L Dorrell, 731 N Balsam, Ridgecrest CA 93555. 619-375-8888.

Engineer, 21 years experience, FCC gen, SBE, NARTE-Master Certificate. seeks major market, Chief Engineer AM/FM position. Excellent reference and experience track. KJ Benner, PO Box 17291, St Paul MN 55117.

20 years solid experience, morning man, news, production, copy, medium/large markets only, prefer warm climates, dedicated worker, married, available now. Larry Kay, 717-653-2500.

Broadcast professional seeks sales opportunity with AM, FM or related industry, all markets considered. Reply: Box 492, Clemson SC 29631.

CHR gladiator with 11 years OM/PD/MD/AT experience seeks new challenge. Call Jim, 304-233-8937.

Chief Engineer, FCC General, ASEE, Ham seeks CE, Assistant CE or group CE with radio station(s). Former radio CE Boston, Houston, Miami and Ft Lauderdale. Nondrinker. M Gottesman, POB 761, Laramie WY 82070.

HELP WANTED

Group needs engineers, AM DA & FM to turn around stations technically, SBE cert a plus. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-89-2RW.

Contract or PT engineer needed in the Lee County, Ft Myers, FL area. Facility is a Class A FM. Please call Joe, 1-508-548-3102, Technical Director. E.O.E.

Nationwide Communications Inc. has an immediate opening for an experiencd CE at WKZL-FM, in Winston-Salem, NC. A well equipped, 100 kW facility with possible 80-90 transmitter site move. Applicant should be competitive and communicate well. Call Jeff Gulick, Corporate Group Engineer, 614-224-9624. E.O.E./M.F.

Group needs CE for maj AM/FM rebuild. Must maint older equip while developing & implementing 5 yr rebuild. WIRL/WSWT, Box 3335, Peoria IL 61614. 309-694-6262. E.O.E./M.F.

Experienced broadcast technician needed for small market group (2) AM, (2) FM, excellent opportunity. Reply to: D.A. Thurston, WNAW, PO Box 707, N Adams MA 01247. 413-663-6567.

Well-known New Age radio host, Joyce Keller. Advice, interview format. Proven ratings winner. Entertaining, therapeutic, informative, currently on National TV seeks radio hosting position. 516-587-2013.

BROADCAST EQUIPMENT SALES REP

Leading national distributor of broadcast audio equipment is expanding our sales rep organisation. We seek aggressive professionals. We support your efforts and pay top commissions. Exclusive territories available in most regions of the U.S.
Send resume to:
Roy Laurence
RADIO RESOURCES
7483 Candlewood Road
Hanover, MD 21076

ACTION-GRAM

EMPLOYMENT SECTION:

Help Wanted: Any company or station can run "Help Wanted" ads at the flat rate of $25 per listing per month (25 words max). Payment must accompany insert; **there will be no invoicing.** Blind box numbers will be provided at an extra charge of $2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

Positions Wanted: Any individual can run a "Position Wanted" ad, FREE of charge (25 words max.), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a $2 fee which must be paid with the listing **(there will be no invoicing).** Responses will be forwarded to the listee, unopened.

Check as appropriate:

☐ Help Wanted ☐ With Box Number
☐ Positions Wanted ☐ Without Box Number

Text (25 words maximum): _____

_____

_____

_____

Name _____ Title _____

Company/Station _____

Address _____

City _____ State ____ Zip _____

Telephone _____

Mail to:
BROADCAST EQUIPMENT EXCHANGE
PO Box 1214, Falls Church, VA 22041

TAPES . . . WTS

Audiopak A-2, (30) less than 6 mos old, will sell for BO. C Springer, KLMR, POB 890, Lamar CO 81052. 719-330-2206.

Capitol HOLN 60 hubs, 3600', all new, cart winding tape, sold individually or as package, BO, 9-5 EDT. 717-489-0005.

Audiopak AA4 (453) HOLN tape, 5.5 to 10.5 min, mint cond, $300 pls shpg. R Curtis, 17870 Orchard, Guerneville CA 95446. 707-869-3053.

Want to Buy

KCS-20 type small U-matic carts for BVU-100 VCR's, also gd used Beta carts. C Lund. 203-756-7761 aft 4PM.

Video tapes: classic movies & cartoons of classic films that are in the public domain, for LPTV, would buy or rent. Dee, 334 N State, St Ignace MI 49781. 906-643-9494.

Aristocart cart pads, need appro 200 for the old black square Aristocart carts that were made in Canada. E Fess II, WLRB, 119 W Carroll, Macomb IL 61455. 309-833-5561.

RCA 16" Thesaurus or other transcriptions. W Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9631.

Top 40 record library's rock oldies from the 50's, 60's & 70's, in fair cond, albums as well as 45's, no tapes. B Coleman Jr, WIST, Box 460, Lobelville TN 37097. 615-593-2294.

Transcriptions, 16", 7" to 10" blank recording discs, pre 1960 bdct equip magazines, catalogs, instruction manuals. R Van Dyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

Jaz-LP's. B Rose, Program Recordings, 228 E 10th St, NY NY 10003. 212-674-3060.

TAX DEDUCT EQUIP

Eng student desiring donation of old bdct equip (anything)in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Small Christian radio needs small console & (2) turntables & (2) cassette decks, free donation. Kisk, 407 S New Madrid, Sikeston MO 63801.

Gatesway stereo control board/mixer, Executive or Diplomat, 10 mixing chnls; Ampex R-R recorder 601 mono or stereo; Russco or other similar brand Cue Master. Donation or token price, will be used in religious FM in foreign country. D Daniell, Apdo Postal 310, 53102 Cd Satelite, Mexico. 011-525-572-4568.

FM xmtr, 250-100 watt; also (3) deck tape recorders & R-R & 120' tower, 1-4 bay antenna, sportscaster board. J Setzer, Christian Entertainment Ministries, POB 93, Brookfield MO 64628. 816-376-2502.

Small Christian radio needs small console & (2) turntables & (2) cassette decks, free donation. Kisk, 407 S New Madrid, Sikeston MO 63801.

Mission of the Queen of the Holy Rosary is seeking donation of all types of audio & video equipment. Most need at this time R-R, cart machines & stereo console. Tax deduct donations. Mission of QHR, 865 Seneca Creek, W Seneca NY 14224.

Seeking 3-deck BE cart machine, cassette decks. C Spartt, WVMR, Rt 2B, Dunmore WV 24934. 304-799-6004.

Radio station at small liberal arts college is looking for donations of bdct equip. Cart machine compressor, FM exciter, EBS monitor, etc. Will pay shpg or pick up. B Luginbuhl, Bluffton College, Box 1327, Bluffton OH 45817. 419-358-8015 X214.

Elementary school needs donations or bdct equip, anything in gd working cond, will pay shipping chgs. Linda Minton, KdSTAR, 1325 N Shumway Ave, Chandler AZ 85225. 602-786-7120.

Non-profit missionary station in El Salvador needs 8008's in any cond so long as the bases, pins & plate caps are gd, will pay shipping; Also need 892R's for xmtr, will pay shipping. J Counter, YSLE, 5484 San Patricio Dr, Santa Barbara CA 93111. 805-967-6410.

ED FM needs 4 bay antenna, carts, records, any format. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

Non profit station seeks donation of 16mm movie cameras & equipmt in any cond. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Christian Bdct Ministry seeks donations of production equipment to construct studio. We need everything top to bottom, to begin producing several non-profit bdct venture. We'll pay postage charges. TGATS, Inc., POB 42, Medford OR 97501. 503-773-3200.

Non-profit educ sta upgrading our svc, nds stereo 950 MHz STL sys & (2) Scala STL antennas. B Rathman, KRVM, 200 N Monroe, Eugene OR 97402. 503-687-3370.

TEST EQUIPMENT

Want to Sell

Potomac Instruments FIM-21 field strength meter .54-1.6 MHz, excel cond, $900. J Anderson, W 621 Mallon, Spokane WA 99201. 509-326-6229.

Leader LAG-120A AF sig gen, $200; Leader LSG-16 RF sig gen, $75, both units in excel cond, orig bxs w/manls. B Turner, Turner Audio, Box 788, Ridgefield CT 06877. 203-438-1803.

Fluke DMM 8050A, excel cond, $375. J Claybrook, WMJJ, 530 Beacon Pkwy W Ste 600, Birmingham AL 35209. 205-942-9600.

Bruel & Kjaer 4220 piston phone, calibration standard for sound measuring systems, mics, analyzers, etc, in wooden box w/barometer & adapters, manual & datasheet (4), $500. C Elmasian, Tri-Core Rec, 2750 Five Mile Rd, Livonia MI 48154. 313-427-8784, before 2PM.

B&W audio osc, $200; B&W dist meter, $300; (3) Comrex TCB-1 phone line couplers, $100 ea; Gates SSA-3 silence sensor, $50. B Clark, WFAS, Secor Rd, Hartsdale NY 10530. 914-693-2400.

Simpson 458 oscilloscope, old but works, manuals, $200/BO. R Fess, WLRB, 119W Carroll, Macomb IL 61455. 309-833-5561.

Potomac 120E AM field strength meter, $1100/BO. P Huback, 1209 St Joseph St, Gonzales TX 78629. 512-672-3516.

Bird 3128 Wcher alarm RF power monitor, up to 10 kW, 450 kHz to 2300 MHz, mint cond w/manual, $350. R Sumner, CAVU Comm, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

EICO 277 audio generator, $50. S Weber, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

B&K 1260 NTSC video pattern/sync gen, mint cond, $1200. B Hoover, Colorburst Comm, Box 39, Valier PA 15780. 814-938-7237.

Tektronix 454 portable 150 MHz dual trace scope, calibrated sweep delay & Mod 163D, mint cond w/manual, $825; Bird 8890 dummy load, oil cooled, 2.5 kW, DC to 2.4 GHz, 50 ohm w/N(F) connector & new resistor, excel cond, $595. R Sumner, CAVU Comm, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

HP 524B freq counter w/200 MHz plug in, BO. B Humpherys, KUSU, Utah State Univ, Logan UT 84322. 801-750-3133.

Heathkit IM48 audio analyzer, tube type, gd for parts w/manual, $60 pls shpg; Heathkit IM58 distortion meter, gd for parts, w/manual, $60 pls shpg. L Spivey, WLLS, Hwy 231 South, Hartford KY 42347. 502-298-3268.

WE KS-14243 75 ohm RF attenuator, rack mount type, gd cond, $50 pls shpg; WE KS-15658 noise figure test set for 3-5 GHz, poor cond but works, $15 pls shpg; McMartin TBM 3000 FM freq mon, workd, $30 pls shpg. J Cunningham, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Tektronix 547 w/IL20 plug in & manuals, sell separately or together, BO. C Springer, KLMR, POB 890, Lamar CO 81052. 719-330-2206.

UREI 200 X-Y plotter w/Model 2010 audio testing frequency detection module, precision plotted readout on chart paper for testing freq response of tape recorders, audio gen, etc., $2000. J Miller, Sound Patterns, 28475 Bridge, Garden City MI 48135. 313-422-2373.

Tektronix 491 spectrum analyzer, 1.5 GHz to 40 GHz, gd cond, to trade for solid state field intensity meter (FM) or 100 MHz scope also Solid State. L Spivey, WLLS, Hwy 231 South, Hartford KY 42347. 502-298-3268.

HP 350D attenuator, 0-110 dB in 1 dB & 10 dB steps, 600 ohms, 5 W, DC-1 MHz, mint cond w/manual, $195. R Sumner, CAVU Comm, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

Tektronix 491 spectrum analyzer, 10 MHz-12.4 GHz, mint cond, w/manual, $2900; Tek 7L5 spectrum analyzer plug-in, 20 Hz-5 MHz, mint cond w/manual, $5900; HP 141T spectrum analyzer w/8552A/8555A, 10 MHz-18 GHz, excel cond w/data, $7900. R Sumner, CAVU Comm, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

Want to Buy

Leader 120A, 120B, 125 or 126S audio generator & Leader LDM 170 or 171 distortion meter. H Yund, WTKI, 2200 15th, Gulfport MS 39501. 601-863-3522.

Potomac Instruments FIM-21 or 41 AM field strength meter. D Murray, WCCW, 121 E Front, Traverse City MI 49684. 616-946-6211.

TRANSMITTERS

Want to Sell

AM xmtrs including: GE 50kW, Collins 21-E 5kW, Gates BC-5E, Raytheon, RCA BTA-5T 1kW, Gates BC-1J, BC-1G, BC-1F, RCA BTA-1R, and many others, warranteed. Jerry 315-488-1269.

McMartin BF-25K, excel cond; Harris SX-1A fire damaged, for parts, also SX-1A spare parts kit; RCA BTA-500R AM for parts, many good 4-250A tubes. John or Mike, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Harris MW-1A (3) PA modules for 1-kW xmtr, working order, $150 ea. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Parts for a RCA BTF 20 E1, BO. J Schloss, KICD, 2600 Hiway, Spencer IA 51301. 712-262-1240.

BE 3.5 kW FM, 4 yrs old, without exciter, $16 000. L Blakeney, WBBN, Rte 2, Box 273B, Taylorsville MS 39168. 601-729-8100.

Gates BC1F currently in operation, avail 6-89. D Tabor, WHCK, Box 158, Scottsville KY 42164. 502-237-3149.

RCA MI-19086-B 12.5 kW UHF-TV filterplexer for ch 33, excel cond, $1000. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

Gates FM-5B w/Wilkenson exciter, in working cond, w/spare parts & tubes, make offer. K Sleeman, WMMJ, 400 H, NE, Washington DC 20002. 202-675-4800.

Collins A830W 10 watts FM, tube type FM exciter, tuned to 99.5; Also Harris TE-3 FM exciter tuned to 104.1 includes Orban baseband. $1000. J Bahr, WVIS, Box 487, Frederiksted, St Croix US Virgin Islands, 00841. 809-778-5199.

Versacount V-322 10W FM exciter, tuned to any frequency, recently rebuilt, $850. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

Transceiver Heathkit SB102-1 covers all ham bands in excel working cond, BO or 1/2" recorder 4 head or what have you. Leo Meister. 201-667-2323.

Filament transformer for Collins 830F series FM xmtr, new in box. C Leasure, WTBO, POB 1644, Cumberland MD 21502. 301-722-6666.

RCA TTU-1B 1kW UHF plus an addtl unit for spare parts, on-air chnl 33, tunable from 24 to 41, BO. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

Harris MW-1A (3) PA modules for 1-kW xmtr, working order, $150 ea. M Patton, WXON, 6819 Cezanne, Baton Rouge LA 70806. 504-292-4189.

RCA BTA-1MX w/500 watt cutback, w/spare tubes & parts, BO. KA Lancaster, WRFS, POB 5523, Falmouth VA 22403. 703-373-4640.

McMartin B-910 spare transistor/semiconductor kit for B-910, $25; GE 4BT1A, 250 watt FM xmtr, no exciter, needs work, $200. P Russell, Boudoin College, AV Services Sills Hall, Brunswick ME 04011. 207-725-3066.

RCA SO spare parts, transformers, reactors, capacitors, relays & more from mtr being junked. J King, WROB, POB 1336, W Point MS 39773. 601-494-1450.

RCA RTF1E 1 kW FM, fire damaged, for parts, etc, BO. M Black, WEOS, Geneva NY 14956. 315-789-8970.

BTA-250M 250 watt AM, on 1240 kHz, vgc w/documentation, ideal low-power, PSSA or standby, avail immed, $200/BO or will trade for 450 MHz RPU system. R Wolf, WMXR, POB 404, Woodstock VT 05091. 603-675-2506.

BE FS-30 stereo generator, like new, $1200. G Gray, WRQR, POB 1546, Greenville NC 27835. 919-830-0944.

Collins 1000 watt 20V3 in excel cond, on air, 980 kHz, $5300. Jeff Sigmon, WBZK, 803-684-4241.

TRANSMITTERS ... WTS

Rust 5 kW FM; Collins 20K 1 kW AM; Gates 250C 250 W AM, PCB's removed, needs plate transformers, lots of spares, call for more details, BO. G Nicholas, KXIC, I-80 at N Du-Buque St, Iowa City IA 52241. 319-354-9500.

Harris 2.5 kW, 1983 in excel cond, BO. T Ferebee, KLLR, POB 70, Walker MN 56484. 218-547-1200.

CSI FM 3000E 3 kW xmtr, 95.3, excel cond. H Cochran, KITX, Box 886, Hugo OK. 405-564-3043.

Kintronics power cutback interface w/contactor 500 W in 47 W out, new cond; Kintronics power reducer for AM xmtr, BO; Kintronics RF switching relay, 110 volts, power capacity 10 kW, gd cond, BO. D Mussell, WTCW, POB 904, Whitesburg KY 41858. 606-633-2711.

Wilkinson FM10E, working when removed, BO/trade. M Koscak, WSKB, Western Ave, Westfield MA 01085. 413-562-1950.

Gates FM-10H3 (2) w/TE-3 exciter, 10kW FM xmtr at 92.9 MHz, worked when removed w/spare parts, BO. B Williams, KRWN, POB 1047, Farmington NM 87401. 505-327-4449.

RCA BTF20E 1975 20 kW, recently removed from service, spare final & parts. $8000 firm. J Boyd Ingram, WBLE, POB 73, Batesville MS 38606. 601-563-4664.

Harris FM 2.5K, 8 yrs old, gd cond, MS exciter, new tube, gd spare tube, $15,000. J Denison, Esprit Comm, 4510-A S 14th, Abilene TX 79005. 915-691-9292.

Carrier current 50 W home brew xmtr, 19" x 16" x 16", adjusts 2 Ws to 50 W w/instruction book, $400. J Cunningham, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Gates/Harris FM-1G needs minor repair, w/all tubes & manual, tuned to 93.5, $4500/BO. A Wilkerson, WLIL, POB 340, Lenoir City TN 37771. 615-986-7561.

RCA BTE-10C/BTS-1A exciter, stereo gen, metering panel & CBS Volumax, stereo, in 4' rack w/manuals & spares, $7000 pls shpg. T O'Laughlin, O's Own Eng, Rt 1 Box 41, Barnereld WI 53507. 608-924-2001.

CSI T1A, new, 500 W AM xmtr, still on pallet. P Rondeau, Radio Hanover Inc, POB 234, Hanover PA 17331. 717-637-3831.

BE 3.5K & exciter, currently on air in Arkansas, will consider owner finance of up to half or discount for all cash. You pick up or reimburse crating/shipping charges, $19,900. 501-444-9544.

McMartin BA-1K gd cond, $3000. H Henderson, KDAP, POB 1129, Douglas AZ 85607. 602-364-3484.

Gates FMS-1B FM w/Collins 310Z-1 exciter, 1 kW; Gates FM-10G, 10 kW FM. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

CCA FM 10,000D 10 kW FM w/10DS exciter, will re-tune & help load, 3 phase, $12,500. R Henry, WPIO, 505 Josephine, Titusville FL 32796. 407-267-3000.

Gates 1 kW w/RCA BTE 15A exciter w/stereo gen & SCA gen, gd cond, BO. D Agnew, 5601 So 27th, Lincoln NE 68512. 402-421-2223.

CSI FMT-1 1 kW FM includes Bext 80W exciter, spare tube, tuned to 100.1 MHz, ready to ship, BO. D Fredeen, WBRR, POB 545, Bradford PA 16701. 814-368-4141.

Want to Buy

780KHz, original freq. L Amstutz, Lumiere Haiti, 4526 Arlington, Ft Wayne IN 46807. 219-429-8366.

Any Solid State, 1kW AM rebuildable. R Hobbs, WMLR, Rt 1 Box 402B, Hohenwald TN 38462. 615-796-5966.

1 kW LPTV xmtr or translator or amplifier wanted, any make, used/demo, any year. S Kafka, Ste 902, 941 O St, Lincoln NE 68508. 402-476-6115.

AEL AM5KD or AM10KD exciter-driver unit and/or oscillator PC card. R Jenkins, WAVL, POB 277, Apollo PA 15613. 412-478-4020.

Any 1.0 kW FM, exciter optional. RM Posey, 400 3rd Ave, Jasper AL 35501. 205-221-2222.

Harris 20 kW FM less than 10 yrs old in gd to excel cond. T Ferebee, KLLR, POB 70, Waler MN 56484. 218-547-1200.

FM 2.5 to 3.5 kW for new Class A FM in central Indiana, no junk please. J Bulmer, 216-964-9890 or 997-1025.

Any 20 or 25 kW FM xmtr, prefer recent model. H Cochran, KITX, Box 886, Hugo OK. 405-564-3043.

FM xmtr, 1-5 kW for NCE station, will pick-up with or without exciter OK. D Van Zandt, Cornerstone Radio, 2596 State Road 44, New Smyrna Beach FL 32069. 904-427-9000.

Gates BC-01-G 100 W AM from mid-80s; also 50 W Sparta AM xmtr. P Hunn, WZZZ, Lakeshore Rd, Fulton NY 13069. 315-593-1313.

AM xmtr 5 kW, late model for gospel station, will pay $10,000 to $15,000 plus tax write off on balance. J Cunningham, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

1 kW UHF transmitter, translator or amplifier, must adapt to output chnl 61, all ages & types considered. S Kafka, K61CU-TV, Ste 902, 941 O St, Lincoln NE 68508. 402-476-6115.

Transmitter, translator or repeater for FM; FM xmtr, 500 W & 5-6000 W, new or used, late model; Marti portable to feed regular Marti for remotes. L Maierhofer, WTGC, 101 Armory Blvd, Lewisburg PA 17837. 717-523-3271.

Any FM 1-3 kW, any cond; also 1 kW AM any cond. D Kohn, KESM, 200 Radio La, El Dorado Spgs MO 64744. 417-876-2741.

TUBES

Want to Sell

Tubes including 4CX250B, 4CX250R, 6146B, 3CX1500A7, 4CX3000A & more. We carry large inventory of all major brands such as EIMAC, Amperex, RCA, etc. Call Stew at 1-800-842-1489.

4CX500 rebuilt, used 2 mos., no longer needed, $500. J McDermott, KCVO, POB 800. Camdenton MO 65020. 314-346-2763.

UHF xmtr tube 6806, 4CX250B used tube, make offer. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

RCA 6161, 6181, used in RCA TTU-1B 1kW UHF-TV xmtrs, fair-excel cond, negotiable. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

3CX 3000 F1, used but good, $110. J Cunningham KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

UHF xmtr tube 6806, 4CX250B used tube, make offer. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

RCA 6806, one new, 5 used, 12 kW UHF TV tubes in RCA TTU12 xmtr, $3000/BO. C Fox, WTUV, Greenfield Rd, Rome NY 13440. 315-476-4963.

Tubes: (3) 4-400; (3) 4-250, some new, some used, $25 ea. S Engelke, WWDJ, POB 970, Hackensack NJ 07602. 201-343-5097.

Used 813's, $20; 872A's, $10; 8008's, $10; 5894 w/socket & tuning assy, $35; (4) 7289 tubes w/RF socket parts, $28/all. J Cunningham, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

GE 833A's (2), one new, $100, one used, $55. J Strong, WXFM, 120 Wildwood, Mt Zion IL 62549. 217-877-1130.

6B4's (15); 80's (2); 502A (5), never used, $75/all. A Wilkerson, WLIL, POB 340, Lenoir City TN 37771. 615-986-7561.

Want to Buy

5-500A (4), gd used tubes for spares. J Gerber, WCHT, 524 Ludington, Escaraba MI 49829. 906-789-0600.

TURNTABLES

Want to Sell

Gates 77 w/Microtrak tone arm, BO. D Tabor, WHCK, Box 158, Scottsville KY 42164. 502-237-3149.

Technics SP 10 MKII; Technics 10B3; DV 505, 4 yrs old, excel cond, BO. J Brown, Acme Recdg Std, 112 W Boston Post Rd, Mamaroneck NY 10543. 914-381-4141.

Kenwood semi-auto, gd cond, dust cover, very stable, $80. P Wolf, 813-574-5548.

QRK 3 speed, no tonearm (2), gd cond, $75 ea. B Reck, WPTL, POB 909, Canton NC 28716.704-648-3576.

Technics SP-15 (4), $350 ea; AT 12T tone arms (2), $75 ea or $800/all; Shure SME tonearms 3009 (2), $25 ea. R Delius, WFXC, 2515 Apex Hwy, Durham NC 27713. 919-596-2000.

RCA/BE BQ-50, BDR-1, BA-36A tables/arms on damped, castered RCA steel cabinets w/RCA stereo preamp/EQs. J Vengrouskie, Soundscenes, 11700 Old Columbia Pk Ste L-3, Silver Spring MD 20904. 301-622-9318.

Presto 1-D cutting heads 500 ohm, excel cond, long shank sapphire cutters, $50; sapphire cutting stylus dural shank long sapphire cutting needles new for LP groove & 45's, $5/BO. ER Arn, Film Assoc., 7240 Paragon Rd, Dayton OH 45459.

Technics SP-10 Mk II turntable, no base, no arm, $475; 16 chnl 2005 AD Inc road board w/spares, $1200. Pat Appleson Stds, 305-625-4435.

Empire (5); (1) Sparta, $200/alt or BO. R McDaniel, KJRG, Box 567, Newton KS 67114. 316-283-5150.

QRK (2) 3 speed, one a corner control design the other center control, no tonearms, $150/both. B Reck, WPTL, POB 909, Canton NC 28716. 704-648-3576.

Technics SH-15B3 base for SP15/25, new, $100. F Grundstein, WEGX, 3 Bala Plaza Ste 580E, Bala Cynwyd PA 19004. 215-667-3939.

Grampion feedback cutting system, mono 150 watt Gotham amp & pwr supply, head is gd cond, amps as is, has hum in amps, $400. HL Sewell, Oakridge Studio, 2001 Elton, Ft Worth TX 76117. 817-838-8001.

Technics SP-10 Mk II turntable systems (2) w/glass base, PS, Micro-Trak arms & 681-SE's, $3K firm. Pat Appleson Stds, 305-625-4435.

Russco 505, vgc, $300 pls frt. J Monroe, WRYD, 900 River, Palatka FL 32077. 904-325-4556.

Russco Studio-Pro vgc, (2), $100 ea. M Brown, 3740 SW Cornus, Portland OR 97219. 503-245-4889.

Russco Studio B in gd cond, $80; QRK SF4H13A w/tonearm, gd cond, $125. J McMahan, WAMD, POB 970, Aberdeen MD 21001. 301-272-4400.

Technics SP-15 (2) complete w/preamps, excel cond, $1000. D Agnew, 5601 So 27th, Lincoln NE 68512. 402-421-2223.

Technics SL-1200 MKII (2) in new cond w/Stanton 600A carts, also (2) in vgc w/Stanton 681A carts w/manuals, $325 ea. D Davis, KMBA, 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

Want to Buy

Turntable, 16", stylus, pre-amp in operating cond. Joel Blake, 201-423-5395.

TV FILM EQUIP

Want to Sell

Quad-eight film mixer, 6x1, EQ, comprssr, filters, no pwr supply, $1200; Westrex 3x1 mic mixer for prod, $1100. J Gaffney, Ross-Gaffney, 21W46th, NYNY 10036. 212-719-2744.

Moviola UL-20-535 one film head, one sound head 16mm film editor, complete, $1500. P Russell, WBOR, Sills Hall, Brunswick ME 04011. 207-725-3066.

B&H 540 Series 16mm sound projector, vgc, pix & sound fine, 2" F-1.6 lens, 1000 W lamp, $200/BO pls UPS shpg. B Leslie, Pro Recdg Srvs, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435.

RCA 35mm film recorder excel cond, $3500; Moviola 35mm upright (1) Moviola/(1) Pix sound head, $5000. J Faggney, Ross-Gaffney, 21W46th, NYNY 10036. 212-719-2744.

Proj 16mm sound DeVry Jan top of the line in excel cond, 35mm 3 gang synsiciser, 35mm splicer, 16mm sng cam Auricon Pro 1200 compl opt mag in new cond w/zoom lens, BO or cons home ½" recorder, ¾" recorder port w/news camera. Leo Meister. 201-667-2323.

Want to Buy

Kodak VP-1 super 8 film-video player. D Dewese, WJYM, 8761 Fremont Pike, Perrysburg OH 43551. 419-874-7956.

VIDEO PROD EQUIP

Want to Sell

Hotronic AD51-TFS frame sync/TBC, $4000; Prime Image TBC+, $2750; Lenco TBC-450, $2500. H.M. Dyer Electronics, 2982 Wixom Rd, Milford MI 48042. 313-685-2560.

Trompeter LPL-75, video patch plugs, 1" pin spacing, new (24), $3 ea; Vital VI-500 video stab amp w/cable EQ, incl manual, $100; Cohu 2614-400 video waveform multiplexers (2), $50 ea. B Humpherys, Utah State Univ, Logan UT 89322. 801-750-3133.

Shintron 505 video typewriter character gen, gd cond, $350. G Sive, POB 239, Bonsall CA 92003. 619-749-7662.

JVC KY-210B (3); JVC KY-210; JVC KY-2000 w/std pkg; (2) JVC RS-500U CCU's w/cables; JVC KM-2000U switcher; (3) Sony 6800 port recorders; (2) Sony + 5850/5800/RM440 edit syss, + more, call for details. Richard, 206-754-7081.

Ampex VPR-80/TBC 80 boards & access & heads, all types, call; Sony 1" alignment tapes & Tentelometers. $100 ea. D Brassell, Video Services, 424 Commerce Lane #5, Berlin NJ 08009. 609-768-2439.

CVS 506 timing corrector, 1-line heterodyne processor perf for edit to rem skew error, excel cond w/updates & manual, $1200; IVC/Quantel TBC-2000 direct-only, full bandwidth 4-line TBC (2) w/svc manual, $1600. TFG, Box 9, Wethersfield CT 06109. 203-527-2972.

Micro Script II video titler/character gen/bar gen, vgc, $150. D Bailey, 3422 Beech St. Rowlett TX 75088. 214-475-9796.

Jatex VSEC-42T edit/ctrller configured for Sony ¾" top loading VTR, cables & book, BO. A Zand, Villanova Univ, Villanova PA 19085. 215-645-4285.

Video equipment rack. M Bejarano, Falcon Comm., 6923 Forbes, Seabrook MD 20706. 301-794-5754.

Cezar The Controller, brand new edit controllers w/some cables, BO; Cezar EA-3X, new edit controllers w/some cables, BO. B Hoag, 2814 Hearthside Ct, Marietta GA 30067. 404-973-8918.

Mindset II char gen & animation system, 2 disk drives, graphics tablet, titler, lumina, PC paint, animator, Glyph software, $2000; Chyron IIIB char gen, BO; 8000 CBS Labs 2H enhancer, GVG 731 color video insert keyer, Conrac CLD 14 rack mount B&W monitors. H Larson, Matrix Mobile TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

CBS Labs 8400 RGB, composite video enhancer, inter problem w/manual, $100. J Cochran, Gateway Video, 225 Ross, Pittsburgh PA 15219. 412-471-3333.

Sony PVM-5300 (3) 5" color monitors in 19" rack mount, needs new CRTs, units new but dropped, call for info, $175. P Russell, Bowdoin College, Sills Halls, Brunswick ME 04011. 207-725-3066.

Vital VI-500 color stab amp w/cable EQ. w/manual, $100; Cohu 2614-400 video waveform multiplexers (2), $50 ea; RCA MI-4069B1 RCP for RCA TR-50 VTR. B Humpherys, KUSU, Utah State Univ, Logan UT 84322. 801-750-3133.

Conrac 9", 14" B&W monitor, ½ & full rack monitors, sev avail, BO. R Rickly, WUAB, 8443 Day Dr, Parma OH 44129. 216-845-6043.

Canon UA Series assorted male, female, cable & panel mic connectors; Trompeter LPL-75 video patch plugs, 1" pin spacing (24), $3 ea. B Humpherys, KUSU, Utah State Univ, Logan UT 84322. 801-750-3133.

Quick-Set QHT-1 Hercules, tripod w/QHD-1 dolly, friction head, vgc, $350; Panasonic NV-A950 editing controller, excel cond, $100. R Sumner, CAVU Comm, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

Want to Buy

JVC VHS BR8600U edit deck, working or not, must be intact. G Sive, POB 239, Bonsall CA 92003. 619-749-7662.

Sony PSA 101 manual. F Haynes, 1718 N 79 Terr, Kansas City KS 66112. 816-654-2407.

VIDEO TAPE RECORDERS

Want to Sell

Sony VO-3800 field recorder w/AC-3000 power adapter, $600. L Albert, WKMS, POB 2266, Murray KY 42071. 502-762-4664.

NEC 3/4" video cassette player, like new, $175. C Haynes, POB 31235, Jackson MS 39206. 601-948-1515.

JVC KY-210B (3); JVC KY-210; JVC KY-2000 with standard package; (2) JVC RS-500U CCU's with cables; JVC KM-2000U switcher; (3) Sony 6800 portable recorders; (2) Sony 5850/5800/RM440 editing systems, plus more, call for details. Richard, 206-754-7081.

Sony VP-2000 3/4" deck, needs minor repairs, $95PP; Panasonic NV2110M 3/4" needs minor repairs, $95PP. L Graziplene, Macrotel, 3532 N Main, N Java NY 14113. 716-535-7251.

Panasonic NV9500, NV9200, NV950 3/4" edit system, gd cond, $2000 set; (2) Panasonic NV9500, NV9200 3/4" VTRs, heads OK, need tune up, BO. H Larson, Matrix Mobile TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

Panasonic NV-8030 time lapse logging VCR, w/tapes (2), BO; Panasonic NV-9100A U-matic 3/4" machine, good condition, BO. R Rickly, WUAB, 8443 Day Dr, Parma OH 44129. 216-845-6043.

Sony VO-6800 portable 3/4" U-matic VTR, AC-PS, 8-NP1's w/charger, kangaroo case/strap incl., $2950.

Panasonic AG-6810S VHS HiFi & normal audio professional duplicator w/Dolby, 50 hrs on machine, like new, $500. P Russell, Bowdoin College, Sills Halls, Brunswick ME 04011.

Want to Buy

Sony RM-430 edit controller in used/repairable condition, consider complete editing outfit if reasonable. C Lund, 203-756-7761 after 4 PM.

Sony SLO-340 or SLO-320 Beta portable, operating or not, repairable, shoulder strap for BVU-100, carry bag. C Lund. 203-756-7761 aft 4PM.

Ampex/Sony 1" type C with TBC, must be in good working condition. G Sive, POB 239, Bonsall CA 92003. 619-749-7662.

Panasonic AG2200 only. Grace Dalzell, Premier Film Video & Recording, 3033 Locust, St Louis MO 63103. 314-531-3555.

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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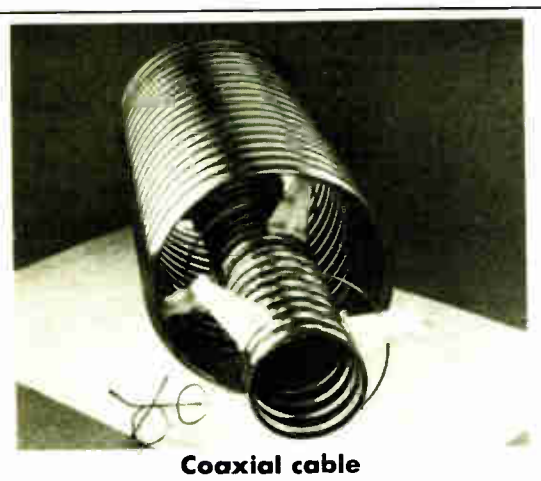
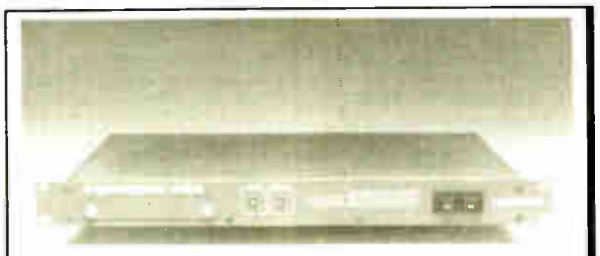


Coaxial cable

Cablewave Systems has expanded its Flexwell line of RF transmission lines to include 5, 6 1/8, 8, 9 and 12 inch diameter 50 ohm coaxial cables.

Flexwell high power coaxial cables can handle RF power to 9 megawatts.

For information, contact **Al Criscuolo at Cablewave Systems: 203-239-3311,** or circle **Reader Service 72.**



Telephone hybrid

Gentner Electonics has introduced a new digitally-processed telephone hybrid, the Digital Hybrid ANA. It uses an advanced nulling algorithm to provide hybrid null regardless of telephone line conditions.

Applications for the Digital Hybrid ANA include broadcast talk shows, interviews, teleconferencing and IFB.

The new Gentner product is available for immediate delivery at a suggested retail price of $2395.

For information, contact **Gary Crowder at Gentner Electronics: 801-975-7200,** or circle **Reader Service 77.**

Precision digital meter

Symetrix has introduced the new SX205 Precision Digital Meter, a microprocessor controlled two-channel level display that measures both voltage and power. Included is a 1000Hz sine wave calibration oscillator.

Each channel may be set to display information as average level or peak level. The SX205 provides ±½ dB accuracy over the bandwidth 20 Hz to 20 kHz.

It also accepts balanced or unbalanced voltage inputs via ¼" TRS connectors and power inputs via number 6 barrier strip terminals.

For information, contact **Doug Schauer at Symetrix: 206-282-2555,** or circle **Reader Service 79.**

Professional CD player

New to the Barco-EMT product line is the EMT 981 Professional CD player.

The unit features EDIT mode for set-up and ONLINE mode for "on-air" applications. It also includes automatic switching between elapsed time in EDIT and remaining time in the ON-LINE mode.

Audio outputs are balanced line level with 16 bit, 4 times oversampling. The TAKE MEMORY function implements storage of up to four takes and the disc drive functions provide VARISPEED with a ±10% range.

For information, contact**Bob Allen at Barco-EMT: 617-969-4900,** or circle **Reader Service 71.**

Test disc

The new Prosonus Studio Reference Compact Disc contains white noise, pink noise and sine wave bursts in third octaves. It also has sine-waves in 17 bands from 15.525 Hz to 16.0 kHz, impulse clicks and musical pitch references.

For information, contact **your regional Allied representative.**

Pro recorder

The newest addition to Studer Revox's A807 line of professional recorders intended for use in recording studio and broadcast applications is a ½", 4-channel 30 ips machine.

It is also available in the high speed version.

For information, contact **Charles Conte at Studer Revox: 615-254-5651,** or circle **Reader Service 76.**

Subscription/Reader Service Form

Radio World

June 14, 1989 Issue Use until September 14, 1989

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E. Network/group owner
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H. Consultant/ind engineer
I. Mfg, distributor or dealer
J. Other _____

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ADVERTISER INDEX

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West Coast, Pat Macsata: **415-786-2198** Fax: **415-786-2754**

LPB introduces... Citation II.

The brand new console with a ten year track record.

Start with one of the longest-running success stories in the radio console business: the LPB Citation I. Then add the combined wisdom of ten years of user feedback and make that "wish list" of features standard. Now you've got the idea behind LPB's new low profile Citation II console.

Not just a change for change's sake, Citation II represents the "real world" of radio today. For today's fast-paced air shifts, we placed all essential controls — and *only* the essential controls — directly in front of the operator. Lesser-used controls are logically grouped together on the right.

For flexibility, the ten-mixer Citation II features three inputs per mixer with lock-out switching, two stereo output busses, mix-minus capability, mono mixdown with independent VU, two user configurable four position auxiliary selectors and programmable monitor and cue muting for the first five mixers.

For convenience, a digital clock and a separate event/cumulative timer are standard, and every input has a remote start button which follows the input selected.

For durability, Citation II's low profile front panel is protected by a tough Lexan® overlay. And the entire console is built for long life and easy maintenance, in the LPB tradition. Plus, it's value priced in the LPB tradition as well.

Best of all, Citation II sounds great, just like our legendary Citation I.

Before you buy *any* studio console, talk to a LPB Citation user (there are hundreds of them, so finding one won't be hard.) Then call your LPB distributor and check out our Citation II, the only brand new console backed by ten years of proven reliability and performance.

LPB®

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Circle 59 On Reader Service Card

We Re-invented the Wheel

AND IT'S SQUARE!

Naturally, with all of Wheatstone's experience at building and interfacing consoles, it was inevitable that we would take on the design and manufacture of suitable furniture for our audio installations. First we listened to engineers and their requests, then we went to work. The result is a significant improvement over previous designs.

Consider the advantages of double-sided equipment cabinets with fully interchangeable door panels, with each side able to accommodate 19 inches of rackmount equipment. Consider the convenience of hinged twin drop-down punchblock panels for easy installation and maintenance. Consider the advantage of hard chrome plated steel mounting rails that eliminate the stripping problems associated with lesser aluminum designs. Simply consider the strength we've achieved with full inch and a half thick side panels and hybrid inch and a half thick countertops.

We have re-invented cabinet technology. We've wedded the latest precision NC metal componentry to hybrid plywood high density, high resin pressure-laminated substrates. Our construction and bonding techniques have been optimized to eliminate stress related laminate problems. We've handled wire management: there are generous pathways between each enclosure, as well as an integral channel punchblock housing under the console counter to keep everything neat, concealed and away from unauthorized hands. And, since cabinet faces can accept either equipment or door panels, systems can easily be configured to fit virtually any room. Doors can even be placed on cabinets intended for future electronics installation.

This cabinetry is very clever, unbelievably strong, and (of course) square--*precisely*. It has that Wheatstone major market look. So contact Wheatstone for furniture, consoles, or prewires.

Wheatstone® Corporation

6720 V.I.P. Parkway, Syracuse, NY 13211

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Circle 97 On Reader Service Card