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NAB
Survival Guide
Preview Section - Page N11

Radio World®

Vol 14, No 5

Radio's Best Read Newspaper

March 14, 1990

NAB Eyes Show Changes

by Alan Carter

Washington DC The scramble for rooms for the NAB convention has left some would-be attendees dissatisfied and has convinced NAB to seek changes in future conventions.

NAB can't escape the haunting experience of the fiasco at the 1989 convention when there was a last-minute scramble for hotel rooms in Las Vegas.

While there are enough rooms for the 1990 show in Atlanta, companies plan-

ning to attend the show say they are too spread out over the metro area.

Those who requested large blocks of rooms, 50 or more, may be split among hotels that are not adjacent to each other. In fact, it could take up to an hour to reach the downtown convention site from the suburbs during rush hour.

In planning for the 1991 convention that NAB wants to take back to Las Vegas, the association has not signed a final contract because the city apparently isn't being too cooperative on housing

assignments.

The opening of the Mirage and Ex-caliber hotels will put some 8000 to 9000 new hotel rooms on the market, but that does not mean the facilities are willing to guarantee them to convention travelers. Like other Vegas casino-hotels, the two are after what they see as the more lucrative prospect of hosting gambling tourists.

These housing issues were among the

major topics the NAB exhibitors advisory committee discussed at a meeting 15 February in Washington.

Committee Chairman John Phelan, director of technical markets for Shure Brothers, said the Atlanta show has come together fairly smoothly, except for the continuing problems with housing.

"It's certainly not as logistically easy as Las Vegas," he said. "I don't think there

(continued on page 29)

DAT Bill Before House

by John Gatski

Washington DC Legislators introduced unprecedented electronics legislation into the House of Representatives last month by submitting a bill requiring all US consumer DAT recorders to use the Serial Management Copy System (SCMS) anti-copying technology.

Sponsored by Reps. Al Swift (D-WA), Henry Waxman (D-CA), Don Ritter (R-PA) and about 20 other co-sponsors, the DAT legislation (HR-4096) will mandate the SCMS technology, which would finally allow digital recording of CDs onto DAT, but imposes a limit on the number of times the tape copy can be copied.

The Electronic Industries Association

(EIA) was instrumental in helping legislators draft the DAT bill and will push Congress to pass it, according to EIA Consumer Electronics Group VP Tom Friel.

Friel declined, however, to predict if the SCMS law will pass the Congress this session, but he is certain it will get a thorough debate.

"I think there will be an awful lot of questions during the committee hearings. This is an unprecedented piece of legislation" Friel said.

Legislate technology?

The bill is considered an unprecedented action because Congress will be legislating a technology, Friel

(continued on page 8)



All eyes are on Atlanta as NAB moves its convention here for the first time. See special NAB preview section.

VOA Tech Survives Belize Plane Crash

by Frank Beacham

Punta Gorda BELIZE Gary R. Shirk had a nagging premonition it was not a good day to fly. It only got worse when he boarded the tiny single engine Cessna 206 airplane and noticed some disturbing things in the cockpit.

Though not an aviator himself, Shirk is a technician with the Voice of America (VOA). "I see technical things," he says of himself. So it was troubling to him that he boarded a commercial aircraft with the engine already running.

And it was even more troubling that a red alarm light, indicating low voltage, was lit on the plane's display panel. And why did the pilot not check the magnetos or speak on his aircraft radio before taking off?

But Shirk remained mum and within minutes, the plane, with one other passenger, was on the runway, about to take off. "As we taxied, I almost tapped the pilot on the shoulder and asked to be let off, but I didn't," he remembers.

Shirk, 41, was on the return leg of a

routine flight he makes twice a week for his supervisory broadcast engineering job with the foreign service of VOA.

The Belize VOA office and studio is in Belize City and the transmitter site is 120 miles away in Punta Gorda.

On the afternoon of 14 November 1989, Gary Shirk was en route to his home in Belize City.

Trouble after takeoff

"About 12 minutes into the flight the whole plane started to shake," Shirk recalls. "We were out over the water at the time, and the pilot knew we were in trouble. He banked to the left and started to head toward land. Oil sprayed over the windshield and limited visibility."

"The plane started to drop rapidly. I told the pilot to call 'Mayday' on the radio and give our location. He said the radio would not work. At about 200 feet or less above ground, the pilot told me to open the side door to my right, which I did.

(continued on page 7)

Q.

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Spectrum Squabble Hits the Hill

House Committee Underscores Need To Reassign Government Allocations

by Benn Kobb

Washington DC A congressional hearing on a bill that would reallocate government spectrum underscored the politicized nature of spectrum allocations and the difficulties legislators face in deciding between spectrum auctions and alternative license assignment methods.

The hearing 8 February was on the "Emerging Telecommunications Technologies Act," HR 2965. The bill would direct the Commerce Department to make available to the FCC at least 200 MHz of spectrum from its exclusive government allocations for reassignment to the FCC for commercial purposes.

The House Telecommunica-

tions Subcommittee hearing included witnesses from industry, academia, digital radio manufacturers, public-safety radio users and one broadcasting industry representative—Margita White of the Association for Maximum Service Telecasters (MST).

Co-sponsor and subcommittee chair Rep. Edward Markey (D-MA) said that the allocation, management and use of the radio spectrum is an area where re-examination is "clearly overdue."

He noted that overseas competitors such as Britain and Japan have allocated spectrum to

spectrum needs of worthwhile users because of the insufficient spectrum allocated to commercial use."

Industry representatives generally supported the aims of the legislation.

Echoing the positions of other

... the allocation, management and use of the radio spectrum is an area where re-examination is "clearly overdue."

new communications technologies, while the FCC is "bogged down assessing competing

witnesses, Motorola Lobbyist Leonard Kolsky argued that without more spectrum, US leadership in mobile radio will suffer and employment will decrease as US investment goes to Europe and Japan, "because that is where the spectrum is."

He noted that spectrum shortages are forcing Motorola to spend resources on trying to extract more capacity out of existing spectrum rather than on the preferred expenditures of finding new applications for the spectrum.

The legislation would bar the FCC from using auctions to assign licenses in any of the reallocated spectrum. The Bush Administration's FY 1991 budget proposes to raise billions through spectrum auctions.

The administration did not provide enough detail about how the revenue raising would work, according to subcommittee member Rep. Don Ritter (R-PA), who asked the White House to deliver more information within 30 days. Ritter asked specifically for data on which communications services and frequencies would be affected.

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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.

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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.



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ITC Looks to Future Expansion

by Charles Taylor

Bloomington IL A month after completing the purchase of International Tapetronics Corp. (ITC) from 3M, new owner Donald Carle announced that the company will introduce a cart machine at the NAB show this month.

ITC is promoting the new Series 1, in development by 3M for the past year, as a high performance unit offering LED

hardly represents all that ITC has in store for the future.

"We're planning to grow and diversify," Carle said. "There's no question in my mind that our thrust is heading toward merging digital and cart."

Fifty technology patents

Carle certainly has the capability to do so. In the December purchase agreement, he acquired the company's plant

and laboratory here, 55 employees and the right to manufacture cart machines and carts under the ITC name (3M will furnish the tape), as well as 50 patents that will serve to link 3M's unfulfilled technology with Carle's already established telecommunications know-how.

"We did inherit a fair chunk of patents," Carle said. "We have patents on digital audio and audio tech-

niques that we could pull out and use very quickly. There's a lot of technology there that could be captured."

For one, the company could further explore 3M's failed HCD-A digital cart machine—circa 1986—which Carle said

was an admirable product, although apparently too expensive for the market to support.

On to public safety

ITC also likely will diversify its broadcasting base. Carle hesitated to discuss just where, beyond a mention of the public safety industry.

"We're determined to continue the base that's been set by ITC in the past to grow and diversify," he said. "But the broadcasting industry will remain our focal point."

To insure growth in that area, ITC plans a big push on the new Series 1, the first in what Carle called a new family of products.

Features on the record/playback and companion playback-only units include mono/stereo capability, high-speed cue, DC servo motor, three standard cue tones, 1 kHz add and defeat, LED bar graph metering, and a new cart hold-down system that uses plastic parts to lock carts in smoothly.

The one-third rack width unit can be rack or table mounted, can be disassembled in five minutes and is extremely easy to service, according to 3M Product Supervisor Bill Parfitt, who is working with ITC through the transition period.

"We believe there's a resurgence in analog products," he added. "The digital products are taking a while in coming and people are comfortable with analog. We see it as a long-range viable product."

Marketing focus in Europe

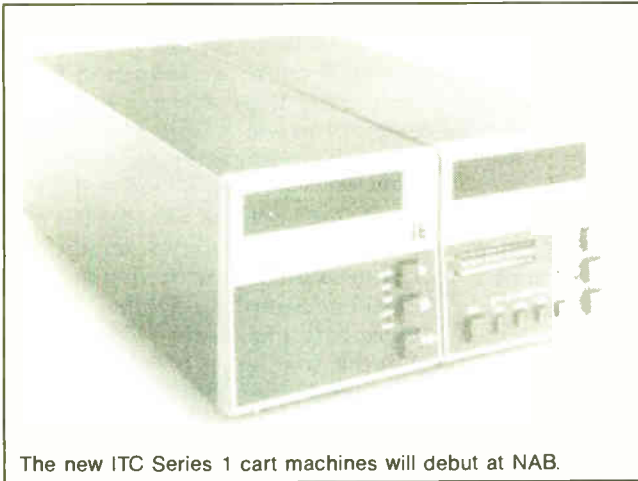
Part of the company's marketing efforts for the Series 1 will be focused in Europe. Carle spent the first six weeks as owner of ITC strengthening the company's ties there, shaking hands with broadcast customers in nine European countries.

"It's very key to me that we continue to build up our outside distribution," he said. "I want to attune to the needs of the market, not some engineer's dream of what it should be. To insure that, I want to get around and see as many customers as possible."

That spells progress for Carle, who noted that in the past, ITC was often held back from reaching its potential.

"This is a positive step for ITC, to get away from the bureaucracy of 3M. There was a hold-back there," he said. "The reputation of ITC is important to me, and it's important that we continue to be a leader in this field."

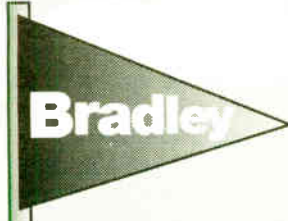
For information on ITC, call 612-736-5019.



The new ITC Series 1 cart machines will debut at NAB.

meters and easy maintenance and care in a new cast aluminum nickel-plated deck.


While Carle hinted that the new cart machine is the first of several debuts on the horizon, it is clear that the Series 1




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NAB: Anything But "Dead"?

by Judith Gross

Falls Church VA Atlanta. Peachtree. Rhett and Scarlett. Southern hospitality. The Grateful Dead. **The Dead?**

That's right, across the street from the Georgia World Congress Center, where NAB will host its annual spring jamboree, there will be a Grateful Dead concert for three days during the show.

So what? Well, it wouldn't be worth mentioning, even, except for the "deadheads"—you know, the folks who follow their idols from concert to concert, camping out and creating a mini-Woodstock in their tracks.

Let's see, get my painted VW van and my love beads, we're going to a Dead concert. Don't sneer, now, the Dead have endured longer than some of the formats radio stations keep coming up with.

flower-child-like or psychedelic, take a Deadhead to lunch.

(OK, it isn't exactly slot machines or the roulette wheel, but you gotta find excitement wherever you can.)

And next year, back in Vegas, the NAB show is going all-weekdays. The casinos would rather have tourists in the City of Sin on weekends, you know, to lose their money faster than broadcasters apparently do.

So NAB figures it'll be easier booking rooms for weekdays and all of you who plan on going don't have to get conned out of a spring weekend anymore. And that's a relief, 'cause these shows tend to interfere with my weekend nap schedule.

☆☆☆

All right, you're going to the show and you don't know the first thing about Atlanta. Not to panic. Check out the "Sur-

show (and definitely if you are) you probably want to check out the latest gizmos the industry is unveiling.



Since the show is so early this year, an awful lot of companies are being very, very secretive. So we just have to wait and see.

And what's this mystery over at Radio Systems? It was a foggy, dark February afternoon and there, fresh out of the FAX machine was a new product press release announcing Radio Systems' introduction of—get this—a cartridge machine!

Now I'm not normally suspicious, but this so-called "release" came from an office supply place in Fort Collins, CO and Radio Systems is based in Bridgeport over there in Joisey. First I called Radio Systems and they were as baffled as I was.

Then I called the office supply place and the plot thickened.

Seems the FAX had been sent by a mysterious blonde woman in a big hurry to get to Boulder, CO. No name taken. Who was the anonymous blonde? (Hmmm, isn't Gary Hart from Colorado?) Why did she send a bogus FAX? And is Radio Systems going to introduce a cartridge machine?

We'll visit their booth and fill you in on the details.

☆☆☆

One company with a new cart machine sans the intrigue is ITC. First a buyout by Don Carle, now a new product. I call that quick work.

And Fidelipac has a new cartridge: the Audiomax.

You say you wanna console? No shortage of those out there. Wheatstone, however, is aiming at the lower priced market with a new one, the Audioarts (I always said it was an art, not a science).

There's digital wizardry galore. For workstations see: AKG, Symetrix, and Studer-Editech to name just a few. Don't be surprised if digital storage systems are coming down in price as well.

And oh yes, how about a recordable CD? Gotham Audio has one, a system designed for stations to record spots, jingles, etc. Although initially it may be more at home in a production house which offers these services for broadcasters, I can see a large group owner buying one to share among its stations.

Still hot are STLs. Check out TFT's new one (let's not wait until the last minute to plan for that type notification you'll need three years from now, OK?) and still noteworthy is QEI's CATLink.

Processing, processing—what can I say about this soaring part of the business? You want to see the digital creation which is part of the legacy left by the former Texar? Go to Gentner's booth and see the LazerPrizm digital processor. Gentner has quite a few more goodies in store, so plan on taking a little time to see it all.

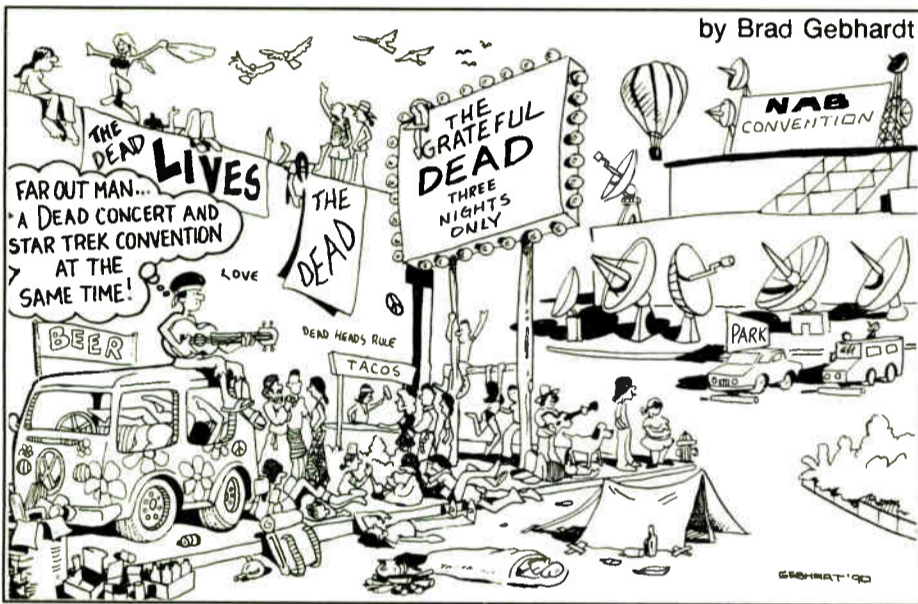
CRL has a new processor as well, so check that out.

In transmitters, there are several solid state models for FM out there. See Continental and TTC to name a few. But I can't resist telling ya about the new line from Harris.

First they shake up the AM transmitter scene by being the first to go with digital modulation, oh say two shows back. Now they have a new transmitter line, and it's the name that gives it its distinction. What are they calling it? Why, "Gates," what else?

Parker would be proud.

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



Did you know that in the Dead's concert contract it says space must be provided for their followers to "camp out?" I don't think NAB knew this when they booked Atlanta, either.

So, like, groovy man, far out and all that Sixties stuff. If the Dead is your bag, you might get a chance to groove to the music. And if you're feeling

vival Guide" in our special NAB preview section in this issue and find out where to eat, what's hot in Atlanta radio and some interesting tidbits about the city.

Also, a map of MARTA, since there isn't going to be room for all of us to park downtown.

But even if you aren't going to the

Two Transmitter Sites?

Lee Waller says "no problem" with Burk

WBPM delivers CHR programming 24 hours a day to Kingston, New York and the greater Hudson valley. Chief Engineer Lee Waller knows what it takes to keep the signal on the air all the time.

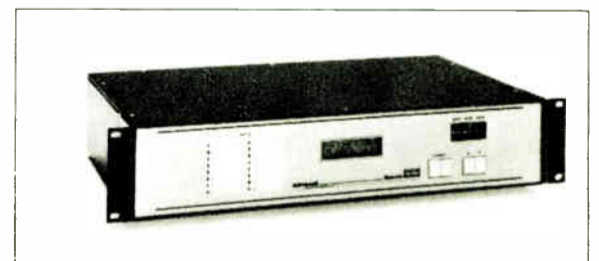
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"My favorite feature," says Lee, "is the ability to operate any function at any site from anywhere in the system. I do my routine maintenance at the auxiliary site, then drive to the main site, switching between sites without having to bother the jock."

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More harm than good

Dear RW:

I would like to address the comments of Mr. Francis X. Santore Jr., in the 13 December, 1989 issue of *RW*.

Group W would support the nighttime operation of WTNN, Farragut, TN, if the station could contain its signal within the 5 to 10 mile radius mentioned in his letter. No technology known today would allow WTNN to operate at night with any reasonable coverage without impacting WMAQ's operation in the Chicago metropolitan area.

For argument's sake, let's say that the FCC would allow WTNN to operate at night, with its 500 W daytime facility and ignore WMAQ's loss of skywave service. WTNN's nighttime coverage would be worse than its daytime signal, due to existing nighttime interference from WMAQ (670 kHz), and its two adjacent channels (660 and 680 kHz). If we employ the FCC's 10% skywave curves, we see that WTNN's signal would be degraded to a 26 dB signal to noise ratio (SNR) at a distance of approximately 4 miles from the station's transmitter (its 17.85 mV/m contour).

It is felt that the 50% skywave curve is more realistic in representing the interference that WTNN would experience. If the 50% skywave curve is employed, WTNN would be degraded to a 26 dB SNR at a distance of 7.5 miles, or its 7.1 mV/m contour. No one is going to listen to a signal with 26 dB SNR,

therefore the useable service area of this station would be less than the distances shown in these examples.

We can see that it would be necessary to operate WTNN with at least 500 W at night to meet Mr. Santore's coverage goals. Operating at 500 watts, WTNN would obliterate all of WMAQ's skywave coverage and present WMAQ with significant interference within its groundwave service area. The WTNN signal that provides minimal coverage in Farragut, TN would cause interference to WMAQ's signal within 50 miles of downtown Chicago.

In addition to the interference that WMAQ would experience, stations located on adjacent channels (660 kHz and 680 kHz) would also experience increased interference from WTNN's nighttime operation.

The above-quoted interference is based on the FCC's interference definition of 26 dB SNR, hardly what could be considered competitive in today's audio environment. Today's listeners receive more than 60 dB SNR from their favorite FM station and greater than 90 dB SNR from CDs.

The 26 dB SNR used by the FCC is based on audience testing done by the Commission in the 1940s. The NAB hired B. Angell and Associates to re-test listeners' expectations and determine the levels of interference that today's audiences would accept. These tests determined that in today's audio environment, the audience would consider a signal "listenable" if 40 dB SNR could be achieved.

If we were to re-examine the interference levels that WMAQ would experience from WTNN's nighttime operation based on a 40 dB SNR, people living outside of WMAQ's 17.5 mV/m contour (approximately 37.5 miles) would experience interference. Even if we use the FCC's outdated 26 dB SNR, listeners in the bedroom communities surrounding Chicago that presently receive news, weather, traffic and sports relative to their daily lives and commuting patterns would be denied these services.

Today's listeners are less tolerant of interference than listeners have been in the past. If WTNN were allowed nighttime operation, WMAQ would be left as a non-competitive entity in the Chicago market.

The effects of nighttime interference are often underestimated by both those inside and outside the engineering community. When the engineers at Group W are discussing the effects of interference, the phrase "strong enough to interfere but too weak to be heard" is often used. Many regard AM's ability to travel great distances as AM's greatest strength; it is also its greatest weakness.

Policy makers sometimes fail to weigh lost service versus service gained. In this case, WMAQ would lose approximately 121,245 square miles of groundwave service area versus a gain of 176.7 square miles of service for WTNN. This isn't even taking into account the additional hundreds of thousands of square miles in lost skywave service area.

The NAB spring convention, with its increasing emphasis on technology, offers an excellent opportunity to take stock of the state of the radio industry from a technical viewpoint.

As attendees and exhibitors flock to Atlanta it's a chance to scrutinize developing trends and examine how far the industry has come.

This year two directions in equipment have clearly emerged. On the one hand are the super advanced, high-tech "blue sky" offerings of new technologies such as RDS, DAB and other digital modes of transmission.

Equally as important are the industry's more "mature" technologies—carts and cart machines, for example—where product offerings are as abundant as ever.

This year as well, the trend toward "hybrid" systems, with digital and analog equipment coexisting in a single station and serving a variety of individual station's needs, is finally coming of age.

A Chance For Great And Small

In addition to the variety of products on the showcase floor, the diversity of companies successfully competing in radio's marketplace is impressive.

While other technical industries have seen the dominance of large—and in many cases off-shore—conglomerates, the radio industry is still small enough to support the modest innovation closer to home

and to continue to generate enthusiasm for the simple "good idea."

A station engineer with a vision of a new product can still bring a concept to fruition and enjoy at least modest success, existing alongside giant companies with their larger R&D budgets.

In this way, the true ideal of the open marketplace, promoting the greatest diversity and free competition to benefit the end user, is alive and well in radio.

And carrying on previous ideals of American enterprise, the radio industry is still one arena where the little guy is given a chance to succeed.

The convention time is an exciting one for the technology of radio, as the industry is reminded to enjoy its current contributions and savor its future potential.

—RW

If we want to help stations like WTNN, we should support the NAB's proposal to allow "homesteading" of the expanded band (1605-1705 kHz) by existing daytimers. This would allow daytimers full-time operation on their new frequencies, while allowing them continued daytime operation on their existing frequencies until a sufficient number of receivers are available for the expanded band.

The interference levels that presently exist on the AM band limit its ability to deliver a quality product to our listeners. If we believe that AM needs to be able to compete with FM on a more even footing, then we must look to ways to reduce interference, not increase it.

E. Glynn Walden, Eng. Mgr.
Group W
Philadelphia, PA

Rethinking EBS

Dear RW:

I read your comments about EBS in the 24 January *RW*, especially your call for newer technologies applied to emergency public information. Funny you should mention that...

An idea we've been kicking around for the last few months has moved to the front burner since the October quake. It's a digital radio system to deliver "hard copy" of messages from government officials to broadcast outlets. We can build it for peanuts (relatively speaking) using "packet radio" equipment developed by the hams and existing government and/or broadcast auxiliary radio systems and controlling it with our statewide emergency computer network.

This would let authorized federal, state and local emergency officials send emergency releases instantly to broadcasters and other news outlets. At the stations these messages could be printed, ripped and read—or they could be fed directly

into newsroom computers (or even TV graphics systems).

Not only would this be more convenient for originating officials and broadcasters alike, but it would be useful for a wider range of emergencies than EBS. (There's a natural reluctance to use EBS for "minor" or localized emergencies—it seems so drastic. Then, when the big one comes, nobody is familiar enough with EBS to use it right.)

We've taken to calling this system "Digital EBS," but that's really a misnomer. This would be a supplement to the audio feeds provided by the Emergency Broadcast System.

We've also done some work on updating the technology of the audio EBS. The state of California has a microwave network with two-way radio outlets in all regions. Using DTMF bursts we can now activate special receivers at broadcast stations, from our state headquarters or from any regional office. Now we're making the same system available to local authorities as a "backup" to the FCC-mandated relay system.

But I think the biggest problem with EBS isn't technological, it's conceptual. Our expectations about the whole system are vague. Is EBS a warning system or is government expected to generate extended public-information broadcasts from some official studio somewhere? The wording of the FCC's mandated weekly test-message blurs the line between the warning and public information functions. I think this fuzziness about the EBS mission is at the root of the various technical, procedural and public-relations problems with EBS.

(continued on page 24)

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Plane Crash Spares VOA Tech

(continued from page 1)

"Then I'm not sure what happened. I wasn't sure whether I was dead or alive."

Racing at a speed of 101 miles per hour, the plane hit an embankment cushioned by 12-foot high grass in an isolated, swampy marsh 24 miles north of Punta Gorda. The water under the grass was nearly six feet deep.

"The first thing that came back was my vision," says Shirk. "I saw two guys slumped over their seats. I figured they were dead."

in his baggage.

He had charged the battery on the ICOM 02AT the night before. "When I opened my bag, I found the antenna had broken. It was too damaged for repair," Shirk says.

Jerry-rigged setup

"An hour went by and I began to think clearer. I remembered the plane had an antenna on the tail section. I pulled down the head liner trying to find the



Gary Shirk



"Next thing that came was my hearing. Then my mind started working again. Then I realized the others were just knocked for wind like I was."

Pilot sets off alone

In the first minutes after the crash, a confused Shirk questioned the pilot about the warning light. "He said he was trying to make it back to Belize City," Shirk recalls. The pilot then left the aircraft to get help, wading alone through water up to his neck.

"He lost his phase lock. He was just crazy," Shirk says, adding that the pilot no longer flies airplanes.

Meanwhile, the aircraft was supported by the swamp grass. "I tried shaking the plane," Shirk says. "It didn't move. The nose of the plane was submerged in water. The tail section, where I was, was in the air."

As time passed and Shirk became more coherent, he remembered he had brought his portable 2-meter transceiver

for my frequency but was close enough."

Shirk put the radio in the scan mode and at 146.76 MHz heard a strong signal. He interrupted the transmission with a "Mayday."

A man, identified only as "Dean," responded in English from his post in San Pedro Sula, Honduras, some 70 miles away. Through "Dean," Shirk was able to communicate with his boss, VOA station manager Fred Haney in Belize City.

Radio advice

Within five minutes, a fleet of British Puma rescue helicopters were en route to the crash site. While waiting for the rescuers, Shirk got more help through his portable radio.

A pilot, familiar with the Cessna 206, got on the air and talked Shirk through cutting off the fuel lines, to avoid a fire

"The nose of the plane was submerged in water. The tail section, where I was, was in the air."

or explosion.

"It was so quiet you couldn't hear anything but the wind blowing through the swamp grass," Shirk recalls. "After I realized I wasn't really hurt, all I had on my mind was spending the night out in that swamp. Then I heard the sound of choppers in the air. 'Thank God,' I said."

About three hours after the crash, rescue harnesses were lowered from the choppers to the swamp crash site for Shirk, his fellow passenger and the pilot, who had wandered back.

Suffering no more than a stomach bruise, Shirk was at home in Belize City

two hours later.

Although there were no serious injuries in the crash, Shirk says the day was nevertheless traumatic.

"It took at least ten more plane trips before I got comfortable again with flying," Shirk says. "I should have gotten off that plane. I didn't and I crashed. Next time I won't hesitate if I see something wrong."

A few days later Shirk was back in a Cessna, resuming bi-weekly visits to the transmitter site. The ICOM: cheap, reliable communications in the subtropics—and now a lifesaver—is, as always, in his travel bag.

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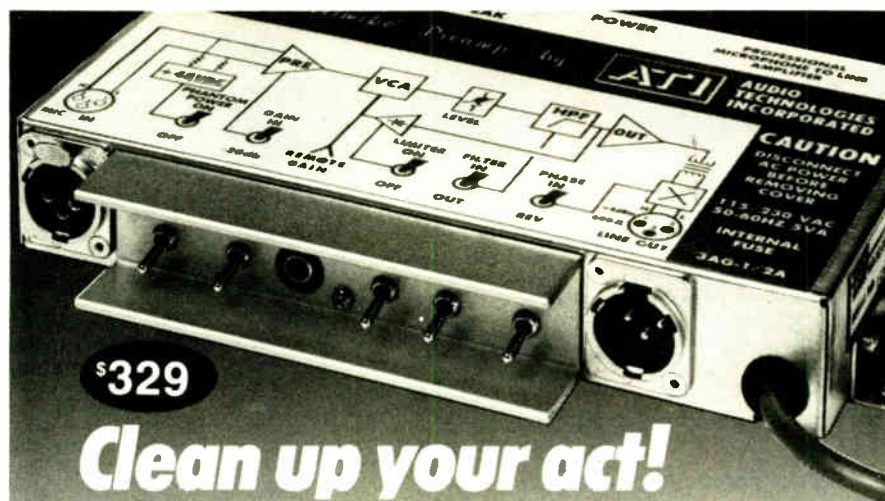
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coax feed line," he recalls.

"I found it back in the tail section of the plane. With luck it had a BNC connector which fit on my handheld. The antenna was for ELT (emergency locator transmitter) on 121 MHz. It was not cut



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FM2 Petition Strikes Out at FCC

Benn Kobb

Washington DC A plan for a second FM band to help daytimers, dubbed "FM2," has struck out again in its quest for spectrum.

The FCC has denied a request from Radio New Jersey (RNJ) to reallocate the six-meter (50-54 MHz) amateur band to the proposed FM service.

As in past plans for FM2, the petitioner was Laurence Tighe Jr., president of WRNJ, a 2.5 kW AM daytimer in Hackettstown, NJ. He had asked the FCC to reallocate the spectrum as a relief action for AM daytimers, limited-time and low-

... RNJ had not adequately addressed the amateur issue.

power AMs, and certain low-power FM's. Tighe also is a licensed radio amateur.

FCC Engineering and Technology Chief Tom Stanley initially rejected the latest Tighe petition in February 1989. According to Stanley, RNJ did not adequately consider the impact that FM2 would have on amateur radio communications both domestically and internationally.

In March 1989, RNJ petitioned for

reconsideration of the dismissal. Stanley again turned down FM2, repeating that RNJ had not adequately addressed the amateur issue.

Tighe returned again in May 1989 with an application for review of the chief engineer's actions and requested that the FCC take public comment on the reallocation.

The full Commission affirmed the staff decision 25 January, stating, "The peti-

tioner has not provided a satisfactory demonstration that amateur operations at 50-54 MHz could be accommodated elsewhere in the spectrum, or that broadcast operations in this band would not cause interference to international amateur communications."

By international agreement, the six-meter band is exclusively allocated to the amateur service in North and South

America. The band is authorized for broadcasting in Europe, Africa, the USSR and some nations in the South Pacific and Asia.

Tighe has tried to generate interest in FM2 in the radio industry with little success. Previous requests for spectrum for the proposed service were also turned down because of the current users of requested spectrum.

House Introduces DAT Copying Bill

(continued from page 1) noted.

The mandatory technology was proposed last summer as a compromise between industry and recording artist groups. It is seen as a way to resolve the concerns of the recording artists organizations and maintain DAT's technical potential to record digital-to-digital.

With SCMS, a DAT recorder can make an original tape recording of a digital source (CDs, digital broadcasts, other DATs), but that tape cannot be copied. The original DAT recording of an analog source can be copied once.

Limiting the number of copies from an original tape would curtail the potential for bootlegging, SCMS proponents believe.

Congressional involvement with digital recording stemmed from an intensify-

ing DAT controversy in 1987.

Recording artists organizations complained that a DAT recorder's ability to make "perfect" copies of CDs increased the likelihood of high quality bootlegged tapes, depriving artists of millions of dollars in royalties.

Companies wary of litigation

Although there have been no laws prohibiting digital-to-digital capable DAT machines, the Recording Industry Association of America has repeatedly threatened litigation against manufacturers sending such machines to the US.

As a result, mostly non-consumer, professional decks were imported to the US for sale with full warranty. The few thousand consumer decks that made it here were expensive and lacked digital-to-recording capability, which hurt the market.

In 1987, legislation was proposed to require an audible frequency notch in CDs to thwart DAT copying, a move audio purists and manufacturers quickly denounced. That proposal was eventually withdrawn, but the bitter debate remained until the SCMS compromise was proposed last July.

With the SCMS legislation many audio experts believe the sagging consumer DAT market will pick up. This will also benefit the professional market through

lower prices of hardware, software and accessories.

Audio consultant Leonard Feldman said SCMS is a good compromise for the recording industry, manufacturers and the consumer.

Depriving consumers the chance to record their CDs does them a disservice because surveys show that most people only record music for their personal use—not to profit from tape piracy, he said.

If SCMS settles the copy controversy, Feldman predicted that the DAT market will catch on, but slowly.

Hope for success

Although the copy controversy, high DAT deck prices and the lack of tapes have kept DAT from booming in the US, the technology may yet succeed, Feldman added.

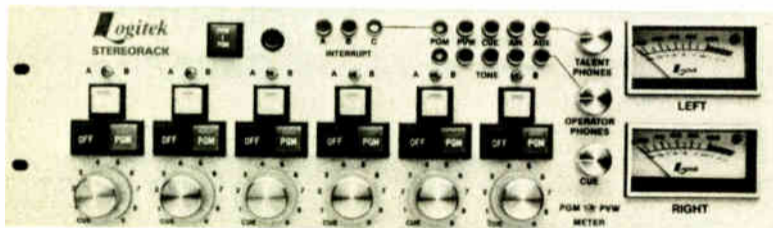
Companies anxious to market the DAT technology took an interest in SCMS prior to any proposed legislation.

Several manufacturers displayed SCMS-equipped DAT machines at the Winter Consumer Electronics Show in January including Sony, Panasonic and JVC.

Initial prices will be in the \$1200-\$1500 range and they could be on the market by mid-year, companies reported.

For more information, contact Tom Friel at the EIA, 202-457-4919; or Leonard Feldman at 516-482-5629.

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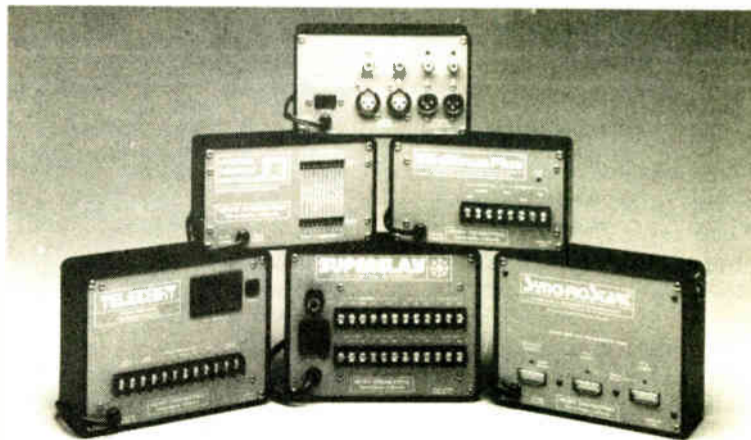
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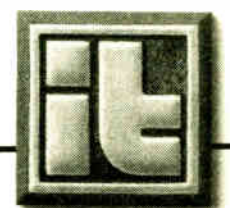
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FAA-FCC Talks Go On

by Alan Carter

Washington DC Two officials involved in negotiations between the FCC and the Federal Aviation Administration (FAA) over who regulates broadcast tower interference near airports said significant differences must be settled before the long-standing feud can end.

"Our discussions have been an eye opener on both parts," said Bill Hassinger, FCC Mass Media Bureau assistant chief for engineering. "For the first time in many years, we've made good progress."

Hassinger, however, noted, "Our interests, our timetable—everything is different."

The bottom line

FAA Systems Maintenance Service Director Peter Kochis said the two agencies have some "bottom-line gut issues" to resolve. The FAA and FCC have to "get rid of the turf orientation," he added.

One major agreement the two agencies reached is monthly meetings during which representatives will discuss individual cases that the FAA may have rejected. Hassinger said the goal is to reach a compromise.

Broadcasters contend they are caught in the middle, with applications being delayed and at times denied. Some broadcasters have had the added ex-

pense of submitting applications for alternative sites—when they are even available.

Both officials said the key to the negotiations focuses on the computer model the FAA uses to judge broadcast tower interference. Broadcasters, until this point, have not had an opportunity to examine the program. Broadcasters also question what statistics the FAA feeds the program and how the program calculates its results.

Room for progress

Sitting down to discuss the model was the next step, with two days scheduled in late February. Plans for earlier meetings had apparently fallen through.

A final round of meetings will focus on procedures within each agency. The goal is "to better mesh" the operations of the two.

Hassinger said after those discussions, he hoped the FCC and FAA could reach "interim" rules for evaluating tower applications.

To show its commitment to settling the dispute, Kochis said the FAA is providing an independent facilitator to observe the discussions and evaluate the progression.

But he was cautious. "Like anything, you are not going to see results immediately," Kochis said.

For information, contact Bill Hassinger at 202-632-6460.

Commission Scuttles Three Radio Pirates

by Charles Taylor

Washington DC Three illegal radio transmitter operations have been shut down by the FCC and their operators slapped with fines.

Such an offense is viewed sternly by the Commission because of potential interference with safety-of-life services such as marine, law enforcement and aviation. Maximum administrative fines can reach \$10,000 and/or criminal fines can be as high as \$100,000 with the possibility of a year in prison.

Gerald Kawalec from Fulton, TX, and Roger Moore of Stuart, FL, were each fined \$750 for operating on 16,198 kHz.

Investigators from the FCC's Allegan, MI, office, for the past several months, monitored the illegal transmitters. In cooperation with offices in Kingsville, TX, and Vero Beach, FL, investigators used mobile and long-range direction finding equipment to locate the unlicensed stations, the FCC said.

Kawalec's signal was traced to the vessel *Margaret Hannah*; Moore's to the vessel *Fairwinds*.

Meanwhile, Norman Putt of Francessville, IN, and Marshall Putt of West

Lafayette, IN, were each fined \$1000 by the Commission for the unauthorized and unlicensed operation of a radio transmitter on frequencies allocated for the Maritime Radio Service (156.25 to 157.25 MHz.)

Allegan investigators traced the signal to the farm of Norman Putt and the business of Marshall Putt.

The transmitters were sold by Comtronix Corp. of Indianapolis. Last fall, Comtronix was cited for the unauthorized sale of VHF transmitters and for instructing consumers on how to illegally modify and alter transmitter frequencies.

In another action, Mark Leavitt of Beech Bottom, WV, was fined \$1000 for illegally operating on 3820 kHz, which is allocated for Amateur Radio Service. The unlicensed station was identified as Experimental Radio (ERP) and broadcast a music and talk show format.

The station was monitored by the Commission's Field Operations Bureaus in Baltimore and Detroit.

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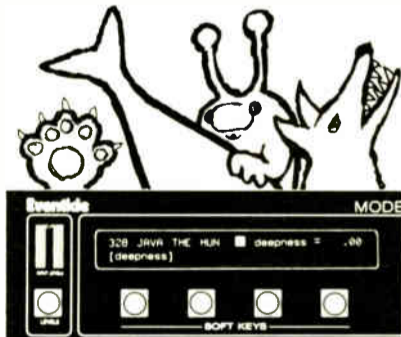


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Blaupunkt Gears Up for '90s

by Marissa Friedman

Broadview IL Blaupunkt Bosch Telecom is expanding its US engineering operations by opening a manufacturing plant in Texas, adding sales, marketing and engineering personnel, and by changing its logo to include Blaupunkt and Bosch Telecom.

The company says it is making the move to gear up for the '90s and the next century. "You can't fight the future," said Blaupunkt US GM Alex Wijen who has taken several steps to prepare for anticipated increased growth.

Engineering Manager Harold Glass will head the expanded engineering facilities located on the Blaupunkt and Robert Bosch industrial camps in Chicago's suburb of Broadview.

Glass brings to Broadview a 10 year history in sales and engineering with Blaupunkt in Germany.

The multimillion dollar facility will be used for the develop-

ment of Blaupunkt entertainment, communication, navigation and other products for the US and Canadian markets.

The complex has four fully-equipped installation bays for product testing and training purposes and an anechoic chamber for speaker testing.

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aided design (CAD) system with real-time satellite links bridges the gaps to Blaupunkt's engineering and production facilities worldwide.

El Paso, TX, is home to the recently opened Blaupunkt Bosch Telecom car stereo manufacturing facility. Bernd Sukop is manufacturing manager of the

operation. He is responsible for launching Blaupunkt factories in Brazil, Malaysia and Germany.

Blaupunkt Bosch Telecom said the logo projects a future-oriented, flourishing organization. Blaupunkt effectively retains the company's image while accentuating its link with Bosch Telecom and the Robert

Bosch Corporation.

Bosch Telecom is an entity within Bosch that is responsible for all communications, entertainment, navigation and any related products.

One of the company's recent ventures into new radio technology has been its support of RDS (radio data system).

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Licensing Foes Continue Efforts

NARTE Requests FCC to Include Issue on the Agenda of April's Regulatory Summit

by Charles Taylor

Washington DC On the eve of the release of a government-sponsored study on the implications of the state licensing of broadcast engineers, one of licensing's primary opponents has requested the issue be discussed at an April meeting between the FCC commissioners and state regulators.

In a letter addressed to Kenneth Robinson, senior advisor to FCC Chairman Al

Sikes, the National Association of Radio Telecommunications Engineers (NARTE) asserted its concern over state regulation of engineers and asked that the matter be included on the meeting's agenda.

The meeting—tagged a "Regulatory Summit" by the Commission—will take place 24-26 April at the Airlie House, a meeting facility in Warrenton, VA. It was called by Sikes as a forum to discuss common concerns.

The state licensing issue surfaced amid

mounting efforts in a number of states to require telecommunications engineers to meet various requirements—including a minimum term of experience, passage of a written or oral exam and a four-year academic degree—to legally practice and advertise as consulting engineers.

Discussions stalled

Discussions between proponents and foes were stalled when, in January 1989, a General Accounting Office (GAO) study was ordered by Rep. Matthew Rinaldo (R-NJ) and Rep. Edward Markey (D-MA), chairman of the House Telecommunications and Finance Subcommittee, to take

a state-by-state look at charges thus far brought against engineers.

That study, due this month, is hoped by NARTE and other opponents to persuade Rinaldo and Markey to introduce legislation that would protect engineers from state legislation.

Initial efforts

In the letter to Robinson, NARTE Attorney Robert Thompson called attention to the "inchoate efforts by state licensing boards to regulate telecommunications engineers, (which would) both balkanize telecommunications engineering standards and also reduce competition among telecommunications engineers nationwide."

Thompson enclosed a position paper on the issue and added, "I hope you will conclude that the question of federal preemption of state licensing efforts should be put on the agenda" for the Summit.

Robinson acknowledged receipt of Thompson's letter, but in mid-February, said no decision had been made regarding the issue's chances for discussion at the April meeting.

"There will be a list of things the Com-



Representative Matthew Rinaldo called for a GAO study into charges against engineers.

mission wants to talk about, but there won't be a formal agenda in terms of issues to be discussed," Robinson said. "Some of these things tend to be much more thematic and less detailed."

But Ray Thrower, president of NARTE, was emphatic about the issue's relevance: "This is becoming more and more of a problem. It's important for this to be presented at a level where state and federal powers are united."

In the organization's position paper, NARTE recommended that control of certification programs for engineers be left to professional organizations rather than government agencies.

"Because a professional organization can adapt more quickly than a federal agency to changes in technology and the need for higher professional standards, a private-sector certification program is more likely to maintain the proper professional standards, be less subject to extraneous political pressures and better promote continuing-education programs," NARTE said.

The organization recommended existing certification groups for such a task, including itself and the Society of Broadcast Engineers.

For information, contact Ray Thrower at NARTE at 817-799-9661; or Robert Thompson at 202-296-0600.

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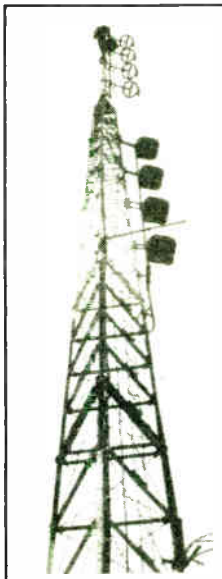


The rolling hills of the Lehigh valley

by Judith Gross
Part I of II

Allentown PA From 170 feet in the air the Lehigh valley rolls out in endless waves of hard brown earth. It's not hard to understand that those little dips and peaks are responsible for some of the worst multipath in the nation.

The site is a remote mountaintop overlooking Egypt, PA on an icy day in late January and the occasion is the



(Above) WAEB's tower: ERI at top; Shively below. (Right) The crew removes the ERI antenna bay-by-bay.



second round of multipath tests in the WAEB multipath project.

RW was invited to observe the testing, which was to focus on tests under various antenna conditions and attempt to answer questions raised in the first round of tests, which concentrated on collecting data from a General Motors test van (see RW 23 August, 1989).

It's early afternoon on the second day; the sun is out but a thin veil of snow covers the ground. The crew from Hazleton, PA-based D&R Communications Services—Don and Ron Spevak and Cliff Nenstiel—are removing the four bays of WAEB's ERI circularly-polarized ERI antenna under the watchful eye of ERI president Tom Silliman and WAEB CE Harry Simons.

Donny mans the mechanics of a motorized winch-pulley system and Ronnie and Cliff slide up and down on steel cables, meticulously removing each heavy, massive bay and bringing it to the ground.

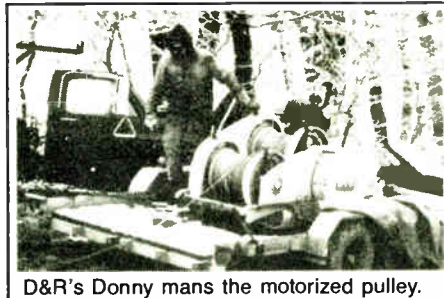
The crew, who has gained a respectable reputation along the eastern seaboard for their work, are replacing the circularly-polarized ERI first with a horizontal only radiator, then a vertical radiator and finally, the four-bay Shively

which is mounted on the tower leg as an alternate antenna.

Between each interval, Tom Becker and Ralph Chambers, the radio engineer-software specialist and radio engineer-pilot who are Air Systems Technology, will fly the tower at a one-mile radius and collect real-time pattern readings via computer.

In January the two flew the ERI antenna at a three mile radius; yesterday it was flown again at a mile. The object is to determine what effect, if any, varying the horizontal and vertical radiation has on multipath.

Without the GM van this time around, the measuring device will be the well-trained ears of Harry Simons (along with station associates), who in his six years at WAEB has been able to pinpoint the locations where multipath is most severe.



D&R's Donny mans the motorized pulley.

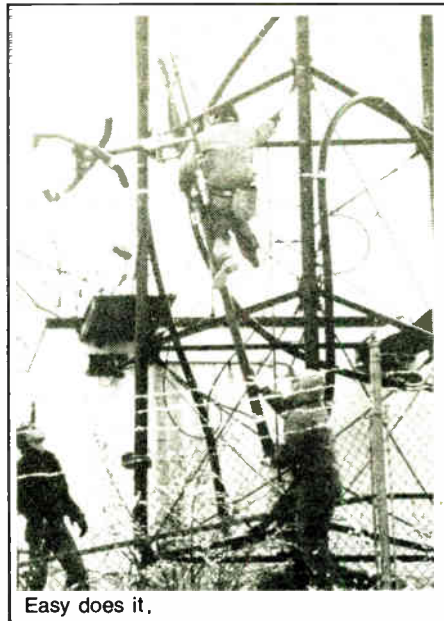
The wind picks up and the afternoon heads toward twilight as the bays are airlifted to the ground one-by-one until tangled metal circles lay like giant pretzels.

To ease the chill in the tiny transmitter shack, Harry powers up the dummy load which provides heat—on the rare occasion the building's door remains closed.

There is hot coffee from the Texaco station five miles down a sparsely populated rural road.

Finally, the vertical radiator is in place, Harry fires up 17 kW of power (the nominal power chosen for the tests), and WAEB, which had been running from its auxiliary site, is back on with its Continental 816 R4 but running vertically only.

On the horizon, getting closer, is the small white speck that is Air Systems Technology's Piper Warrior. As Ralph and



Easy does it.

Tom fly by before positioning themselves to take readings at a mile, you can make out the thin cross of their wing-mounted antenna.

The anticipation of seeing the vertical-only patterns charges discussions inside the transmitter shack with excitement. Soon Harry will head out in his Blazer to listen for multipath.

Later, there will be analysis of today's results and plans for tomorrow's tests over a leisurely steak dinner. An associate of Harry's will report how the Allentown station's signal, radiating vertical-only, could be heard loudly and strongly in Philadelphia—45 miles away.

And Harry will report a concurrent



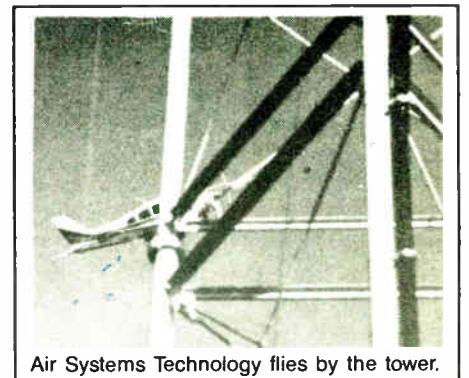
ERI's Tom Silliman inspects one bay.

worsening of multipath along with the strengthening of the signal.

But for now approaching darkness lets Donny, Cliff and Ronnie and the rest of the weary test crew call a halt for the day; perhaps tomorrow it will be warmer and the quilted coveralls they wear during long hours at 200 feet in the air will ward off the cold more effectively.

Harry tries to persuade me to take a ride on the cables up the tower but I hesitate; tomorrow is another day.

Next: The effect of a horizontal-only radiation and tests on the Shively antenna from the air.



Air Systems Technology flies by the tower.

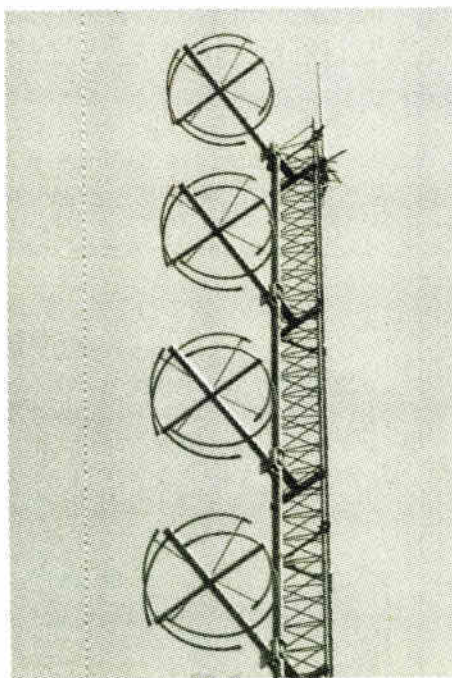
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Taking On Mount Washington

by Judith Gross

Mount Washington NH It's Superbowl Sunday, 1990 and the Denver

Broncos battle the San Francisco 49ers 2500 miles to the south, in a warmer place.

Pilot Ralph Chambers and his partner Tom Becker are mounting Air Systems Technology's data-gathering antenna to the wing of a Piper Warrior inside a hangar at New Hampshire's Laconia Airport, gratefully removed from the piercing wind outside.

The small airstrip is deserted, as residents of dozens of ice-enveloped islands that comprise the town of Guilford stay indoors with eyes on the game. Just

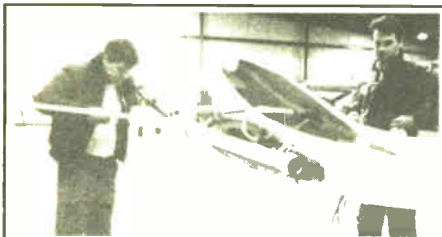
minutes earlier, we finished a late lunch in Patrick's Pub—lunch that helped settle a stomach made queasy by constant turbulence from the three-hour flight from Allentown, PA.

The antenna is in place, we fuel up and after a flight check are airborne again, the Loran helping the plane zero

nings of a ring form.

At four and a half miles away a headwind picks up and pummels the tiny plane. Ralph goes full throttle, and as we press on, the 100 knots speed drops to 80. Sixty knots is stall speed for the Warrior and we don't want to fall too near that.

The gusts shake us mercilessly, the Warrior lurches and begins to lose altitude, dropping 100 feet as Ralph circles back to steady it. He is a calm, careful pilot and the little plane's difficulties



Ralph Chambers and Tom Becker wing-mount their special antenna.



Cold day for a take off



Laconia's deserted air strip on Superbowl Sunday

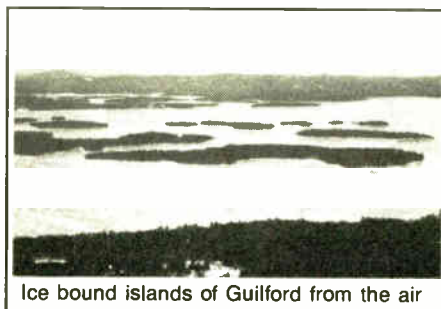
in on Mount Washington, at 6288 feet the highest peak in New England.

At the peak are several radio station towers, one with a six-bay Shively which has had thorough documentation. De-

don't panic him.

We press on for a second attempt, then a third and after several heavy gusts the stall warning buzz goes on at the 4.5 mile out point.

It's nearly dark and the other side of the looming mountain, with its threat of downdrafts and windshear, is an unknown factor. Opting for safety Ralph



Ice bound islands of Guilford from the air



View from five miles and 7000 feet

spite industry confidence built up through the company's participation in the WAEB multipath project, plus satisfaction from other stations for whom the two have collected real-time pattern readings, Ralph and Tom hope to verify their methods through readings from Mount Washington.

As the nautical miles count down on

and Tom call a halt to the attempt to fly the circumference and we head back to Guilford across the crimson clouds of sunset.

The three hours back to Allentown-Bethlehem airport are in total darkness and the night hours have quelled any turbulence.

Tom and Ralph are only slightly disappointed that in this game of "gotcha" the mountain, at least for the time being, has won. There will be other patterns to add to the credibility of their methods; other days to fly Mount Washington.

Like any conscientious air team, they operate under the knowledge that it's better to be around for a next time.

The landing is smooth and we head out for a well-deserved dinner. By the time we are seated at a nearby restaurant, the Superbowl game is history.

The host hands us menus and we ask him, "who won?"



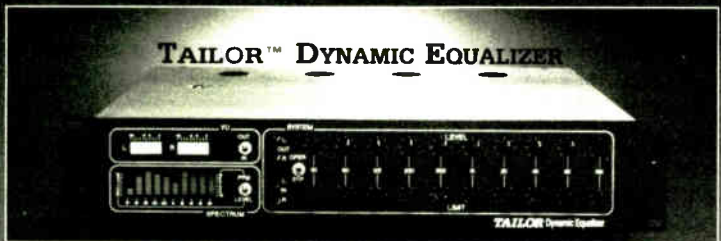
Off the wing: antenna in the sunset

the Loran, the mountain glows amber in the first stages of a brilliant sunset. At an altitude of 7000 feet, Ralph's approach is as smooth as glass.

At five miles out, Tom begins to gather preliminary readings from the Shively. We bank left to begin a circle, as close as we dare in the tiny Warrior. On Tom's computer screen the begin-

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Seattle Postpones RF Decision

by John Gatski

Seattle WA The Seattle City Council will not act on a proposed city RF ordinance before April, according to city officials.

The council is taking several months longer than originally estimated to approve the controversial ordinance because of other matters including the election of two new city council members and a new mayor, who were not familiar with the issue, Seattle Senior Environmental Planner Cliff Marks said.

The Seattle ordinance is considered a test case for other communities . . .

Marks also attributed the delay in adopting an RF ordinance to extensive city budget concerns and the Department of Land Use's as-of-yet unfinished work on a city land use ordinance.

City officials expect the council to act either on the city Department of Planning's 100 $\mu\text{W}/\text{cm}^2$ proposal or former Mayor Charles Royer's more lenient 200 $\mu\text{W}/\text{cm}^2$ exposure limit proposal, Marks said.

Seattle broadcasters, the NAB and other groups vehemently oppose the 100 $\mu\text{W}/\text{cm}^2$ standard and support the 200 $\mu\text{W}/\text{cm}^2$ or no ordinance at all.

Unlike former Mayor Boyer, new Mayor Norman Rice "really hasn't taken a position on the ordinance," Marks said.

The Seattle ordinance is con-

sidered a test case for other communities in the US and is being closely monitored by observers nationwide.

RF exposure has become a much-debated issue in recent years because of studies that suggest a link between prolonged RF exposure and ab-

normal health effects including cancer and body warming.

Broadcasters usually follow the American National Standards Institute (ANSI) recommendation of 1000 $\mu\text{W}/\text{cm}^2$ for workers and the general public.

But public concern has prompted even ANSI to re-

evaluate its current standard. Within the next two years, the standards making body is likely to adopt a more stringent recommendation of 1000 $\mu\text{W}/\text{cm}^2$ for workers and 200 $\mu\text{W}/\text{cm}^2$ for the general population, ANSI officials said.

The rush to enact lower RF

standards is based on public hysteria more than scientific fact, according to opponents of stricter standards.

For information about the Seattle RF ordinance, contact Cliff Marks at the Seattle Office of Long Range Planning, 206-684-8056.



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audio without the headaches of manual mixing or the time-consuming setup of so-called automatic mixers.

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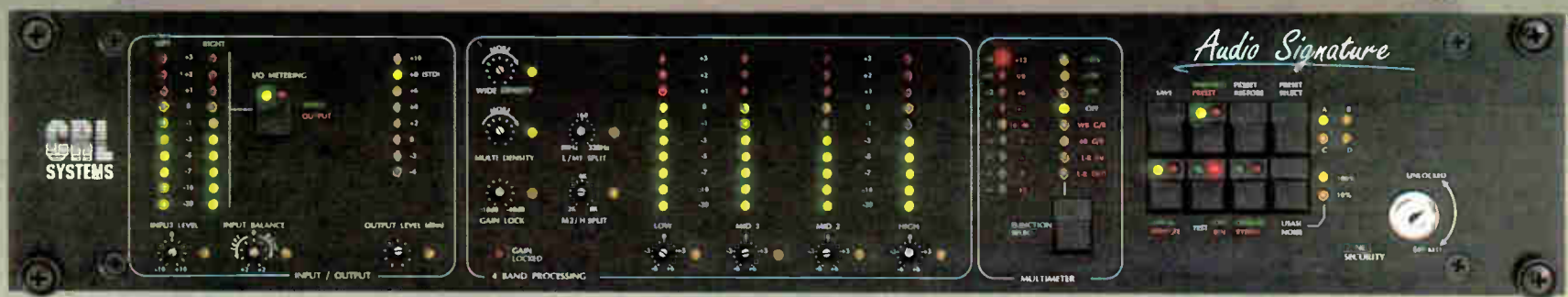
Duggan OK'd for FCC Seat

Washington DC The Senate has confirmed Ervin Duggan to fill the fifth—and final—seat on Al Sikes' Commission.

Duggan fills the Democratic seat vacated last June by Patricia Diaz Dennis, whose term expired. He will be sworn in this month after dissolving his Ervin S. Duggan Associates "editorial consulting" firm in Washington.

He was approved unanimously by the Senate after a hearing the day before. Duggan was well-received at the gathering, and promised to balance his family-value stance with protection of the First Amendment.

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FCC Acts on Renewals, CP

by Marissa Friedman

Washington DC The FCC has taken action on a series of license renewals and reversed approval of an application granted under the previous administration.

The FCC reversed its 23 December 1988 approval of a settlement involving a Florida-based radio station. The agency also renewed the licenses of six South Carolina radio stations and a San Francisco TV-radio station, but denied renewal for a San Francisco TV station and an Ohio radio station.

The Commission reversed its approval of the settlement agreement in a Marco, FL, FM proceeding. Rowland Gulf Radio, Inc., formerly not a party to this proceeding, received a CP for a new FM station on Channel 224A at Marco.

The settlement agreement between Rowland and the seven parties to the proceeding provided that Rowland would pay Affirmative Broadcasting to amend its application. The application would substitute Rowland as the applicant, and Rowland would pay the other six applicants to dismiss their competing applications.

The Commission said it is granting reconsideration because this approval would advocate the filing of sham applications conceived only for the purpose of entering into profitable settlement agreements.

Carolina conditions

In South Carolina, Greenville-based WESC/WESC-FM and Columbia-based WEAC/WAGI-FM received unconditional renewals.

Columbia's WODE/WNOK-FM obtained renewals subject to reporting conditions, as did Spartanburg's WSPA/WSPA-FM, the FCC said. Additionally, WSPA/WSPA-FM also received notice of apparent liability for forfeiture of \$5000.

WKZQ/WKZQ-FM, Myrtle Beach, SC, and WGSN/WNMB-FM of North Myrtle Beach received short-term renewals, all subject to reporting conditions and a notice of apparent liability for forfeiture in the amount of \$10,000, according to the Commission.

The renewals were given despite the objections of the South Carolina State Conference Branches of the NAACP, various local NAACP branches and the National Black Media Coalition (NBMC).

Ohio omissions

In another action, the FCC denied Mid-Ohio Communications (MOC), review of a Review Board decision denying MOC's application for renewal of station WBBY-FM in West-

ville, OH.

The Commission and the Board agreed that MOC made misrepresentations before the Commission in prosecuting its renewal application. The Commission said this conduct warranted the denial.

Richard Nourse, MOC's 24.7% stockholder, served as its full time manager. The Board found that Nourse deliberately concealed his extensive outside responsibilities. This course of action cast doubt on the credibility of Nourse's claimed in-

tegration in the station's management.

MOC may continue to operate the station for 90 days after the release of the Commission's order.

San Francisco saga

In San Francisco, the Commission has denied KQED, Inc. review of a Review Board decision that denied the station's application for a license renewal. The renewed license would have been for noncommercial educational station

KQEC-TV on Channel 32. The facilities of KQEC-TV have been turned over for use to Minority Television Project, Inc. (MTP).

But the Commission upheld the Board's renewal of KQED-TV, Channel 9 and KQED-FM, both San Francisco-based.

The FCC said it agreed with the Board's conclusion that KQED committed serious misconduct. KQED misrepresented the reasons that KQEC-TV was off the air from January through May 1980, the Commission said.

The Commission noted that, according to official records, KQED's board of directors adopted a resolution authoriz-

ing the de-activation of Channel 32 as a means of alleviating KQED's financial problems.

KQED notified the Commission, on three separate occasions during 1980, of the station status. These notifications did not indicate financial duress, but instead suggested technical malfunctions.

The Commission found that KQED deliberately misled the FCC after receiving warnings in 1975 that it considered KQED's practice of deactivating Channel 32 for financial reasons contrary to the public interest.

Despite KQED's misconduct, the Commission agreed to renew the licenses of KQED-TV and KQED-FM.

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Beware of Scrap Metal Thieves

by John Gatski

Kansas City MO Scrap metal pirates cost broadcasters thousands of dollars when they steal cable, antennas and other metal items from unattended tower/transmitter sites that are considered easy prey.

KXXR-FM in Kansas City, MO, was a recent example of such metal grand theft. Sometime over the weekend of 15-17 December, thieves took a 900' spool of Heliac[®], valued at \$13,000, which was about to be used for new auxiliary tower installation.

According to KXXR CE Ronald

Sweatte, the Heliac was going to be installed on 15 December along with a new auxiliary antenna at a remote site outside of Kansas City, but the work was delayed

1000-lb. spool on the hard packed snow along a path to the street where they probably had a truck with a lift, police theorized.

"I have heard of AM towers where thieves took copper that was buried underground."

because of extremely cold weather.

Although precautions were taken to protect the site including police patrols of the area, thieves apparently slid the

"Had there not been snow on the ground, they probably couldn't have done it," Sweatte said.

A market for metal

The police discovered that unidentified persons tried to sell the Heliac to a local scrap dealer, who refused to buy it.

So far, the Heliac has not turned up, Sweatte said. "I think the persons who stole it know we are hot on the trail so they haven't tried to unload it."

Although burglary of tower and transmitter sites is not a wide-spread problem, the remote location and the value of metal can make broadcasting sites inviting targets, according to NAB Science and Technology Staff Engineer Kelly Williams.

"It can be problem," Williams said. "It primarily happens in areas where it is

remote. I have heard of AM towers where thieves took copper that was buried underground."

Transmitter buildings also can be vandalized in such locations, he added.

Williams said most stations take precautions with fences, locked buildings and frequent inspections, but it is hard to make sites 100% theft-proof unless there is a full-time guard.

Insurance to the rescue

Sweatte said that KXXR was lucky that the Heliac was insured (a replacement was procured soon after the theft to finish the job) and, thankfully, the new \$20,000 antenna was not stolen.

Just to be safe, however, Sweatte moved the antenna to a safe storage area the next day in case thieves returned.

To avoid transmitter/antenna site rip-offs, Sweatte suggested that stations consider storing valuable items somewhere else if safe storage can't be guaranteed on site—even if it means paying for it.

"Spend the extra \$100 a month and put it in storage," he said.

Despite the nearly unbelievable effort the thieves put into stealing KXXR's Heliac, Sweatte said he was not surprised that people would go that far.

"It just goes to prove the desperation for money out there. They know the value of high-grade copper. Broadcasters need to be aware of that," he said.

For information, contact Ronald Sweatte at KXXR at 816-421-1065 or Kelly Williams at the NAB, 202-429-5346.

AES Sets New Dates for Fall

Los Angeles CA The Audio Engineering Society (AES) has rescheduled its annual fall convention this year so it will not conflict with the fall Society of Motion Picture and Television Engineers (SMPTE) show.

The new AES dates are 21-25 September at the Los Angeles Convention Center. The move also allows for increased exhibit space and places the show in a single venue, AES said.

AES Executive Director Donald Plunkett has also confirmed that AES and SMPTE are holding discussions on possible combined ventures in the future. "We're entering into discussions," he said.

While declining to reveal details, he described the meetings as "deep thinking."

Indications are that no action could take effect until after 1992. SMPTE said it could not comment on the issue.

For this year's new arrangements, exhibitors will have more time for load-in and load-out, which will not be on over time for the drayage company. There will be expanded exhibit time with 8-hour maximum days.

In addition, parking will be more convenient and affordable, because of the singular location. An expanded shuttle bus service will connect area hotels to the Convention Center, as well.

For information on attending, participating, or exhibiting at the convention, contact AES at 212-661-8528 or FAX, 212-682-0477.

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MAB Expo Draws 700 to Lansing

by Judith Gross

Lansing MI Regulatory issues and the latest equipment trends were on the minds of engineers as they attended the Michigan Association of Broadcasters Mid-Winter Telecommunications Conference & Expo here in February.

Co-sponsored by SBE Chapter 91 and

EBS, and directional antennas for FM audio processing.

In a special opening address presentation, FCC Chairman Al Sikes spoke in a live teleconference from Washington DC.

An informal dinner/drinks/discussion session brought engineers and manufacturers together for a variety of roundtable discussions.

Also of concern is the EBS system and what many engineers characterized as its "lack of effectiveness." Michigan broad-

casters are currently involved in a field test of shorter EBS tones. Frank Foti of Cutting Edge Technology and Eric Small of Modulation Sciences. The majority of engineers present maintained that overly-aggressive processing—a problem in large radio markets—was not a great factor in Michigan radio markets.

Of greater interest was a discussion on new technologies such as DAB—digital broadcasting—which emerged out of the processing panel.

Engineers expressed concern about existing stations' ability to compete with all digital services such as the terrestrial and satellite technologies currently being investigated by the NAB.

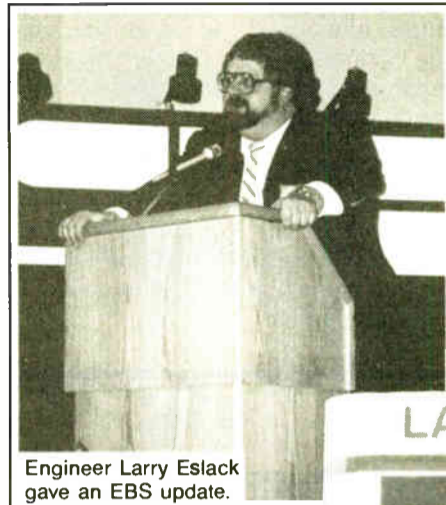


Processing manufacturers Frank Foti (Cutting Edge Technology) and Eric Small (Modulation Sciences) at the informal "Beer and Bull" session

the ITVA mid-Michigan chapter, the conference drew 700 attendees from radio and TV management and engineering. In the exhibit area, some 48 companies showed their wares.

For radio engineers, the three-day conference featured a variety of technology updates. There were sessions on PCBs,

PCB handling and related safety matters were on the minds of engineers at several roundtables. The concept of "unending responsibility" has caused concern and talk centered around the fact that some would-be station owners have had difficulty obtaining financing from banks if the PCB issue surfaces.



Engineer Larry Eslack gave an EBS update.

casters are currently involved in a field test of shorter EBS tones.

The benefits of Noise Free Radio (NFR), a proposal to help AM stations by allowing them to transmit narrowband FM on the AM band came in for a lively discussion at one table with NFR inventor George Yazell present to field questions.

A panel on audio processing featured



The MAB hosted more than 700 attendees.

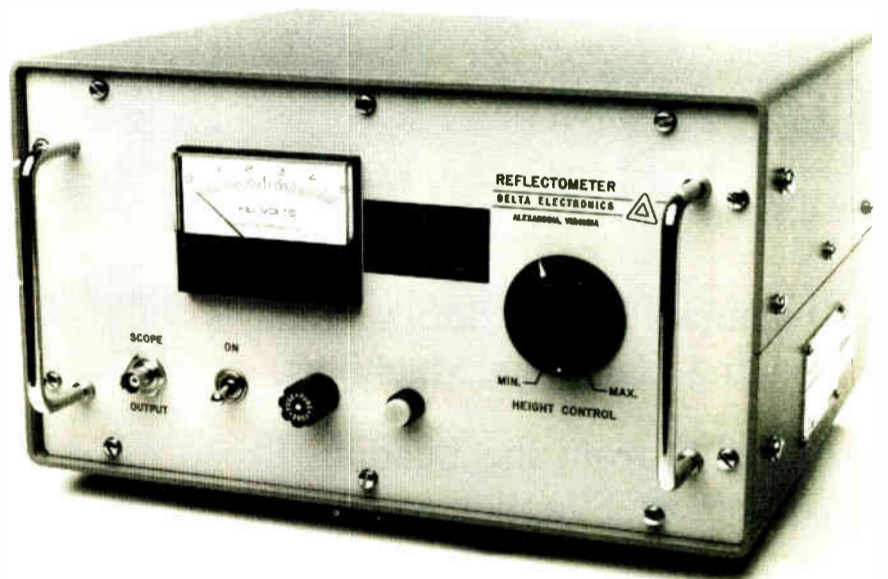
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Softening FM's "Hard Look"

by Charles Taylor

Washington DC The FCC has initiated four changes in processing new FM license applications in the hopes of streamlining a backlog of 2200 pending applications.

The move, initiated at an 8 February Commission meeting, comes in response to a consistent flow of new station filing windows amid FCC processing staff decreases of 25% in fiscal year 1989.

The four commissioners unanimously supported the amendments. "This will save time, expedite grants and speed

service to the public," Commissioner James Quello said.

Three of the changes affect a 1985 Report and Order that adopted a "hard look" at filing window processing procedures. In essence, the stance alleviated the Commission's investment of a large amount of time in an application that was found flawed.

Softening rules

The changes soften those rules, allowing applicants the opportunity to correct mistakes in certain situations without time-consuming formal resubmission to the Commission.

First, the Commission will waive current rules to allow an applicant to correct mistakes in an application where only one applicant has applied in a filing window. In such instances, the Commission now will allow one opportunity for an applicant to correct mistakes.

Second, any applicant who proposes to buy out all other applicants in a mutually exclusive group, including any previously dismissed applicant whose dismissal is not final, will be allowed one opportunity to correct mistakes without resubmission.

And third, "hard look" rules will be waived in a situation in which any applicant dismissed for flaws, whose case was not final, proposes to buy out other applicants.

The Commission's final amendment

authorizes staff to issue the required "Notice of Acceptance for Filing" before its engineering study of the application.

Better timing

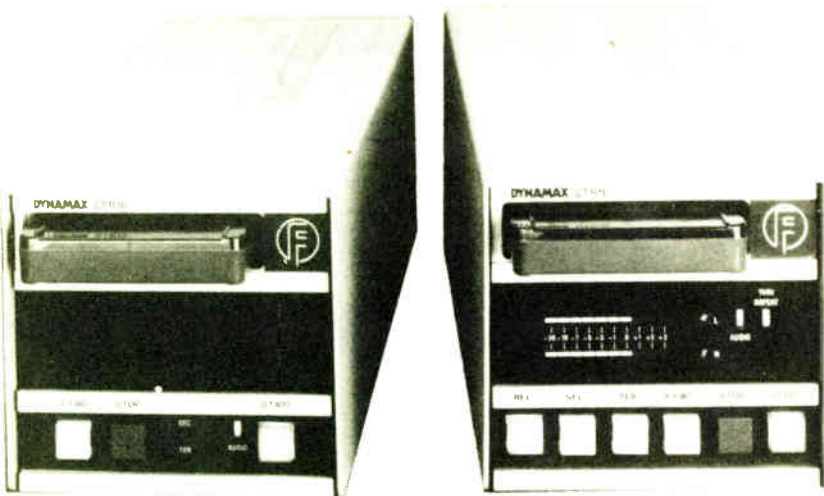
The Notice is required by the Communications Act to establish a 30-day period for the filing of petitions to deny. Currently, the Notice is released after the engineering study, thus, legal study cannot be completed until the petition to deny pleading cycle has ended.

Beginning the regulated petition to deny pleading cycle while applications are still awaiting the engineering study will insure that each file is nearly complete before both engineering and legal processing begins, the Commission said.

According to FCC Auxiliary Services Chief Larry Eads, the change will save about 45 days in an application's processing time.

For information, contact the FCC at 202-632-5050.

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Budget Increase for FCC

Washington DC The FCC has proposed a fiscal year 1991 budget of \$117,998,000 and 1778 full-time permanent positions. This represents an increase of \$10,448 and 28 positions over the Commission's FY 1990 budget.

According to the FCC, the increase would allow the agency to "effectively carry out (the) statutory mission in a rapidly growing and ever changing telecommunications industry."

"The resources requested in the FY 1991 budget give high priority to those programs and activities which authorize service, resolve critical safety of life interference problems and increase use of the spectrum," according to the Commission.

The Commission says additional personnel are needed for FM application processing, enforcement activities and introduction of new services.

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SBE Seeks Changes to STL Rules

by Paul Rebmann

Washington DC Minimum antenna standards and power limits for studio-transmitter links are among rule changes the Society of Broadcast Engineers (SBE) is seeking to relieve congestion in the 944-952 MHz band.

In a petition for rulemaking submitted to the FCC in January, the SBE proposed that existing minimum antenna directivity specifications for the 952-960 MHz Private Operational Fixed Microwave Service also be adopted for the Aural STL band.

The proposal also requests a tighter frequency tolerance, transmitter power limits and specified desired-to-undesired ratios to existing co-channel and first-adjacent channel stations.

The SBE proposed minimum criteria for Category A and Category B antennas identical to those specified in Section 94.75 (b) of the FCC rules and regulations, according to Dane Ericksen of the engineering consulting firm Hammett & Edison in San Francisco.

Ericksen, an SBE board member, drafted the proposal that would require stations in congested areas to use transmit antennas that conform to the Category A specifications for side lobe attenuation. Stations in non-congested areas would be required to use at least Category B antennas.

STL rules

The SBE petition noted that two very popular STL antennas, the Scala Paraflector and Miniflector, "qualify as Category B antennas only when vertically polarized."

Existing stations in non-congested areas would only be required to upgrade their transmitting antennas if they are making a change that requires FCC Form 313 be filed, or if the upgrade was the only way that a new Aural STL station could use the band.

The FCC does not have a clear definition of a congested area, even though the term is referred to in rules for the 2 and 7 GHz Broadcast Auxiliary bands, Ericksen said.

His firm is currently working on a proposed definition for the SBE to submit to the FCC for consideration.

To clarify the FCC requirement that new Aural STL stations not cause harmful interference to existing stations, the SBE proposed that new stations "must provide at least a 50 dB desired-to-undesired (D/U) ratio to existing co-channel stations, and at least a 0 dB D/U ratio to first-adjacent channel stations."

Technical parameters

This requirement would prevent any new station from creating a signal stronger than that received by any existing STL station if the stations are separated by less than a 200 kHz guard band.

"The SBE proposes that calculations demonstrating such protection be made by assuming that such stations are employing standard receiving antenna with a radiation pattern envelope" corresponding to a typical 1.8 meter grid parabolic antenna for congested areas and a 1.2 meter antenna for non-congested areas, according to the proposed rule making.

Frequency tolerance of Aural STL

transmitters should be tightened by a magnitude of ten, from 0.005% to 0.0005%, the proposal states. Research indicates that STL transmitters currently on the market meet this requirement.

Any old models that do not have a frequency tolerance of 0.0005% are those that will become obsolete in July 1993 when the FCC type notification requirement goes into effect, the SBE said.

Transmitter limit

To remove the ambiguity of the FCC requirement that Aural STL stations be licensed with "a power output not in excess of that necessary to render satisfactory service," (74.534a) the SBE proposed a limit of 10 W of transmitter power. There would be no limit on effective isotropic radiated power unless the station's path length was less than 22 kilometers (13.7 miles).

The SBE proposed adopting 22 km as the minimum path length for the 950 MHz STL band. STL stations with paths of less than 22 km would be limited to an effective isotropic radiated power (EIRP) according to the formula: $EIRP = 30 \text{ dBW} - 20 \log(22/\text{actual path length in kilometers})$. The SBE noted that a 30 dBW EIRP corresponds to a system with a 10 W transmitter, 3 dB of line loss and a 1.8 meter grid parabolic antenna.

TFT Marketing Director Jesse Maxenchs said that his "principal concern with the SBE proposal was on the power limitation of transmitters."

The limitation would be a "technical inconvenience" as most TFT transmitters were running at 12 to 14 W, he said.

The difference can be made up by using a larger antenna with more gain, Maxenchs added.

Eliminate band congestion

But Maxenchs spoke favorably of the proposed rules and reiterated that "the bottomline is to relieve congestion."

Of the feedback Ericksen has received on the proposal, most said it is reasonable. Responses from radio engineers were also mostly favorable.

Larry White, CE at KVOO AM/FM in Tulsa, OK, said "It all looks great (although) I am a little disappointed that they failed to mention anything about frequency coordination, either SBE or some other form."

Lloyd Berg, CE at WUSA-FM and WDAE in Tampa, FL, responded enthusiastically to the SBE proposal.

He said his stations "voluntarily replaced the Scala miniflector and paraflector antennas with 6" dishes at both the studio and transmitter sites to avoid interfering with others as well as to protect our received signal quality at the transmitter site."

The SBE proposal also includes a three-year grandfather period for existing stations as well as a suggestion that waivers be available for stations unable to upgrade their antennas due to local zoning laws.

Although stations in congested areas would have to upgrade to Category A antennas by the end of the grandfather period, those in non-congested areas could continue to use antennas that did not meet the Category B specifications until that use precludes addition of a new service, Ericksen said.

It is likely that the FCC would issue a notice of proposed rule making on this matter before the NAB convention, he added.

Paul Rebmann is CE for WLKF-AM, WEZY-FM, Lakeland, FL.

Cordless Service Fight

Washington DC The Society of Broadcast Engineers (SBE) has filed in opposition to a petition for rulemaking by Cellular 21 that requested allocation of the 940-944 MHz band for a new roaming cordless telephone service.

SBE noted the existence of large numbers of "grandfathered" studio-to-transmitter links and inter-city relays used by broadcasters in that band. The comments also maintained the 942-944 MHz band is still used extensively in Puerto Rico for the same purpose.

Cellular 21 suggested moving existing STL and ICR stations to bands above 24 GHz in order to accommodate expansion of this service into the 944-947 MHz band.

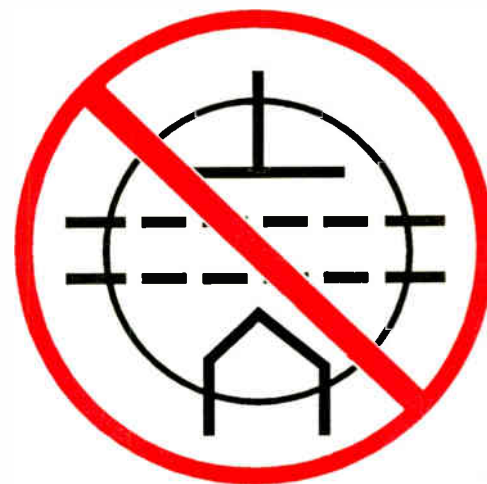
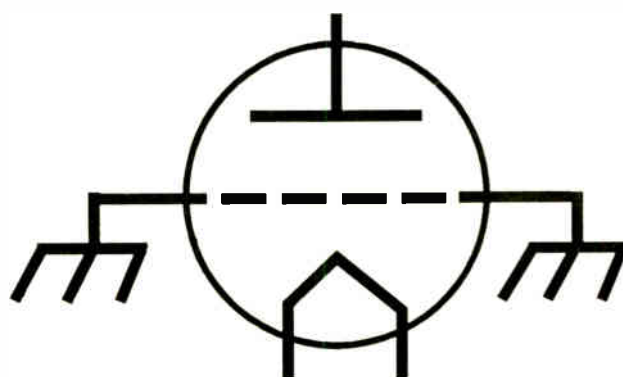
Cellular 21 did not explain how this would be accomplished nor give details of a plan to accommodate other government and non-government fixed users operating at 941-944 MHz, SBE noted.

The group also said there is no way that the crowded 944-947 MHz band can accommodate other STL/ICR users grandfathered into the 942-944 MHz band in most markets.

The SBE also maintained there cannot be any compatible co-channel sharing between the devices proposed by Cellular 21 and existing STL/ICR fixed stations. The Cellular 21 devices have an unspecified interference contour. The location of such devices is unpredictable and the transmitters unidentified. There would be no way to resolve interference problems or to predict incidents or interference, SBE said.

SBE said it took no position on the overall merit of the device, nor with any plan to utilize the 940-941 MHz band but opposed any use of the spectrum above 942 MHz for the Cellular 21 devices.

For information from SBE, contact Richard Farquhar at 614-221-0966.



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RAC Meeting Focuses on AM

by Charles Taylor

Washington DC A full menu of issues relevant to AM broadcasting was offered to nearly 50 attendees of the FCC's Radio Advisory Committee, which met here at the end of January.



The FCC fielded AM issues at the RAC meeting.

The group, composed of broadcast equipment manufacturers, broadcasters, NAB officials and other interested parties, discussed concerns regarding AM directional antennas, the AM expanded band and general AM improvement. The continuing saga of FM translators also was addressed.

For the NAB, the forum presented an opportunity to question the FCC—specifically Larry Eads, chief of the audio services division and RAC advisory

committee chairman—about impending action regarding the various issues.

"I think there's a sense in this town that the time for discussion is over and the time for action is now," said Barry Umansky, deputy general counsel for NAB and a committee member. "This

gave us an opportunity to tell the Commission that there are some priorities we have for 1990."

Eads made it clear that the FCC administration under Chairman Al Sikes intends to take quick action on a number of the issues, including FM translators, the subject of much criticism from broadcasters.

One complained that it was time that the signal-extending technology, which has been frozen by the FCC since March

1988, "be used as it was intended. To operate out of the 1 mV/m contour is dangerous to the economy."

Added Umansky, "We are hopeful that the Commission will look toward having that service return to its original purpose, which is providing service where there is not established full-time broadcast operation."

"This is one of those issues that the Commission is going to have to grapple with," Eads said. "But I think it will be settled in the very near future."

Others argued that rules governing

directional antennas still allow for too much error to justify their use. Said one, "A lot of old directional antennas are not operating near where they're supposed to be. We need to take a look at the systems we use (for measurement)."

Comments regarding general AM improvement primarily focused on issues covered exhaustively at the Commission's *en banc* AM hearing in November; expanded band assignments, interference and AM stereo all generated some discussion.

Finally, Eads informed participants that Cuban radio interference continued to be monitored by the FCC at facilities in South Florida and that the Commission "stands ready" to take action if necessary.

More Readers Forum Mail

(continued from page 5)

For example, how long is an EBS broadcast? Is it thirty seconds, or several hours? How do we know when it's over? The FCC regulations and most local EBS plans are silent on these points. But how can we expect government to produce a program, or broadcasters to carry it, if we don't know the answers to these basic questions?

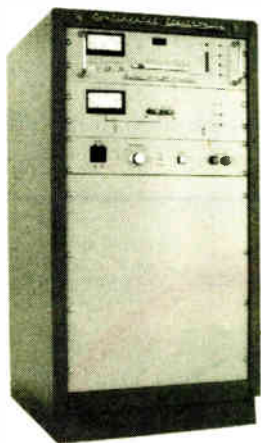
Because participation in EBS at the state and local level is entirely voluntary, we also need a consensus among broadcasters as to what types of EBS messages they're willing to carry. Is a hazardous materials incident in one jurisdiction within a major metropolitan area an appropriate subject for EBS activation area-

wide? On the other hand, if only the most local stations carry the message, what happens to people in the affected zone who listen to a station located somewhere else?

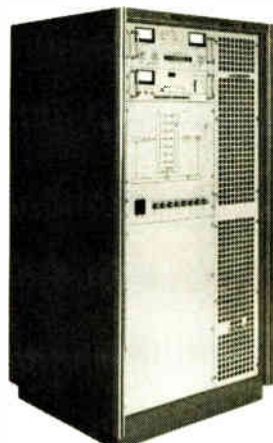
Personally, I think we should sharpen our focus on EBS as a warning system and update our technology to make it do that one thing well. At the same time, we should recognize that there's a lot more to emergency public information than just EBS. And I certainly agree that the 1960s technology of EBS is due for an overhaul at the federal level.

Thanks for raising this important topic.
Art Botterell, Asst. Chief
Telecommunications Division
Pleasant Hill, CA

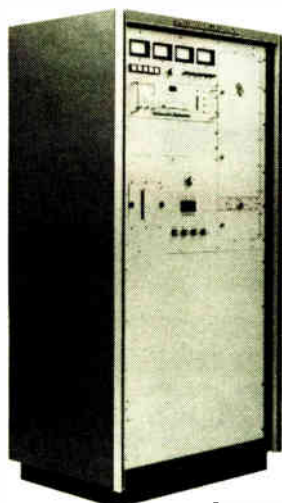
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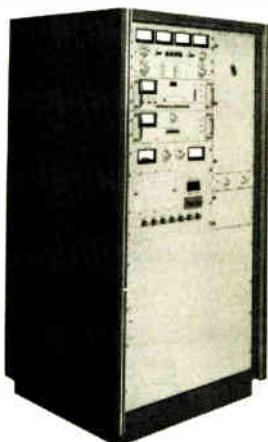
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Alternatives Sought to DA Short-Spacing

by Alan Carter

Washington DC Petitioners seeking to have the FCC revise newly-established rules that allow short-spaced FM stations by use of directional antennas are trying to develop an alternative proposal to give the Commission.

Six petitions filed at the FCC sought a review of the rules that the Commission announced last February under Docket MM 87-121 after a two-year proceeding. The petitions have not seen action.

The new rules allow a facility not meeting the separation requirements under Section 73.207 to be approved if no interference is created or received. The

"You can't mix separations with contour protection," du Treil said. "It doesn't work."

He noted that about half of the short-spacing situations can't be accommodated under the new rules.

While du Treil commented that each petitioner had its own agenda in seeking reconsideration, there is an underlying theme: "I guess it's because nobody likes the new rules."

Looking for a consensus

NAB Engineering Regulatory and International Affairs Director Ralph Justus said the petitioners are looking for "grounds for agreement" to make a recommendation to the FCC.

The bottom line, according to consultant Bob du Treil of du Treil, Lundin & Rackley, is to present the Commission a replacement for the section covering short spacing.

facility can shield itself against interference by a directional antenna, a reduction in the facility or by taking advantage of the terrain.

Broadcasters no longer can apply for waivers for co-channel and adjacent channel short spacing. Protection now is similar to contour protection criteria currently used in the non-commercial service. The intent by the Commission was to discontinue the granting of waivers.

Numerous complaints

However, the petitioners cited complaints ranging from limited applications to shortcomings for interference protection. Calling for a reconsideration were the NAB, the Association of Broadcast Engineering Standards (ABES), Genesis Broadcasting, Greater Media and the consulting firms of du Treil, Lundin & Rackley and Mullaney Engineering.

The bottom line, according to consultant Bob du Treil of du Treil, Lundin & Rackley, is to present the Commission a replacement for the section covering short spacing.

The FCC rejected a plea to hold off on implementing the new rules and is accepting applications.

The NAB called on the FCC to look into the lack of safeguards against FM interference. Among the issues the association questioned were: whether installation instructions of FM antenna manufacturers should be a formal part of the application; whether a registered professional engineer should be required to sign all technical documents on design and installation and measurement of an FM DA and whether necessary safeguards should be adopted to protect FMs from interference stemming from antenna deterioration.

ABES questioned the technical and procedural requirements on design and installation of DAs. Directional antennas used to give "equivalent" contour protection "ought to be limited to the resolution of site availability problems not solved by other means."

For information contact Ralph Justus at the NAB, 202-429-5341, or Bob du Treil at 202-223-6700.

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A New Attitude for the '90s

by Mark Durenberger

Minneapolis MN My friend Kevin Cattoor was signing the lunch tab when he uttered in typical understatement, "If you think the '80s were something, hang on for a real ride in the '90s." He was talking about his company, but speaking for all of us.

To be involved today is to be part of a technological revolution, facing a future so complex and powerful it staggers the imagination. As broadcast engineers, we may be particularly involved, because it's telecommunications that fuels the information explosion, which in turn drives the exponential rate of change.

When we put ideas into perspective, we like to think in tidy packages like decades, but because it's the rate of change that is increasing exponentially, a decade is too long a time-span. In just the past few years we've embraced MIDI, CD, CD-I, CD-ROM, the VCR, BBS, FAX, LAN and the V-SAT, to recognize just a few developments which make 1980 seem like a long time ago.

Think what's in store in the next few years, not just in communications technology, but in scientific disciplines from bio-medicine to optical computers to fusion power to genetic engineering.

Our technological responsibility

It's a marvelous time to be alive and to be involved! As "technologist-citizens" however, we have a particular responsibility, not only to understand what the emerging technologies are all about, but to comprehend the implications of the change they will bring to our planet. For we will be called upon to make serious decisions about their deployment.

Most of us like to think we're futurists and we strive to expand our knowledge far beyond broadcast engineering. But as the telecommunications explosion bombards us with incredible information alternatives, we find that the limited

amount of time we can dedicate to processing that information may mean that we're absorbing more, but perhaps understanding it less.

We know there's a lot going on, but we wonder if we can keep up. For some of us, it's not only a question of the amount of time available to assimilate new technologies, but whether some of this change is so complex that we'll not be able to understand it!

The answer is, of course, that we can understand it. We've demonstrated again and again a capacity for assimilating and controlling change in our lives. If there's anything different about the current situation, it's that our perspective on the world of technology, and in particular the broadcast engineering profession, must be radically different from what it was just a few years ago.

That implies we must take a different mindset into the '90s, realizing that we have a lot to learn and—mindful of the way our own jobs have evolved—striving to establish a new frame of reference from which to continue our growth.

Examining evolution

Our profession has evolved from "janitorial" duties and tube replacement to systems management. Competent engineers became technologists, communicators, budgeters, facilities managers, insurance profilers and experts in computers, automation, digital workstations, satellites, fiber optics and FCC regulation.

To examine the evolution, it's useful to consider broadcast workplace trends of the 1980s, when the very nature of the changes around us forced a redefinition of the title and the duties of the broadcast engineer.

The '80s were, of course, the decade of the "bean-counters," leveraged buy-outs and incredible debt loads. This sometimes meant an end to the dreams of technical expansion that made broad-

casting "fun" for some. But the successful broadcast engineer survived and grew in this leaner environment.

During a dark moment our very use of the word "engineer" was questioned by the PEs. Most broadcast technologists didn't have time to worry about titles; they were busy coping with the challenges of the new technologies.

In a new round of deregulation, we saw the demise of the First Phone and the abandonment of some of radio's Good Engineering Practices and we discovered that our most important task was to sound "competitive"—as defined by the station's programmers.

The successful engineers didn't stop to whine, but did their best to give the programming folks what they wanted, challenging themselves to minimize the side-effects of super-processing and to learn more about SIMP and VSWR and all the myriad newly-understood mechanisms which make up the really competitive broadcast systems. New positive attitudes were being forged.

Trend to interoperability

These workplace trends are evolutionary and ongoing, and are not limited to our own profession. In the workforce of the future we'll see a continuing trend toward group "interoperability." Open work areas and conference/meeting rooms replace closed doors. In "Groupware" applications, think-tanks flourish and ideas are pooled in true community effort.

The "lunch-box" mentality is replaced by serious involvement in the company and contribution to common goals. At the same time, the trend toward employee independence continues; headhunters seek those qualified technologists whose resumes display diverse experience rather than protracted tenure at one company.

While the dizzying pace of change will continue, the focus will turn to refine-

ment and we will necessarily adopt new roles and new attitudes, if we are willing to accept responsibility for the way we live. A social conscience will be as important as a good technical background. Beyond the demand that we master the technology explosion, I believe there is a rising awareness of the need to get involved with what's happening in the rest of our world.

The next few years are going to require responsible decisions in the applications of technology that are going to affect how we live in the next century. Their resolution will require specialized knowledge, yes, but we will also become humanists. We will accept a stewardship for the control of change in our world, and will learn to impose reasoned political, ethical and aesthetic value judgments on our decisions about the deployment of technology.

Promoting education

Toward that end, we must be concerned about the state of education in this country and promote the dedication of a far greater proportion of our resources to education in both the sciences and the arts. Our own specialized broadcast knowledge must adapt to meet this change in focus; it will not be enough to be merely technically savvy.

We must also promote the betterment of those in our own profession and further an understanding of its uniqueness. This means education of and about. We must develop useful internships and education programs to attract new people to our "fraternity." And acting as "disciples" of broadcast technology, we must do our best to make this business a fun place to hang out and a good career move!

Above all, we cannot be afraid of change. We can't be afraid to change jobs, to move, to improve, to try something for the first time, to learn to effectively communicate our position, to fail . . . and to learn while failing.

I think the fundamental ingredient to a useful mindset is a positive attitude about change; the willingness to admit we don't have all the answers . . . and the realization that we can learn anything, no matter how complex the issue, as long as it's explained clearly.

Taking that first step

How do we go about the learning? Carl Sagan said, "The first step is to ask the right questions." Find out what you want to know, then go ask for the explanations. Translate that information into language you can relate to and are capable of understanding.

The information resources are readily available. Technology is creating tougher problems . . . but it's also providing the solutions. If we're going to take charge of our future, we must avail ourselves of its potential and of the information available to those who know how to use it.

My friend Fred Baumgartner said in his Christmas message: ". . . so again we are mystified by life's larger purpose, but thrilled by the ride . . ." Indeed, the next few years will be a roller-coaster journey and I pray that you'll enjoy the trip. I'll see you at the other end . . . and we'll exchange notes again. Hang on!

Mark Durenberger is Director of Technical Operations for Midwest Cable and Satellite and the Midwest Radio Networks. He can be found at 90 South 11th St, Minneapolis MN, 55403.

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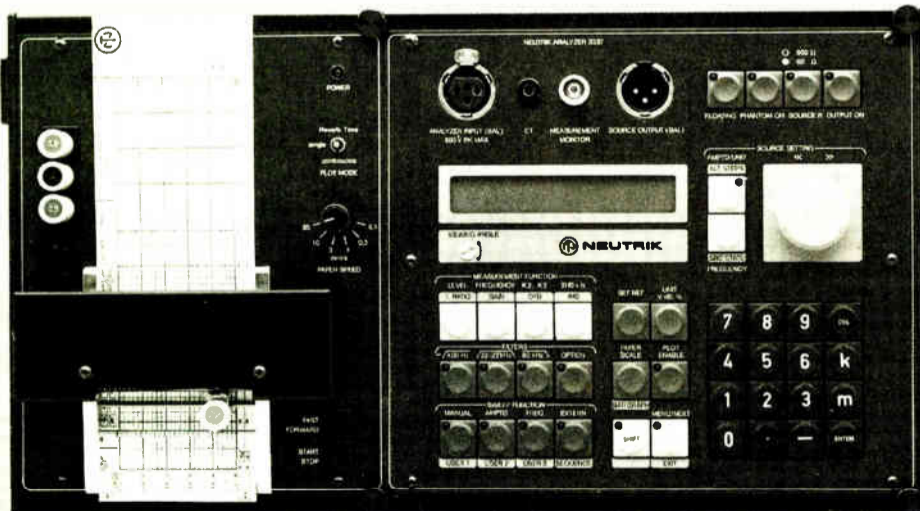
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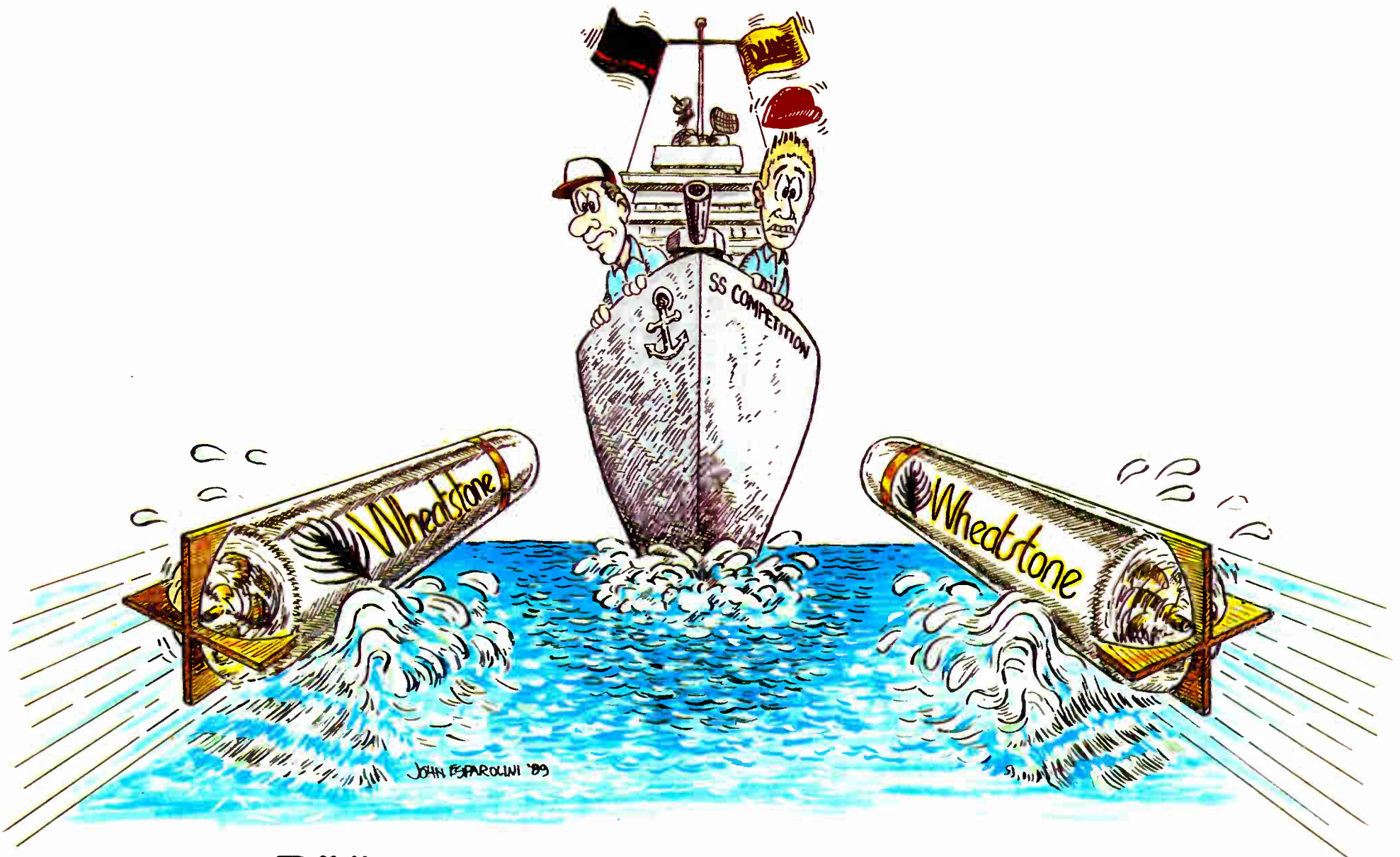
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March 31 - April 3

Atlanta Plays Host to NAB

by Charles Taylor

Atlanta GA With a new setting, more space and the presence of some influential technical innovations, the 1990 National Association of Broadcasters convention has become more than ever a must-see event for the radio industry.

The annual show, to be held 31 March to 3 April for the first time at the Georgia World Congress Center here, will offer 430,000 square feet of exhibit space booked by more than 700 companies; 120 technical papers and 50 radio-oriented engineering sessions.

Floor hours also will be extended an hour each on Saturday and Sunday, from 9 AM to 7 PM. Monday hours are 9 AM to 6 PM, Tuesday from 9 AM to 4 PM.

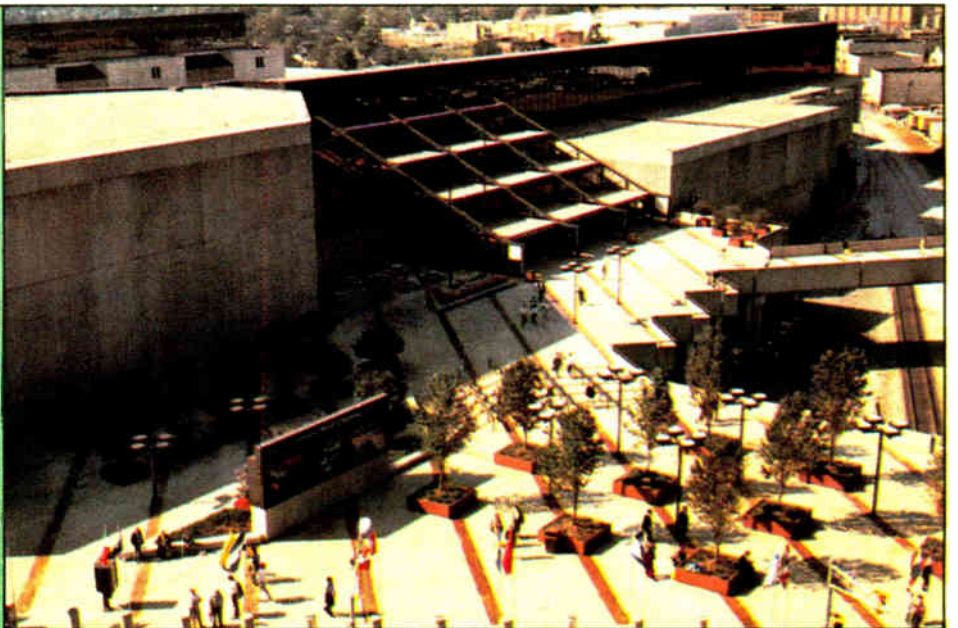
Last year, a record 50,136 attended the show, according to NAB. Because of the East Coast location, NAB President Eddie Fritts said he anticipates another bold showing.

"We see it as a special opportunity in the Southeast to get a lot of people driving in," Fritts said at a pre-show press conference. "There are a lot of stations clustered in the southeastern US."

Digital Audio Broadcasting debuts

Highlighting the show for radio is the first US demonstration of the EBU/Eureka 147 system of Digital Audio Broad-

The Georgia World Congress Center will host more than 700 exhibitors and over 50,000 attendees at NAB.



casting (DAB). The exhibition will run throughout the show.

The project, initiated by the European Broadcasting Union—comprised of 38 broadcasting organizations in the European Broadcasting area—began in 1987 and has been operational in testing for about 15 months.

The concept allows a new terrestrial means of transmitting digital radio signals directly to new receivers in cars and homes and to portable radios. The technology is available only as a substitute

for AM or FM broadcasting, since DAB is not technically compatible.

NAB 1990 also will feature several local FM stations with FMX stereo enhancement. JVC and Alpine will furnish the FMX receivers.

The benefits of the NRSC standard—required for all AMs by 1 July—will be demonstrated once again. Prototype NRSC receivers will also be shown.

More new tech

Another new technology which is gaining acceptance world wide will also be demonstrated at the convention. The Radio Data System (RDS) allows a listener to tune an FM station by format, rather than by frequency and permits FM stations to transmit audiotext to the listener for display on the receiver's front panel.

But perhaps more importantly for US applications, RDS can be used as an emergency alerting system.

NewCity stations Y104 and Y106 will carry the RDS signal. Several manufacturers will furnish prototype receivers.

The Engineering Conference will feature discussions on numerous other new tech topics, including FM systems engineering; digital audio systems; AM antennas; RF radiation; safety, interference and environmental concerns.

Prominent personalities featured

As usual, a number of prominent personalities will be present for honors at the convention, including Bill Smullin, chairman and founder of California Oregon Broadcasting, who has been named recipient of the NAB 1990 Distinguished Service Award, the organization's highest industry award.

The presentation will be made at the opening luncheon 31 March.

The NAB Engineering Conference Committee will award Hilmer Swanson, a senior staff scientist at Harris Corp's Broadcast Division, its Engineering Achievement Award.

Swanson, who is credited for much of the technology used in AM transmitters today, will receive the award at NAB's engineering luncheon Tuesday, 3 April.

CBS News Correspondent Charles Osgood and Inner City Broadcasting Corp's Hal Jackson have been named radio recipients of NAB's Broadcasting Hall of Fame Award and will be inducted at the Sunday radio brunch; while John Naisbitt, author of the bestselling "Megatrends" and co-author of its follow-up "Megatrends 2000," will speak to radio broadcasters at the Sunday Leadership Brunch on 1 April.

Former NFL player Fran Tarkenton, now a management advisor for some American corporations, will speak to radio managers 2 April.

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Paper Will Intro Digital Radio

by Alan Carter

Atlanta GA Judging from the session topics and demonstrations slated for the NAB convention, digital broadcasting has come of age.

To bring the technology to its completion from the beginning of the audio chain right through the receiver is a new system which has already had extensive testing overseas.

Digital Audio Broadcasting (DAB), being evaluated by the European Broadcasting Union (EBU), is on its way to becoming a force to be reckoned with in the US.

The EBU will outline the new approach and give examples, in addition to preliminary experimental evidence, in a presentation during the NAB engineering conference: "Digital Audio Systems," 1:30-5 PM, 30 March.

The EBU system also will be demonstrated at NAB in the World Congress Center with a set-up near the engineering conference area.

The presentation will outline the advantages of a hybrid approach for satellite audio broadcasting systems, which the EBU said makes highly efficient use of the radio spectrum and improves the possibility for sharing with other services.

Another area to be covered is a new approach that combines a satellite's capability to cover a large area and the flexibility of terrestrial co-channel retransmission in completing coverage in service areas where shadowing prevents mobile or portable receivers from working reliably.

Spectrum allocation needed

DAB is incompatible with existing over-the-air broadcasting. In the US, such a service would require approval by the FCC and allocation of spectrum.

The EBU noted that the application of digital techniques to broadcasting is feasible only if it includes an effective use of

spectrum, a vital condition for these new techniques in times of increasing competition for the "precious natural resource."

One advantage cited is spectrum efficiency—one TV channel will accommodate 12 to 16 DAB channels compared with 6 FM channels.

Both satellite and terrestrial applications of digital broadcasting are under studies which look at coverage area, the number of national or local program channels, the available operating frequencies and associated economic factors.

The EBU listed several requirements for developing a DAB system for today's audio world.

They maintain that the quality of the service must equal consumer digital recordings on compact discs. The service also must ensure service continuity for mobile reception—car radios and portables.

A final requirement is simple program selection and a clear information service.

The EBU system will be demonstrated at NAB in the World Congress Center . . .

With regard to the definition of the service area for both mobile and portable reception, the EBU said a new sound broadcasting system should aim to provide good reception in at least 99% of locations for at least 99% of the time.

Consider the trade-offs

In determining whether the service should be satellite delivered or over the air, EBU said trade-offs to consider are the size of the service area—whether it is local, regional or nationwide—and program content flexibility in time and location.

In the future, when digital audio broadcasting matures, the EBU said it seems most likely that the most cost-effective and radio spectrum-efficient solution will be provided by a UHF satellite-based service and VHF/UHF terrestrial service.

But new spectrum must first be found to establish these new services before the full advantages of increased spectrum capacity and utilization can be exploited by re-engineering existing FM radio bands.

The EBU research focuses on a terrestrial network, a satellite network and a hybrid satellite/terrestrial combination.

With regard to multipath and obstructions, the EBU said terrestrial transmission has the drawback of a low elevation angle of wave propagation. But in many cases a low elevation angle is perfectly adequate to provide favorable propagation conditions—for tunnels and to residences for portable receivers, the organization continued.

In contrast, satellite transmission may be endowed with the advantage of high elevation angle and, EBU concluded, a clear path in open sky receiving conditions. But it is probably not adequate for reception under highly-enclosed conditions, as in residences and tunnels.

With satellite broadcasting, the propagation margin trade-off between open sky and non-open sky receiving conditions depends on the elevation angle, but it is clear that if one margin decreases, the other will increase.

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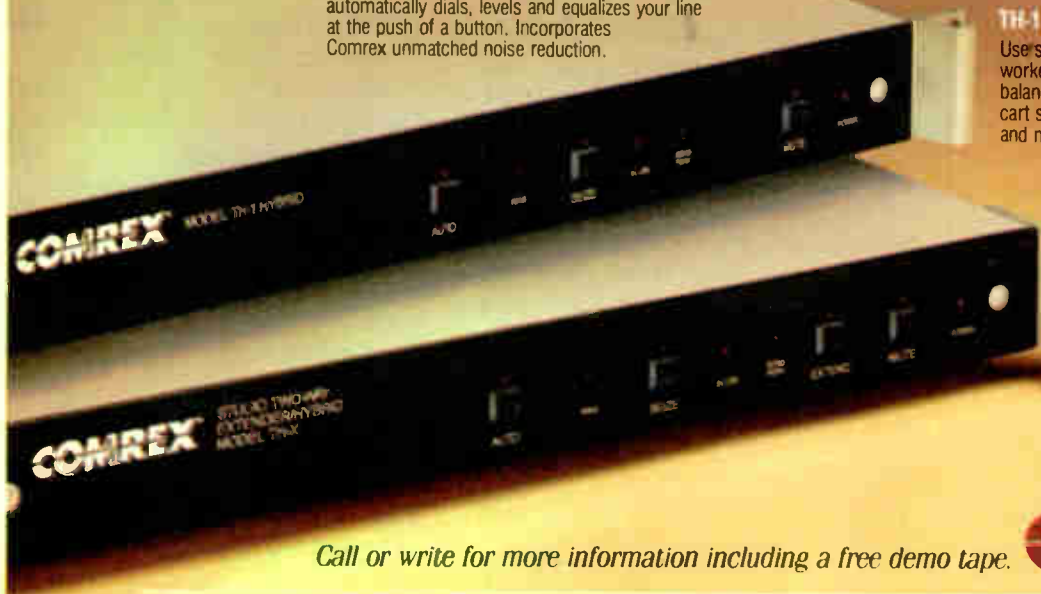
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Radio, Atlanta-Style: Civilized

by Charles Taylor

Atlanta GA Imagine a radio market where the band is not so overcrowded that fortunes are spread thin, where processing competition could be termed "polite," and where a cool \$84 million is collected annually in advertising revenue.

Sounds like a real peach, huh? That, say analysts, is what Atlanta, the nation's 12th-largest market, offers the fortunate owners of 22 FMs and 30 AMs in what is viewed as a conservative but lucrative city in which to conduct business.

"So many want to get into this market because with very few exceptions, everybody makes a fistful of money here," said Bill Cate, president of Chapman Associates, a broadcast consultant based in the city. "Characteristically, everybody thinks of Atlanta as being 'under-radioed.' For its size there are fewer competitive FM signals than most anywhere in the country."

Second best market in the nation?

As an example, the city's top-rated station pulled a 13.1 share in the fall 1989 Arbitrons. New York's No. 1 station peaked with a much more divided 5.0 share; Los Angeles' No. 1 brought in a 6.2 share.

"I categorize Atlanta as probably the second best radio market in the country, next to Los Angeles," said Hal Gore, president of Gore Brokerage in Atlanta. "But it's conservative. You don't have the competitive signals you do in LA. Everyone can find their own niche; there's not more than two to three stations competing in one format."

Indeed, among Arbitron's top-10 ranked Atlanta stations, only one format is duplicated—country. The rankings favor, in order, urban (WVEE), easy (WPCH), adult contemporary (WSB-FM), top 40 (WAPW), news/talk (WSB-AM), album (WKLS), oldies (WFOX), country (WKHX), classic rock (WZGC) and country (WYAY).

No loudness battle here

Because of this diversity in signals, station engineers claim that the backstabbing battle to be loudest through extremes in audio processing, prominent in New York and LA, simply doesn't exist in Atlanta.

"It's kind of an odd market in the sense that you don't find the loudness competition as great in FM as in other FM markets," said Jim Gantner, CE at the No. 2 ranked easy WPCH-FM. "I really don't know why, but I'd say it's one of the least-processed markets I've ever heard."

"We're not much into composite clipping or any of that. We don't overprocess anything; we would rather have it sounding good," said WGST Facilities Manager Mike Lawing. "This market pretty much plays by the book."

Added Sidney Daniels, CE of the No. 1 ranked urban WVEE-FM, "It's the personalities and the music that makes us the best, not necessarily being the loudest."

Mind you, that's not to say that Atlanta doesn't keep up technically with other markets, according to Cate.

"Everybody has the technical wherewithal to be competitive. They've all got their Optimods and Prisms," he said. "If you've got a \$30 million radio station, aren't you going to spend another \$10,000 more to make it as loud as your competitor?"

Competition on the AM band

On the AM band, oddly enough, engineers claim that efforts to be boldest are more prominent, particularly between Atlanta's three news/talk outlets—WSB, WGST and a recent entry in the market, WCNN.

WSB, Atlanta's oldest station (signed on March 15, 1922), traditionally is the only AM to rank in Arbitron's top 10 and also the single AM stereo in the market. The 50,000 W clear channel at 750 "has always maintained strong viability, even during all of this FM dominance," Cate said. "They are one of the top billing stations in the market because they have so much regional business."

But competitive fires were ignited when WGST (which signed on two days after WSB) swapped last March from 920 to 640 on the dial and became a companion 50,000 W clear channel, although it's a daytimer.

Months earlier, WCNN signed on with a news/talk format, aiming to take a slice of the market from WSB and WGST.

So far, WSB continues its reign: it ranked No. 5 in the fall ratings, while WGST was No. 13 and WCNN No. 15.

Still, "those three AMs are in a battle royal," said Cate. "It's interesting to see so much promotion and money being spent by three AMs trying to carve out a meager share of the Atlanta market, because Atlanta is highly FM. Eighty-seven percent of Arbitron's share points went to FM and all these other guys are battling over 13 share points."

FM values escalate

Atlanta's FMs, as in most markets, are escalating in value rapidly. As an example, Gore explained that he bought

WPCH-FM in 1971 for \$650,000. The station was sold in 1978 for \$6.3 million, again in 1984 for \$20 million. Today, he said, the station is worth \$65 million.

One property here that has greatly increased its value with a novel twist has set the stage for a national trend. In March, NewCity Communications, which owns country WYAY-106.7 in Gainesville, GA, became the first station owner to take advantage of new FCC duopoly rules when it purchased the license to broadcast at 104.1 out of nearby LaGrange, GA.

Because the two stations technically cover different markets—Gainesville is north of Atlanta and LaGrange is south—NewCity was allowed to simulcast its country format over the two frequencies, WYAY and WYAI. Arbitron, in turn, has allowed the stations to add together quarter hour totals.

FCC rules require the stations to broadcast separate IDs and jingles, which is accomplished with equipment that decides which jingle should go over which frequency with the push of one button. Signals are sent over the air by microwave from the WYAY studios.

The result? "We make money," said WYAY/WYAI CE John Bridges. "The entire southwest part of Northern Georgia now can hear us. We cover more of the market than (chief competitor WKHX) and we damn sure cover more of the country music (demographic)."

Update: Atlanta

"It really is novel," said Gore. "I think it's something we're going to find a lot more of in radio, where you've got suburban stations moving in and not getting complete coverage of the market."

Opportunities are rare

Such opportunities, at least in Atlanta, certainly are rare. According to Gore, very few stations have changed hands in the past several years: "I think a lot of your major groups would like to buy a radio station in Atlanta, but at this point, there's been nothing for sale."

Perhaps because there isn't a constant influx of new blood into the market, some claim that Atlanta trails other top markets in promotional style and production techniques.

"Technically, I think it's on the leading edge," said Lawing at WGST. "But this is a southern setting and I think the people who live here have a different approach to life. It just doesn't seem that everything is as up to the minute, rush, rush, as it is in other places. It seems that Atlanta doesn't necessarily track what's going on in other markets."

But no matter. All agree that in general, the Atlanta radio market has enough room to offer good fortune to those with the acumen to be heard.

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Remote Audio In the Spotlight

by John Gatski

Atlanta GA Although remote broadcast quality has improved with satellite links and other methods, phone links remain cost effective, viable options for remote broadcasting.

At NAB on 2 April in an auxiliary and satellite systems engineering session, topics will focus on improved audio from remote broadcasts.

During "Program Quality Audio Over Dial-Up Telephone Lines," Gentner Electronics Telephone Products Specialist Michael McKenzie will trace the history of frequency extension technologies that

provide broadcasters with improved audio transmission over standard telephone lines.

very expensive, if available at all. For most broadcasters, standard dial-up telephone lines offer the easiest and least expensive

"For most broadcasters, standard dial-up telephone lines offer the easiest and least expensive alternative to equalized loops."

"We will mention different ways to get audio from point-to-point," McKenzie said. "Getting a good signal from a remote broadcast has always been a problem. Equalized telephone loops have become

alternative to equalized loops."

Multi-line frequency extension is one method that has improved audio quality from phone-line delivered remote broadcasts, McKenzie noted.

"Frequency extension equipment provides broadcasters with a flexible low-cost method for doing remote broadcasts. It circumvents the limitations of telephone lines," he explained.

Using equipment such as the Gentner EFT 3000 digital frequency extender allows the normal 250 Hz to 3.25 kHz phone line to carry a 50 Hz to 7.5 kHz signal by using an encoding/decoding process with three phone lines, said McKenzie.

"It shifts the frequencies into the passband of the telephone lines," he explained. "The first line is shifted up 250 Hz. The second line is shifted down 2500 Hz and the 3rd line is shifted down 4600 kHz."

Frequency extension is based on a formula from noted 19th century mathematician Joseph Fourier, according to McKenzie.

"The telephone company began using single-sideband frequency shifting in 1926 to multiplex several conversations on a single channel. In 1972, this process was applied to frequency extension," he added.

McKenzie's presentation also will address other remote delivery systems including the Integrated Services Digital Network (ISDN), which passes digital signals through the phone lines via fiber optics or other means.

Digitizing Processing

by John Gatski

Atlanta GA With digital technology pervading most segments of electronics, it is no surprise that processing equipment is beginning to incorporate the technology.

One of the many digital applications, all-digital FM limiting and composite baseband generation, is among the topics that will be highlighted in the FM Systems Engineering and Improvement session at NAB on 3 April.

In the presentation "FM Limiting and the Generation of the Composite Baseband in the Digital Domain," Gentner Electronics Corp. Engineering VP William Gillman will discuss how digital processing can be used to implement an all-digital multiband stereo limiter and stereophonic signal generator.

Gentner plans to introduce a digital stereo limiter and digital stereo generator in 1990, according to the company. The technology also will utilize fiber optic links.

"At NAB, we are going to be talking about all the technical considerations that are going to be needed to implement a composite baseband in the digital domain," Gillman said.

Gillman will address the ability of the digital technology algorithms to perform the various functions including pilot generation, 38 kHz subcarrier generation, FM limiting, pre-emphasis, left-right anti-alias protection, overshoot control, peak duration detection and control, Bessel calibration of modulation monitors and digital generation of SCAs.

The advantages of digital generation of stereo signal and processing include improved fidelity, lower processor distortion and more flexibility for user adjustment, Gillman said.

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STEREO**

Engineering Award Winner Talks Radio

Harris Senior Staff Scientist Hilmer I. Swanson will receive the NAB Engineering Achievement Award at the 1990 NAB convention. Credited with development of much of today's AM transmitter technology, Swanson is specifically cited for work in pulse modulation techniques and digital modulation for AM.

Radio World News Editor Alan Carter talked with Swanson about the history and future of radio technology.

RW: What is the most exciting technological change you've seen in the industry?

Swanson: High-powered MOSFET transistors for AM that are rugged and low-cost. I think they will help AM stay alive.



Hilmer Swanson, Harris Corp.'s senior staff scientist

tal be a reality for FM like it is today for AM?

Swanson: Digital will be employed in all equipment, to some extent. I don't know about the full extent, but to some extent in all equipment, not just broadcast equipment.

RW: Is digital modulation as advanced as the industry can expect to go for transmitters?

Swanson: We live in a world that is rapidly changing. The thing to expect in this world is change. I don't know of anything that is going to happen. These transmitters we are currently designing are well designed; the solid state devices will last very long. A 20-year life is quite easy to expect. It will probably be quite a while before they need new AM transmitters to replace what we are shipping right now.

RW: Looking at the state of AM—stations going dark, a reluctance to upgrade because of financial restrictions—how do you assess this side of broadcasting?

Swanson: I think some stations will go dark because they have not upgraded. Some still have the opportunity to upgrade, they still have sufficient finances, but if they don't, they may go dark because of that.

There are some cases where they just have too much competition, either from other media or even from other AM stations causing interference.

RW: Is cost important for AM?

Swanson: I think that's very important. All businesses have to make money to survive, and these MOSFET transistors are going to help AM survive.

RW: How can the industry counter what some see as a reluctance among broadcasters to readily adopt or experiment with new technologies?

Swanson: I think broadcasters will use new technology if it does something useful for them. Just because something is digital or solid state, doesn't mean it's useful.

Our new DX Transmitters are digital and solid state and they have been well received, not because of the buzzword, but because they sound good and their life-cycle cost is low.

If you can provide broadcasters with something useful, they will use it. When remote control came along, broadcasters jumped on that very fast, because it did something useful.

RW: How do you think broadcasters define "useful"?

Swanson: If the product helps them make sufficient money to stay alive.

RW: The industry has gone from tubes to solid state and now to digital. Will digi-

tal be a reality for FM like it is today for AM?

Swanson: It probably is, but I'm sure the people being "weeded out" don't agree. I think the AM band is more crowded than it needs to be, or maybe we have more stations than we need to have.

RW: Is it too late for AM stereo? Is it worth the effort now, or would broadcasters be better off spending their energy elsewhere?

Swanson: I think the answer is for the marketplace to decide but we're still waiting for the answer.

RW: Another current problem is a drain on engineering development resources by attrition and by other industries, such as the computer industry. Where will the "Hilmer Swansons" of the 21st century come from?

Swanson: I think that broadcasting is an attractive industry because of its interesting history and peaceful purposes.

The Cold War is over partly because people have better communications. The world is smaller because of communications throughout the world. I feel quite fortunate that I was able to be involved in broadcast and I would hope those who come after me will see it that way, too.

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*Radio Technology Component Grand Prix '88, CD Division, Stereo Sound Component of the Year (1988) & Best Buy (1988)

Handheld Uplinks a Likelihood

by Frank Beacham

Atlanta GA A major equipment downsizing in satellite uplink technology for the television industry could open the door in the near future for ultra portable hand-held audio uplinks for radio broadcasters.

At the NAB equipment exhibition, Sony Broadcast Products Co. will demonstrate a new digital codec (encoder/decoder) device that compresses audio and video data, permitting it to be transmitted at reduced bandwidths on satellite dishes of "dramatically smaller size," Sony Product Development Manager Stevan Vigneaux said.

Though the new system has not yet reached hand-held size for television, Sony Product Management VP Peter Dare is quoted as saying a highly portable audio-only satellite system could probably be built today with the new digital codec technology. "Conceivably, yes. You could allow that," Vigneaux said. However, the Sony executive emphasized the company has "no plans even in the pipeline" for such a product.

Sony's prototype codec system is capable of sending a channel of video, two channels of audio and communications at about 23 megabits-per-second on a DS3 link. That's about half of a DS3's 45 megabit-per-second capability. The system can handle two simul-

taneous channels of video on a full DS3 link.

Use of the new device could substantially reduce the size of SNG systems needed to deliver high quality video images. The transmitting antenna could be as small as 1.2 meters compared to 1.8 meter dishes typically used in mobile SNG systems, Vigneaux said.

Though far from portable, the SVT-2000 also breaks new ground in size and power requirements, Vigneaux said, thanks to VLSI (very large scale integration) technology.

"Originally, the ability to do data compression like this . . . the ability to create a relatively small, powerful system wasn't possible," Vigneaux said. "To build such a system would have required a great big box, like a large refrigerator. But using VLSI we have been able to produce the SVT-2000 in a box which is small enough and has the power consumption low enough to be installed in an SNG truck."

In another development involving digital codec technology, BTS will introduce a \$5000 audio-only encoder/decoder device at NAB. The BAC-3000 is designed to provide a bridge in the studio between analog audio and AES/EBU digital audio.

"It's a bridging device that allows you to enter the world of digital audio and leave the world of digital audio," said BTS Product Manager B. Lamont

Dorrity.

Utilizing the BTS codec system, analog signals may be integrated with AES/EBU digital devices such as DAT recorders, DASH and CD player/recorders. The encoder section accepts two stereo pairs of analog audio and creates two AES/EBU digital audio bitstreams. The decoder section is com-

prised of two independent AES/EBU stereo decoders that use 8x oversampling and 18-bit converters for analog audio recovery.

The 18-bit encoder uses a 64x oversampling technique that virtually eliminates conversion distortion, Dorrity said. The decoder is compatible with 16-bit and 18-bit systems and accommodates the full range of 16- to 20-bit AES/EBU signals. It also provides for three separate sampling rates, including 32 kHz, 44.1 kHz and 48 kHz signals.

Booster Paper Slated

by John Gatski

Atlanta GA FM boosters have become popular in recent years to help stations overcome weak regions of their service area and to overcome certain types of interference from other stations.

Sometimes, however, boosters can create problems.

This among other FM topics will be covered 30 March at NAB in the FM systems and engineering improvement session.

During "The Application of FM Boosters Without Terrain Obstructions," engineers Mark Olkowski, Osborn Communications Corp. and Edward Schober, Radiotechniques Engineering Corp. will review efforts to reduce Receiver Induced Third Order Intermodulation Effects (RITOIE) interference with a booster and eliminate the incidental mutual interference between the main transmitter and the booster.

Olkowski and Schober will discuss WIOI-FM, Brunswick, GA, and its successful effort to overcome RITOIE and eliminate the booster/transmitter mutual interference side effect.

Last year, WIOI installed a large 8 kW ERP booster in Jacksonville, FL, to overcome RITOIE interference, which had become a problem in a portion of the station's coverage area.

RITOIE occurs when signals of two or three co-located or closely located

transmitters cause a multipath-like interference to another station's signal within the receiver, Schober said.

RITOIE is more likely as more and more stations co-locate as a result of the FCC's 80/90 ruling, he added.

"It (RITOIE) is very much dependent on the quality of the radio," Schober noted.

Because WIOI had received several hundred complaints from listeners in the Jacksonville area, the station decided to try a booster to lessen the RITOIE.

"The solution was to put a booster near the co-located stations so the stronger signal would overcome the interference," Schober said.

However, the audible incidental booster/transmitter interference also had to be overcome, Schober explained.

According to Olkowski and Schober, there is no terrain shielding between the booster and main transmitter and the 70 dBu contours overlap, resulting in the mutual interference.

During the presentation, Olkowski and Schober will review the techniques used to reduce the mutual interference between the transmitter and the booster.

They also will update progress of a prototype TFT reciter used to synchronize the main transmitter and booster signals to lessen the mutual interference, Schober said.

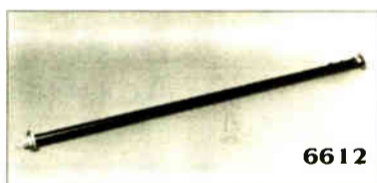
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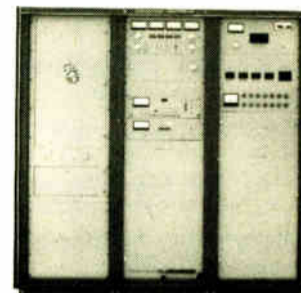
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2061

Session To Feature FM Stereo Solutions

by John Gatski

Atlanta GA Ever hear a "burbling" sound from your FM stereo receiver, then punch the mono button and it disappears—or have a listener report a similar sound when listening to your station?

This phenomenon sometimes can be heard on about 99 percent of receivers in this country because of PLL stereo decoder design, according to Broadcast Technology Partners consultant Tom Keller, who will discuss a method to reduce the annoying interference during the "FM Stereo: What can be expected from the new technologies" at NAB.

The paper is one of several on FM stereo technologies to be presented 3 April in the FM systems engineering and improvement session.

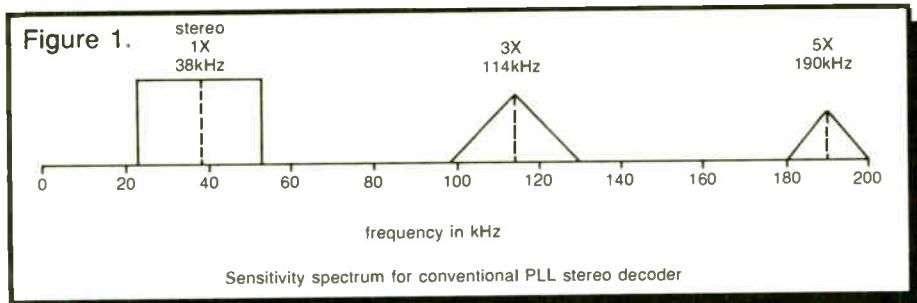
BTP produces the stereo-enhancing FMX technology, which does not have the problem because receivers are equipped with a Walsh-function



Broadcast Technology Partner's Tom Keller

body knew what it was."

Keller said the decoder not only decodes the 38 kHz stereo signal, but also a 190 kHz signal of the first adjacent



decoder, Keller said.

Keller said that the problem has existed since the receiver manufacturers switched from filtered stereo decoders to Phase Loop Lock (PLL) stereo decoders in the 1960s.

"It's a problem that has been around a few years, but nobody paid attention to it," Keller said. "It's common but no-

channel's stereo signal.

With the Walsh-function decoder, the first adjacent interference is filtered out 15-25 dB, eliminating the noise, Keller explained.

There is an estimated million receivers in the US with Walsh-function stereo decoder chips made overseas, but millions more do not have it, he said.

Starcruiser Ready

by Frank Beacham

Atlanta GA Combining all the comforts of home with a modern office and a radio production studio on wheels was the challenge to KIIS AM/FM in building its new state-of-the-art "Starcruiser" for remote broadcasts.

KIIS CE Michael D. Callaghan is scheduled to present "Building and Operating a Multipurpose Remote Studio Vehicle" at the NAB engineering conference on 1 April. The paper covers design considerations and construction of a multipurpose remote and promotional vehicle.

The station began the project with a stock motor home and ended up with a self-supporting and independent broadcast production facility.

Not your average RV

The "KIIS Starcruiser" houses a complete radio studio with cart machines, tape decks, wireless microphones, a public address system, three isolated announce positions, a FAX machine, cellu-

lar phones, audio processing, UHF radio facilities and a telescoping mast for the parabolic antenna.

Because Southern California is prone to earthquakes, the mobile unit is capable of housing and feeding an air staff and programming a broadcast facility for up to four days without outside support. The unit includes sleeping provisions, food and cooking and food storage facilities.

The special requirements of producing a top-rated morning show were included in the design concept for the mobile unit. Because these needs are common to many stations and most multi-talent morning shows, they are explored in-depth in Callaghan's presentation.

"The vehicle uses several transmission paths to return programming to the studio in both stereo and mono modes," Callaghan said. In the months preceding NAB, a "narrow-deviation" microwave link has been used as the primary system.

However, Paul Donahue, engineering VP for Gannett Radio which owns KIIS,

(continued on page N10)

WHEN IT'S TIME TO WORK, WE PLAY.

ON AIR

Few things can make you look worse than equipment that doesn't work on cue. What you need is a CD deck that's at home in the studio, not at home in the home.

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Remotes Go Digital

by Frank Beacham

Atlanta GA The "D"-word has come to broadcast remotes. In a process described as "very, very revolutionary" by its developers, a new digital stereo audio system for radio remotes using off-the-shelf components will be revealed in a highly-anticipated radio engineering session at NAB.

"Digital Audio Techniques for Remote Broadcasts," to be presented 30 March by Gannett Radio Engineering VP Paul Donahue and Mark Durenberger, a consultant and technical operation director for Midwest Communications, will describe a remote broadcasting process using several newly-available technologies.

"Digital audio bit rate reduction systems, digital telephone networks, VSAT satellite systems and high speed modems have recently converged to permit high quality digital audio remote broadcasts," Donahue said. These technologies can now be cost effectively implemented by stations for 7.5 kHz to 15 kHz bidirectional remote broadcasts.

New to broadcasting

"It's totally new and has not been used previously by broadcasters," Donahue said. "Using compressed digital audio methods over satellites or digital telco networks allows high quality, bidirectional, stereo and mono feeds at a cost competitive with standard analog systems."

The NAB presentation is slated to discuss the theories, methods, and equipment needed for digital audio compression on a 4:1 basis. High-speed modem requirements; interconnection with new telephone company dial-up 56 kbit networks and portable VSAT satellite system links also will be addressed.

Donahue said one valuable feature of the new system is that broadcasters can work outside their coverage area by utilizing digital feedback of station audio to the remote location.

Gannett, who developed the system with the aid of some unnamed equipment manufacturers, has concluded a series of tests and prior to the NAB convention will be using the technology on a regular basis for remotes and for feeds between affiliated stations, Donahue said.

Remote unit on line

"The KIIS Starcruiser," a new remote unit for Gannett's LA flagship station, "will be doing satellite-generated digital audio" by the start of NAB, he confirmed. (The remote vehicle is described in detail in another NAB presentation, "Building and Operating a Multi-Purpose Remote Studio Vehicle," by KIIS CE Michael D. Callaghan.)

Though a detailed cost analysis of the technology will be presented in the NAB paper, Donahue said a single fixed, bidirectional digital stereo audio teleport

should cost about \$25,000. He said he did not know whether a single broadcast manufacturer would be selling a system at NAB but said all the components are currently available on the market from different vendors.

"There's a whole group of stuff that broadcasters have never looked at that makes doing remotes better than they've ever been," Donahue said. "This will be an education process for most broadcasters."

NAB Debut for RDS

by John Gatski

Atlanta GA Europe's innovative Radio Data Systems (RDS), developed in England to automatically switch radios from one BBC transmitter to the other to maintain consistent programming, has enormous potential for US stations, according to the technology's proponents.

The developments will be covered 1 April at NAB during a radio engineering session titled "RDS Systems: a North American Plan and Update on the European Experience." Technical Marketing Consultant Inc. President Jerry LeBow will present a proposal to alter RDS Programming Identification (PI) codes to fit into the North American broadcasting structure.

The technology also allows broadcasters to feed information to LED displays in RDS equipped radios, such as station IDs and was demonstrated at NAB last year.

The European version of RDS would not work in the US, LeBow said, but there are other important features it could offer including selecting the strongest translator of a station to ensure a

good signal while driving, display of call letters and frequency, automatic format selection and emergency alerts.

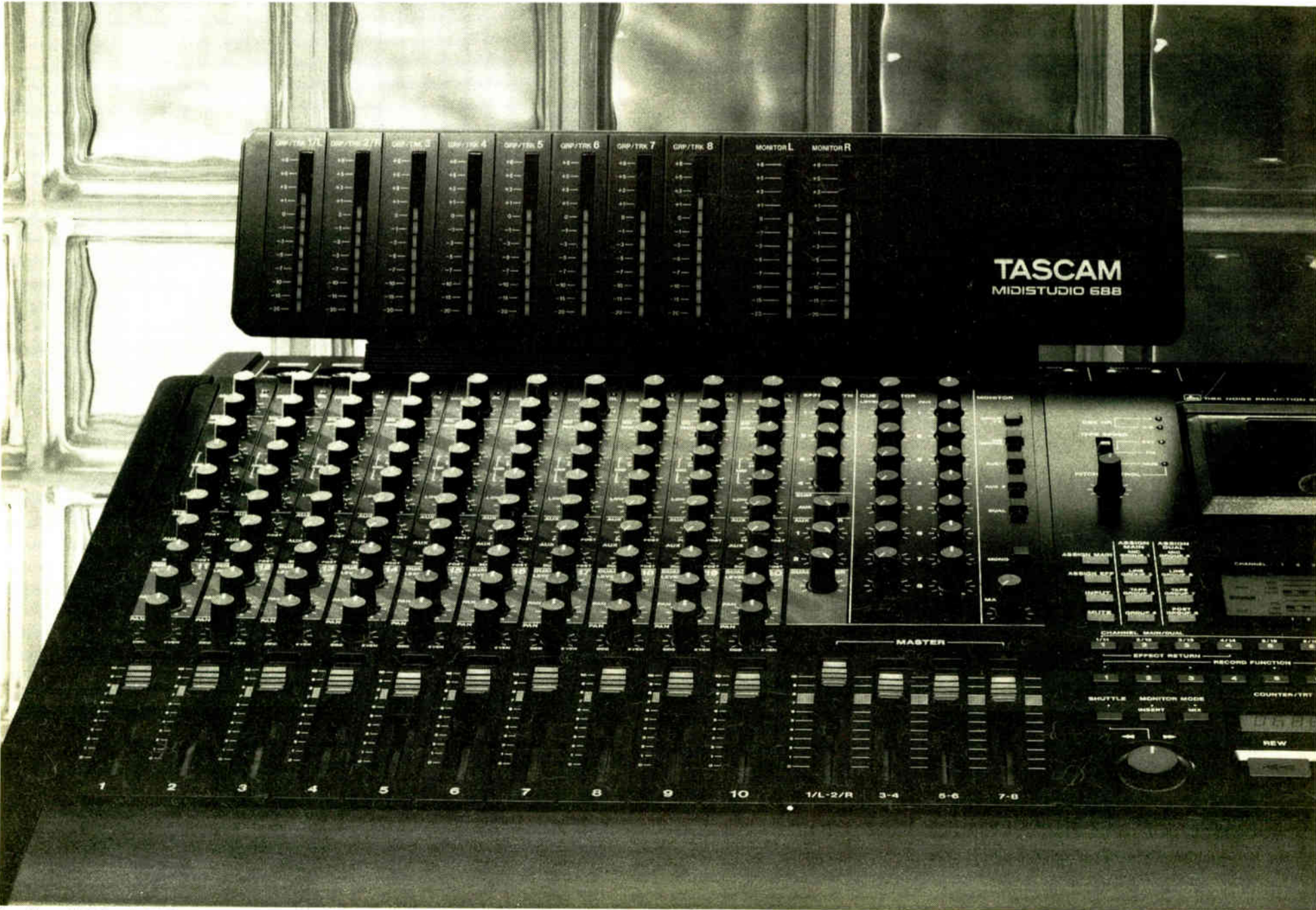
LeBow said the PI codes and format codes will have to be modified so that stations in the same area would not use the same code and confuse the RDS receivers. Because there are more music formats in the US, the format codes would have to be expanded from the European version, LeBow said.

RDS will be demonstrated at NAB from two Atlanta-area radio stations, WYAY-FM and WYAI-FM, two simulcast country stations, and cars will be available to drive the area to hear the technology at work, LeBow said.

Also, an RDS emergency alert system that could someday replace EBS as the national emergency alert system will be demonstrated at NAB, according to LeBow.

"We are going to show the system for the first time in the US at NAB," LeBow said.

The RDS emergency alert system would have the ability to automatically switch a receiver to emergency information, even if the receiver is turned off, LeBow said.



See Us at NAB Booth 3352

Hot Products Set For Showcase

Atlanta GA Products on the NAB exhibit floor are split evenly into two directions: sophisticated new tech or firmer inroads into established markets.

In the latter category International Tapetronics Corp., recently purchased from 3M by Don Carle (see related story, this issue), is introducing a brand new line of analog cartridge machines: the Series 1.

Features bring it up to the cutting edge of cart deck technology, and the body borrows heavily from ITC's previous at-



Carts are alive and well, as Fidelipac's introduction proves.

tempt at a digital cart machine.

Fidelipac, meanwhile, is introducing not a machine, but a new cartridge. The Audiomax 4000 is a new series being marketed by the company as an "upgrade" to Audiopak AA-4 carts.

In the console area, there is one new product slated. Wheatstone plans to introduce the A-50 Audioarts, a lower cost version of its console line.

Processing is an area where some innovations will be evident. Gentner will introduce the LazerPrizm, an all digital processor.

There are several other product debuts planned by Gentner, among them the PeopleLink, a modular telephone system with user configuration.

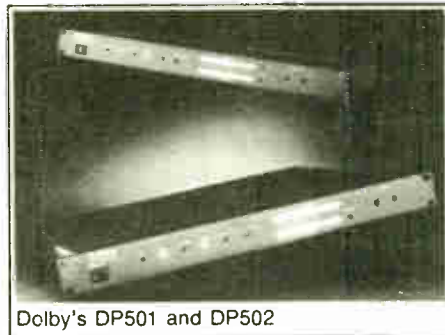
Also in processing, Orban will introduce its 4000 Transmission Limiter which offers transparent control of the peak modulation level on transmissions on analog or digital microwave links.

And CRL will debut the Audio Signature, a programmable stereo four-band compressor.

In the phone communications arena, Comrex will show a multi-line frequency extender that lets the user choose one, two or three dial-up phone lines.

TFT meanwhile, is introducing its 9000 series STLs. And also in STL gear, not new this year but still worth noting is QEI's CATLink, which makes use of T-1 phone lines for digital STL transmission.

Finally, the subject of much discussion, Modulation Sciences' ModMinder modulation indicator will be at the show as well. The company is introducing a demodulator card so ModMinder can be used as a standalone modulation monitor.



Dolby's DP501 and DP502

In transmitters there are two notable introductions. Continental will show its 813A 500 W and 814A 1 kW solid state transmitters for FM.

And Harris will be introducing a new line of AM transmitters in the 1-, 5- and 7.5 kW range. Harris is calling its new transmitters the "Gates" line.

One area of new tech which holds a great deal of potential as a broadcast product of the future is Dolby's DP501/DP502 Professional Digital Audio Coding Products. Using a new bit reduction techniques, the DAC modules code two audio channels at a data rate of 128 k bits while maintaining audio quality.

Elsewhere in the digital domain, Sony plans to introduce a professional DAT editing system, which should generate more interest in the slowly emerging technology.

Gotham Audio, meanwhile, is the first to market with a CD recording system for broadcasters. The Spot 90 uses record-once CDs to let stations record spots, jingles, promos and the like.

In digital workstations there are some new entries and some advanced versions of existing products. Symetrix will show the DPR-100 first unveiled at last fall's AES show, with upgrades for broadcasters.

AKG will have a production version of the DSE-7000 digital audio workstation at its booth and the upgraded Dyaxis will be shown by new owner Studer-Editech.

Other companies offering digital workstations are AMS, with an upgrade of the Audiofile; Alpha Audio Automation Systems with the DR/8 hard disk digital recorder; and 360 Systems with its Permanent Playback digital audio message system.

Meanwhile two offerings featured at the Broadcast Supply West booth will be the Yamaha DMP7 digital mixing processor and the new SMI-5A Broadcast Monitor Intercom system for Don Winget of Broadcast Tools.

Audio Broadcast Group will feature Rolling Radio II, a complete mobile broadcast studio in a sleek Chevy Astro Van.

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*Manufacturers suggested retail price.

KIIS' Remote Truck

(continued from page N7)

said the unit soon will be equipped with a new stereo digital audio system capable of utilizing either satellite or digital telco networks for transmission.

Digital, in time for NAB

"About NAB time, the mobile unit will be doing satellite-generated digital audio," Donahue said. He said the microwave unit also will be able to handle digital audio later in the year.

Gannett's new digital audio system for remotes utilizes digital audio compression techniques, high-speed computer modems and can work with either sat-

ellite or digital telco lines. (A separate presentation on this system, "Digital Audio Techniques for Remote Broadcasts" will be presented 30 March.)

In the presentation on the vehicle, Callaghan said he plans to outline "a series of novel steps involved in aiming the parabolic antennas at both ends of the transmission path."

Other areas to be covered are making the best use of limited space in a motor home, block diagrams of signal paths, RF links and primary power wiring. Numerous photographs and diagrams of the vehicle will be presented to illustrate the construction process.

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be most confident that your project will have a functional, ergonomic layout like the ones pictured here. You can be sure that all of your equipment will meet the highest standards of form, function and reliability. You can then concentrate on the other important aspects of managing your facility.

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NAB '90 Schedule At A Glance

Friday, 30 March

9:00—11:30 AM FM Systems Engineering
1:30—4:35 PM Digital Audio Systems

Saturday, 31 March

8:30—11:30 AM Radio Station Tours:
Tour One: WAOK/WVEE and WKLS-FM
Tour Two: WRAS-FM and WSB-AM/FM
Tour Three: WZGC-FM and WGST/WPCH
9:00 AM—7:00 PM Exhibits open
9:00—10:45 AM AM Antenna Workshop; RF Radiation Workshop
10:50 AM—12:35 PM Contract Engineers Workshop
12:00—2:00 PM All—Industry Luncheon
1:30—4:10 PM Safety, Interference & Environmental Concerns
2:45—5:45 PM International Seminar—Workshops
for International Broadcasters
6:00—8:00 PM International Reception

Sunday, 1 April

7:30—9:00 AM FCC/NTIA Policymakers Breakfast
9:00 AM—7:00 PM Exhibits open
9:00 AM—12:05 PM Radio Engineering
12:15—2:30 PM Radio Leadership Brunch
1:30—5:00 PM New Broadcast Technology

Monday, 2 April

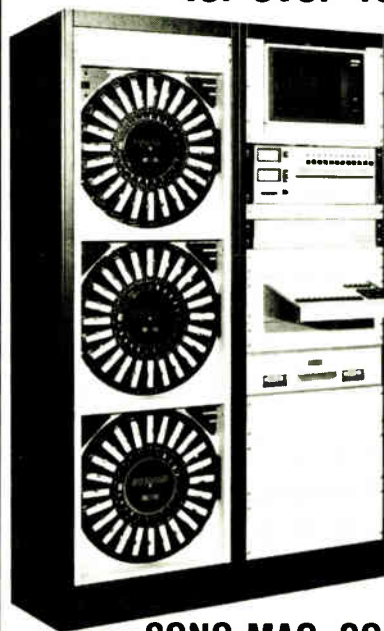
9:00—11:35 AM AM Systems Engineering
9:00 AM—6 PM Exhibits open
10:45 AM—12:15 PM Challenges of the '90s with Fran Tarkenton
12:30—1:45 PM AM Action
1:15—2:45 PM FCC Q&A Forum
1:30—5:00 PM Computers & Communications for Broadcast Engineers
2:45—5:25 PM Broadcast Auxiliary & Satellite Systems
6:00—8:00 PM Ham Radio Operators Reception

Tuesday, 3 April

9:00 AM—4 PM Exhibits open
9:00—11:00 AM FM Systems Engineering II
9:00—11:30 AM Professional Development
9:30—10:30 AM Industry Address: FCC Chairman Al Sikes
12:30—2:00 PM Engineering Luncheon

Convention schedule is subject to change. Check with NAB.

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Atlanta's Peachy Charm

by Marissa Friedman

Atlanta GA NAB, welcome to "The Gateway to the South."

Gone With the Wind, written by Atlanta's own Margaret Mitchell, captures the immortal southern spirit behind the continuous success of this thriving city. Historically speaking, Atlanta is recognized and relied upon as one of the nation's most technologically advanced cities.

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All aboard

In 1837, the birth of a great transportation mecca occurred, when the first railway stake was driven. Engineer Steve Harriman Long chose Atlanta, then called Terminus, as the ideal center for transportation and business growth and founded the southern terminal of the Western & Atlantic Railroad.

As rail connections increased in those early days, Atlanta became established as the major transportation link between the North and the South in the mid-1800s. During the Civil War, Atlanta became a strategic distribution point for supplies and munitions. But Atlanta's own technological advances soon became a disadvantage. Sherman's troops burned Atlanta to the ground to sever the connection between the Confederate states. But Atlanta rose from ashes and railroads continued to play an integral role in the city's development.

By air and MARTA

The first scheduled passenger air service to Atlanta was initiated just 30 years ago. Today, Atlanta operates the world's largest air terminal. The 12.6 acre complex measures the equivalent of 45 football fields and is an established, dependable international air transportation hub for both passengers and cargo.

Metro Atlanta continues the tradition of providing reliable, speedy transportation to its 2.7 million residents with MARTA—Metropolitan Atlanta Rapid Transit Authority.

For just 85¢, a commuter can take advantage of the 32-mile track, which includes 29 individual stops at the major airports, shopping arenas and historical attractions. Additionally, MARTA oper-

ates an integrated bus and railway system with free transfers.

For 10 of the last 15 years, the American Public Transit Association (APTA) has chosen MARTA as the safest mass transit system in the nation for a populated city. Furthermore, the Urban Mass Transportation Administration ranks this system as one of the top two cost-effective systems available.

MARTA strictly enforces vandalizing laws, resulting in virtually one of the cleanest transit systems in the country. Conclusively, said Jerry Stargel, public affairs director for the Georgia Department of Transportation, "The road and



Atlanta's airport is the hub of the southeast.

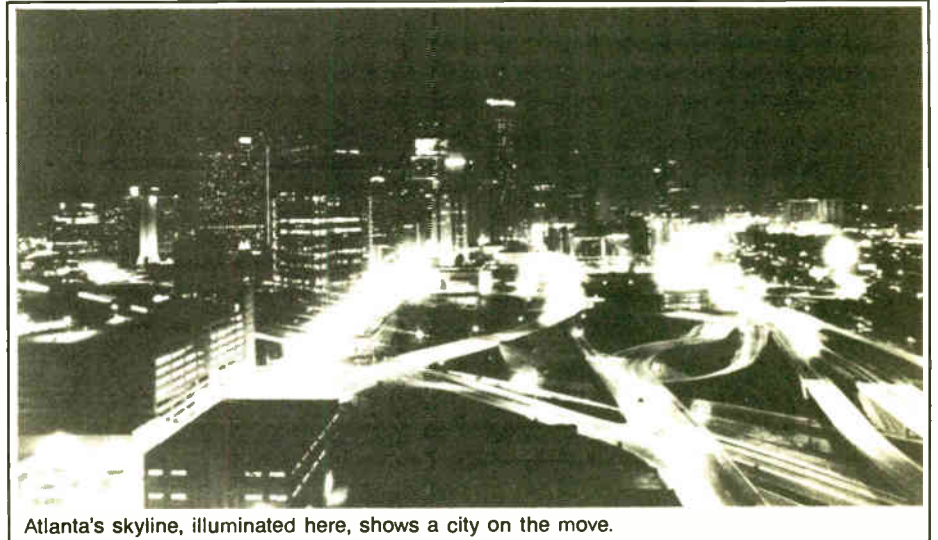
rail improvements that have been made means Atlanta should have adequate transportation beyond the turn of the century."

Where oh where should I go?

Atlanta contains a wealth of entertainment, and there is certainly something for everyone. The Atlanta Underground, nestled between the government and financial centers in the heart of the city, covers six city blocks, or, 200,000 square feet—versus the original Underground's 75,000 square feet.

Designed like a town square with 1900s-style pushcarts, wagons and trucks, visitors stroll below flickering street lights and iron balconies as they become acquainted with Atlanta's charm.

This revitalized entertainment complex is actually as much above ground as below. The \$142 million establishment holds nearly 100 retail shops, 22 restaurants and nightclubs, an array of jazz and comedy clubs, and a colorful street market streaming with vendors.



Atlanta's skyline, illuminated here, shows a city on the move.

Fountains Plaza Park, the main entrance to the Underground, provides, within an 85,000 square foot radius, a "town center" gathering spot, complete with an amphitheater for live performances.

The Park is marked by a newly-

developed 138-foot light tower, equipped with oscillating search lights. New construction, including a central plaza, courtyards and alleyways, beautifully compliment already existing structures.

Other tourist attractions include the

(continued on page N13)

It's Not Just A Phase We're Going Through.

The tremendous success of the Tannoy PBM series of reference monitors is by no means coincidental. Since the introduction of the world renowned NFM-8 nearfield monitor, much time and effort has been spent on discerning the needs of the mixing engineer and the applied requirements of "playback monitors". The PBM Line exemplifies this commitment to excellence in reference studio monitoring. These compact loudspeakers sport robust poly cone mid-bass transducers utilizing efficient long-throw, high power voice coils. The low frequencies are carefully controlled by optimally tuned ports located on the rear of the loudspeakers. Hi frequencies are provided by Hi Power ferro fluid cooled polyamide dome tweeters which extend H.F. bandwidth beyond 20KHZ. The driver accompaniment is knitted

together by means of a precision hardwired crossover unit, utilizing robust low loss components, and heavy-duty input terminals which will accept standard 3/4" spaced banana plugs and the majority of high quality, specialist audio cables. Transducers and crossover assemblies are neatly housed in a stylish, high density, partial wrap cabinet, specially designed to minimize unwanted cabinet resonance, and high frequency reflection. In summarizing, we have left the best feature of all for last "price versus performance."

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Tasting Southern Hospitality

by Marissa Friedman

Atlanta GA Simply saying the name, Atlanta, should make your mouth water. After a tough day on the convention floor, there's nothing like a well-prepared culinary feast to restore energy and soothe frazzled nerves.

According to *Atlanta* magazine, the following dining establishments lead the pack of "in" spots.

■ **Morton's of Chicago** (404-577-4366)

Founded by Arnie Morton, this celebrity restaurant offers superior steaks and lobster and a chance to meet Bob Hope, Roger Moore, Oprah Winfrey, Charlton Heston, Ringo Starr or other superstars. A respectable but informal atmosphere complements the fine cuisine. Morton's is conveniently located adjacent to the Marriott Marquis and within walking distance of many other downtown hotels.

■ **Bone's Steaks** (404-237-2663)

Excellent steak, an outgoing staff, and a dedication to superior customer service make Otto's a favorite choice for George Bush, Dolly Parton, Arnold Palmer, Michael Jordan and Burt Reynolds. Bone's may well be characterized as a club without dues.

■ **Otto's** (404-233-1133)

Otto's offers an assortment of steaks,

pasta and light fare for those individuals who enjoy looking good and letting everybody know it. Raquel Welch, Ralph Lauren, Brooke Shields, and Ted Turner are known to have sampled the selections of this New York-styled establishment. Guests can take in the nightly jazz combo while sipping drinks at the sleek and narrow bar, or while enjoying a fine meal on the upper level.

■ **Indigo Coastal Grill** (404-876-0676)

The energetic and stylistic atmosphere, when mixed with the colorful coastal seafood offerings, makes Indigo's a must-go dining adventure. Warm weather lovers may opt to dine on the back porch, or mingle at the bar as does Lauren Hutton when she visits family in Atlanta. Kelly McGillis, Christopher Reeve, Maria Shriver and (by golly) even Jim Nabors choose the Indigo Coastal Grill to lead their list of favorites.

■ **Buckhead Diner** (404-262-3336)

This updated and slightly extravagant diner offers a variety of gourmet American selections. Exotic seafood dishes including calamari, lobster and shrimp, in addition to unique salads and sandwiches, keep Dan Aykroyd, Tom Brokaw, Jimmy Buffet and Chubby Checker coming back for seconds.

■ **The Coach and Six** (404-872-6666)

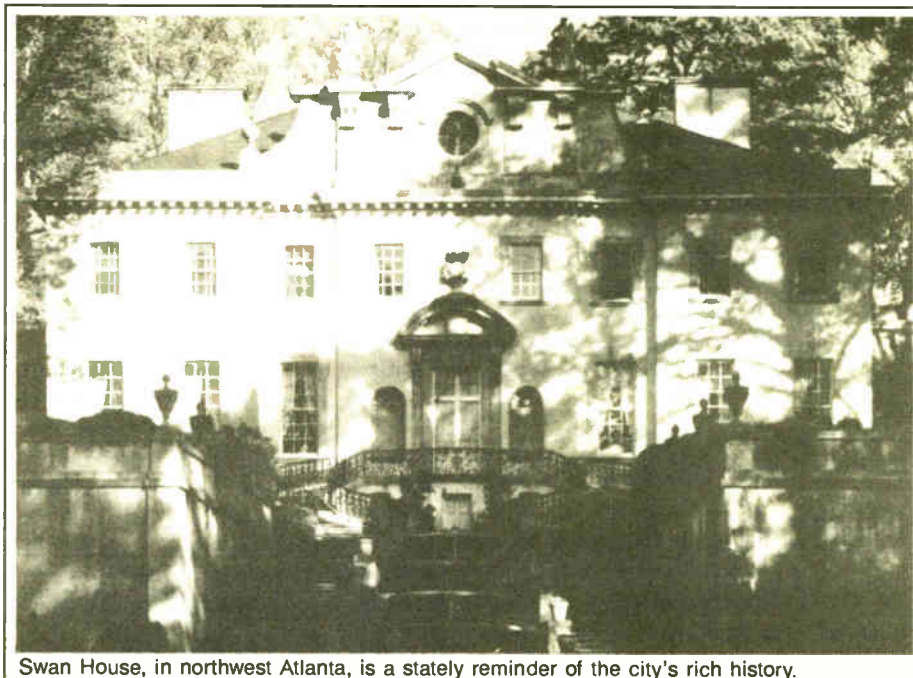
Certified master chef Michael Robins

graces the kitchen of this superior establishment. Seafood specialties and steaks, Continental and American cuisine and specialty triple-cut lambchops receive

Chops as the heavyweight champion of the steak house world. This is considered one of the most fashionable new restaurants of 1989.

■ **Frogs** (404-261-2299)

Frogs offers an excellent menu designed by executive chef Heinz Sowinski. As natural daylight floods the room



Swan House, in northwest Atlanta, is a stately reminder of the city's rich history.

relentless inspection before being served. Ted Turner, Linda Evans, Deborah Norville and Burt Reynolds have been known to whet their pallets occasionally at The Coach and Six. An in-house bakery and pastry kitchen provides an assortment of melt-in-your-mouth desserts.

Atlanta magazine also lists a selection of "highly recommended" restaurants in the metro area.

■ **Chops** (404-262-2675)

The name fits the place like an evening glove. Three-pound steaks, veal chops, lamb chops and grilled swordfish are just a few of the offerings that grace the menu. Award-winning chef Paul Albrecht substantially influenced the entree selections. Owner Pano Karatassos aims to establish

through uncluttered windows, guests are welcomed to try frog legs, veal shanks and chicken hash. A most notable Frogs feature is an available prix-fixe wine list, consisting of approximately 70 selections for a set price of \$15. For dessert, inviting bowls of sweetened whipped cream accommodate any one of several sinful choices. Frogs is also noted to be one of the most fashionable new restaurants of 1989 and delightfully caters to the self-indulgent.

■ **Baci Italian Restaurant** (404-876-3488)

Specialties of the classic Italian setting include calamari, scampi and shrimp dishes. Baci's offers a low-key, comfortable setting with separate dining rooms. A moderately priced menu gives the guest an enjoyable taste of Italy.

■ **J. Paul's** (404-233-4840)

J. Paul's offers the most classic of classic American cuisine. This upscale dining saloon features barbecued smoked ribs and chicken, crab cakes, as well as the classic hamburger. For night owls, late supper is served to 1:30 AM weekdays, and to 2:30 AM weekends.

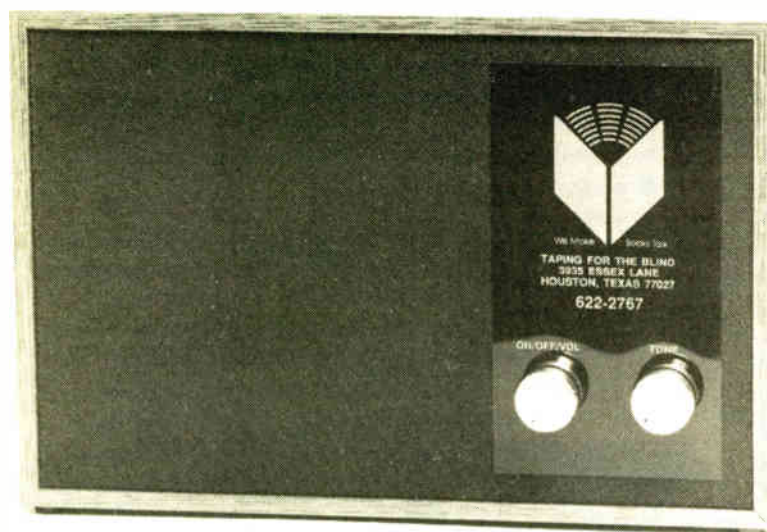
■ **The Spaghetti Warehouse** (404-953-1175)

Shop for pasta! A perfect blend of Americana elegance and homemade Italian cuisine guarantees an enjoyable dining experience. The Spaghetti Warehouse features spaghetti with 11 sauces, a 15-layer baked lasagna, veal and chicken parmigiana, cannelloni and much more. Classic Italian pastries complete your meal—if you have room.

■ **The Lark and The Dove** (404-256-2922)

Considered to be the best kept secret in Atlanta for 18 years, The Lark and The Dove has consistently been chosen for the best prime rib in Atlanta. With a Club Room large enough to accommodate 30 people, a Gallery Room to seat 70 and a menu available in four languages, this could be the prime location for a successful international business gathering.

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A Tour of Atlanta

(continued from page N11)

new Coca-Cola Pavilion, located just three blocks away from old Jacob's Pharmacy, where the first Coke was served in 1886.

This 45,000 square-foot complex features exhibits that trace the 100-plus year history of Coke. Located in the Depot Plaza of Underground Atlanta, the pavilion is expected to draw 500,000 visitors annually.

And still more

Atlanta Heritage Row, located at Underground Atlanta on Upper Alabama Street, chronicles the fascinating history of Atlanta. Through a series of audio/vis-



Blending old with new, this year's host of the NAB convention is a thriving metropolis.

ual displays, visitors are invited into Atlanta's historical periods dating back to the Civil War.

The Science and Technology Museum of Atlanta, known popularly as SciTrek, offers science lovers and curious minds opportunities to challenge the laws of science. This scientific playground will stump even the sharpest minds as visitors lift an automobile engine with one hand or hear whispers from across the room. SciTrek is located in the former exhibition hall of the Atlanta Civic Center.

The Georgia Freight Railroad Depot is within a short walking distance from Underground Atlanta. Atlanta's Oldest Building (1869) is home to the New Georgia Railroad, which departs on steam-engine-driven excursions around the city and to Georgia's Stone Mountain Park.

Zoo Atlanta just celebrated its 100th birthday. Here you can see giraffes, zebras, and big cats in their natural habitat, or visit the Ford African Rain Forests where gorillas and orangutans "run wild."

Six Flags Over Georgia provides a full day of amusement park fun. Or liven up your day at Road Atlanta, the home of various road racing events including the Camel Pro Motorcycle Races and the Camel GT.

These attractions only skim the surface of Atlanta's deep entertainment and cultural offerings. Convention-goers who find the time for some "time-out" will not run out of things to entertain.

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Tara: Gone, But Not Forgotten

by John Wiley

Atlanta GA Ever since Scarlett O'Hara vowed to return to it, Atlanta tourists and conventioners have tried to track down their own piece of the red earth of Tara—but to no avail.

That's because Tara, of course, never existed outside the imaginations of author Margaret Mitchell and filmmaker David O. Selznick, creators of *Gone With the Wind*.

But now through June, visitors can at least get a look at the actual doorway of the most famous film plantation home in history as the Atlanta Historical Society commemorates the 50th anniversary of the 1939 film classic with an exhibit titled "*Gone With the Wind: The Facts About the Fiction*."

Facts on fiction

Also on display are a life-size portrait of Vivien Leigh as Scarlett (at which Clark Gable's Rhett throws a glass of whiskey after she bans him from her boudoir); the original "Paris hat" he presents to her just before that little unpleasantness at Gettysburg and pieces of the vase Scarlett, in a fit of pique, throws at the fireplace in the Twelve Oaks library, barely missing Rhett's head.

Atlanta's phenomenal growth in the past few decades has obliterated many of the city's Margaret Mitchell- and GWTW-related sites, but using the society's exhibit as a starting point,

modern-day Scarlett searchers still can find enough places of interest to fill a pleasant spring afternoon.

The first stop should be "The Dump" (so nicknamed by Mitchell)—the apart-

ment building at Crescent Avenue and

10th Street where the author lived while writing most of her 1037-page novel in the late 1920s.

Looking as if a good breeze would send it tumbling down, the ramshackle structure has been at the center of a raging court battle between Midtown developers and Atlanta preservationists, with a federal judge's ruling in January giving the "Save-the-Dump" side the latest victory.

Continuing down world-famous

Peachtree Street, the Georgian Terrace Hotel, directly across the street from The Fox Theatre, is where Gable, Leigh and other celebrities stayed in town for the premiere.

Closed since the early 1980s, it, too, recently has been given a new lease on life by an Atlanta developer and a Japanese firm that have joined forces in an effort to convert the *grande dame* of Atlanta hotels into a luxury apartment and retail complex.

Downtown, directly behind Margaret

Mitchell Square, visitors can find a smaller exhibit at the historical society's visitor center titled "The Premiere

of *Gone With the Wind: A Grand Event*."

Just across the street stands the Georgia-Pacific Building, constructed on the site of Loew's Grand Theatre, where the film premiered Dec. 15, 1939. On the other side of the square is the Atlanta-Fulton Public Library, where a permanent GWTW exhibit on the main floor displays, among other items, the typewriter on which Mitchell wrote the novel.

At historic Oakland Cemetery, visitors can pay their respects at Mitchell's simple grave, where the author lies among other famous Georgians and quite fittingly, hundreds of Confederate soldiers whose story she told so well.

Catch the movie

Finally, if one is determined to take home an actual piece of the legend, a visit to The Turner Store in CNN Center is in order. Cable television king Ted Turner now owns the rights to the film, and his shop, located adjacent to the World Congress Center, features a wide range of GWTW souvenirs from 50-cent postcards to an \$8.95 reproduction of an original set of paper dolls and a \$14.95 box of "Miss Scarlett" chocolates.

Turner shows *Gone With the Wind* daily in his CNN Cinema 6. What better way to wrap up a tour than to watch Scarlett, Rhett, Melanie, Ashley, Mammy, Prissy and the others in action once again?

■ ■ ■

John Wiley is Senior News Editor for the Kingsport (TN) Times-News and Editor of *Gone With the Wind Collector's Newsletter*.



Fans of Rhett and Scarlett can still find a lot to do in the city that gave birth to *Gone With the Wind*.

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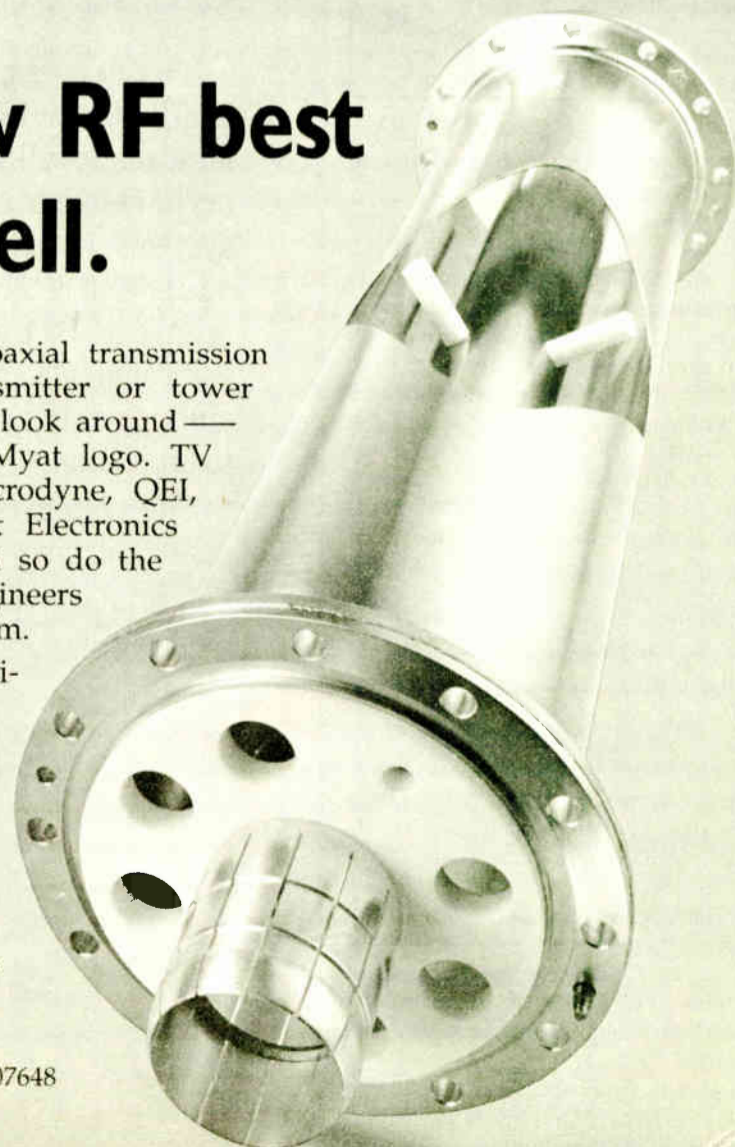


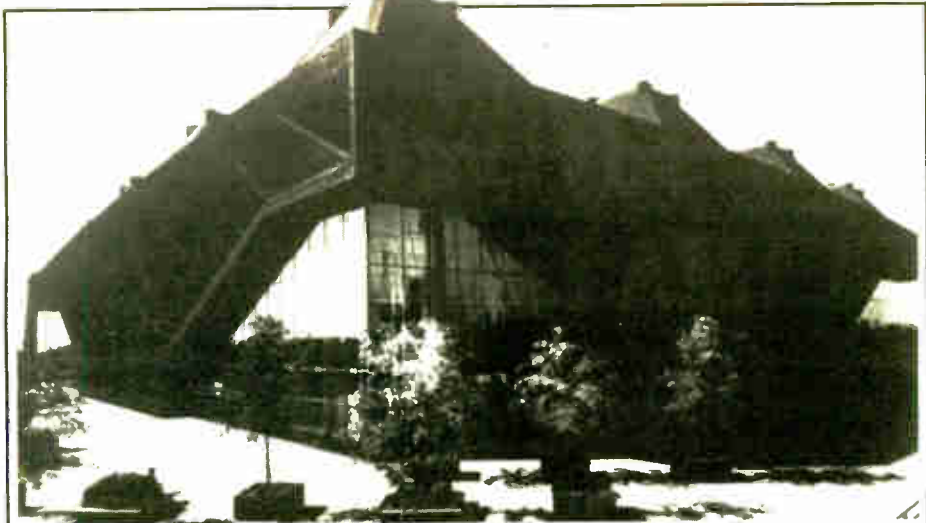
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All About Atlanta...

- The population of Metro Atlanta is more than 2.7 million.
- Eighty percent of the nation's population lies within a two-hour flight of Atlanta.
- Atlanta is the best place to relocate a business, according to Louis Harris and Associates in 1989.
- Atlanta is the second best place to locate and conduct business, according to *Fortune Magazine* in 1989.
- Atlanta had the second highest amount of top trade shows—151 in 1988, according to *Tradeshaw Week Data Book*.
- More than 1.7 million people attended conventions in Atlanta in 1988, according to *Business Travel News*.
- The average daily cost for a traveler to Atlanta in 1989 was \$180.12, according to *Corporate Travel Index*. That breaks down to: food, \$63.82; lodging, \$69.39 and car rental, \$46.91.
- The Georgia World Congress Center offers 640,000 square feet of exhibit space, along with 72 meeting rooms. There are projected to be more than 50,000 hotel rooms in the metro area.
- Atlanta's temperatures range from 41° to 61° in March, and 51° to 71° in April.
- Atlanta is the US Designate to host the 1996 Summer Olympics.

Next, the Olympics

Atlanta GA After graciously accommodating the hordes of broadcasters expected for the 1990 NAB convention, the city of Atlanta will be ready to compete for the world.

The United States Olympic Committee has chosen Atlanta as the US designate to host the 1996 Summer Olympics.

The actual site of the games will be selected in September and Atlanta faces competition from Athens, Greece; Belgrade, Yugoslavia; Melbourne, Australia; Manchester, England and Toronto, Canada.

In selecting Atlanta as our country's choice, the USOC cited superiority in six categories: organization, venue quality, hotels, international airport, rapid transit and ability to handle large crowds.

Atlanta proved her capabilities when she hosted 35,000-plus press members, citizens, and delegates during the week-long Democratic National Convention in 1988. These factors should weigh heavily in Atlanta's favor during the week-long international judging to take place in Tokyo.



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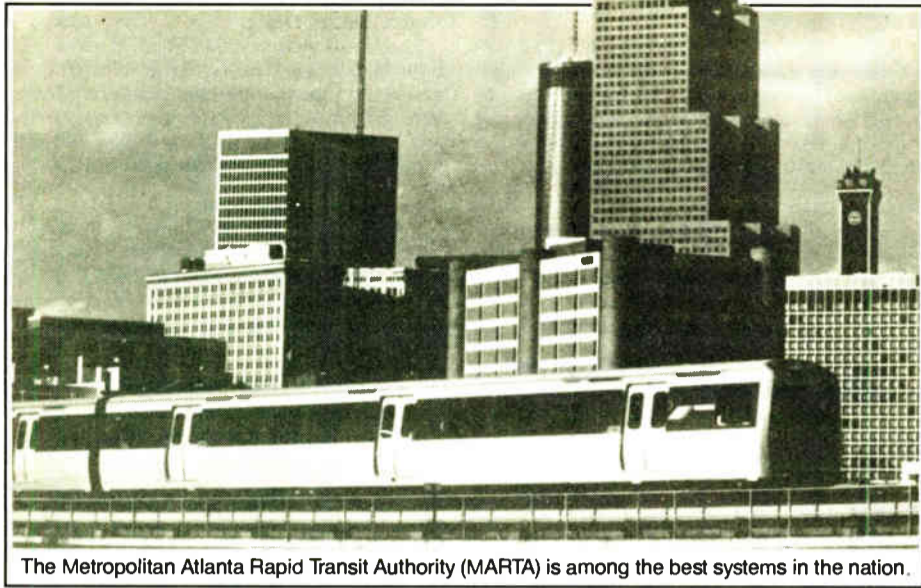
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N9 CHAMBLEE STATION
IRS Building—bus route 125,130; Peachtree/DeKalb Airport—bus route 70; Peachtree Industrial Blvd.—bus route 25

N8 BROOKHAVEN STATION
Windsor Station Shopping

N7 LENOX STATION
Perimeter Mall—bus route 92; Lenox Square Shopping Mall; Holiday Inn-Buckhead—bus route 23; Phipps Plaza—bus route 23, 25; Buckhead—bus route 23; Callanwolde Arts Center—bus route 48; Rhodes Memorial Hall—bus route 23; Ritz-Carlton Buckhead—bus route 23; Westin Lenox; Embassy Suites—bus route 23; Resurgens Plaza; Days Inn Hotel—bus route 23; Terrace Garden Inn; Atlanta Center

N6 LINDBERGH CENTER STATION
Atlanta Historical Society—bus route 40; La-Quinta Inn; Holiday Inn; Lanier Plaza; North-lake Mall—bus route 30, 91; MARTA Headquarters; Buckhead; Buckhead Crossing; Lindbergh Plaza; Chastain Park—bus route 38

N5 ARTS CENTER STATION
Colony Square and Hotel; AT&T Long Lines Bldg.; Woodruff Arts Center; High Museum of Art; The Academy Theatre; Center for Puppetry Arts; Alliance Theatre; Piedmont Park—bus route 36; Buckhead—bus route 23; Peachtree Playhouse; Bell South Corporate; Headquarters; The Granada; Atlanta Botanical Garden—bus route 36; Marriott Suites Atlanta Midtown; Center Stage Theatre; One Atlantic Center (IBM); Rhodes Memorial Hall—bus route 23

N4 MIDTOWN STATION
Piedmont Park; Regency Suites; Residence Inn Midtown; 999 Peachtree Bldg.; Wyndam Hotel

N3 NORTH AVENUE STATION
Ferbank Science Center—bus route 2; Coca-Cola Complex—bus route 13; Southern Bell Building; Days Inn; The Varsity; Pierremont Hotel; Fox Theatre; Georgia Tech Campus; Rio Shopping Center

N2 CIVIC CENTER STATION
SCITREK Museum—bus route 46; EPA; Medical Arts Center; Atlanta Civic Center

N1 PEACHTREE CENTER STATION
Greyhound Bus Terminal; Atlanta Public Library; Georgia-Pacific Center; Macy's Department Store; Atlanta Market Center/Merchds. Mart; The Westin Peachtree Plaza; Comfort Inn; Days Inn; City Centre Hotel; Hyatt Regency Atlanta; Equitable Building; Peachtree Center; Shopping Mall; Ritz Carlton, Atlanta; Marriott Marquis; Atlanta Hilton & Towers; Radisson Hotel

FIVE POINTS STATION
Rich's Department Store; Woodruff Park; Underground Atlanta; Martin Luther King, Jr.; Historic District; Richard B. Russell Bldg.—bus route 3; Grant Park Zoo—bus route 31; Stadium Shuttle; New Georgia Railroad

S2 WEST END STATION
Atlanta Area Tech—bus route 95; Morehouse College; Spelman College—bus route 68; Wren's Nest—bus route 71; West End Mall

S3 OAKLAND CITY
Greenbriar Mall—bus route 83

S4 LAKEWOOD/FORT McPHERSON STATION
Fort McPherson—bus route 76

S7 AIRPORT

E1 GEORGIA STATE
State Capitol; City Hall; Ga. State Univ.

E4 EDGEWOOD/CANDLER PARK STATION
Emory University—bus route 6; Callanwolde Arts Center—bus route 6

E6 DECATUR STATION
South DeKalb Mall—bus route 15; Market Square at N. DeKalb—bus route 123; Ga. Regional Hospital—bus route 15; DeKalb County Courthouse & Admin. Bldg.

E7 AVONDALE STATION
DeKalb Community College; Market Square at N. DeKalb—bus route 75, 8; Stone Mountain Park—bus route 120; DeKalb Farmer's Market—bus route 120, 8

W1 OMNI STATION
CNN Center; Omni Hotel; Omni Coliseum; World Congress Center

W2 VINE CITY STATION
Atlanta University Center—bus route 63

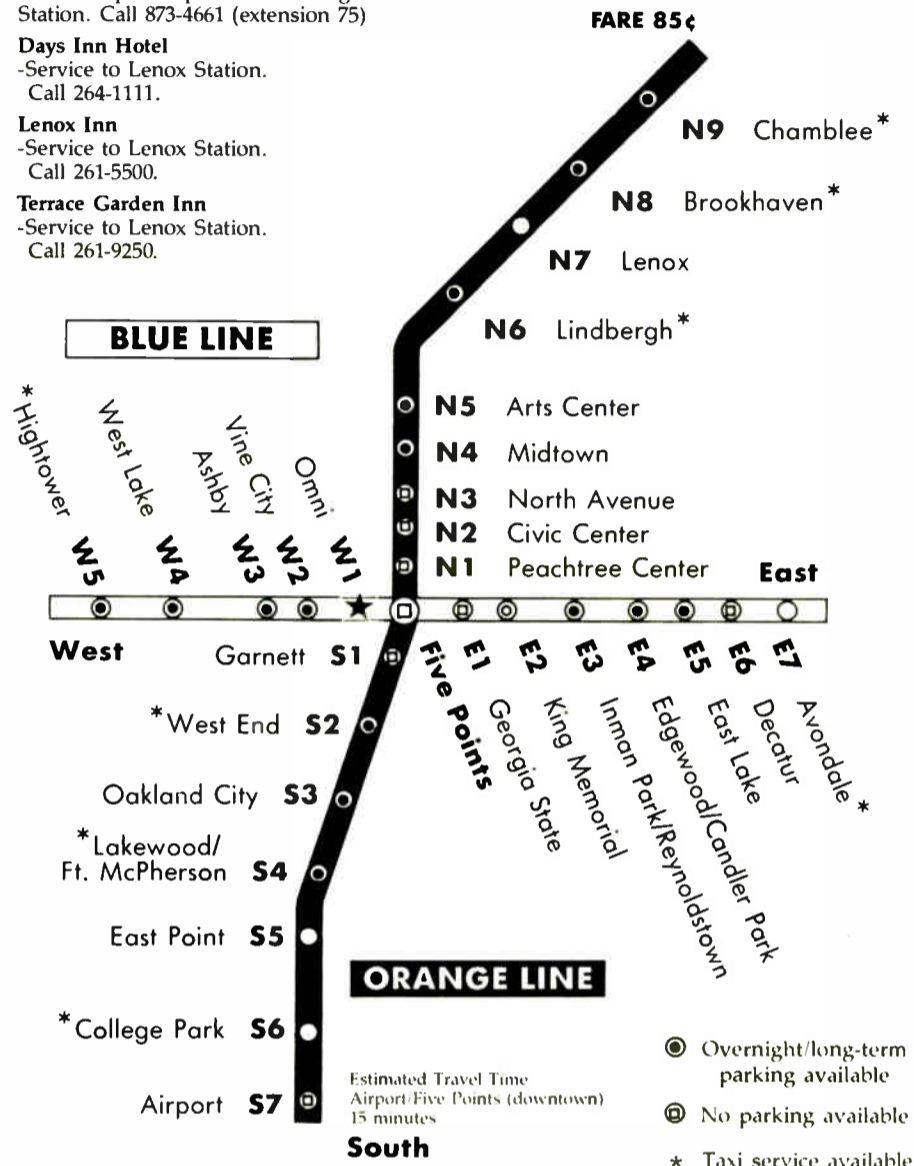
W5 HIGHTOWER STATION
Southwest Hospital—bus route 165; Greenbriar Mall—bus route 66; Six Flags—bus route 201

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- Days Inn Hotel**
-Service to Lenox Station. Call 264-1111.
- Lenox Inn**
-Service to Lenox Station. Call 261-5500.
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A Memo to C.E.'s About Audio Switchers

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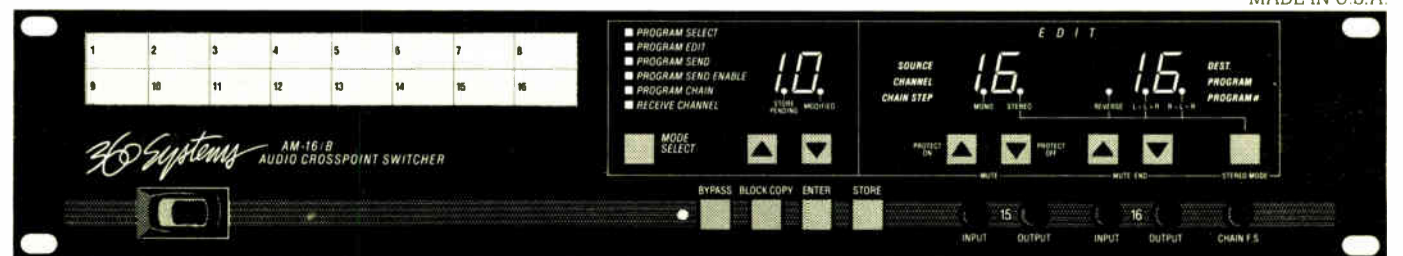
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The 1990 NAB Exhibitors Director is a listing of information provided by exhibitors who responded to an NAB Radio questionnaire survey. Past and potential NAB exhibitors were asked about new and established radio products scheduled to be shown at the NAB this year.

The questionnaires were mailed to vendors in January 1990. Those returned by the deadline are included in this directory.

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COMPANY **BOOTH**
A
Absolute Broadcast Automation 7118
On display: Automation products for the radio industry.

Accu-Weather, Inc. 6723, 6724, 6725
Introductions: Satellite 4-D images.
Established products: Full line of weather graphics images, enhanced RadarPlus images, advanced version of Amiga weather graphics system, forecast/briefing service, Ultragraphix 240 Mac-based weather graphics system.
Contact: Dr. Joel H. Myers, President
619 W. College Avenue
State College, PA 16801
814-237-0309

Accurate Sound Corp. 4111
Introductions: AS-6000B tape conditioner for audio and video tape; MCS-500 cassette recorder/logger.
Established products: AS-200A high speed audio reel-to-reel magnetic tape duplicator; Model 180 Starbird mic boom/stand; CR3A professional studio condenser mic.

Acoustic Systems 1019, 1021
On display: BB voiceover booth.

ADC Telecommunications, Inc. 6001
Introductions: Optical Switch/multiple video switch

Established products: Integrated Cable Organization Network (ICON) Component Analog Patching Systems (CAPS).

Advanced Designs Corp. 2021
On display: WDDS weather data display system displays RRWDS and lightning data; Doprad II Collins Doppler turbulence detection radar system includes 8-bit graphics package, Delta frame animation time lapse recording and playback, map builder and color mixer.

Advent Communications Ltd 1300
Introductions: Analogue and data up- and downconversion systems.
Established products: Radio satellite uplink system, flyaway radio satellite uplink systems.
Contact: Mr. S. McGuinness, Director
Alma Road
Chestham, Bucks England HP53HE 44 494
774400

Akai Professional/IMC 3902, 3904
Introductions: DD1000 stereo optical disk recorder/editor; S1000KB stereo digital sampling keyboard; XR10 16-bit PCM drum machine; DIF1200 AES/EBU interface for Akai ADAM system.

AKG Acoustics, Inc. 6500
Introductions: K270-S, a special, switched version of the K270 headphone. It is a sealed circumaural design, with two transducers per side in a parabolic arrangement for accurate transient response and faithful reproduction even at high playback levels.

Alden Electronics, Inc. 5153
On display: Alden live color weather radar display system; Model C2000 features multi-radar image compositing.

ALLIED

Allied Broadcast Equipment Corp. 4430
Introductions: Model AKG DSE 7000, PeopleLink telephone system, SqueezePlay AM/FM radio cassette with integrated skimmer, Digispot commercial digital storage system with total touchscreen radio control capability.

Established products: Model DN-950FA Cart Player, Dub Center, DART 348 satellite receiver, Microdyne SCPC Equipment, Tec-tan SCPC demodulators, Wegener 1600 Series and 1800 Series, Comtech Satellite Antennas.
Contact: Martha B. Rapp
3712 National Road West
Richmond, IN 47375
317-962-8596 or 217-222-8200

Allied Tower Co. 5606
Established products: Towers and tower services for the broadcast industry.

Alpha Audio Acoustics 6701, 6702
Introductions: Sonex ceiling tiles: drop-in, Class I fire rating.

Alpha Audio Automation Systems 6704, 6704
Introductions: DR/8 hard disk digital recorder.

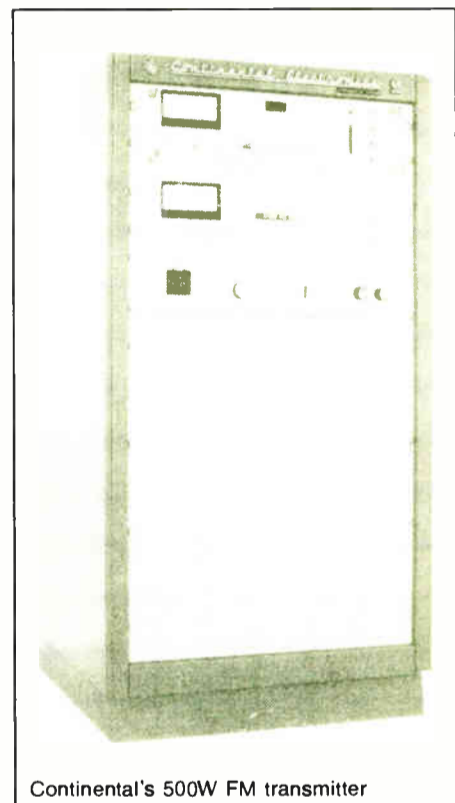
Altronic Research 6814, 6815
Introductions: Model 6775 75 kW air cooled coaxial dummy load for AM, FM and low band VHF; Power Test load system dummy load with calorimeter and interlock mounted on a portable board.
Established products: Water cooled load models: 5705/5 kW; 5715/15 kW; 5750/ 50 kW; 5780/80 kW; 57200/200 kW. Air cooled coaxial load models: 6705/5 kW; 6715/15 kW; 6725/25 kW; 6735/35 kW.
Contact: Doug Starky
PO Box 249
Yellville, AR 72687
501-449-4093

Amber Electro Design 4900, 4901
Established products: Total Solution audio measurement package. This system is able to fully automate a complete audio check-out procedure on tape machines, studio equipment, transmitters and transmission links. Also on display will be the Model 3501 portable audio measurement system.

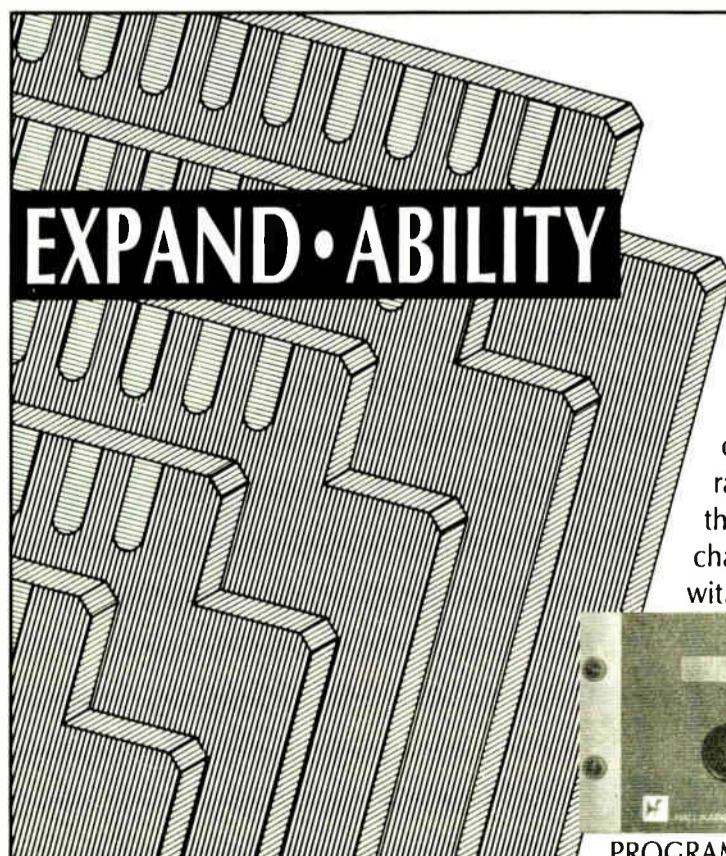
Amek-TAC US Operations TBA
Introductions: TAC AFV Bullet 10/4/2 console; TAC serial interface; Amek Medici equalizer.
Established products: Amek Classic consoles; BCII broadcast console; ESM32 serial interface; Mozart master recording console.

AMS Industries 6338
Introductions: AMS AudioFile Plus: Upgrade of AudioFile, has a transfer of operating software to 32 bit, 4 Mb and transputer platform. Allows for 8 simultaneous inputs/outputs, in analogue and/or several digital formats. Logic 1 (production version has 32 bit floating point architecture. System power provides 4 band parametric equalization and filters on each channel. AMS ST250: XY and MS stereo microphone. AMS Virtual Console System.

Established products: S-DMX stereo digital audio display, A/V sync audio delay for use with video, Timeflex time compression/expansion device, RMX 16 digital reverberation unit Sound-field microphone.

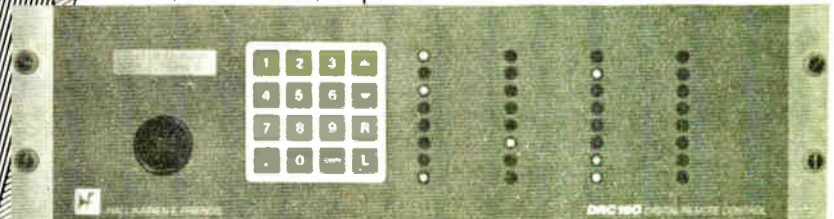


Continental's 500W FM transmitter



EXPAND•ABILITY

EXPANDABLE DIGITAL REMOTE CONTROL. As your station metering requirements grow to additional sites and channels, the DRC 190 from Hallikainen & Friends grows with you. By its inherent, modular-expansion design, the DRC 190 can accommodate a single transmitter or grow to manage up to 100. Reliable firmware includes a multiple access, anti-contention data packet system, allowing any site to communicate with any other site over wire-line, subcarrier or half-duplex UHF radio. The same firmware allows expanding the system by adding additional sites or channels at any time. For a system to grow with, not out of, expand with the DRC 190.



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HALLIKAINEN & FRIENDS 141 SUBURBAN E4 805 / 541-0200
SAN LUIS OBISPO, CA 93401-7590 USA

Andrew Corporation 1860
 Introductions: Segmented semi-flexible coaxial cable for high power HF, MF and LF stations; CATVR and CATVP rated Heliac cables; CATVR and CATVP rated radiac slotted cables.
 Established products: Heliac coaxial cables and waveguides.

Anixter Bros. 1506
 Established products: Line of STL antennas for radio stations.

Aphex Systems Ltd. 6054
 On display: Complete line of audio processing equipment including the Exciter, Compellor and Dominator.

Applied Research & Technology 8117
 On display:

Arrakis Systems 4052
 Introductions: Modulink pre-wired studio systems: cost effective systems based around the 12,000 series modular consoles and a new furniture line, designed for on-air, newsroom and interview studios.
 Established products: SC series turbo consoles; 5000 series modular console; 12,000 series modular console: systems 6, 12 and 18; 10,000 series modular consoles; turret support products for 12,000-10,000 consoles; Modulux series furniture systems.
 Contact: Michael Palmer
 2619 Midpoint Drive
 Fort Collins, CO 80525
 303-224-2248



ATI-Audio Technologies Inc. 5051, 5053
 Introductions: SDA200/SMDA200 Stereo 1x4 audio distribution amplifier modular plug-in to ATI DA10000. Systems available with or without metering. DIP switch output selection for stereo/sum or difference/left only to 8 outputs; right only to 8 outputs. Can hold 10 interchangeable plug-ins.
 Established products: MicroAmp and Encore series audio amplifiers; microphone line/turntable, distribution, interface and power types. Vanguard series 8 and 12 mixer on-air consoles, Emphasizer microphone processor, VU200-VU800 2-8 channel LED bargraph, VJ and PPM studio metering.
 Contact: Ed Mullin
 328 W. Maple Avenue
 Horsham, PA 19044
 215-443-0330

Audi-Cord 4204
 Established products: The DL series cart recorder/reproducer and the S series cart recorder/reproducer.

Audio Accessories, Inc. 3718
 On display: Audio jacks; jack panels; patch cords; standard and custom pre-wired patch panels; polysand polishing cloth for cleaning patch cord plugs; patch cord holders.

Audio Broadcast Group Inc. 4039, 4041, 4045
 Introductions: Rolling Radio II/a complete mobile broadcast studio in a Chevrolet Astro Van.
 Established products: Studio system for AM, FM, and TV audio.
 Contact: Phylliss Freeman
 2342 South Division
 Grand Rapids, MI 49507
 616-452-1596

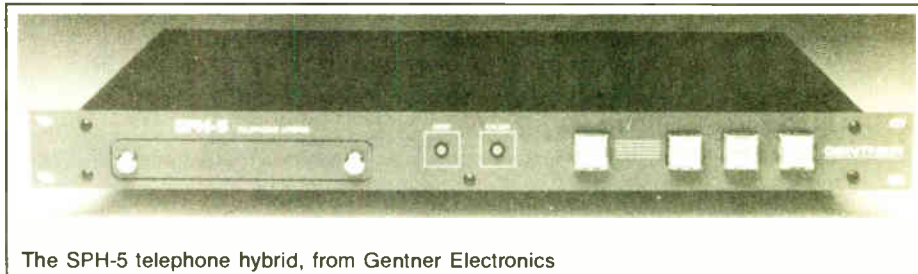
Audio Developments, Ltd. 1942
 Established products: ADO62 Multimixer, ADO62-E Edit Mixer, AD145 Pico Mixer, AD145-E Edit Mixer, AD160 & AD260 ENG mixer, AD081 Distribution System, AD0666 Port-A-Flex system.

Audio Precision Inc. 3252
 Introductions: APP-FM1 software package for audio proof-of-performance testing for FM stereo.

Audio-Technica US Inc. 4214
 Introductions: AT825 X-Y stereo microphone, AT814A omni-plate omni-directional microphone, AT851A cardioid boundary mic, 600 studiphones.
 Established products: AT4071 and AT4073 transformerless externally polarized line & gradient capacitor mic; AT835, AT815, AT 877 shotgun microphones; AT 1031/32 diversity wireless system.

Audiopak Inc. 4811, 4812
 Introductions: New version of AA-4 broadcast tape cartridge/uses advanced 614 tape and the "neutral" casing developed for AA-3. Allows cart machine to handle all tape guidance functions. AA-3: loaded with Audiopak 613.

Auditronics, Inc. 4542
 Introductions: 900 Series television on-air and production consoles with computer control.
 Established products: 200 Series consoles, 310 Series consoles, 400 Series consoles, 1100 Series monaural audio distribution amplifiers, 1200 Series stereo audio distribution amplifiers, 1900 series IFB/mix minus systems.
 Contact: Murray Shields
 3750 Old Getwell Road
 Memphis, TN 38118
 901-362-1350



The SPH-5 telephone hybrid, from Gentner Electronics

Autogram Corp. 4806, 4807, 4808
 On display: Audio consoles: AC-6 six pot rotary; AC-8 eight pot rotary; IC-10 10 pot rotary; LC-10 10 pot slide; Pacemaker 828 slide; Pacemaker 648 slide; Pacemaker 1032 slide; R/TV-12 12 slide; R/TV-20 20 slide. Autoclock timer.

AVCOM of VA, Inc. 3151
 Introductions: PSA-35-A/PSA-37D portable spectrum analyzers for TVRO. COM-96 Ku commercial satellite receiver. SCPC-3000E agile SCPC demodulator. SCPC-500-70 high stability SCPC downconverter. SS-1000 SCPC audio demodulator (crystal controlled).
 Established products: PSA-65A: Portable analyzer, 2-1000 MHz. SCPC-97: Fully agile SCPC international satellite receiver. AVCOM's 3.7-4.2 GHz line amplifier. DCP-20: DC power inserter and/or blocker. RFP 24: RF preamplifier/designed with the PSA-65A in mind.

B

Barrett Associates 4606
 Introductions: Ramko XL series console with new optical linear faders. The Radio Spook from Russco Electronics.
 Established products: Dorrrough Electronics Discriminate Audio Processor Model 610/active display from digital audio source. Beyer Dynamic M500 & M260 Ribbon microphones in active display. Tandum compact disc player, cassette decks, reel-to-reel tape decks and self powered monitors. Energy-Onix FM transmitters.
 Contact: Ernie Belanger
 3205 Production Ave.
 Oceanside, CA 92054
 619-433-5600

Beekman Laboratories 7117
 Established products: Electronic Tubes for the broadcast industry's major manufacturers/RCA, EIMAC, Amperex, Sylvania, EEV, R.F. Labs

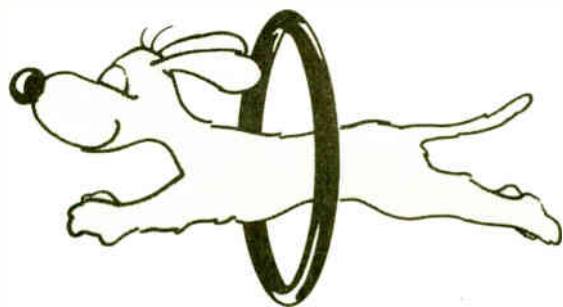
Belar Electronics Laboratory 4308
 Introductions: New concept in modulation minders to accurately monitor the L+R or loudness content and the stereo composite/simultaneously viewed on two displays.
 Established products: Broadcast monitoring equipment.
 Contact: Arno Meyer
 119 Lancaster Avenue
 PO Box 76
 Devon, PA 19333
 215-687-5550

Belden Wire & Cable 6007-6015
 On display: Complete line of cables and connectors.

Benchmark Media Systems, Inc. 1318-1322
 Introductions: New products designed to be used exclusively with the Benchmark System 1000 card frame, i.e. #1201 Input Buffer/Mixer Module, #1202 Matrixed Output Module and #1203 Gain Control Module.
 Established products: System 1000, SPM-2/3, MIA-4x4/MIA-4x4, and IFA Series.
 Contact: Albert M. Beckary, Acct. Exec
 3817 Brewerton Road
 North Syracuse, NY 13212
 315-452-0400

BEXT, Inc. 8104 through 8108
 Introductions: FM Equipment: LC STL systems (1.5 & 15 W), SDC stereo generator, LCR FM composite receiver.
 Established products: TEX 20 (20 W exciter), PTX 20 (30 W exciter), PTX 80 (80 W exciter), PJ 1000 (1 kW amp) T 5000 (single tube type 5000 W FM amp), PJ 2000 (single tube type 2000 W FM amp), PJ 250 (solid state 250 W amp), PJ 500 (solid state 500 W amp), STL 15 W amp.
 Contact: Anne De Fazio
 739 5th Ave., Suite 7A
 San Diego, CA 92101 619-239-8462

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 LANCASTER AVENUE AT DORSET, DEVON, PENNSYLVANIA 19333
Call or write for more information on Belar AM, FM, Stereo, SCA and TV monitors.

Beyer Dynamic Inc. 1938, 1940
 Introductions: DT 158 and 159 headset mics; M500DJ and M260DJ ribbon mics; DT770 Pro sealed ear monitoring headphones, M58 ENG news and sports interview mic; HM560 head-worn mic; TG-X Series high performance mics.

Bogner Broadcast Equipment 2028
 Established products: FM antennas for radio stations.

Broadcast Audio Corp. 4452
 Established products: Line of broadcast consoles in a variety of sizes and configurations.

Broadcast Automation Inc. 8123
 Introductions: Live Assistant 100% digital automation.

Broadcast Electronics, Inc. 4500
 On display: FX-50 solid state 50 W FM exciter, one tube 1 kW to 35 kW FM transmitters, Phase Trak 90 cartridge machine with electronic non-encoded phase correction & learn mode, Mix Trak 90 modular audio consoles, 12, 18, & 21 mixer models, microprocessor program automation systems and C-QUAM AM stereo exciter.
 Contact: Jim Ulm
 4100 N. 24th St.
 Quincy, IL 62301
 217-224-9600

Bradley Broadcast Sales, Inc. 6354
 On display: As a distributor of broadcast equipment, Bradley will be displaying both new and established products.
 Contact: Neil Glassman
 8101 Cessna Avenue
 Gaithersburg, MD 20879
 301-948-0650

BSW
 BROADCAST SUPPLY WEST
 America's Full-Time Broadcast Supplier

Broadcast Supply West 4046
 Established products: Audio consoles, audio processing equipment, CD players and cartridge machines, portable DAT recorders, telephone EQ.
 Contact: Tim Schwieger, VP Marketing
 7012 27th Street
 West Tacoma, WA 98466
 800-426-8434

Broadcasters General Store, Inc. 8016 through 8022
 Introductions: Hit Design Taylor Equalizer, SMO-900 stereo modulation optimizer, California Digital DigiMod 2000 Optimod replacement cards. Sine Systems NewsDirector, news edit work station. Sine Systems RFC-1 Dial-up remote control. Cellcast, cellular remote package.
 Established products: Telos Systems digital hybrid products; Dolby SR Spectral Recording; Studer A-727 CD player; Denon DN 950 FA CD player; BE Dura Trak 90 series cartridge machines.
 Contact: Todd Harrington
 2480 S.E. 52nd Street
 Ocala, FL 32671
 904-622-9058

Broadcast Technology Partners 1045, 1047
 Introductions: FMX-equipped receivers.
 Established products: FMX technology and its implementation.
 Contact: Tom Keller
 FMX
 6721 Cielia Court
 Springfield, VA 22152
 703-569-3135

Bryston Ltd. 6039, 6041
 On display: Audio products for the professional industry.

Burk Technology 9038, 9040
 Introductions: CL-16 Enhanced Operating Software for total station facilities control.
 Established products: TC-B transmitter remote control systems and ARC-16 transmitter control systems featuring simplicity, cost effectiveness and reliability.
 Contact: Peter Burk
 7 Lomar Drive
 Pepperell, MA 01463
 508-433-8877

Cablewave Systems, Inc. 4020
 Introductions: Rigid line products, STL elliptical waveguide.
 Established products: Coaxial transmission line, elliptical waveguide, RF connectors, FM broadcast antennas, mounting hardware, rigid line, pressurization equipment and associated accessories.
 Contact: William Meola, Natl Sales Mgr
 60 Dodge Avenue
 North Haven, CT 06511
 203-239-3311

Cam-Lok Inc. 9017
 On display: Electrical connectors, receptacles, power devices.

Canare Cable, Inc. 3730, 3732
 Introductions: Coaxial stripping tools; crimp style RCA plugs.
 Established products: Star Quad mic; snake systems including audio trucks, pigtailed and junction boxes; cable reels; audio connectors; multipin connectors.

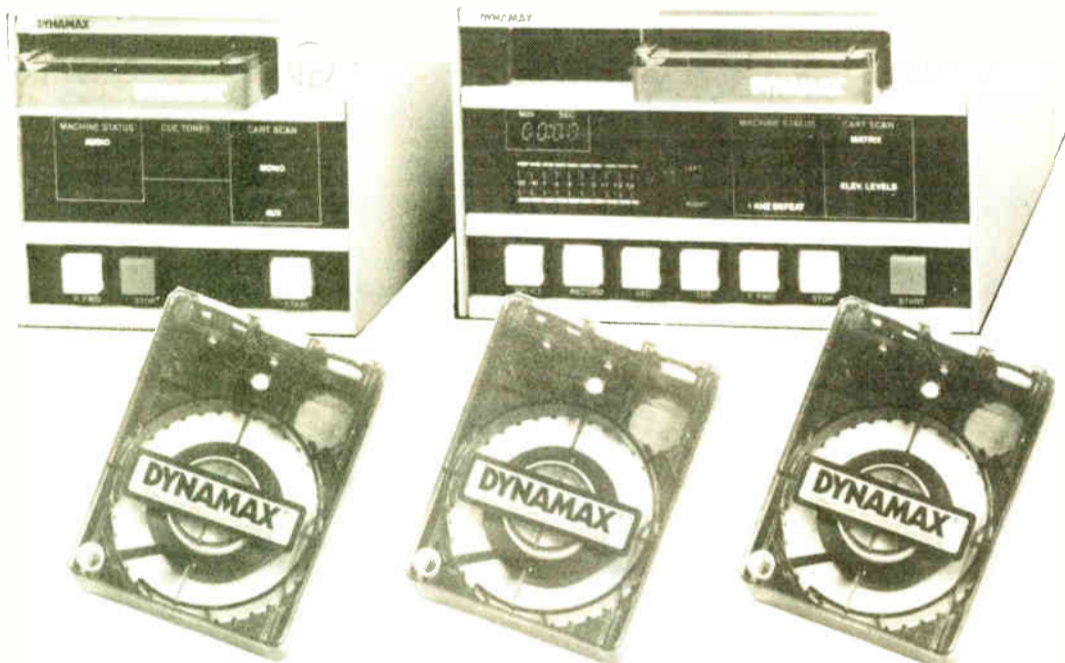
CCA

CCA Electronics, Inc. 4442
 On display: Line of FM transmitters in a variety of powers.
 Contact: Bernie Moskow
 PO Box 426
 Fairburn, GA 30213
 404-964-3530

Central Tower, Inc. 6602-6606
 Established products: Towers and towers services for the broadcast industry.

Century 21 4203
 Introductions: Upgrades to the Digital Studio System, a complete CD automation system.
 Established products: CD changer and variety of music libraries and formats on a variety of storage media.

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Computer Concepts Corp. 4040
 Introductions: Commercial Management System/PC-based product combining a digital audio board and software fully integrates with the Broadcast Traffic System or operates as a stand-alone system.
 Established products: Integrated Broadcast System: includes traffic, billing, accounts receivable, word processing, general ledger, payroll, accounts payable, music management, station automation, data management and script manager.



Comrex Corporation 5214
 Introductions: The multiline Frequency Extender provides the flexibility of using one, two, or three dial telephone lines for audio program transmission. It features one button auto-dial and setup, automatic line equalization and noise reduction.
 Established products: Remote program audio transmission equipment, telephone interface systems for both analog and digital telephone lines, frequency extenders, telephone couplers and hybrids. Fiber optic transmission system.
 Contact: Lynn Distler
 65 Nonset Path
 Acton, MA 01720
 508-263-1800

Comtech Antenna Systems, Inc. 3002, 3004
 Established products: Complete line of satellite antenna systems from 2.4 to 7.3 meter. The 3.8 is used extensively for SCPC downlinks and the Offsat EL/Az is the antenna of choice for most transmit SCPC applications.
 Contact: Tom Christy, V.P. Marketing
 3100 Communications Road
 St. Cloud, Florida 34769
 407-892-6111

Concept Productions 4330
 Introductions: CAPS I: Computer Assisted Programming System w/DAT decks. Can control 12 DAT decks w/full random access of all audio selections. Used for automated, live and satellite programming. CAPS II: Features DAT decks/DTL (Digital Tape Loader), 120 hours of accessible storage. Radio Formats available on analog or digital audio tape.

Conifer Corp. 1334 through 1338
 Introductions: Wireless Cable (MMDS) and Wireless Cable (ITFS) product technology: five models of low noise, GAsFET 2.1-2.7 GHz amplifiers Model QL-1015, a 31 channel wireless cable downconverter wireless cable/ITFS repeater (beam bender) system.
 Established products: HLN Series/ITFS Downconverters with interdigital bandpass filter for excellent input selectivity. QL-1010/broadband 31 channel block downconverters.

Continental Electronics 4316
 Introductions: 813A 500 W totally solid state FM transmitter. 814A 1000 W solid state FM transmitter.
 Established products: Continental will be exhibiting a complete line of AM & FM transmitters along with FM antennas and other related RF equipment. Also on display will be audio processing and other studio equipment.
 Contact: Steve Claterbaugh
 Div. of Varian Associates
 4212 S. Buckner Blvd.
 PO Box 270879
 Dallas, TX 75227
 214-381-7161

Control Concepts Corp. 2025
 On display: Islatron product line provides complete facility protection, or system protection for transmitter, studio, satellite system, video editing, control systems and other digital equipment; Islatron active tracking filters.

Cortana Corporation 3734
 Introductions: New Radial Chaser. Effective for low power stations.
 Established products: Complete Stati-Cat System for lightning protection.
 Contact: Evelyn Nott
 PO Box 2548
 Farmington, NM 87499
 505-325-5336

CRL 4656
 Introductions: Audio Signature/programmable microprocessor-based stereo four-band compressor.
 Established products: Complete line of audio processing products for AM, FM, TV and mediumwave/shortwave, Dynafex single ended noise reduction systems, SCA and FM stereo generator programmable microphone processor.
 Contact: Dottie Leeseekamp
 2522 West Geneva Drive
 Tempe, AZ 85282
 602-438-0888

Current Technology 9026, 9027
 Introductions: MPA/MPAP auxiliary digital-quality power panels for use with Current Technology Power Siftors.
 Established products: Power Siftors Series: handle line noise, electrical impulses and reactive spiking.
 Contact: Martin Sandberg
 1400 S. Sherman
 Richardson, TX 75243
 214-238-5300

Data Center Management, Inc. 5014
 Established products: The DCM NewsData newsroom automation software designed exclusively for radio and television newsrooms.
 Contact: Rick Summers, Marketing Mgr.
 1017 Kenilworth Avenue
 Charlotte, NC 28204
 704-377-1496

Dataworld 4456
 On display: Station coverage maps and complete coverage research and consulting services.
 Contact: Jack Neff
 PO Box 30730
 Bethesda, MD 20814
 301-652-8822




Delta Electronics, Inc. 4518
 Introductions: AM stereo/FM stereo modulation monitoring and metering panel, several new options for the AM splatter monitor; TCT-XHV/ a super high voltage toroidal current transformer.
 Established products: Stereo Noise Generator, AM Stereo Exciter Monitor, Coaxial Transfer Switches, RF Ammeter and Monitoring products.
 Contact: John Bisset
 5730 General Washington Drive
 Falls Church, VA 22312
 1-800-8-DELTA-8 or 703-354-3350

Denon America 8114
 On display: DN-950FA CD cartridge player for station use.
 Contact: Beverly Williams
 Professional Products
 222 New Road
 Parsippany, NJ 07054
 201-575-7810

DIC Digital 7002, 7004
 Introductions: Full line of DAT cassettes in both packaged and bulk form. Standard lengths: 15, 30, 40, 60, 90, 120 minutes. Custom loading for duplications and programmers is available on request. Also available: DAT pancakes and empty DAT shells and other accessories including splicing tape and clear library cases.
 Established products: Full line of 8mm video cassettes in lengths of 15, 30, 60, 90 & 120 minute length. Also custom loading on request. All 8mm accessories available including empty shells (V10s), pancakes, splicing tape and clear cases.
 Contact: Kevin Kennedy
 2 University Plaza
 Hackensack, NJ 07601
 201-487-4605

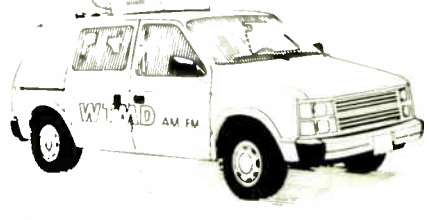
Dielectric Communications 4108
 Established products: FM antennas; dummy loads; RF filters; transmission lines.
 Contact: Colleen Mitchell
 Unit of General Signal Corp.
 Tower Hill Road
 Raymond, ME 04071
 207-655-4555



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- Easily installed on your van or promotional vehicle.
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Dolby

Dolby Laboratories 4443

Introductions: MT Series: Up to 24 channels switchable between Dolby SR or A-type noise reduction. Automatic alignment; channel grouping capabilities. Automatic encode and decode changeover. DP501/502 Digital Audio Coding Technology: 2 channels of audio in 128 kbits/s/channel.

Established products: Two channel unit switchable between Dolby Spectral Recording (SR) and A-type noise reduction. Automatic encode and decode changeover.

Contact: Lisa Van Cleef
100 Potrero Avenue
San Francisco, CA 94103
415-558-0200

Dorrrough Electronics 5506, 5508

Introductions: Model 40-P loudness meter with peak hold; 120-S routing chassis for multiple source connections for use with stereo signal test model 1200.

Established products: Discriminate audio processor model 610; Models 40-A, 10-A, 12-A, 20-A and 21-A loudness meters; stereo signal test set model 1200.

Contact: Kay Dorrough
5221 Collier Place
Woodland Hills CA 91364
818-999-1132

Digital Audio Research, Ltd. 8000

Introductions: WORDFIT/Automatic dialogue synchronization software; 16 Channels Systems/16 channels of simultaneous output, Rewritable Optical Disk/2 track hours on one removable MO disk.

Di-Tech 2954

On display: Audio distribution amplifiers; EBS equipment; audio routing switchers.

E

Econco 5756

On display: Rebuilt power transmitting tubes and low wattage reflex klystrons.

Contact: Debbie Storz
1318 Commerce Avenue
Woodland, CA 95695
916-662-7553

Electro Impulse Lab Inc. 4305

On display: Dry, forced air cooled RF dummy loads for FM; RF calorimeters; RF attenuators; dry convection cooled loads.

Electro-Voice, Inc. 4618

Established products: Full line of Electro-Voice broadcast/production microphones, Sentry monitor loudspeakers, and broadcast electronics.

Contact: Ivan Schwartz
600 Cecil Street
Buchanan, MI 49107
616-695-6831

Electronics Research Inc. 4013-4015

Introductions: System monitor & alarm; The SMA-104 unit with its microprocessor based multi-tasking controller, rugged isolated power supply and I/O capability can provide protection for a multi-user antenna/combiner system by selective monitoring at key locations throughout the system. The unit provides connections for up to 15 stations and issues warnings and alarms to these stations when problems occur such as combiners overheating, excessive power, high VSWR and low transmission line pressure.

On display: Antennas, filter, field services, etc.

Emergency Alert Receivers 6442

On display:

Energy-Onix 4744, 4746, 4748

Introductions: SST-30:30 W exciter; SST-1000: 1 kW solid state transmitter; MK-3.5/5.5: 3.5/5.5 kW FM transmitter; MK-7.5/12: 7.5/12 kW FM transmitter; MK-25/30: 25/30 kW FM transmitter; low power solid state AM transmitter, 5 kW AM broadcast transmitter, AM protector.

ESE 6714, 6715

Established products: Complete line of clocks and timers for the broadcast studio.

Eventide

the next step

Eventide Inc. 6707, 6707, 6708

Introductions: H3000B Broadcast/Post Production Ultra-Harmonizer, a digital audio effects device with software specifically for video, film and radio applications. Can tailor all H3000B's presets. H3000SE Ultra Harmonizer: includes 6 new algorithms, multi-band delays, can modify any parameter using 1 of 19 waveforms. BD941/BD942 Broadcast Audio Delays: designed to offer obscenity protection. BD980 Delay Line and PD860 2 Channel Audio Delay.

Established products: HS322 internal sampler board option for H3000 Models: adds 16 bit, 44.1 kHz sampling to already extensive tool list. Stores 11.8 seconds/stereo, or 23.7 seconds/mono.

Contact: Gil Griffith
One Alsan Way
Little Ferry, NJ 07643
201-641-1200

F

Fidelipac Corporation 4624

Introductions: Audiomax/a new series of broadcast audio endless loop tape cartridges.

Established products: Dynamax/broadcast audio cartridge recorders, reproducers, and eraser/splice detectors. Broadcast audio endless loop tape cartridges, tape, bulk erasers, cartridge storage systems, on-air lights.

Contact: Larry Lamoray, Director Mktg
Box 808
Moorestown, NJ
609-235-3900

Film House, Inc. 4053

On display: Producer of TV marketing campaigns for radio stations.

Flash Technology 5612

On display: Tower strobes and lighting devices.

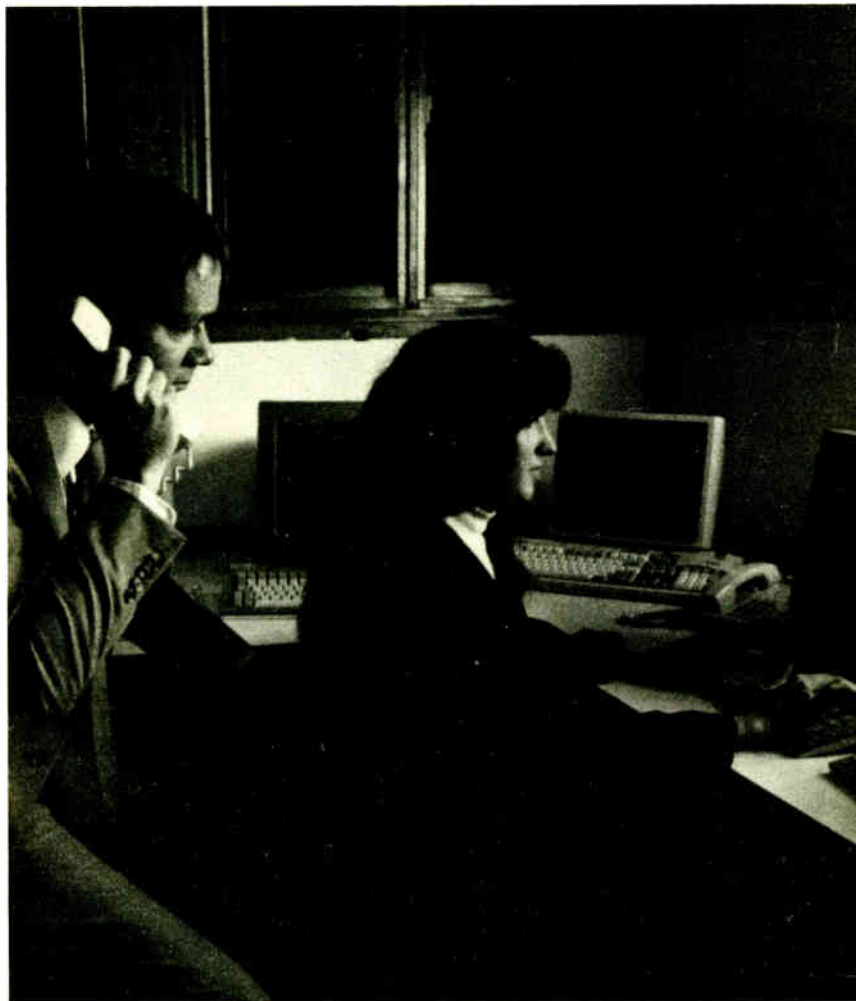
Focal Press 1946

On display: Publishers of books on equipment and techniques for the video and broadcast industry.

Fort Worth Tower Co., Inc. 4730, 4732, 4734

On display: Full line of tower products.

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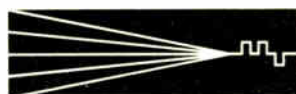
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1318 Commerce Avenue
Woodland, CA 95695 USA
Telephone: 916-662-7553
Fax: 916-666-7760 Telex: 176756

Future Productions, Inc. 3201
 Established products: Video duplication systems, signal distribution systems, and EFP Production Console.
 Contact: Jerome Horowitz
 630 Ninth Avenue, #403
 New York, NY 10036
 212-333-3606

Gotham Audio Corp. 2342
 Introductions: The Spot 90 compact disc production system for broadcasters/the industry's first recordable CD system allowing stations to record spots, jingles and promos on CD.
 Established products: Totally digital DJ suite from Harmonia Mundi Acustica; Prodat superdynamic limiter and Audio Tool Kit from Audio+Design; the Ferrograph 9500 digital disk recorder in several versions; and several microphones from Neumann.
 Contact: Russell Hamm
 1790 Broadway
 New York NY 10019
 212-765-3410

G

GE American Communications Inc. 5722
 Established products: Satellite communications services to the TV and radio broadcast industry.

GENTNER™

Gentner Electronics Corporation 5852
 Introductions: Digital Hybrid II, auto-nulling telephone hybrid, uses digital signal processing technology, SPH-5: Full-featured analog hybrid. SPH-5E: Full-featured analog hybrid with built-in single line frequency extender. PeopleLink: Modular telephone system that allows you to specially configure the system. Lazer/Prizm: All digital processing chain for FM/TV stereo audio. Established products: EFT-3000: 3-line digital frequency extender; VRC-2000 remote control; routing DA; Audio Prism: Digitally controlled audio processor for FM; Phoenix: digitally controlled processor for AM, NRSC-1 compliant.
 Contact: Gary Crowder
 1825 Research Way
 Salt Lake City, UT 84119
 801-975-7200

H

H&E Micro-Trak Corp. 4722, 4724
 On display: Full line of station and studio consoles and cabinets; audio amps and DAs along with other studio needs and accessories.

Hallikainen & Friends

Hallikainen & Friends, Inc. 4202
 Introductions: DRC200 Transmitter Remote Control System, SAT201 Satellite Dish Steering System. The SAT201 can communicate with standard CRT terminals over any full time circuit, including leased lines and sub-carriers.
 Established products: TVA132/142 Audio Mixing System, TEL171 Digital Telemetry System. The updated TEL171 system provides stable, easy to read digital metering, with automatic decimal point placement.
 Contact: Harold Hallikainen, President
 141 Surburban Road
 San Luis Obispo, CA 93401-7495
 805-541-0200



AKG's DSE7000 digital audio workstation

Harris-Allied Broadcast Equipment 4430
 Introductions: Transmitters: Gates Series: 1 kW, 5 kW, 2.5 kW medium wave. DX-100: Digital 100 kW medium wave/expansion of DX Series. Also includes 10, 25, and 50 kW models. HT 1FM: 1000 watt solid state FM; part of new HT Series. Also includes 250 & 500 W models. HT 7 MM: 3-8 kW FM. Available in single or three phase models. Expansion to HT 3.5/10FM, 3.5-10 kW HT Series. HT 1LS: Platinum Series 1 kW low band VHF TV transmitter. Includes low band/high band VHF transmitters from 1-60 kW.
 Established products: Transmitters: SX-2.5A: 2.5 kW medium wave. Also includes 1 & 5 kW models. HT 25FM: 25 kW FM transmitter from HT 20/25FM Series. Also includes 20 kW model. HT 35FM: 35 kW FM from HT 30/35FM Series. Also includes 30 kW model.
 Contact: Marilyn Wilson
 PO Box 4290
 Quincey, IL 62305-4290
 217-222-8200

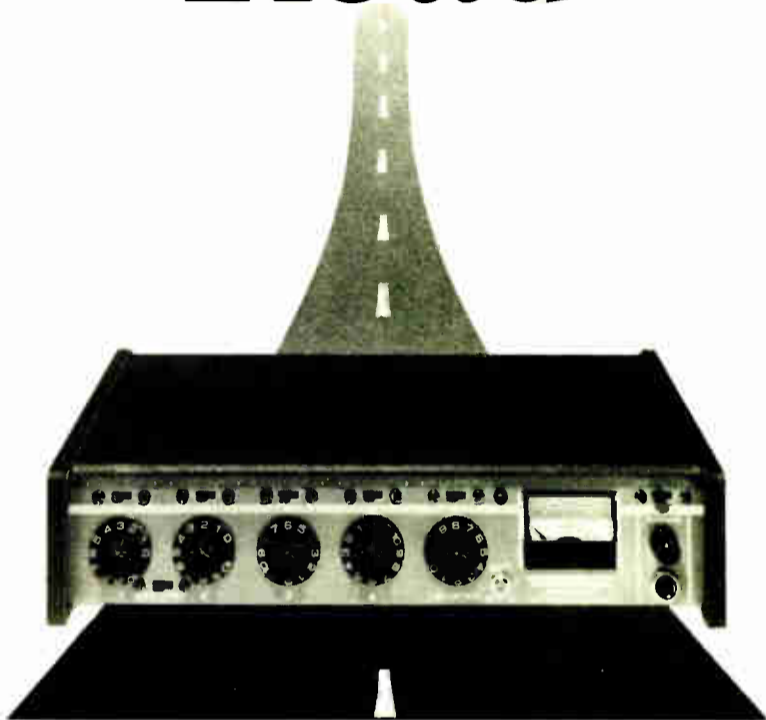
GLW Enterprises 4124
 Established products: Complete line of on-air and production consoles for radio stations.

GML, Inc. 3750
 Introductions: Series III Peripheral Systems, Series II Parametric Equalizer, Series III Compressor/Limiter. All are circuit redesigns using latest surface mount technology to increase dynamic range.

Gorman Redlich Mfg. Co. 4902
 Introductions: EBS encoders and decoders, NOAA weather radios, digital antenna monitors.
 Contact: Jim Gorman
 257 W. Union Street
 Athens, OH 45701
 614-593-3150

Holiday Industries, Inc. 5049
 Introductions: The ELF (Extremely Low Frequency, 50-60 Hz) sensor for the HI 3600 series of non-ionizing radiation detectors measures both magnetic and electric fields at power line frequencies.
 Established products: Complete RF radiation exposure measurement system measures both magnetic and electric fields and provides ANSI standard time-averaged values in real time; full line of broadband field strength meters for measurement of both magnetic and electric fields.
 Contact: Burton Grant
 14825 Martin Drive
 Eden Prairie, MN 55344
 612-934-4920

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IDB Communications Group, Inc. 3634

Introductions: New radio services include international digital audio to Tokyo and Sydney. Existing routes include London, Paris, Moscow, West Germany. Also, new cost effective C-Band "FM2" service available domestically on Satcom IR data voice services.

Established products: Domestic and international satellite transmission and distribution services for radio communications. IDB owns and operates a major 24-hour teleport facility in New York and Los Angeles; radio backhaul and remote events through nationwide sports satellite interconnect system. Contact: Michael B. Teeling, PR Coord 10525 West Washington Boulevard Culver City, CA 90232-1922 213-870-9000

IGM Communications Inc. 4612

Introductions: IGM-MC. Third member of the PC-based Audio System Controllers family. Features logging, direct start, built in monitor and meters, RS 232 communications, R-DAT ready outputs and new software features.

Established products: Program Automation Systems for automated, live assist and satellite stations. PC-Based program controllers and switchers, multiple cartridge playback systems, Instacart, Gocart 24, SC-MC-EC Controllers.

Contact: Rick Sawyer
4041 Home Road
Bellingham, WA 98226
206-733-4567

Innovative Automation 8113, 8115

On display: Automation equipment for radio stations.

Inovonics Inc. 5601, 5603

Introductions: Production-ready version of Model 706 FM stereo generator with the FMX coverage-extension as an option.

International Tapetronics Corp. 3422

Introductions: The Series 1, a new cart machine featuring high performance, LED meters and easy maintenance.

Established products: Complete line of cart machines and cartridges for the radio industry.

Contact: Ken Waterman
Pro. A-V, 3M Center
Bldg. 255-35-05
St. Paul MN 55144
612-733-1110

Jampro Antennas Inc. 5030

Introductions: JA/LS/New low power TV antenna series based on our JSH high power series.

Established products: JTC, circular polarized spiral antenna for all bands; JHPC, side mounted FM penetrator series; JBPC, band pass combining system providing group delay specifications, designed for all power levels.

JBL Professional 2916

Introductions: Control 1 Plus high performance personal monitor loudspeaker system.

Established products: Control 5, Control 10 and Control 12SR control monitors; JBL 4400 Series studio monitors.

Kahn Communications 4410

Established products: ISB AM stereo system; PowerSide; Good 'N' Loud.

Kintronic Laboratories, Inc. 6638

Introductions: 100 kW AM transmitter combiner, 25 kW dummy load, solid state directional antenna controller, model of HF curtain antenna.

Established products: 50 kW directional AM phasor cabinet, AM diplexer equipment, STL isocoupler, standard equipment rack, vacuum RF contactor, fixed and variable inductors.

Contact: Gwen King
144 Pleasant Grove Road
Bluff City, TN 37618
615-878-3141

Kline Towers 8034, 8036

On display: Guyed towers; self-supporting towers; platform towers; multi array towers; space frame towers; special type antenna structures.

Lake Systems Corp. 1712

Established products: Equipment and accessories for professional broadcast use.

LDL Communications, Inc. 1634

On display: One bay of the broadband spearhead antenna that LDL is supplying for the Shoreview Master FM System in Minneapolis, MN. This master antenna will have the capability of handling ten full power, Class C FM stations.

Established products: LAMBDA CP Antenna for low band VHF stations.

Lexicon Inc. 2452

Introductions: OPUS/e digital audio editing system; Model 300 digital effects system; LXP-5 multi-effects processing module; MRC MIDI remote controller software version 3.00.

Established products: OPUS digital audio production system; Model 2400 stereo audio time compressor/expander; 2400 version 3.0 software; 480L digital effects system; 480L version 3.00 software.

Lightning Eliminators & Cons. 5027

On display: Complete line of lightning protection devices.



Logitek Electronics Systems, Inc. 4750, 4752

Introductions: MAS-LC a new audio accessory system plug-in module. This is a stereophonic peak limiter and RMS compressor with four DA outputs. Five modules can be plugged into the audio accessory system rack.

Established products: Distribution amplifiers, power amplifiers, phono preamplifier, preselectors, consoles, LED VU meters, meter monitors, audio interface, audio accessory system and an automated crossfader.

Contact: Tag Borland
3320 Bering Drive
Houston, TX 77071
713-782-4592

LPB Inc. 4512

On display: LPB audio consoles and transmitters showcased in low power radio station. Highlighting specialty equipment for commercial broadcast low power authorizations, Travelers Informations Systems, carrier current, etc. Citation II Signature III will also be shown with the S-2 audio compressor/limiter and the Denon DN-950A CD cart player.

Contact: John Tiedeck
28 Bacton Hill Road
Frazer, PA 19355
215-644-1123

M/A-COM 2152

Introductions: K-Line line of 2 to 15 GHz radios with heterodyne and remodulating transmitters.

Magnum Towers Inc. 6712, 6713

On display: AM, FM, TV and microwave towers.

Marti Electronics 4400

Introductions: PA-48 4' diameter full parabolic reflector for 940-960 MHz.

Established products: Model STL-10 aural studio transmitter link; Model TSL-10 multi-channel data link; Model SCG-10/SCD-10 subcarrier system; Models RPT-2, RPT-15 and RPT-30 remote pickup systems; UHF/VHF radio links.

McCurdy Radio Industries 5322

Introductions: Multi bus on-air automation system, TIF-800 telephone hybrid frame, TIF-951 telephone interface and DTMF decoder, MDA-100 1x8 summing distribution amp w/individual level adjustment, SA 14023 extended range audio level meter (VU & RPM), IKP-950 intercom key panel for CS9500/CS9400 plus digital intercom system.

Established products: CS9500/CS9400+ digital intercom systems with upgrade capabilities, ATS-100 stereo audio test set, ADA 700 stereo 1x8 audio distribution amplifier, ADS-500 compact audio distribution system, SS8800 audio console.

McMartin Inc. 4429

Established products: Line of RF products for the radio industry.

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Comtech's 3.8 meter antenna is the perfect antenna for reception of any format audio network, whether the transmission is Digital, Sub-carrier or SCPC. Careful, tight tolerance construction assures maximum gain and minimum beamwidth so necessary for today's crowded satellite arc. Range tested gain spec of 42.9 dB.

Comtech's 3.8 meter antenna. You simply won't find a better price anywhere. What you will find from Allied is top quality performance at realistic prices. It just wouldn't make sense to

go somewhere else. At Allied, we carry a complete line of audio downlink equipment, and we sell it for the best price. We back it with Allied Satellite Equipment's unequalled reputation for quality, price and service.

Complete audio downlink equipment will be on display in the Harris Allied booth #4430, Hall D at NAB.



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Media Computing Inc. 3540-3544
 Introductions: PROTEC/PC-based programmable remote control system for broadcast equipment. Established products: The Electronic Newsroom (TEN)/PC-based, menu-driven newsroom software.

Media Touch Systems 1200
 On display: Touch Screen broadcast control systems: OpLOG Air Control/Automation System integrates traffic, newsroom, and playlist systems, creating "paperless" studio & fully interactive control "console" OmniPLAY CDs and DATs provide control of emerging audio technologies for air, production, and effects. OmniPLAY Automatic Engine brings the power of Touch Screen to conventional automation systems.
 Contact: John Connell
 50 Northwest Blvd. Unit 11
 Salem, NH 03079
 603-893-5104

Micro Communications, Inc. 2728
 Introductions: FM super power isolator (SPI), a high power, waveguide or coaxial device that stabilizes RF system response and eliminates VSWR deviation as seen by the transmitter.
 Established products: FM multiplexers, FM hybrid combiners, FM switching combiners, FM notch filters, FM band pass filters, FM power dividers, coaxial transfer switches, and line sections.
 Contact: Jennie E. Allen, Sales/Advertising Manager
 438 Kelley Avenue, Grenier Field, Box 4365
 Manchester, NH 03108-4365
 603-624-4351

Modulation Sciences Inc. 4802, 4803
 Introductions: New hardware options for the FM ModMinder, including an internal demodulator card that allows direct connection to an RF sample port.
 Established products: FM ModMinder, the "UnProcessor" precision peak modulation monitor with PC remote capability; StereoMaxx spatial image enlarger; Sidekick SCA generator available for audio or data; CLD composite line driver systems and composite DAs; CP-803 composite processor for FM.
 Contact: Eric Small
 115 Myrtle Avenue
 Brooklyn, NY 11201
 718-625-7333

Moseley Associates 4336
 Introductions: MRC 1620 remote control with optional Task Master 20 PC control smart options; smart options for MRC 2; new family of program multiplex & SCA products.
 Established products: PCL 6000 Series frequency agile STLs; PCL 606 for high RF environments; CL-100 telemetry link, Data-Mux/4 & 8 channel data transmission; MRC 2 remote control with PC control software/controls up to 99 sites; RPL 4000 Series remote programming links.
 Contact: Jamal Hamdani
 111 Castilian Drive
 Santa Barbara, CA 93117
 805-968-9621

MOTOROLA
Motorola C-QUAM Stereo 4704 through 4716
 Introductions: New C-QUAM AM stereo portable receivers.
 Established products: C-QUAM AM stereo model 1400 exciter and model 1410 modulation monitor
 Contact: Steve Kravitz
 1216 Remington Road
 Schaumburg, IL 60173
 312-576-0554

Myat Inc. 6708
 Introductions: New 9 3/16" 50 ohm rigid coaxial transmission line. Also available: 7/8" 50 ohm, 1 5/8" 50 ohm, 3 1/8" 50 ohm, 4 1/16" 50 ohm, 6 1/8" 50 ohm, 6 1/8" 75 ohm, and 9 3/16" 75 ohm. Other products include power dividers, hybrids, adapters, Tee assemblies, U links, hangers, anchor plates, lateral braces, slip-type hangers, gas barriers, reducers, flexible line assemblies, end seals and manual transfer patch panels.
 Contact: Phil Cindritch
 PO Box 425
 Norwood, NJ 07648
 201-767-5380

Nautel 4144
 Introductions: AMPFET ND 25/AMPFET ND50 New Model 25 kW (upgradable to 50 kW) and 50 kW solid state AM broadcast transmitters.
 Established products: AMPFET SERIES AM broadcast transmitters/solid state, modular, available in powers from 400 W to 100 kW.
 Contact: Jorgen B. Jensen, Mgr Broadcast Services
 201 Target Industrial Circle
 Bangor, ME 04401
 207-947-8200

Neutrik USA, Inc. 6610, 6612
 Introductions: Pro-Fi: Professional RCA plug which "breaks no ground"/ground contact is spring loaded to make first, break last. A1 audio generator/analyzer: simplifies advance audio measurements while maintaining laboratory quality specifications.
 Contact: Bill Dorman
 195-S3 Lehigh Avenue
 Lakewood, NJ 08701-4527
 201-901-9488

New England Digital 161W 0161
 Introductions: Post Pro™ SD, a new model of the company's Direct-to-Disk™ hard disk recorder/editor family, designed specifically for sound design applications in post-production. Has a maximum of 16 tracks with 60 minutes of recording.
 Established products: Synclavier® 6400 featuring 32 sampling voices, up to 64 Mb of random access memory and an enhanced velocity/pressure keyboard. NED's 2 Gb Optical Disk database is available as an option, for on-line storage and retrieval.
 Contact: Ted Pine, Marketing Manager
 49 North Main Street
 White River Jct, VT 05001
 802-295-5800

NPR Satellite Services, Inc. 6545
 Established products: Full range of domestic and international interconnection services to radio broadcasters.

Orban Associates 4208
 Introductions: 4000 Transmission Limiter, for complete transparent control of peak modulation level of transmissions on analog or digital microwave links, telephone/post lines, or on-air broadcast. Does not allow on-air loudness to vary with peak-to-peak coverage.
 Established products: Optimod AM, FM, TV, and HF systems. Rx signal restoration and enhancement processor with Orban circuitry. Allows transfers of older material to tape with open, modern sound. Full line of compressor/limiters, equalizers/processors.
 Contact: Howard Mullinack
 A Div. of AKG Associates Inc.
 645 Bryant Street
 San Francisco, CA 94107
 415-957-1067

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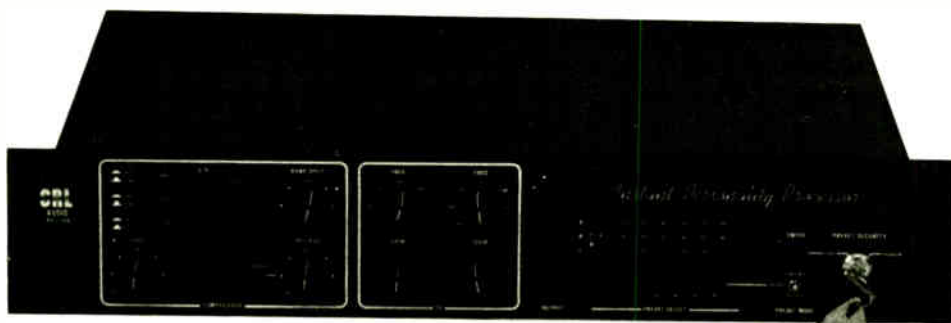
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Otari Corp. 4352
 Introductions: MX-5050-B-III 2-track featuring improvements to the B-II and the MK-IV series: 2,4 and 8-track machines. Also the series 54 audio mixing console and TC-100 transfer console.

Panasonic Pro Audio (Ramsa) 2534
 Established products: The SV-255 portable DAT recorder and the SV-3500 studio DAT recorder/player will be shown.

Patch Bay Designation Company 1346
 On display: PatchPrints custom labeling for most brands of audio and video patch bays, control panels, racks, mixing boards, rear-illuminated button switches and other field designation areas.



Potomac Instruments, Inc. 4406
 Introductions: Type 1900 AM directional antenna monitoring system.

Q

QEI Corporation 4300
 Introductions: CAT-LINK STL/TSL auxiliary channels may be used for PRO and SAP baseband. BTT-500 FM exciter/transmitter in a 19" rack mount package. Solid state FET power amplifier, fully current, voltage, and VSWR protected. BTT series can be ordered in powers from 10 W to 600 W. Also new, the 695-Sync FM exciter system, allows one or more 695 channels to be synchronized to one "master" exciter.
 Contact: William Hoelzel, III
 PO Box D
 Williamstown NJ 08094
 609-728-2020

R

Radio Design Labs 6646
 On display: AMS-1 AM synchronous noise monitor.

Radio Systems 4903-4910
 Introductions: New product rumored.
 Established products: RS-Series consoles: RS-6, RS-12, RS-18; RS-1000 Broadcast DAT machine; DA-8 and -16 audio DA; PA-1 stereo phono preamp; timers and studio clocks; pre-wired patch panels and Lazer studio cabling.

RAM Broadcast Systems 6820
 Introductions: SX Series audio consoles, PS-1000 phascope, Telecom C4 noise reduction system.
 Established products: SAS 3200 audio routing switcher series.

Regier Data Systems 6106
 On display: Traffic Master line of micro-computer business systems for the broadcasting industry/sales, traffic, logging, billing, receivables, payables, payroll, general ledger, financial reporting, management, music, ratings.

RF Technology 2612
 Introductions: RF-Pathfinder central receive antenna system with remote control; RF-ACC automatic chrominance corrector; RF-FOM-13 fiber optic link system; RF-Quadscan central receive horn antenna system for ENG applications; RF-C Series miniature portable microwave systems.
 Established products: UPL series compact transmitters for live sports coverage; O3 Series miniature portable transmitters; RFL Series fixed links; full range of low noise power amplifiers.

Richardson Electronics, Ltd. 2844
 On display: Power tube grid tubes/rectifiers for AM, FM, TV, SW; power grid tubes/planar triodes for UHF translators, transposers and transmitters; camera tubes; cavity amplifiers for FM, UHF and VHF; cathode ray tubes; klystrons and TWTs for studio transmitters.

Rohn 6400
 On display: Guyed and self-supporting antenna towers; tower accessories; tower hardware; tower lighting; fiberglass equipment shelters.

RTS Systems, Inc. 2624
 Introductions: MRT327 modular intercom user station; Series 2100 wireless intercom; Series 2200 wireless IFB
 Established products: BP325 programmable user station 2 channel intercom headset station; MCE325-2/4 channel intercom headset/speaker station; 4-way modular packaging/portable or permanent mounting; 2528 dual channel remote control mic preamp.

S

Scala Electronic Corp. 4224
 On display: FM antennas; transmission lines; coaxial cable; STL antennas.

Schafer World Communication Corp. 4602
 Introductions: Schafer programming automation systems including CDs, DATs, digital, full automation live assist and standalone units. Schafer audio consoles.

Scientific Atlanta Group 5730 A249
 Introductions: Digital Audio-SEDAT Model AD 7565 Receiver: Allows use of partial transponder (narrowband) carriers and provides customized network management features for radio networks.
 Established products: Analog FM SCPC satellite receivers, models AD 7550, AD 7450. In use by radio networks for satellite delivery of analog FM SCPC audio (stereo and mono) and data to network affiliates. Analog FM SCPC satellite transmitter/AD 7350.

Seck 2916
 On display: Models 62 and 122 portable production mixers; Model 1882 multitrack recording mixer.

Sennheiser Electronics Corp. 3101, 3103
 Introductions: MKH 60 P 48RF condenser microphone short shotgun, HD 25 headphone, HD 450 studio headphone, WM-1 wireless microphone mixing system, MKH 70 P 48 long shotgun condenser microphone.
 Established products: Full line of products which includes high quality headphones, microphones, wireless RF microphones and infrared products for film, broadcast, sound reinforcement, hearing impaired and pro sound industries.

P

Pacific Recorders & Engineering 4130
 Established products: The STX Series stereo television consoles. The Radiomixer BMX Series II, BMX Series III, Newsmixer and Stereomixer consoles for broadcast and production; the AMX Series four track and ABX Series eight track.
 Contact: Anders Madsen, Sales & Mktg Mgr
 2070 Las Palmas Drive
 Carlsbad, CA 92009
 619-438-3911



BOOTH #4144 - NAB '90

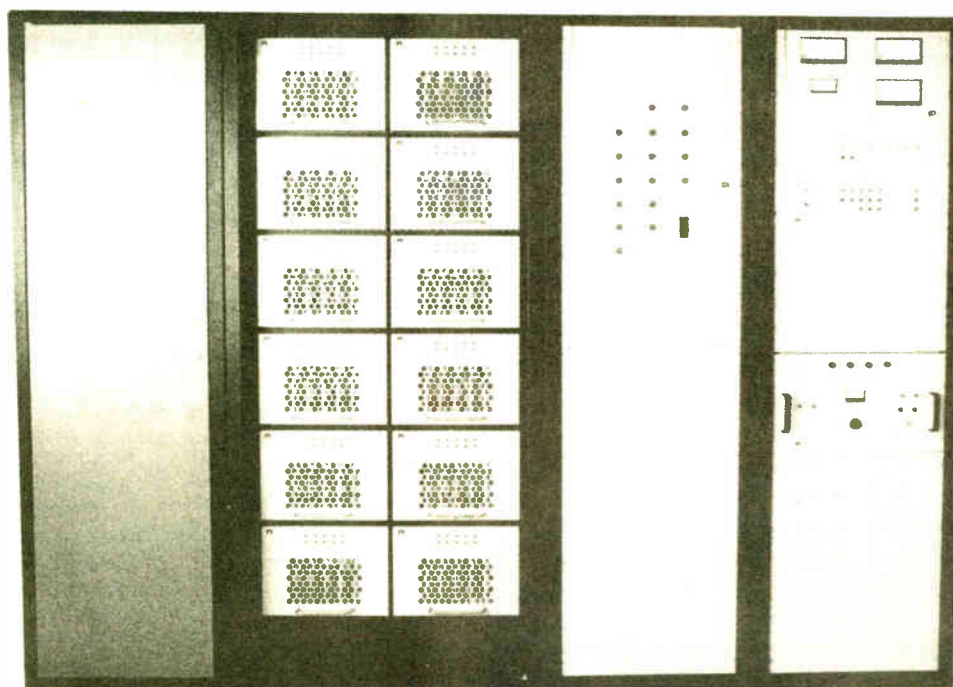
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Nautel Maine Inc.
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Shively Labs 4030
 Introductions: Full range of pattern work available, particularly directional requirements. Class A upgrade packages will also be featured.

SHURE®

Shure Brothers, Inc. 4524
 Introductions: VP88 stereo mic; L Series wireless mic system for lavalier, body-pack and hand-held.
 Established products: Beta Series of supracardioid mics; AMS totally integrated automatic mic/circuitry system; FP Series of audio circuitry products for field production, SM Series of professional broadcast mics.
 Contact: Jack Kontney
 222 Hartrey Avenue
 Evanston, IL 60202
 708-866-2200

Solutec Ltd. 6800
 Introductions: SOL-6800 new software; Sol-20/20 new Graticule feature.
 Established products: SOL-6800 automated broadcasting system for commercial inserts; SOL 5532 audio DA.

Sono-Mag Company 4301, 4303
 Established products: Program automation systems for satellite services; syndicated services; live assist and local programming, CD players and programmers; carousels; cartridge recorders and players.
 Contact: Tom Rousey
 1833 W. Hovey Avenue
 Normal, IL 61761
 309-452-5313

SONY®

Sony Corporation of America 5130 0155
 Introductions: Pro R-DAT editor and player and new products in the MXP-2000 category. The VSP-8000 Digital Audio Mixer will complement the D-1 and D-2 VTRs and can be used in CD mastering applications. It operates at 48 kHz and 99.7 kHz.
 Established products: Designed to interface with video equipment in demanding audio-for-video applications. On display will be the PCM-3348 48-track DASH recorder, the PCM-3402 digital two-track audio recorder, the APR-5003V analog two-track record and MXP 2000 audio console.
 Contact: Nick Giordano
 1600 Queen Anne Road
 Teaneck, NJ 07666
 201-833-5229

Sound Ideas 5011
 On display: General Series 100 stereo effects on CD; General Series 2000 stereo sound effects on CD; Ambience Series 3000 4-minute ambience sounds on CD; Hollywood Series 4000 effects on CD; Production Music Library; Sampler Library.

Soundcraft 2916
 Introductions: 200 Delta and 800 production consoles.
 Established products: SAC 200 and SAC 2000 production and on-air consoles; 200 B/VE audio for video console.

Sound Technology 4344
 On display: The 3100 series programmable transmission/audio test system; the model 1510A tape recorder/audio test system and other test equipment including distortion analyzers, oscilloscopes, spectrum analyzers and test systems.

Sprague Magnetics Inc. 5406
 Introductions: Long wearing heads for MCI, Otari, Scully and Ampex machines.
 Established products: Head recontouring; replacement heads; recorder care products; alignment tapes; recorder parts; replacement head assembly.
 Contact: John M. Austin Jr.
 15720 Stagg Street
 Van Nuys CA 91406
 818-994-6602

Stainless Inc. 5613-5619
 On display: Towers and related equipment.

Stanton Magnetics Inc. 4726
 Introductions: ST-3.5; ST-5; ST-Surround; ST-10; 45M/MC; 680EL-MP; 500 AL-MP.
 Established products: Magnetic cartridges; replacement styli; turntable slip mats; turntable preamp/EQ; announcer earphone; professional headphones; record care products; DJ starter kit.

Stantron 3534, 3536, 3538
 Introductions: Modular, pre-assembled consoles, with wood trims and choices of paint colors. Mobile workstations to accommodate 1/2" or 3/4" editing. Economy lightweight equipment racks.
 Established products: Pre-Assembled Modular Consoles and Equipment Racks. Featuring wood trims and color selections. Accessories including rack slides and fan trays.

STUDER REVOX

Studer Revox 4552
 Introductions: D820 digital recorder; A807 2-channel recorder; A729 CD system controller; A779 mixing console; A723 active studio monitor; Dyaxis 2+2 multichannel hard disk audio recording/editing system.
 Established products: D820X digital audio recorder; A820-24 multichannel tape recorder; A827-24 multichannel tape recorder; A812 2-track tape recorder; A810 2-track tape recorder; A807 2/2 VUK tape recorder; A807 4 1/2" VUK tape recorder; A730 CD player; A727 CD player.
 Contact: Douglas Beard
 1425 Elm Hill Pike
 Nashville, TN 37210
 615-254-5651

Studio Technologies, Inc. 5605
 Introductions: Broadcast simulator/Generation II stereo simulator, converts mono program material to simulated stereo.

Swintek Enterprises Inc. 6531
 Introductions: Mark 200D/RJ remote telephone switching box; Mark QDC-50A/HiFi microphone system.
 Established products: Mark QDC, Mark 50A, Mark 1L wireless microphone systems; Mark 200D, Mark 200D/AC, Mark 200 D/C wireless full duplex intercoms.

Switchcraft Inc. 6043,6045
 Introductions: Audio patch panel.
 Established products: Jacks; plugs; switches; connectors; molded cable assemblies; audio accessories.

Symetrix Inc. 6342
 Introductions: DPR100 digital audio workstation; SX205 precision audio meter; SX206 multi-dynamics processor.

Comtech's 3.8 Meter has the Extra Performance Margin Needed for Crystal-Clear Audio Reception.

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face tolerance unequalled by mesh or other home-type antennas. The result is higher efficiency, optimum side-lobe performance and increased gain. This is the extra margin of performance that only a Comtech Antenna can provide. That's why literally hundreds of Comtech 3.8 Meter Antennas are operating today at radio stations throughout the U.S.

So why settle for marginal performance when you can have a performance margin today and in tomorrow's 2° spacing environment.

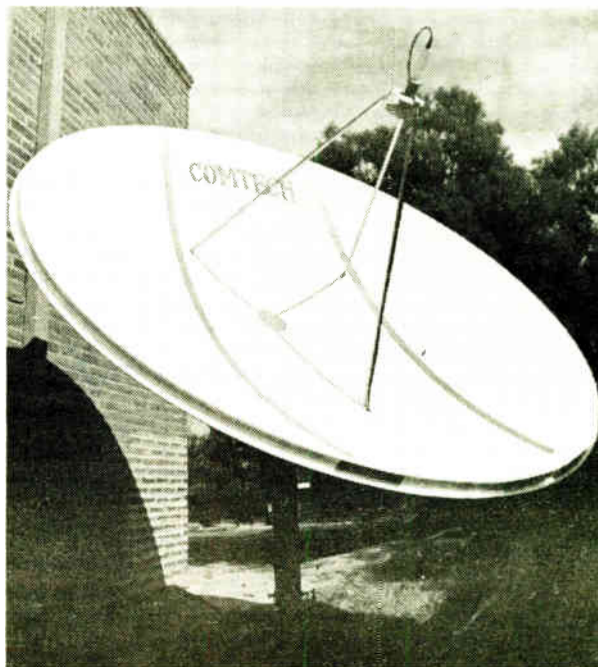
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Radio Station KAIR/JOY, Inc.
 Tucson, Arizona
 3.8 Meter Antenna Installation

Systemation Corporation 6722
 Introductions: Digital/analog automation for satellite, live assist, or standalone. The Informer: interactive telephone system with automation interface. Compucast: automated and customized weather service. HDA-1: Hard disk automation for satellite and live assist. FD-1: Floppy disk automation. Sales Force: Friendly complete sales management software.
 Contact: Maureen Bellinger
 337 N. Walter Street
 Decatur, IL 62523
 217-428-7101/214-458-8807

TASCAM 3352
 Tascam
 Established products: Professional CD and DAT players; cassette decks, studio mixers, reel-to-reels.
 Contact: Karl Moet
 7733 Telegraph Road
 Montebello, CA 90640
 213-726-0303

TFT, Inc. 4642
 Introductions: 9000 series of STL systems synthesized and economically priced.
 Established products: Full lines of composite and monaural STL systems; frequency synthesized RPU systems; intelligent EBS units; FM modulation monitors, Models 844A, 884, and 845. 450 MHz TSL systems and AM modulation monitors and the "Reciter" combination STL receiver and FM exciter.
 Contact: Jesse Maxenchs
 3090 Oakmead Village Drive
 Santa Clara, CA 95052-8088
 408-727-7272

Varian Microwave Equipment Division 5100
 Established products: 300 Ku-band single drawer high power amplifier (HPA), VZU 6993S3, for mobile and fixed SATCOM applications. 125 W Ku-Band HPA, VZU6992A6, for mobile/transportable SATCOM applications. Modular design allows for flexible mounting configurations: Rack, Hub, Plate, Transit Cases. 125 W C-Band HPA, VZC 6962D7. Can be configured in a dual-redundant package. 50 W VSTAR small terminal amplifier in C or Ku-band. Mount to minimize transmission loss.

T

Tannoy-TGI North America Inc. 6630
 Introductions: NFM8-DMT dual concentric portable reference monitor.
 Established products: PBM6.5 TEC portable playback monitor; PBM-8 extended bandwidth playback monitor.
 Contact: Bill Calma
 300 Gage Avenue, Unit #1
 Kitchener, Ontario, Canada N2M 2C8
 519-745-1158

Television Technology Corp. 2006
 Introductions: MSDC 240 kW drive system UHF transmitter, Multiplex 30 kW air-cooled klystrode.
 Established products: FMS4000: 4 kW FM solid state transmitter, XL1000MU: 1 kW UHF TV transmitter, XL100MU: 100 W UHF TV transmitter, XL10MU: UHF 10 W STL, XL10FM: 10 W FM translator, FM-25000J: 25 kW FM transmitter.

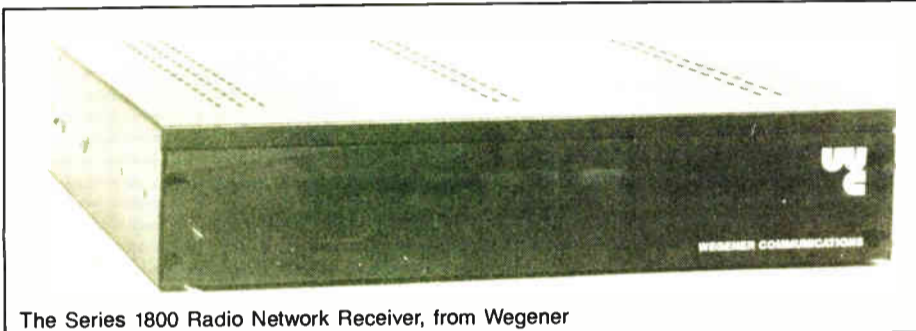
Thomson Electron Tube 6348
 On display:

360 Systems 7201, 7202
 On display: Permanent Playback series digital audio message systems; AM-16 series audio crosspoints switcher; MIDI Patcher 8x8 routing system with memory.
 Contact: Don Bird
 18740 Oxnard St #302
 Tarzana, CA 91356
 818-342-3127

Valley International, Inc. 6710, 6711
 Introductions: PR 10B: Ten position powered rack for 800 series modules. R2B Two position powered rack for 800 series modules.

W

Ward-Beck Systems Ltd. 5002
 On display: Line of consoles for the broadcast industry.



The Series 1800 Radio Network Receiver, from Wegener

TARGET TUNING INC.
Target Tuning 8110
 On display: Full line of personal frequency-locked radios for AM, FM and SCAs.
 Contact: Tina Jacobs
 6 Caesar Place
 Moonachie, NJ 07074
 201-935-8880

TENNAPLEX 4325
 Tennaplex Systems, Ltd.
 Established products: FM antennas and towers.

Transmission Structures Ltd. 4025, 4027
 Introductions: Broadcast Towers for TV, radio, cellular and microwave communications. New TSL product line, engineering and tower inspection services.

U

UREI 2916
 Introductions: SR Series of power amps in two-rack space forced air-cooled package. SR6615: 150 W, 4 ohms; SR6630: 300 W, 4 ohms, SR6650: 500 W, 4 ohms.
 Established products: Broadcast signal processing electronic products.

WEGENER COMMUNICATIONS
Wegener Communications, Inc. 6530
 Introductions: Series 1800 stereo radio network receiver featuring dual 15 kHz audio channels and 6 or 15 relay closures for station automation. Currently in use by Braiker Radio Services. Established products: Audio and data transmission products and systems for use in satellite, terrestrial and fiber optic applications.
 Contact: Kenneth D. Leffingwell
 11350 Technology Circle
 Duluth, GA 30136
 404-623-0096

Utility Tower Company 4717
 On display: Full line of guyed and self-supporting towers for AM, FM, TV and STL.


V

Valentino Music And Sound Effects 5400, 5402
 Introductions: Radio station sound effects package on 8 CDs.
 Established products: Production music library on 40 CDs; production sound effects library on 30 CDs.

Weircliffe 1734
 Established products: BTE line of magnetic media degaussers.

Wheatstone
Wheatstone Corporation 4010-4016
 Introductions: Audioarts A-50 cost-effective radio console; A-32ex radio console; TS-500 talent station: designed to interface with audio consoles, station intercom system.
 Established products: On-air consoles: A-500e, A-20, SP-6/SP-5 stereo production consoles; studio furniture; signal processing equipment: stereo distribution amps, limiter compressors, stereo selectors, parametric equalizers, graphic equalizers, notch filters.
 Contact: Michael Shane
 6720 VIP Parkway
 Syracuse, NY 13211

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The SX-87-MUX combines the isolation afforded by its unique Bi-Directional amplifier with a high speed feed and return path multiplexing scheme to provide constant nulls approaching 40dB in actual usage.

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 peak control
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Will-Burt Co. 6806, 6807
 Introductions: Portable manually extended 30' antenna mast for light-weight antennas. Low profile pan & tilt positioner, rugged construction with fast and slow speed 12 YDC operation. Designed for mast mounting with slowed height of 3".
 Established products: Pneumatic telescoping mast model 6-25-357/367. Mast is 6' nested, 25' extended with 150' topload capacity. Mast will be shown with a microwave radio antenna mounted to pan and tilt positioner with proform cable conduit.
 Contact: Jeff Milligan
 169 Main Street, P.O. Box 900
 Orrville, OH 44667
 216-682-7015

World Tower Co., Inc. 5023, 5025
 On display: Towers and tower services for the broadcast industry.

Y

Yamaha Corp. of America 1440
 On display: A full line of mixers, processors and MIDI equipment for the professional studio.

BUILT TO SURVIVE THE MORNING ZOO

Don't let its stylish chassis fool you: Micromax[®] is engineered from the inside out to handle everything your crew can throw at it. The way DJs in a hurry sometimes "slam-start" carts, for example. Ordinary cart machines can't always keep up with that kind of treatment. But Micromax's belt drive flywheel/capstan and DC servo pinch roller motor roll with the punches—they deliver smooth, wow-free starts in as little as 60 milliseconds.

PR&E engineers designed Micromax to the same high standards of dependability and efficiency as a Pacific Records console. In fact, it actually runs so efficiently that cooling vents are unnecessary. Cooler components are longer-lived components—and this is the coolest cart machine made.

It's loaded with standard features, too: Replay Inhibit, three cue tones, cue erase, auto fast re-cue and many more. Including Pacific Records'

Maxtrax[®] tape heads* with matched electronics for outstanding audio quality.

On performance, features and reliability, Micromax will go head-to-head with any cart machine you can name (except, of course, our own Tomcat[®]). Yet its manufacturer-direct price will make extremely efficient use of your equipment budget. So if things sometimes get a little wild in your studio, your next step should be clear. Call PR&E for more detailed information on the cart machine that's engineered to hang tough and stay cool—Micromax.



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Circle 9 On Reader Service Card

* NAB-format heads are available at no extra cost.

See Us at NAB Booth 4130

World Radio History

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“Auditronics’ 224 helps Valerie Knight keep KZZP® No. 1 in Phoenix,”

says Robert Reymont,
Corporate Group Engineer
for Nationwide Communications, Inc.

“This wasn’t our first 200 series purchase, of course. That honor belongs to an early 218 serial 0045 which we bought for our Cleveland station WGAR back in 1982. We’ve bought eight more Auditronics consoles since.”

“For KZZP, we purchased a 224 and have it set up to handle 30 to 40 hours a week of remotes. The mix-minus and the other needed features are all there. The DJ can answer the fifth caller, or the 25th, record the calls, then play them back on the air after editing.”

“A lot of our on-air talent come from other stations where they’ve had other consoles, and they find the Auditronics 224 a very easy console to operate. And there have been no failures or service problems. The only parts we’ve had to replace were conductive plastic faders made by another manufacturer.”

“Sound quality is very important to us, including dynamic range and noise level. So the 224’s low noise floor is an important factor. In fact, all our tape inputs and cart machines are dbx encoded. The result is that our prog line sounds identical to CD. Sure, we do a moderate amount of post processing (I call it “artful processing”), but with our Auditronics 224 and other similar quality equipment in the chain, our air product sounds demonstrably better than competition. The bottom line is that we’ve been the no. 1 hit music station in our market for over five years.”

Call toll-free 1-800-638-0977 today for more information about the Auditronics 200 series consoles Robert Reymont buys for Nationwide Communications, Inc.



Robert Reymont
Corporate Group Engineer
KZZP-FM
Mesa, Arizona
Nationwide Communications, Inc.



auditronics, inc.

3750 Old Getwell Road, Memphis, Tennessee 38118
901-362-1350 • FAX 901-365-8629

Busy Days at Radio Ventures

by Charles Taylor

Washington DC Radio Ventures President and CEO Jerry Lyman has signed an agreement to add a third radio station to the 14-month-old company's holdings, Suffolk, VA's WAFX-FM.

Radio Ventures bought the station for \$10 million from Downs Broadcasting. The 100,000 W station covers the Norfolk metropolitan area, including Portsmouth, Hampton, Newport News, Chesapeake and sections of Virginia Beach. It operates a classic rock format.

Flurry of activity

The acquisition comes in the middle of a flurry of activity for the young company. A week before, Lyman not only completed the purchase of its first station, but rejected the purchase of another.

Completed was the purchase of WMXB-

FM in Richmond, VA, from Ragan Henry Communications for \$23 million. The adult contemporary station is in a market Lyman said was a primary target for the company.

"It's not over-saturated as a radio market and it's just really popular right now in every aspect," he told Radio World in September 1989.

Last month, Lyman promoted Teresa Hall GM at WMXB. Previously acting to GM, Hall has been with the station for nine years.

Ashville deal nixed

Meanwhile, Lyman called off a deal to buy two Ashville, NC, stations, WWNC-

AM and WKSF-FM. The acquisition originally was intended to launch flagship stations for Radio Ventures, but, according to Lyman, changing market conditions and lower AM ratings lessened the properties' appeal.

The stations, owned by Heritage Broadcast Group, were to be sold for \$25.5 million. The AM is country-formatted, the FM CHR.

Pending FCC approval is the \$30 million purchase of classic rock outlet WXTR-FM in Washington, also from Ragan Henry.

For information, contact Radio Ventures at 202-347-2626.



Radio Ventures' Jerry Lyman

NAB Rooms

(continued from page 1)

is much that can be done at this point. We have to live with it."

Phelan said that if anyone has a workable suggestion, the advisory committee wants the input.

In a move aimed at easing the housing crunch next year, NAB has decided to change the days for the show to all weekdays, Monday through Thursday, from the traditional Saturday through Tuesday, Phelan said. The dates for the '91 show are 15-18 April.

In addition to discussing housing problems, the exhibitors committee also learned the price for floor space will increase in 1991 from \$18 to \$19 per square foot for members and from \$24 to \$25 for non-members, Phelan said. The price increased \$1 from 1989 to 1990.

An NAB spokesperson said the price increase is based on a "dramatic" increase in the cost of the site due to major renovations of the Las Vegas convention center, additional budget for international promotion and the first off-site exhibit space in Vegas that will be in the Sands hotel.

And in one final discussion on this year's Atlanta site, committee members learned that another potential glitch has developed.

A Grateful Dead concert is scheduled 1, 2 and 3 April at the coliseum adjacent to the convention center. NAB was talking with the city over a clause in the Grateful Dead contract that provides for a "camping area" for "Deadheads" who follow the concerts from city to city, Phelan said.

"There was no definite word as to where the camp was going to be," Phelan said.

An NAB spokesperson said the concert should cause no problem for the convention. NAB holds contracts on all adjacent parking lots.

NAB advises attendees not to drive to the convention site but use the shuttle buses or the Atlanta subway system. Parking will be limited, with exhibitors only guaranteed one parking pass per company.

For information, contact NAB convention and meetings at 202-429-5356; exhibits at 202-429-5335 or John Phelan at 708-866-2200.

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Giving you the most complete spare parts kits in the industry is just the first step in a customer support program that lasts as long as your QEI transmitter. If you need expert advice on installing a spare whatever, call us any time at 609-728-2020, day or night. And if you ever need factory parts support, we can deliver — fast. We're just 1/2 hour from Philadelphia International Airport, not out in the middle of nowhere.

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You can count on it with every QEI transmitter, because we design them to stay on the air. And as a fully integrated company dedicated to RF and transmission products, we're able to build in quality and reliability — and still maintain our value advantage.

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Finding an Optimal Zero Level

by Mel Lambert

Studio City CA Analog and digital differ, as we all know, in a number of fundamental ways. Correctly engineered digital systems are quieter, produce less distortion and exhibit a smoother overall frequency response than analog.

Digital systems allow you to go through multiple generations while editing and blending together composite sound elements without any noticeable signal degradation.

Digital workstations and recorders are the definitive wave of the technology future. But, unlike most analog systems,

digital has absolutely no headroom; exceed 16-bits (if that's the format you're using) and it's all over.

Badly designed systems produce harsh glitches (or worse); while user friendly, well-engineered devices simply mute. In either case, all of those brilliant technical specifications are for naught, because your signal's just vanished!

So what can you do to prevent overload muting? Old fashioned sense tells us to reduce the recording level, and/or insert a digital limiter into the system. (OK, digital gain controllers are about as expensive as proverbial hen's teeth; there are a reasonable collection of high-

quality analog designs, but why add unnecessary degradation outside of the digital domain?)

The answer seems clear: Run your systems at an I/O level that ensures adequate headroom below digital clipping. So far, so good.

Gaining max headroom

The problem comes in establishing a "reasonable" headroom level for our myriad recording assignments. Set it too low and we lose the signal into the noise floor; set it too high and we risk digital silence as the system gives up in disgust at being asked to produce a 17-bit num-

ber at the output of its converters.

Reference levels are no new development; we can all recite a litany of operating levels used in various radio hardware, from console input to STL output. Our metering, VU and PPM, is calibrated in such a way that it not only displays current signal levels in dB and/or volts, but the face panels are laid out in such a way that we can also determine how much relative headroom we still have below our clip point.

Let's take an example. Most professional hardware, analog and digital, is designed with power supplies and I/O circuitry that kind of run out of wick at levels in excess of +24 dBm. Working on the more than reasonable assumption that "average" speech and music exhibits an average to peak ratio of some 20 dB, then an average operating level of +4 dB would ensure that our equipment clip point lines up with the maximum peaks within our program material.

If we now define our VU metering so that "zero" corresponds to this +4 dB reference, that ol' familiar scale lets us see peaks as well as average levels.

Some like it hot

For historical as well as practical reasons, the broadcast industry prefers to run hotter average levels. One rationale is that, from virtually Day One, we have had to control our peak levels so that AM/FM transmitters (and now microwave STLs) don't vanish into the ether and to ensure the best possible average-to-ambient noise levels that might be encountered using noise-prone remote lines, and other long-distance runs around an average station.

The formula most of us have adopted is that 0 VU = +8 dB, with 16 dB of nominal headroom before clipping. (All of which also explains why the more enlightened members of our community are using either black-scale, European-standard PPMs that have been designed specifically to display the presence of

DIGITAL DOMAIN

fast, overload-producing spikes, or a combination VU/PPM instrument that shows both average and headroom levels.)

As with analog, so with digital? The answer is, yes and no. Being a medium with excellent—but finite—dynamic range/SNR performance, digital recorders and editing systems obviously have to be interfaced with studio hardware in a way that allows the very best specs to be realized. The first PCM processors were set up so that their peak-reading meters would read overload at 16-bit clipping.

Using the familiar +24 dB analog clip point, early manufacturers referenced the input/output gain structure so that a 0 VU/+4 dB signal produced a meter reading 20 dB below digital clipping. In this way we were assured that, even driven hard, the system would not go into digital overload.

(Or, put another way, digital muting would occur at exactly the same level as the analog circuitry driving the processor ran out of volts— or, during playback, the production console to which the processor was connected started to react unfavorably to such a high input level.)

(continued on page 37)

Recordable CD is now a reality! Our SPOT 90 is a complete system for broadcasters made possible by advanced technology from companies like Yamaha, Dell Computer, Harmonia Mundi Acustica and Fuji Film. See the system in operation in Booth #2342 at the NAB Convention in Atlanta. Move up to CD carts now...the price is surprisingly affordable...and delivery is immediate.

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Vintage Radio Calls

by George Riggins

Long Beach CA Department of Incidental Corrections and Miscellaneous Information. It seems as though my research was not thorough enough to cover all the names and places for college radio in the early years. A call from Tom Duvall of KFJM, University of North Dakota, indicates that their AM station went on the air in October 1923.

A check of the station listings at my disposal lists the station in September 1923. This listing indicates that the license probably had been issued and was printed in anticipation of the station being on the air by the time the publication hit the street.

The station was not listed in the June 1923 issue of *Radio News*. The 1926 issue lists the owner of the station as the University of North Dakota, Grand Forks, ND. The frequency was given as 278 meters (1080 kc) with a power of 100 watts. The same listing carried over in the 1929 edition of the *All American Official Radio Log*, but with the owner now being "Imp. Dealers Ins. Co.," Grand Forks, ND rather than the University.

By September 1931, the ownership was again listed as the University of North Dakota and the frequency was

1440, with daytime power of 1000 watts, and night power of 500 watts. The CE was still A. F. Petrich. The phone number for KFJM had been changed again to 4-6141.

KILO was purchased by the *Grand Forks Herald*, a local newspaper, in April 1948. Interesting to note that the newspaper was in turn owned by Ridder Publications. The station was sold to Red River Valley Broadcasting in July 1973; somewhere along the way the call was changed to KKXL.

Even though the predecessor of KKXL did not go on the air until sometime between 1940 and 1946, the credit line gives credit for the station back to 1923. This has been corrected in later issues of *Broadcasting Yearbook* to indicate 1941 as the station's start-up date.

KFJM is still on the air and continues to be owned by the University of North Dakota.

Memories of WIBU

Don Parker, retired from KFVB, Los Angeles, has some very interesting stories to tell about WIBU, Poynette, WI. It seems that Don started working at WIBU as the "gofer" when he was about 19. Don did not say what year, but it was during the time the WIBU studios were located in Portage, WI.

As Don describes the studios, "outside stairs led to the second floor where the studio was located, a large room with heavy velvet drapes at each end and a small control booth on one side." Si, the local salesman, would fill time with fiddle selections accompanied by his wife on the piano.

On one occasion, the line from the studio to the transmitter went out. Si, his wife and Don drove to the transmitter and went on the air from the living room of the farm house owned by Willy Forrest until time for the station to go off the air.

On the way back to Portage, Don dis-

54 YEARS AGO

Radio Aids in Flood

Portable and mobile radio systems, and other battery operated equipment, came in handy during the recent floods in the New England and Middle Atlantic sections. Even broadcasting stations that had to go off the air for lack of a.c. power scouted around for battery equipment so that an improvised service could be established. In this way, too, announcers at disrupted stations were able to broadcast first-hand descriptions of the extent and terror of the flood. Stations throughout the country took the keenest interest in flood bulletins, and some sustaining programs were wiped out by the flood, as it were, to make time for the bulletins and eyewitness descriptions. Amateurs as well as commercial radio lent a full and unstinting hand as wire telephone service was temporarily interrupted.

*Reprinted from Radio World
April 1936.*

Selectivity vs. Tone

When the selectivity of a super is great enough to eliminate image interference as well as direct interference of carriers, it is so great that the upper side frequencies will be substantially reduced. The result will be excessive suppression of the higher audio frequencies. The output of the receiver will be predominantly bass, music will lack in brilliancy, voice will want in crispness, articulation will be poor, and, generally, the quality will be unsatisfactory. If the selectivity in the radio frequency tuner is reduced much we encounter intolerable image interference. The only way, as many have found, of getting sufficient selectivity in this frequency level to eliminate image interference without cutting sidebands seriously is to use a high intermediate frequency. If the selectivity in the intermediate frequency level is reduced below a certain value, we meet direct interference between adjacent channels. And if we increase it so as to eliminate the interference, we cut the sidebands to the extent of making the quality of the output unsatisfactory. There are two methods available by which necessary selectivity can be retained without ruining the quality. One is to employ a high selectivity and then build up the high audio frequency notes by an equalizer. The other is to employ band pass filters either in the radio frequency or the i.f. tuners or both.

Editor's note: The *RW* of old, printed for a time in the 1920s and 1930s and today's *RW* are unrelated except in name.

covered a long wire directional antenna strung along the tops of the fence posts beside the road. Willy Forrest used this antenna to pick up programs from another city to re-broadcast on his own station.

A few noteworthy items

There is a tremendous amount of information on stations owned by Newspapers. The project has turned out to be much larger than originally anticipated. There is a lot of research to do and it is taking more time than allocated.

According to Tom Kneitel, as compiled in *Radio Station Treasury 1900-1946*, the first commercial standard broadcast license was issued to WGZ, Westinghouse Electric at Springfield, MA on 15 September, 1921. The second license was issued on 19 September, 1921 to WDY, Radio Corporation of America, Roselle Park, NJ.

KDKA (generally considered the first commercial station on the air) is listed as the eighth license issued. This bit of information was confirmed by Don Parker, who worked for Westinghouse at their various properties for many years. According to the list compiled by Tom Kneitel, four of the first nine licenses were issued to Westinghouse.

A total of 25 stations were issued licenses between 15 September, 1921 and 31 December, 1921. A few of the stations are still operating with the same call, some have different calls and some went that-a-way.

And it is time for me to do the same.

■ ■ ■

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.



1370 kc. (Perhaps someone can clarify the happenings of this time period.)

Going a little further, the February 1937 edition of *White's Radio Log* credits KFJM with 100 watts, 212.6 meters or 1410 kc. The 1941 *Broadcasting Yearbook* lists the frequency as 1410, moving to 1440, power 1000-LS, 500 night. The station was by now a Class III-B, under the Havana Treaty. It was owned by the University of North Dakota, with studios in the First National Bank Building; Edwin J. O'Brien was CE.

Sharing time with KILO

The 1946 *Broadcasting Yearbook* shows KFJM as sharing time with KILO. No address is given for the university-owned station, but KILO is listed as being in the First National Bank Building, Grand Forks, ND. The CE was the same for both stations: Arnold Petrich.

The phone number for KILO was given as 1200, the same as the number listed in 1941 for KFJM. The new number for KFJM in 1946 was 2800. The 1950 listings still show the stations sharing time and using the same CE, but KFJM's phone number went from four to five digits—4-6211.

(And now we here in Southern California are looking forward to our fourth area code. Yes, in some cases a city will have two different area codes, and to call a person or business across the street we will have to dial a total of eleven numbers.)

The FM station for the University of North Dakota went on the air in 1976. The 1961-62 *Broadcasting Yearbook* has the two stations in Grand Forks on different frequencies. KFJM moved to 1370 and became a daytimer and KILO stayed on

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"Did you read Judith Gross's gossip column this month? Why would someone fax a phony press-release about a cart machine if there wasn't something to all this?"

"At NAB 88 Radio Systems came out with their new consoles, at NAB 89 they showed the RS-1000 DAT machine --- they've got to have something new again this year, and I say a cart machine it is!"

"The market is saturated with good cart machines in every price range. There's no room for a newcomer, even if it is designed by Mike Sirkis."

"No one is crazy enough to come out with a new analog cart machine now --- the whole industry is about to go digital --- the cart is dead!"

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A Basic Guide to Logic Gates

This is the fifth in a 12-part series called An Introduction to Digital Electronics. Northern Virginia Community College will offer 1.3 CEUs (continuing education units) to registered students who successfully complete the course and an examination mailed at its conclusion.

Successful completion of the course and the final exam also will earn 1.3 professional credits toward recertification under the maintenance of certification provisions of the SBE Certification Program. To register, contact the Director of Continuing Education, Annandale Campus, 8333 Little

S_A and S_B are closed, a high level output is produced at the lamp illuminating it. (The truth table for the "and" gate is shown in Table 1.)

Table 2 is an illustration of "or" circuitry. Switches A and B are wired in parallel with lamp C and the battery. (See Table 2 for a truth table of an "or" gate.)

A "not" gate inverts the output signal. Thus, whatever the results of a Boolean truth table, the "not" gate will produce opposite results. An illustration of a "not" gate is shown in Figure 1.

Table 1.			Table 2.		
A	B	C	A	B	C
0	0	0	0	0	0
0	1	0	0	1	1
1	0	0	1	0	1
1	1	1	1	1	1

numerous applications.

Transistor-transistor logic (TTL) is widely used. These chips are identified with numbers beginning with 54 or 74. Emitter-coupled logic (ECL) is an exceptionally high speed, high impedance logic that operates well on frequencies above 1.2 GHz.

Gates are used as counters and registers in computers and related digital technology.

Metal oxide semiconductors (MOS) are of high density—that is, a large number of gates are present in a small area. They come in P and N channel versions as a complementary version

become "nor." These gates are illustrated in Table 3.

Exclusive gates produce a 0 or low output only if one signal input is 1 or high. The exclusive "or" or XOR and the exclusive "nor" or XNOR truth tables are illustrated in Table 4.

When high levels are assigned the number 1 and low levels are assigned 0, positive logic is said to be used. Negative logic is present when low levels produce a 1 and high levels produce a 0. Gates also can have more than two inputs. Only the simplest illustrations have been used here.

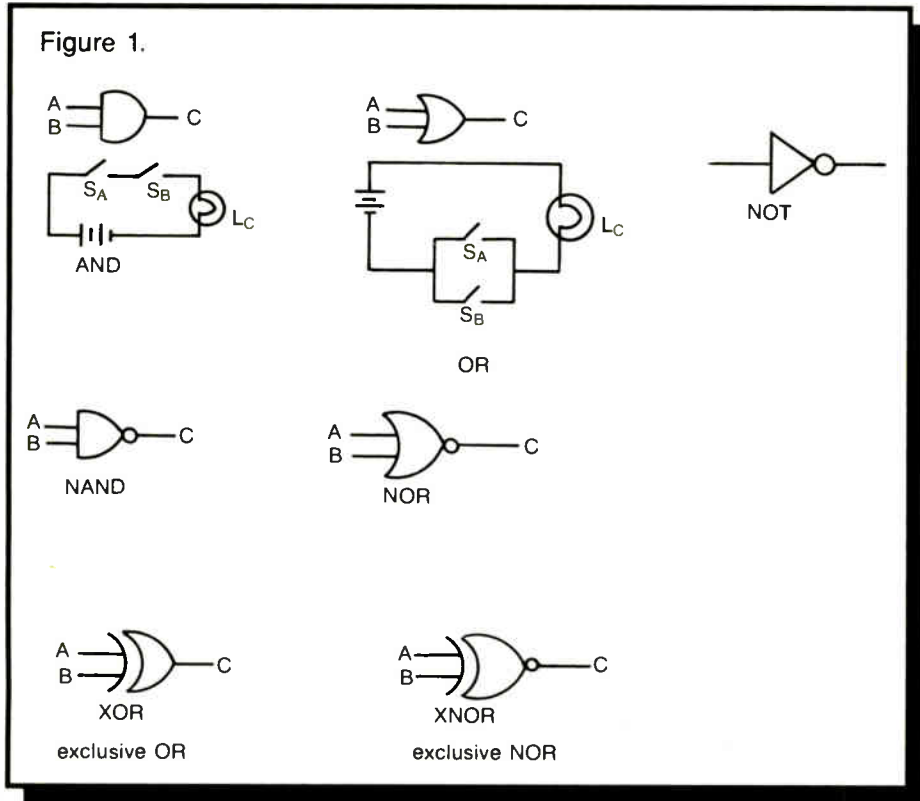
Table 3.			Table 4.								
Nand (Not And)			Nor (Not Or)			XOR			XNOR		
A	B	C	A	B	C	A	B	C	A	B	C
0	0	1	0	0	1	0	0	0	0	0	1
0	1	1	0	1	0	0	1	1	0	1	1
1	0	1	1	0	0	1	0	1	1	0	0
1	1	0	1	1	0	1	1	0	1	1	1

These gates can be used to perform various functions in digital electronics. They operate on very little power and can store information for later use. Pocket calculators and portable computers are constantly supplying voltage to chips storing memory for future use.

(CMOS). CMOS consumes very little power; logic levels are of only a few millivolts. They consume almost no power when in a standby mode.

Illustrations of all of the logic gates discussed are found in Figure 1.

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



River Turnpike, Annandale, VA 22003, or call 703-323-3159. The fee for the course is \$20.

by Ed Montgomery

Part V of XII

Annandale VA Digital electronics is a combination of high and low voltages. Known as logic levels, these voltages are arrived at using circuitry similar to that described in lesson IV.

Originally the high and low logic levels were set with relays. Opening the circuit produced a 0; closing it produced a 1. The term "gate" used to describe logic circuitry is a leftover from the relay days.

An understanding of how switches or gates can be used to perform a specific electronic function is expressed in Boolean algebra, a special branch of mathematics suited to the high and low voltage levels.

Boolean algebra is a simplified mathematical system. Standard algebra contains the fundamentals of mathematics: addition, subtraction, multiplication and division. Boolean fundamentals are: and, or and not. The results of these expressions are illustrated in truth tables.

Gates

Table 1 illustrates an "and" gate. Using switches, the "and" gate can be illustrated as switches S_A and S_B in series with a battery and lamp C. When

When a "not" circuit is combined with "and" and "or," a circuit with the opposite values of "and" and "or" are produced. "And" gates with an inverter become "nand" logic and "or" gates

Logic families

Gates are used as counters and registers in computers and related digital technology. Several logic families are used employing these gates in

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Practical Stereo Miking Tricks

by Bruce Bartlett

Elkhart IN The recent columns in *Radio World* on stereo miking have drawn many comments from interested readers. Some useful comments were from Ed Kelly, a free-lance recording engineer working in Washington, DC at the Kennedy Center for the Performing Arts, and for Elan (a company that produces compact discs). Kelly has made recordings for such ensembles as the Philadelphia and Baltimore orchestras.

Mid-side comments

Kelly had much to say about the mid-side (M-S) technique that we covered in Part 1 of this series. To review, this technique uses a "mid" microphone aiming toward the middle of the ensemble, mounted just above a bidirectional "side" microphone aiming toward the sides. The mid and side capsules are summed and "differenced" to produce left and right signals.

an M-S mic, run through a sum/difference matrix, is just like that of an X-Y coincident pair.

If you vary the sum/difference ratio, you can change the spaciousness and stereo spread. Increasing the difference signal is like angling the X-Y pair farther apart. It makes the polar patterns tighter at the same time.

Note that the mid capsule can have any polar pattern, but cardioid is the most popular. Kelly found some problems with using an omnidirectional capsule for the mid unit. If you increase the side signal enough so that the reproduced stage width extends from speaker to speaker, then the center image becomes weak; there's a "hole" in the middle.

Here's why: If an omni pattern is summed with a bidirectional pattern in a 1:1 ratio, the result is a cardioid pattern aiming 90° left. When the omni and bi patterns are differenced, the result is a cardioid pattern aiming 90° right. So we have two back-to-back cardioids aiming left and right, as in Figure 1.

Sounds arriving from the middle of the ensemble reach both patterns at 90° off axis, where the sensitivity is down 6 dB for each pattern. This makes the center image weak—say, for the woodwinds. Many engineers add a spot mic on woodwinds for this reason.

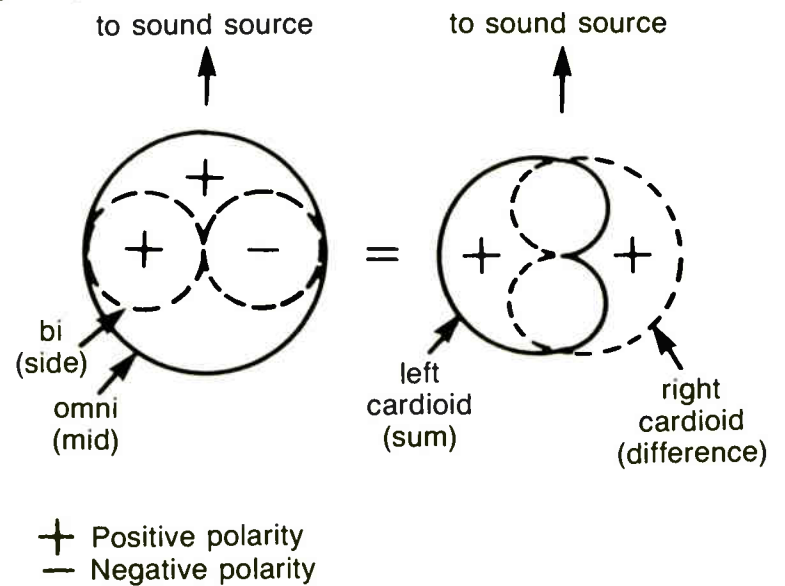
Kelly prefers to use a main M-S pair with a cardioid mid capsule, plus several

M-S pairs in a semicircle within the ensemble. The signals from these spot M-S pairs are delayed to coincide with

cardioids placed somewhat close to the ensemble.

Kelly noted an inexplicable phenomenon: Cardioid capsules tend to give better pitch definition than omnis. Especially when editing, it's more difficult to tell the pitch of bass instruments when omni mics are used for the recording.

Figure 1.



Summing and differencing an omni pattern with a bidirectional pattern yields two cardioid patterns 180° apart.

LINE OUT

The sum signal produces a unidirectional pattern angled toward the left; the difference signal produces a unidirectional pattern angled toward the right. In other words, the effective output of

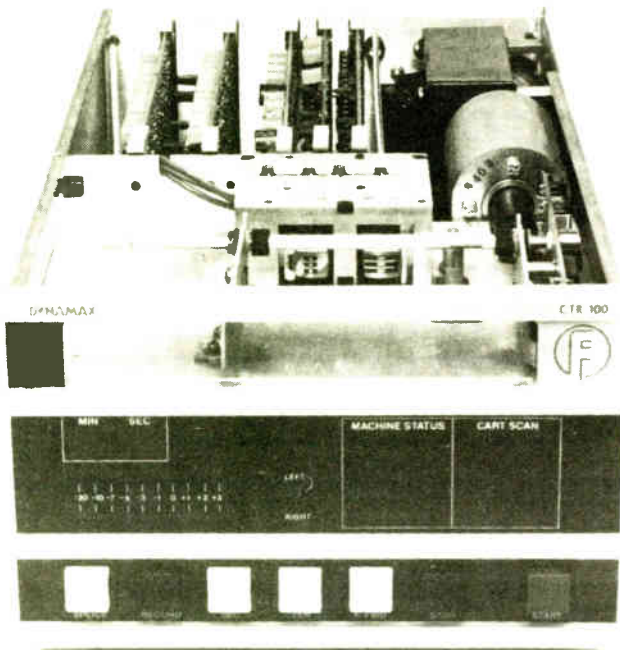
those from the main pair.

Although cardioid condenser mics have poorer low-frequency response than omni condensers, Kelly gets around this weakness by using large-diaphragm

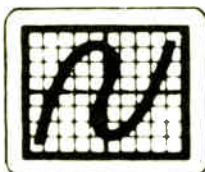
Though the omni has better low end, the cardioid has more clarity, which seems to aid pitch perception.

Chandos, a highly respected recording (continued on page 36)

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PROFESSIONAL AUDIO

Diminutive DJs Revel in Radio

by Dee McVicker

Chandler AZ There are no shiny red apples on Ms. Minton's desk. Instead there are audio cassettes, scripts, record albums and the usual ammunition that one keeps on hand for the fast produc-

The campus station, soon to be broadcasting via carrier current on 590 kHz, is the brainchild of teacher Linda Minton and DJ Perry DaMone of Phoenix station KESZ FM. Said Minton, "I called him one day to come in and talk with our kids about being a DJ during our ca-

atre is brought to you by school. What? School, you say," he inflects. "Without school you couldn't read the names of candy bars, or titles of record albums." School, sums up Barry, is a magic place.

Old hands

As the music fades out for the opening scene, Julie is carefully studying her script. She is playing opposite Barry as

Photos by Jill Jackson



The sixth-grade KdSTR staff

tion of radio. On this Wednesday, the forecast for Ms. Minton's desk is more of the same.

In a crisp voice that only school teachers seem to manage, Ms. Minton instructs one announcer to back away

reer week. And he said, 'Linda, I'll do one better. I'll tell you how you can start your own radio station.'

Now, almost 12 months later, Minton's sixth grade class is getting ready for another weekly broadcast. With a new 30 watt transmitter yet to arrive, the station is temporarily using a means other than carrier current for its broadcasts. Explained Minton, "We run it through the school's TV system by video cassette with only a star showing on the screen, and they hear us as if it's radio."

The new transmitter, an LPB, had just been ordered. But Barry Bredvik and Julie Carpenter, today's star DJs, aren't about to wait. They're having their day on the air without it.

Barry begins this week's *Star Theatre*, "A Night on Bear Mountain," with a word from the station's sponsor. In his best baritone voice, Barry says, "Star The-

OFFBEAT RADIO

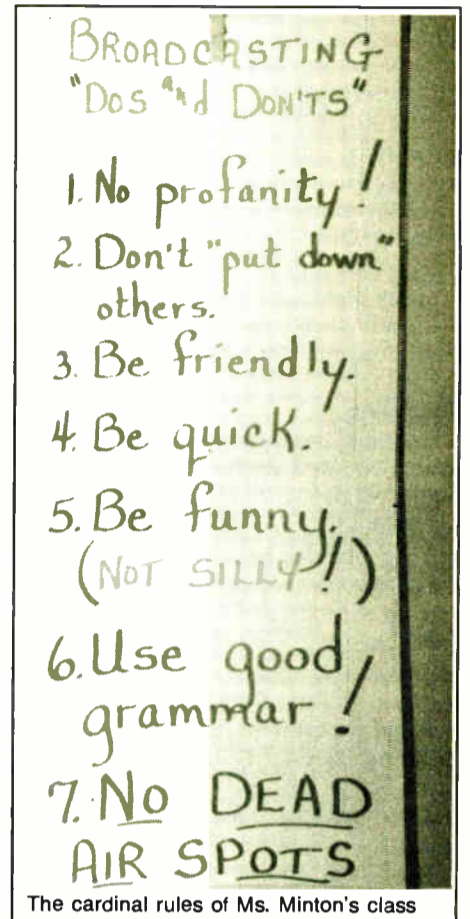
"Irene," a mischievous youngster. In Irene's toothless intonation, she badgers poor Barry, who is playing a ruffled babysitter. The two pull off the scene like pros.

"They were shy in the beginning," said Minton. "At first, they were just stone cold shy." But, after only a few weeks, the sixth graders had warmed up to the mic and were creating their own broadcast announcements.

All told, some 40 students take part in bringing KdSTR broadcasts to Shumway schoolmates. They divvy up the tasks—and fun—into teams, where students create artwork, newscasts and production for the station. What do they think of radio? Barry commented that it's different from what he expected. "It's a lot more work than I thought," he contemplated. Yet it hasn't dampened his enthusiasm to become a fulltime DJ someday, he said.

The work has challenged the young broadcasters. Sound effects, for instance, have been an on-going puzzle. The first gridlock was what to use for the sound of footsteps, a mainstay in just about every script the students use.

Minton discovered sand boxes and soon the sixth-graders were drumming up creative solutions for sound effects.



The cardinal rules of Ms. Minton's class

Now, anything and everything in the classroom is likely to end up behind the mic, including desks. Students especially liked being able to use these school rudiments for more than the routine studies.

Radio rules—the do's and don'ts

But the business of broadcasting is taken very seriously by Minton's sixth graders. This is spelled out on a sign at the front of the class. In the same block-type letters that rival the ABCs bannered across the room, the sign states the do's

(continued on page 44)



Air talent in the making

from the mic. Audio sputters for a moment from an Anista mic and pint-sized DJ Barry Bredvik introduces this week's *Star Theatre*.

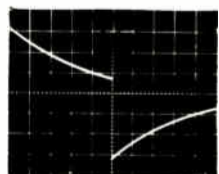
Stand by

It is the first take—a practice run—and Barry speaks at a rapid-fire pace, joined by Julie Carpenter, who is equally quick to address the mic. Perfectly on cue, Anna chimes in with a jangle of the triangle to create the sound of a telephone ringing. Meanwhile, Minton minds the turntable, which pipes up now and then to set the mood and the ambiance.

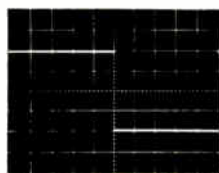
There is no stage fright, no fumbling before the mic—only the animated voices coming from these small DJs, who are all of four feet tall. They are, as the schoolbooks and mimeographed paper set to the side remind us, sixth-graders. And they are the youngest broadcasting crew in the nation, manning KdSTR radio from Shumway Elementary School in Chandler, AZ.

Monitor Modifications for Maximum FM Loudness

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50Hz - 10us Rise Time
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Four years ago, Modulation Index introduced a modification to a major manufacturer's FM monitor to improve its dynamic accuracy. The result was the most accurate monitor commercially available. Monitor-induced overshoot at the peak indicator is reduced from approximately 17% (on typical program material) to less than 1% (on any program material). Since the monitor-induced overshoot is eliminated, modulation and loudness levels can be increased with complete legal confidence by knowing that only real over-modulation will be indicated.

Competitive solutions to this problem involve the use of time-delayed peak indicators, indicating over-modulation only on peaks of a minimum duration or longer. This method, although alleged to be in accordance with the pre-1983 FCC Rules & Regulations regarding monitors, causes certain accuracy problems under dynamic modulation conditions. Most monitor-induced overshoot is low frequency related. The time-delayed peak indicator solution affects mostly high frequency problems by a blindfold method. Claims that processing levels may be reduced and modulation levels increased are false since the ultimate peak level is determined by the long duration peaks as well as the short duration, which presumably are of the same peak level in a non-overshooting system.

Monitors are supposed to provide reference-quality demodulation that reveals every aspect good or bad of the broadcast signal. A monitor that encourages wishful thinking is not worthy of the name. A monitor should be a microscope, not a blindfold.

The Modulation Index modification can turn these monitors into microscopes. The basic monitor design is good, but the transient response as seen by the peak indicator is poor. By correcting the transient response, the Mod Index modification creates a monitor that correctly measures even the most aggressively processed audio. If the transmitted signal is truly overshoot-free, the modified monitor's peak indicator will be highly active at 99% and never turn on at 100%. All this is achieved by fixing the basic problem - not by using trick add-on circuits.

The Modulation Index modification has not compromised any monitor specifications to eliminate overshoot, and has improved several. Frequency response, distortion, separation, crosstalk, and rejection of second-adjacencies are all addressed. (Second-adjacency rejection - a real problem in areas where the spectrum is crowded - was apparently neglected in the original design.)

The Modulation Index modification provides much the same DC-coupled demodulator performance used by the FCC when monitoring, by use of an integrator feedback loop. Monitor-induced overshoot is virtually eliminated, permitting accurate peak reading of dynamic modulation levels including all additional modulation due to sub-carriers. In addition, the modification provides a delay-equalized baseband low-pass filter to replace the original non-delay-equalized filter. Such equalization not only reduces overshoot, but also improves the separation capabilities of the companion stereo monitor.

The Modulation Index modification costs just \$700, including calibration, complete documentation, and any minor repairs. Since type-approval is no longer required, the modification is fully legal, and conforms to the pre-1983 FCC Rules & Regulations regarding FM monitor specifications. The modified monitor will equal or exceed the accuracy of any new monitor allowing maximum legal loudness - but the modification costs 50% to 85% less than replacement or other questionable solutions!

Modulation Index

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Stereo Microphone Placement

(continued from page 34)

company, combines a forward-facing omni with a forward-facing bidirectional to create a mid signal with a variable polar pattern. By varying the omni-to-bidirectional ratio, they can get any polar pattern in the mid element—omni, hypercardioid, supercardioid, cardioid or bidirectional. They matrix this mid element with the usual side-facing bidirectional capsule.

Many stereo microphones are available with switchable mid patterns but Chandos prefers to use its own capsules.

Shuffling

As stated before, the mid-side method allows you to vary the mid-to-side ratio, which changes the spaciousness and stereo spread. You can do this with any miking method, Kelly says. For example, set up two spaced omni mics, run their signals through an M-S matrix box and vary the M/S (sum/difference) ratio. Monitor and record the left and right outputs of the matrix box.

As an experiment, listen to the side or difference signal by itself. If you use omni mics, this side signal will have much more bass than if you use an M-S mic.

Now substitute an M-S mic, and listen to the side signal. Equalize the side signal (boost the low frequencies) so that it has as much bass as you heard with the omni mics. What you've just done is

called "shuffling" or "spatial equalization." When you listen to the left and right stereo signals, you should hear more spaciousness after bass-boosting the side signal.

Alan Blumlein, a brilliant British engineer who pioneered M-S stereo in the 1930s, coined the term "shuffling." The

Though the omni has better low end, the cardioid has more clarity . . .

term "spatial equalization" was invented by another brilliant engineer, Richard Griesinger of Lexicon.

Both methods are similar. They shelve up the low-frequency response in the difference or side signal to increase spaciousness. In addition, shuffling or spatial equalization aligns phantom-image positions at low and high frequencies. This results in sharper images.

Kelly likes to create a "halo" effect of space around the instruments. He tries to confine the ambient sound to the difference signal and confine the direct sound of the music to the sum signal.

Some recording engineers feel that omnidirectional microphones provide

the most accurate reproduction of hall ambience. This is because the omni pattern picks up equally well in all directions.

Most omnis, however, become unidirectional at high frequencies. The smaller the diaphragm, the more omnidirectional the mic is up to high frequencies. To prevent rear rejection of high frequencies in omni mics, some engineers hang the mics straight down over the orchestra.

Some omni mics have a small capsule in a large baffle, which makes the mic unidirectional over a wide range of high frequencies. For example, the Neumann M50 mounts a 12mm capsule in a lucite ball, like an iris in an eyeball. Some engineers love the sound of this microphone.

Choose your favorite

Any stereo miking method can give acceptable results, says Kelly. Recordings made with spaced omnis can be mono-compatible. Recordings made with M-S mics can be spacious. It all depends on the skill and experimentation of the engineer.

You must select a method and develop it. Work with it so you really understand it. If the results aren't right, don't immediately switch to another method. Instead, try varying the microphone arrangement slightly until results improve.

Pete Perkins of Cutler Productions, a

radio syndicator, reported that he was hearing phase cancellations in mono with his dual-mic setup in an announce booth. The two mics, a Sennheiser 441 and EV RE-20, were placed on a single stand with their ends touching and their grilles angled and spaced apart a few inches.

That spacing causes the phasing problem. Sound waves from one announcer travel to the closest mic and to the farther mic. Because sound takes time to travel, the signal from the distant mic is delayed relative to the signal from the close mic. This delay translates into varying phase shifts versus frequency.

The phase shift is 180° at some frequencies. When the mic signals are summed to mono, these frequencies cancel out, causing notches in the frequency spectrum. This gives a filtered, swishing tonal coloration.

The solution? Place one mic on top of the other with their diaphragms aligned. This eliminates the time difference between mic signals. Angle the mics apart 90° to 135° to get a stereo effect. The wider the angle, the greater the stereo spread.

If you'd like to describe the stereo miking techniques your station has found effective, write to me at Crown International, 1718 W. Mishawaka Rd., Elkhart, IN 46517. Also, if there are audio topics you'd like to see covered in this column, let me know.

■ ■ ■

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

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Operating Levels: In Search of the Zero

(continued from page 30)

Now the processor can be considered a familiar "Zero-In/Zero-Out" device, and one that is optimized for I/O overload. Of course, if the system features an advertised 96 dB dynamic range (assuming that the A-to-Ds can resolve to the last bit, which many cannot, even those still being used in top-end hardware), we have 76 dB of useful signal-to-noise ratio below our "average" level setting.

Squeezing out SNR

The trouble begins, however, when production engineers want to wring the very best SNR performance from a digital system, but at the same time need to keep an eagle eye on the overload point.

On several occasions during the past several months, I have gotten into deep discussion with classical recording engineers, jingles producers and production engineers about what exactly constitutes a reasonable, and practical "Zero Level" for digital recorders. The discussions came about originally through my contacts with one of the leading suppliers of pro DAT machines, whose customers were asking about resetting the zero-level calibrations to offer more SNR above the digital noise floor, but still retain a useful headroom performance.

It just so happens that virtually all DAT machines are set up so that 0 VU/+4 dB I/O levels produce meter readings 18 dB below clipping. (OK, what's two decibels between friends?) It had been suggested that for heavily compressed mixes, such as jingles and rock tracks, we might be able to increase this reference level to maybe 14 or even 12 dB below clip, safe in the knowledge that we have already manipulated the average to peak ratio with a high-quality compressor prior to mastering.

(Rumor also had it that a major standards organization was considering setting a new reference level for DATs of 12 dB below clip; to date, I have been unable to locate any manufacturer that is aware of such developments.)

For classical sessions or live actuality/voice recordings, however, where we either want to take advantage of the wide dynamic range of digital, or simply to save us from the unexpected, then a -20 dB reference might be the way to go.

Obviously, we can set our reference wherever we want to, just so long as we make careful notes during the session and accurately label all tapes with the zero level used during the recording. (We also need to provide our engineering staff with recorders that offer front-panel CAL/ADJUST input/output controls.)

To date the dialogue continues, with no definitive answer (except, maybe, to stay with the -20/18 dB setting of most digital recorders). I would encourage anybody with practical experience of running DAT machines, for example, with elevated reference levels to write to me c/o RW, so that I can collate a wider cross section of opinions.

SMPTE involvement

Meanwhile, news reaches me that the Society of Motion Picture and Television Engineers (SMPTE) is currently discussing a Recommended Practice for reference levels used by digital video recorders.

The organization's draft proposal calls for a "digital representation of a 800 Hz sine wave whose positive peaks attain a value of 0CCD (hex) and whose negative peaks attain F333 (hex), considering only the 16 most significant bits. This is 20 dB below system maximum."

In the analog domain this same reference signal would exhibit a ± 0.1 dB amplitude tolerance. I look forward to hearing from RW readers on this.

■ ■ ■

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

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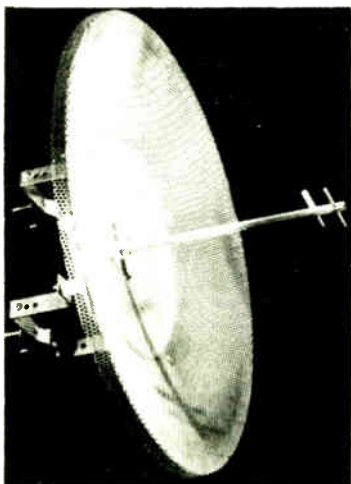
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Reaching the Limit with Clippers

by John Shepler

Rockford IL The ultimate limiting is the proverbial "brick wall." The signal is unaffected below the limiting threshold. But as soon as the set limit is reached the signal level stops cold. Not a volt ... not a microvolt more.

Brick wall limiting can be partially implemented with fast gain reduction, especially multiband gain reduction. Boxes that perform such functions add power to the audio and greatly constrain the dynamic range. The appearance of the

a threshold level.

Clippers have been in and out of fashion since the early days of wireless. The same diodes that rectify AC power and demodulate AM signals can be applied to the audio chain. Crystal diodes and tube diodes work just fine.

What ham radio operator hasn't put a pair of small signal diodes across the headphones to keep from getting blasted when suddenly tuning across a loud station? Maybe you've built the slightly more complex version in the ARRL handbook that has batteries and diodes

For example, take the clippers that are built on simple diode circuits. If diodes were perfect you couldn't use them directly. A perfect diode conducts instantly in one direction and not at all in the other. A perfect diode rectifies the signal and nothing gets through.

The simple diode clipper depends on the fact that silicon semiconductor diodes have a forward threshold of about 0.7 volts. They don't conduct at all until the voltage reaches the threshold. Then they start to conduct and eventually turn on completely. The 0.7 volt threshold is

in your transmitter room, your limiting thresholds are moving all over the place. This is one reason why modulation levels don't hold and the processing sounds "different" every day.

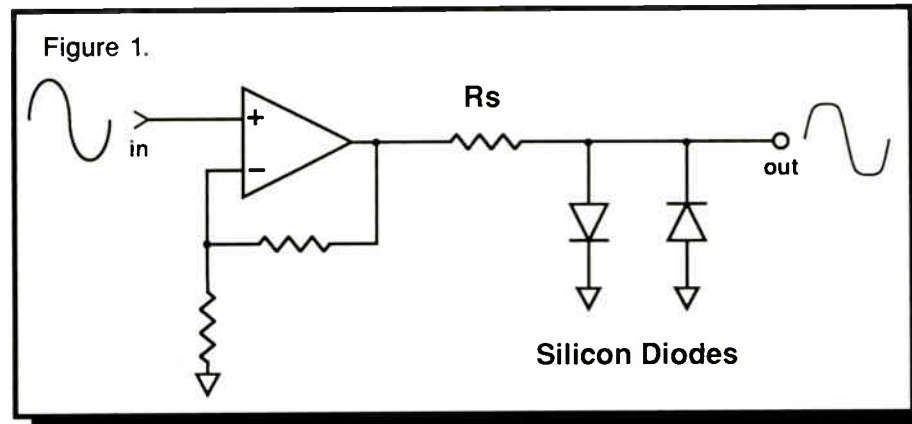
Secondly, all clippers don't take a nice neat razor blade cut to the audio peaks. Most of them sort of rub off the tops, leaving rounded edges. Remember, the diode doesn't instantly change from in-

Clippers have been in and out of fashion since the early days of wireless.

Q-TIPS

signal on a scope, mod meter, or VU meter certainly looks like the signal hits a definite ceiling. But look closer. Some peaks are sneaking through. The brick wall has a few bricks missing.

A more solid wall requires a faster acting circuit. When the limiting circuits get fast enough to control individual cycles of the audio waveform they become clippers. A clipper can be an extremely fast gain reduction circuit with the threshold set to only touch the tips of the waveform. A clipper can also be a passive device, such as a diode, which only conducts when the applied voltage reaches



in series to raise the limiting threshold. Clipper is a generic term that covers any device that changes the shape of a waveform by cutting off the peaks. But, all clippers do not work the same.

conveniently close to normal audio levels.

Figure 1 shows a simple diode clipper. Two garden variety small signal silicon diodes, such as the 1N914 or 1N4148, are connected back-to-back with a series resistor driving them. One diode conducts on positive peaks above 0.7 volts. The other diode conducts on negative peaks above 0.7 volts. Below 0.7 volts, the diodes do nothing and the waveform is unaffected.

This is about the simplest clipping circuit you can build. The resistor and the two diodes are doing the work. The op-amp is just for isolation and to provide some power to drive the clipper. What's even more surprising is that a lot of high-priced and highly sophisticated processors use this circuit in one form or another. Buried deep in the schematics, you'll find a couple of silicon diodes used as clippers.

The circuit works just fine, but there are a couple of interesting characteristics you need to know about.

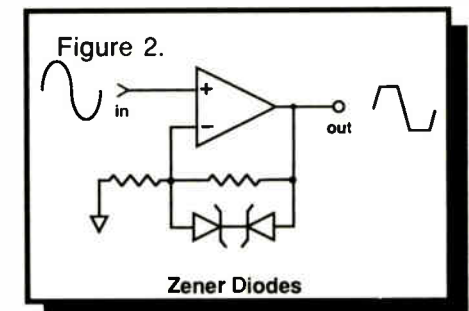
First of all, the 0.7 volt threshold isn't always 0.7 volts. That forward drop is highly temperature dependent and can be anywhere from half a volt to a volt. So, if you have wide temperature swings

finite to zero resistance in the forward direction. It turns on gradually over a range of some millivolts.

You can see this on a scope monitoring the output of the processor. Turn up the scope gain and look at those peaks. What appeared to be nicely cut edges are really rounded peaks. The brick wall is more like a padded brick wall.

Does this matter? Depends. The rounded peak effect created by the soft knee diode characteristic is touted as a feature in some processors. It's called "soft clipping" as opposed to "hard clipping."

A soft clipper has to bite deeper into a normal signal to be sure of being fully



turned on to clamp the highest peaks. This increases the amount of IM distortion generated by the entire clipping process. However, the lack of hard edges reduces the number of harmonics generated by the clipper.

This phenomenon is useful in dealing with big, bouncy, AM transmitters. Big transmitters with big modulation transformers hate sharp edges on waveforms.

(continued on page 44)

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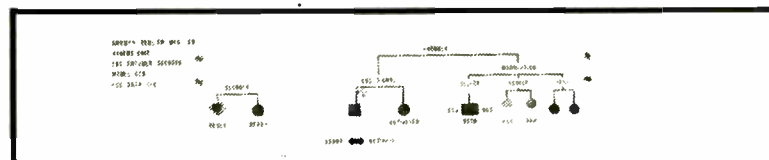
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Should Class IIIs Increase Power?

by Lex Felker

Washington DC Over the past three or four years there has been a lot of discussion regarding technical changes to improve AM broadcast service. A number of good (or at least creative) ideas have come out of that debate; many have been reflected in a series of rule changes proposed by the FCC.

One idea that is only now receiving significant attention, however, is to increase the maximum power at which Class III, or regional, AM stations may operate.

Gains for Class IIIs

AM channels and stations are grouped into various classes. Class I and Class II stations operate on the so-called "clear channels" and are intended to cover large geographic areas. These stations are permitted to operate at a maximum power of 50 kW. By contrast, stations

operated on regional channels (Class III) are limited to 5 kW and those on local channels (Class IV) are confined to 1 kW.

Because AM signals can propagate many hundreds or thousands of miles at night, regulation of the AM broadcast service is international in scope. Although previous AM broadcasting treaties limited US Class III stations to a maximum of 5 kW, these have been superseded (except in the Bahamas and the Dominican Republic) by the 1981 Region II Rio Accord. Therefore, for all intents and purposes, the current international limit for Class IIIs is 50 kW.

Obviously, final action on these matters

will take time, a commodity which is not on the side of AM broadcasters. Lost market share is very difficult to regain, and for some stations, power increases may be just the ticket to stem the audience tide. In the short run, it may be that the waiver process could be used effectively to authorize power increases in those instances where the AM improvement goals would not be compromised.

As things stand now, perhaps only a minority of Class III stations would be

able to take advantage of a higher power limit, because of the need to protect existing facilities. This could change, however, if other policy changes now being contemplated by the Commission bear fruit.

■ ■ ■

Lex Felker is a technical/engineering consultant with the law firm of Wiley, Rein & Fielding, Washington DC, and former FCC Mass Media Bureau Chief. He can be reached at 202-429-7000.

FELKER'S FORUM

operated on regional channels (Class III) are limited to 5 kW and those on local channels (Class IV) are confined to 1 kW.

Because AM signals can propagate many hundreds or thousands of miles at night, regulation of the AM broadcast service is international in scope. Although previous AM broadcasting treaties limited US Class III stations to a maximum of 5 kW, these have been superseded (except in the Bahamas and the Dominican Republic) by the 1981 Region II Rio Accord. Therefore, for all intents and purposes, the current international limit for Class IIIs is 50 kW.

. . . any Class III station that increased power would realize . . . improved coverage

Clearly, any Class III station that increased power would realize significant gains, the most important being improved coverage within its normal listening area. Amplitude modulation is susceptible to disruption from noise, and the AM frequency band is loaded with natural and man-made noise. Signals in this band are also severely attenuated by buildings and other structures, a fact that can make AM reception in urban areas quite difficult. Both of these effects may be mitigated significantly by increasing radiated power.

The catch

As is frequently the case, however, there is no free lunch here. The AM band is already overcrowded and reception is frequently impaired by interference from other stations operating in accordance with existing technical standards.

The FCC is in the middle of several proceedings that seek to tighten the interference rules. Any action taken now to generally permit power increases under the present interference rules could make



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Avoid Fines by DCO Log Reviews

by Harold Hallikainen

San Luis Obispo CA This installment of *Insight on Rules* will continue with chief operator log reviews. Before we get started on that, however, I thought I'd throw in a couple reminders.

Remember that the emission limitations of 73.44 for AM stations change on

INSIGHT ON RULES

30 June, 1990 as a result of the NRSC. On that date, the 25 dB down frequency changes from ± 15 kHz to ± 10.2 kHz (among other changes).

You must meet this spec on that date whether you have an NRSC-1 box or not. If you have an NRSC-1 box by that date, you don't have to demonstrate compliance (as required by 73.1590(a)(6)) until 30 June, 1994, but you still must comply with the emission limitation.

You've got a couple months to determine what you're going to do and to do it. For more details, see the 14 June, 1989 issue of *Radio World* (which is also reprinted in the 1990 *Radio World Annual*).

STL notification

On 12 January 1990, the FCC modified 74.550 to allow STL transmitters (and ICR, etc.) operating in the 944 to 952 MHz band to continue to be used even if not approved under the FCC equipment authorization program until 1 July, 1993. The deadline for removing non-notified equipment had been 1 July, 1990.

While this appears to allow stations to get another three years use out of old STL equipment, that old equipment is required to meet the current rules. Comparing my copy of the 1980 rules with the current rules, I find no change in STL transmitter technical specifications, if the STL is operating on a 500 kHz wide channel (which most are).

What this means is that any STL transmitter that was ever legal possibly still is (that is, meets the emission specifications and frequency tolerance requirements). However, you are required to make sufficient measurements as often as necessary to insure compliance (see 74.562). Get out that spectrum analyzer!

By 1 July, 1993, you need to do something. At that time, you are required to have an FCC notified STL transmitter. It will not be legal to use any other one, even if it meets the emission specifications. You can buy a new transmitter, get the existing transmitter manufacturer to send you a sticker, or type notify it yourself.

Many of the existing transmitters can be FCC notified by the manufacturer. In some cases, an FCC required label (permanently affixed to the equipment, as specified in 2.925(d)) can be supplied by the manufacturer. Some manufacturers, however, want to insure that any equipment with the label does indeed meet the technical requirements, so they will require the equipment to be returned for measurements or upgrade.

Keep in mind that a transmitter that

once met the FCC requirements may not meet them after it has been in service for 20 years. This may be due to component failure or aging that did not totally shut the transmitter down, or could be due to field tuning for maximum output power without paying attention to the radiated emissions. Call your STL transmitter manufacturer to find out more.

Procedures for getting an STL transmitter FCC notified are contained in rule sections 2.904, 2.909, 2.925, 2.947 and 2.975 of the FCC rules.

Chief operator log review

Let's continue to review the 1988 FCC rules violations list to see how these violations could have been prevented by doing the required log review (required by

73.1870(c)(3)). Further, the station identification must be run at the beginning of operation, the end of operation and on the hour, as close as program continuity allows. One station was cited for running the ID at eight past the hour when a program break would have allowed it to run on the hour.

You may insert the frequency, channel number, or name of the licensee between the call letters and the community of license, but nothing else. Further, you may list additional communities, but the community of license must be listed first. Something like "KCBX Bach's the coast from San Luis Obispo" would not be acceptable.

The license or permit for each operator is required to be posted . . . at the point where that operator operates the transmitter.

73.1870(c)(3)).

This 25 page violations list was compiled from 2500 pages of violation notices and related correspondence received from the FCC under a Freedom of Information Act request. We've sent out about 100 copies of the 25 page list. Call me for your copy.

Last time, we discussed the required daily tower lighting inspections. Recall also that 1747 requires an inspection at least every three months of all control devices and indicators associated with the tower lighting system. This would also be a good time to check the painting of the towers. Many stations have been cited for having faded, flaking and peeling paint.

Many stations were cited for not do-

ing the required station identification. This is obviously not something you'd find during your weekly log review, but, as you listen to the station, make sure the top of the hour ID meets FCC requirements. Rule 73.1201(b)(1) requires the station identification to include the call letters followed immediately by the community of license (specified on the station license).

License posting

Many stations were cited for not having various operator and station licenses posted. The license or permit for each operator is required to be posted (not carried in a wallet) at the point where that operator operates the transmitter. Further, at the principal control point, the most recent station authorization must be posted. This should include

any renewal cards, consent to assignment, etc.

Make sure that the technical specifications portion of the license is also posted (DA parameters, etc.). Photocopies of station authorizations should be posted at other control points (such as the transmitter itself). A written designation of chief operator is to be posted along with the chief operator's license.

As part of your weekly log review, you may want to stare at the wall. While doing so, insure that all the required licenses are posted (including that temporary weekend jock).

Several stations were cited for running without remote control for various periods of time (up to a month in one case) without having an operator at the transmitter. Improper remote control operations should be detected during a weekly log review.

Carrier frequency


Lots of stations were cited for having the AM carrier frequency outside the 20 Hz tolerance. Only a few FMs and TVs were cited for carrier deviation problems. Although the rules do not specify a carrier measurement interval, they do require you to be on frequency. Check this occasionally!

Many stations were cited for operating outside the authorized power limits (90% to 105% of licensed). Most were cited for operating below 90% power. This should, of course, be very apparent in the weekly log review.

We are once again out of space. Next month we'll try to finish off the weekly log review. I'll see if I can put together a weekly log review form that can be adapted to your station's needs.

■ ■ ■

Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200.




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School Kids Take the Airwaves

(continued from page 35)

and don'ts of broadcasting.

Among KdSTR's radio rules, which include using correct grammar and being funny but not silly, is the one cardinal rule by which all radio stations live and die: No Dead Air Spots. In Minton's class this decree appears in bold letters and underlined for all to see.

There are other tell-tale signs of professional radio in the classroom. With its chairs and desks askew to make way for the production of KdSTR, the classroom

sports some of the best names in radio, including a TEAC cassette recorder and two Technics turntables.

Donated by those in the community, including Jay Bernstein of Quick Stop convenience stores, the equipment captures the student's rapt interest. The microphones, the Yamaha 8-channel console and a small mixer board are part of the magic of radio and even Minton admits to being smitten by the radio bug.

But the gear that's been getting the most attention recently is the LPB trans-

mitter. All other equipment is "standing by," waiting for the arrival of this important piece of radio that will make the broadcasts official.

Lester Bollinger with Total Broadcast Resources and CE Mike Malo with KTAR AM/KKLT FM, both in the metro Phoenix area, will be the broadcast emissaries delivering and installing this important KdSTR gear. Bollinger, who has donated money and time to the

project, anticipates that KdSTR will be broadcasting via carrier current within a few weeks.

The pint-sized broadcasters at KdSTR are eagerly awaiting that first day, when they get to show off their new radio station to local radio celebrities and the press. The station will cover a mere 200 feet radius outside the school grounds, but for these young broadcasters, KdSTR is the equivalent of any clear channel in its own right.

■ ■ ■

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



Preparing for airtime

Clippers, Hard and Soft

(continued from page 38)

It's like snapping your finger on an empty oil drum. The LC circuits ring like bells and create overshoots that overmodulate. Can you believe it? The clipper makes the transmitter overmodulate.

Lots of fast gain riding mashes up the signal and changes the dynamics irreparably.

It's not just monster AM relics from the thirties that ring on sharp edges. Any circuit that has a transformer or filter with inductors is a candidate. That includes smaller AM transmitters with audio inductors or even input transformers. Stereo generators, including FM stereo generators with those metal can 15 kHz low pass filters, are notorious.

Why hard clippers?

Hard clippers create more of the brick wall effect. Hard does not necessarily have to mean harsh, however. There is a misconception that gain reduction limiting is clean limiting because it

preserves the waveforms of individual cycles. Clipping must therefore be ugly because it rips off the peaks irreparably.

Not necessarily. Lots of fast gain riding mashes up the signal and changes the dynamics irreparably. A small amount of clipping does much less damage overall and leaves most of the audio alone.

Figure 2 shows a harder clipping circuit. The standard silicon diodes have been replaced by back to back Zener diodes. In this circuit, the forward bias knee is less important than the higher voltage reverse bias knee characteristic of Zener diodes. The higher Zener voltage of perhaps 10 to 15 volts tends to swamp out the knee effects, which are in the millivolt and tens of millivolts range.

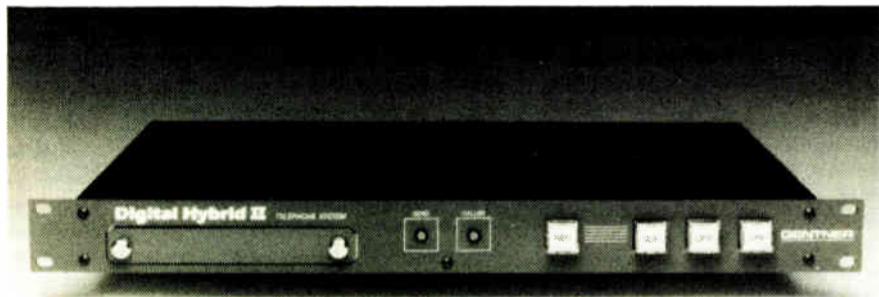
The standard diode has a threshold of 0.7 volts, which is more easily affected by the variable effects of conduction and temperature. This can be improved by biasing the diodes to, say, 10 volts, in order to swamp out the non-linearities. This turns a soft clipper into a hard clipper, much like a Zener diode.

Can you use a hard clipper? Find out by driving your transmitting equipment with the hardest signal you can find, a square wave. Look at the output with a scope. If there is overshoot, you need to make some circuit changes or replace the equipment before biting in too hard. Otherwise, your efforts will be counterproductive.

■ ■ ■

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

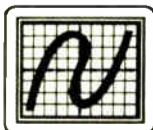
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Sony TA-2000F classic metered preamp, excel cond, \$80. W Laughlin, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

Crown Micro-tech 600 LX stereo pwr amp, \$550; McIntosh 250 solid state pwr amp, \$350. D Lundy, POB 408, Heidrick KY 40949. 606-546-6650.

Realistic STA2100-D exc cond, 120W per chnl, \$150. R Glenn, 1718 Shenandoah Road, Wimauma FL 33598. 813-634-1940.

Crown D-60 exc cond, \$350. R Glenn, 1718 Shenandoah Road, Wimauma FL 33598. 813-634-1940.

Russco 4428 dist amp new cond, (4) separate 1 x 4 amps w/adjustable outputs in one unit, rack mount incl, \$300.

Olson AM 220 pre-amps (3), Realistic stereo, G/E mono, \$10 ea plus UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Dynaco ST120 60 Wch amp, \$35 plus shpg. M Holwin, Anamnesia Studios, 40 South Oxford Street, Brooklyn NY 11217. 718-852-7630.

McIntosh MC-2500 unused, \$3000; MC-240, \$1200; MC-60 (2), MC-40, MC-225 (2), \$600/ea. R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

QSC 1400 stereo pwr amp, 300 W/chnl at 4ohms, 200 W/chnl at 8ohms, mono bridging, fan cooling, octal accessory plugs, \$425. R Ross, 88 Sherman St 2nd Fl, Brooklyn NY 11218. 718-965-2420.

ATI P100 stereo preamps (2) Encore series w/manual, \$125/ea. J Glogowski, 107 N Kenwood, Levittown PA 19055. 215-547-6199.

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

Straight Wire Audio UA-2 amp cards, \$55/ea. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Ampex Mod-A-692 (2) amp/speakers. Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

QRK Ultimate II stereo preamp, separate PS & preamp cabinets, excel cond, \$125. T Crockett, Box 10501, Blackburn VA 24060. 703-953-0222.

Want to Buy

Western Electronic amps, mixers, speakers, turntables, arms, mikes & literature. R Van-Dyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

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Shively 6813 NP's FM 3-bay antenna w/coax mounts couplings, like new, \$3,547/BO. L Torgersen, WQIC, Box 5353, Meridian MS 39302. 601-693-4851.

Andrew 2260B 7/8 EIA to N coax adapters, \$100. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

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Advance 155 370' (2) steel towers w/lights, will support 12 bay FM antenna. R Wright, WLLX, 1208 N Locust, Lawrenceburg TN 38464. 615-762-6200.

Dielectric 4 1/16" rigid transmission line, 50 OHMS, 25-20 sections, Call C Williams 904-763-1035.

Shively 6810 10 bay, 2.5 yrs old, tuned to 101.1 MHz, \$11,000. A Baxa, WAVV, 11800 Tamiami Tr E, Naples FL 33962. 813-775-9288.

Austin ring lighting transformer, 30 yrs old, \$400/BO. D Jack, Mtn. Media. 208-286-7676.

Gates 6 Bay cycloid tuned to 106.5, call for info. J Dunsan, 304-623-6546.

RCA MH-19089-2C 3-1/8" flanged, never used (8), BO. B Maxwell, 6053 Bunker Hill, Pittsburgh PA 15206. 412-661-2020.

RCA 3 bay class A antenna, 106.3 MHz, BO. T Rusk, 501-569-8485.

Windcharger 300 ft, 18 in face well maintained, standing, Continental 8 bay circular polarized antenna at 107.1, 300 ft Andrews 1 5/8" line, \$20000. J McBride, Box 464, Osceola IA 50213. 515-342-6536.

ERI 8 bay class C FM, 98.5 MHz & various 3 1/8" headline connectors, BO. T Rusk, 501-569-8485.

World Tower 429' solid rod, 1 yr old, ERI 95.7 two bay antenna, lights & lines. B Carr, 1201 Fremont Pike, Woodville OH 43469. 419-837-9696.

Harris/ERI 3 bay 'Rototiller' Class A type on 95.9 MHz. M Beasley, 300 W Reed, Moberly MO 65270. 816-263-5800.

Jampro JCP FM elements w/heaters tuned to 107.3, (3) connecting cables w/ power divider, \$1500/all/BO. R Shroyer, Box 1460, Yakima WA 98907. 509-248-1460.

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Shively 6810 8 bay circular w/radomes, new, tuned to 100.3, BO. J Stanford, 2228 Gravier, New Orleans LA 70119. 504-822-1945.

ERI CPS-G1E single bay tuned to 96.5 MHz, 8 months old, \$2500. R Jesse, 3645 South, Springfield MO 65807. 417-887-9650.

Cetec FM 2 Bay, power gain of 1.00, freq 95.9 MHz, true circular polarization, plus 20 radomes designed for this antenna. H Beam, Box 5588, Princeton WV 24740. 304-425-2151.

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Harris/ERI FMH series 10 bay centered 'Rototiller' type at 92.3 MHz, gd cond, \$9950. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

ERI 12 bay circular tuned to 98.5 available Feb 1990, BO. J Stanford, 2228 Gravier, New Orleans LA 70119. 504-822-1945.

Phelps-Dodge 10 bay, class C FM, 104.1 MHz, gd cond. L Magnuson, 2000 Indian Hills Rd, Sioux City IA 51104. 712-239-2100.

Gates-ERI 3 bay CP FM antenna on channel 240 95.9 MHz 2.21 kW in 3 kW ERP, w/tower brackets and deicers, \$3500/or trade for 350 Carousels. F Vobbe, Box 5031, Lima OH 45802. 419-228-4199.

ERI FMHHS G5-4 4-bay, high power horizontal only 4 bay antenna tuned to 94.5 MHz +/- 3 MHz. Available in Eugene, OR. Contact Chris Reid Murray, CE, KMGE. 503-484-9400.

Want to Buy

AM phasor cabinet, 5 tower 1kw tower, w/tuning components, any freq, gd cond., T McGinley, WPGC, Box 10239, Washington DC 20018. 301-441-3500.

Coaxial patch panel 3-port, 3 1/8 inch w/U-link, reasonable, cost effective, economical. K Brown, Box 808, Riverton WY 82501. 307-856-2922.

FM antenna 3 bay horizontal. E Jenner, 102 Elm, Washington MO 63090. 314-239-6800.

Two-bay lightweight FM broadcast antenna for emergency use, tunable to 91.7 MHz, about 1 kW pwr capacity. E Goetsch, 303 W Prospect, Rhineland WI 54501. 715-362-6000.

LPTV antennas UHF & VHF & helix 1 5/8" & larger in lengths between 50'-500'. J Worral, 4618 Gabriel Dr, New Orleans LA 70127. 504-241-6634.

2-4 bay circular, tuned to 98.3 or 98.5. J Stanford, 2228 Gravier, New Orleans LA 70119. 504-822-1945.

Heavy 500' guyed, galvanized tower. M Vande Voort, Rte 3 Box 214, Pella IA 50219. 515-628-1724.

AUDIO PRODUCTION

Want to Sell

Shure SE-30 mixer/compressor, rack mtg, \$135; Soundcraftsman RP-10-12 10 band graphic EQ, pro VU-metered, 600 ohm out, rack mountable, \$125; Altec 1650 1/3 octave graphic EQ, mono, w/security cover, rack mtg, \$135. W Laughlin, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

Orban 8000 6 yrs. old, gd. cond. \$1800. B Weeks, PO. Box 107, B Falls VT 05101. 802-722-4890.

Shure M267 & M268 M267 \$350, and (2) M268 \$190/ea. mint cond. Orig. manuals and plging. D Jackson, 708 E. Whaley, Longview TX, 75601, 214-236-3015.

Shure M267 mixer, like new, BO. D Eressy, 509-945-4855 am.

Orban 245F Stereo synthesizer, never used (2), BO. D Eressy, 509-945-4855 am.

Symetrix T-101 Telephone interface never used (2), BO. D Eressy, 508-945-4855 am.

Telcom C4 DM cards (2), new, \$495/ea. C Richardson, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Dolby feature films portable NR frame in stereo accepts Dolby, dbx & Telcom cards, works on AC or DC & is designed for Nagra IV-S, but works w/other machines, \$1295. C Richardson, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

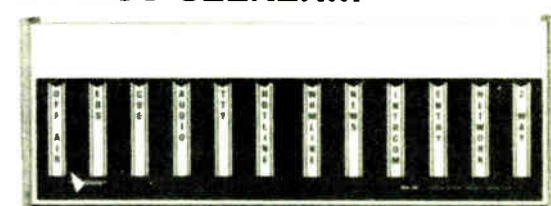
Audio production company quitting business everything goes, write or call for complete list of inventory. Fred Arthur Productions, 1218 E 18th Avenue, Denver CO 80218. 303-832-2664.

Studio Sound S-305 passive filter sets (2), matched pair, rack mount, very rare, \$250 ea/BO. R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Sony PCM-F1 (2) digital audio processor in gd cond w/pwr supply, use w/any VCR, \$1000/ea. P Christensen, 3101 University South, Jacksonville FL 32216. 904-721-9111.

Eventide 1745M 3 separate delays on output & pitch ratio, excel cond, \$600. F Virtue, 1618 N Broad, Philadelphia PA 19121. 215-763-2825.

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dbx Model 140A 2 chnl NR unit, use w/any video or audio tape recorder, provides 30 to 50 dB of NR, \$400. A Romanoff, 374 N Ridge-wood Place, Los Angeles CA 90004. 213-467-1700.

AKG BX20E very gd cond; Marantz tube amplifier Mod-8; Marantz tube preamp Mod-7. Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

Eventide H-969 Harmonizer, \$1500. B Glasser, Box 9917, Canton OH 44711. 216-456-7166.

Howe Phase Chaser, like new cond, \$500; Heath 10-104 15 mHz oscilloscope, \$200; McMartin AM-25 AM noise meter, works gd, \$50. G Barnett, Broadcast Centre, Palm Springs CA 92263. 619-328-1104.

Audi-Cord 132R network delay recorder; Gates 994-6543-001 Solid Statesman AM limiter; Harris 994-6631-006 Solid Statesman FM limiters (2), black face; Harris 994-6631-006 Solid Statesman FM limiter, grey face; Harris ME-1 mod enhancer, AM mono; Gates M6214F Cartridge Tape II stereo cart R/P; (2) Gates M6212C stereo PB cart machines; Maze rack mounted reverb, all equip operational. B Hopkins 501-863-6126.

Orban 536A De-Esser 2 chnl, excel cond, BO. Falk Recdg, 7914 Fegenbusch Ln, Louisville KY 40228. 502-239-1010.

Studio Technology RCU-1 R/C unit, distinguishes between mono & stereo and controls an external synthesizer, excel cond, \$400. M Byrnes, 4400 Massachusetts NW, Washington DC 20016. 202-885-1030.

Lexicon 224 version 4.4 just back from factory w/complete check out, like new, \$3250. F Virtue, 1618 N Broad, Philadelphia PA 19121. 215-763-2825.

Bdct equipment; Orban 111B dual reverb, \$600; dbx 140A Type II noise reduction (2), \$400; ITC Delta I stereo cart machine, \$2200; CRL SEP-800 4 band stereo compressor, \$1250; CRL SPP-800 stereo AGC, \$1250, all prices negotiable. H Ginsberg, 45 Roosevelt Hwy, Colchester VT 05446. 802-655-9530.

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Shure M-63 Audiomaster w/rack mount, (2). Motor Sports Radio, 1285 Zevan, Johnson City NY 13790. 800-462-5677.

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Eventide BD955 broadcast digital delay with 15 kHz bandwidth & 6 second delay, must be in excel cond. M Byrnes, 4400 Massachusetts NW, Washington DC 20016. 202-885-1030.

Tube limiters compressors and EQs, Fairchild 660 & 670, Teletronix LA2A, LA3, any Pultec EQs, Lang EQs, etc; also other vintage tube signal processing equip. J Kreines, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

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Harris 9003, including (5) PR 99, (3) instacarts, (2) terminals, printer, Wegener sat rcvr, (3) Harris racks, options are optional. BO. N Schwanitz, WXYT, 15600 W 12 Mile, Southfield MI 48076. 313-569-8000.

SMC DPI-C, automation system, complete w/(4) 450 RSB Carousels, (4) SMC/Otari R-R PB decks, SMC dual cart, single play deck, (4) matching equip racks, logging w/X-tel printer, digital programmer w/brain & remote encoder w/monitor & all manuals, \$13,500. Debra Kubel, KCIM, POB 886, Carroll IA 51401. 712-792-4321.

Otari ARS1000 automation R-R PB deck, w/25Hz sensor; excel cond, \$1200 or BO. M Brown, 503-245-4829.

SMC mono dual play cart deck, vgc, \$400. D Jack, Mtn. Media. 208-286-7676.

SMC 350 Carousels (3) \$2600/all. G Elder, PO Box 869, Covington GA 30209. 404-786-1430.

SMC 250 RSC Carousels (3) \$11800/all; RSC-50 random select SMC programmer, \$200; RSC-100 programmer, \$275; 510 SMC single cart PB, \$150; SLS-2 Silence Sensor, \$125; DC-7 Clock, \$225. G Elder, PO Box 869, Covington GA 30209. 404-786-1430.

Autogram C-2 dbl Carousel control, diodes on a punch board in drawer, for two RAS Carousels, \$175; Hallikainen TAX-161 time announce cont, \$100. D Jack, Mtn. Media. 208-286-7676.

Otari ARS-1000 RR playback w/25 Hz sensor, \$950. G Gaskey, Box 158, Weed CA 96094. 916-938-3828.

Schafer 903 controller & keyboard w/printer, cables, \$3500. G Gaskey, Box 158, Weed CA 96094. 916-938-3828.

SMC equipment racks (5) \$1000/all; SMC time announce, \$450; DP-2 Brain w/remote start, \$1800; DC-8 Super Clock, \$225. G Elder, PO Box 869, Covington GA 30209. 404-786-1430.

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SONY C48 MIC	700
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TELEX PH75 HEADSET	85
UREI SR1 RACK MOUNT	20

SONY BVP-30 w/CA-30L, Fuji A149X berm, BVF-50 viewfinder, RM-P3, BVW-25, BVM8021, O'Conner mdl 50 system, all excel cond, low hrs, call or write T Wagner, USArt, 512 S Hanley, Ste 90, St Louis MO 63105. 314-567-6777.
--

SONY DXC-M3 (2), 3-tube cameras, excel cond, ea has Canon 15X bcdt lens, complete w/case, charger, field battery pack & extras. D Kahn, TW 33, 601-21 Newark St, Hoboken NJ 07030. 201-659-1700.
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JVC BY110 3 tube camera w/S-VHS upgrade, Fuji 16X zoom lens, MK50 shotgun mic & optional KAM-50 mic grip, A/C adapter-charger, (2) DC11U nicad batteries, VF400 4" B+W studio viewfinder, studio zoom & focus controls, (2) cables, custom case, high resolution & a top quality performer in like new cond, \$3695. B Hines, IPS, Rd 1 Box 413A, Export PA 15632. 412-468-4115.
--

SONY BVW3 Betacam tube camera w/12 extender, Fuji lens, B/WI recorder & access, both recently serviced & in gd working order. S11000. J McBride, Box 464, Osceola IA 50213. 515-342-6536.

SONY AVC-3260DX B/W video camera w/monitor viewfinder, \$100 plus shpg. M Holwin, Anamnesia Studios, 40 South Oxford Street, Brooklyn NY 11217. 718-852-7630.

JVC KY210 3 tube camera, low hrs, mint cond. all extras. \$3500. Jack, 203-264-3666.
JVC KY2000/RS (2) cameras sat type recently retubed w/14:1, w/optional CCU & 50' cable, clean, \$6000. R Krangle, 680 Haines NW, Albuquerque NM 87102. 505-842-1418.

JVC KY210 3 tube w/access, like new. J Jones, 920 Main St N, Southbury CT 06488. 203-264-3666.
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Norelco PC70 3 tube color studio camera systems (20) w/21-210mm studio lenses, CCU's, all cables, complete, Ampex 3 tube color studio camera, Hitachi 3 tube color studio camera, both w/CCU's, studio lens & cables, BO. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

Hitachi FP-60 complete chains (2), w/lenses, viewfinder, RCU's, CCU's, etc, just taken out of service Jan 90, BO. R Shriver, Marietta College, McKinney Mass Media, Marietta OH 45750. 614-374-4802.
--

Sharp XC-700 3 tube, retubed, case & accessories. \$1800/BO; (2) JVC 562-U tube color camera, \$400/BO. T Quinn, 208 Cherry, Capitola CA 95010. 408-475-0423.

RCA Dumont iconoscope & image orthicon cameras, tubes, tripods and parts. A Weiner, 14 Prospect Dr, Yonkers NY 10705. 914-423-6638.

Harris 9000 complete stereo, (6) Scully reels, (2) Instacart 48's, CRT, CPU, all manuals, BO. B Harmon, PO Drawer J, Plant City FL 33564. 813-754-9191.

Broadcast Electronics Control 16-X latest software version, 4 reel to reels, network delay, triple cart, 3 Go Carts, will install, setup & train, \$27000. W Keeney, 863 Benner Pike, State College PA 16801. 814-238-5334.

Want to Buy

IGM 500 System wanted, any cond, BO. T Murray, 100 W 9th Suite 306, Rochester IN 46975. 219-223-6059.

BE Sat-16 satellite program controller system A or B with or without printer, L Maierhofer, 101 Army Blvd, Lewisburg PA 17837. 717-523-3271.

250 or 350 Carousel or similar type multiple cart machine any type, mono or stereo, will pick up. F Vobbe, Box 5031, Lima OH 45802. 419-224-4199.

CAMERAS (VIDEO)

Want to Sell

IVC-240 film chain incl CCU and camera junction unit, must be picked up in Tulsa, OK, FREE. R Hardy, 3239 S 90th East Avenue, Tulsa OK 74145-1661. 918-627-2937.

Norelco PC72, PC70, PC970, color cameras, 15:1 lens, lots of parts, yokes, etc. BO. H Larson, Matrix TV, POB 538, San Luis Obispo CA 93406. 805-544-5657.

Sony VO-2860A (2) w/micro-Loc. \$600 ea; Universal wooden field tripods (2) w/fluid heads, 1 spare head. \$350 ea. all in gd cond. J Romeo, Comm Christian Network, POB 84395, Vancouver WA 98684. 206-254-2978.

Panasonic WV-777 3-tube camera, ENG configuration 12 x 1 lens w/2 NiCad batteries, (2) chargers, hard case, A/C adapter, operators manual, service manual. 4-pin DC input adapter, \$3500. B Marshall, Instant replay Vide, 3836 Harvey, Western Springs IL 60558. 708-246-3110.

Ikegami ITC-2405 (2), 3-tube saticon cameras, complete w/lens, cables, CCU, \$2000 ea/\$3500/both. L Mintzmyer, KOOD, 6th & Elm, Bunker Hill KS 67626. 913-483-6190.

CEI 310 color camera w/CCU w/rear zoom controls, etc (2), \$2000. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Sony BVP-30 w/CA-30L, Fuji A149X berm, BVF-50 viewfinder, RM-P3, BVW-25, BVM8021, O'Conner mdl 50 system, all excel cond, low hrs, call or write T Wagner, USArt, 512 S Hanley, Ste 90, St Louis MO 63105. 314-567-6777.

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JVC KY2000/RS (2) cameras sat type recently retubed w/14:1, w/optional CCU & 50' cable, clean, \$6000. R Krangle, 680 Haines NW, Albuquerque NM 87102. 505-842-1418.

JVC KY210 3 tube w/access, like new. J Jones, 920 Main St N, Southbury CT 06488. 203-264-3666.

Norelco PC70 3 tube color studio camera systems (20) w/21-210mm studio lenses, CCU's, all cables, complete, Ampex 3 tube color studio camera, Hitachi 3 tube color studio camera, both w/CCU's, studio lens & cables, BO. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

Hitachi FP-60 complete chains (2), w/lenses, viewfinder, RCU's, CCU's, etc, just taken out of service Jan 90, BO. R Shriver, Marietta College, McKinney Mass Media, Marietta OH 45750. 614-374-4802.

Sharp XC-700 3 tube, retubed, case & accessories. \$1800/BO; (2) JVC 562-U tube color camera, \$400/BO. T Quinn, 208 Cherry, Capitola CA 95010. 408-475-0423.

Want to Buy

RCA Dumont iconoscope & image orthicon cameras, tubes, tripods and parts. A Weiner, 14 Prospect Dr, Yonkers NY 10705. 914-423-6638.

CART MACHINES

Want to Sell

Macarta 57211 RP for use or parts, BO. D Aase, KHHT-FM, Box 1686, Minot ND 58702. 701-852-0361.

IGM Instacart mono w/Marc I remote box, gd cond, BO. D Aase, KHHT-FM, Box 1686, Minot ND 58702. 701-852-0361.

Sono-Mag 350 RS (2) 6 yrs. old, both in gd. cond. \$800/ea. or 2/\$1500 pls. frt. cst. B Weeks, PO Box 107, B Falls VT 05101. 802-722-4890.

ITC Premium RP, limited use, \$900. F Lauerman, WMAM, Marinette WI 54143. 715-735-6631. 3-5 CDT.

ITC RP w/network delay, excel cond, \$1250; (3) ITC RA's, 3 tones, \$550 ea; ITC RA, 1khz tones, \$500; ITC RA, missing case, \$375. M Brown, 503-245-4889.

Motor w/capstan for ITC 3 deck, cond unkn; manuals for ITC 3 deck, \$100; Collins PB-190 rack mount, gd for parts, BO. D Niccum, KOZA, 1301 S Crane, Odessa TX 79760. 915-333-3101.

Audio-cord E-series (1) w/record/play/stereo & w/1 playback unit-mono, gd. cond. \$1200. B Weeks, PO Box 107, B Falls VT, 05101, 802-722-4890.

Spotmaster BED-17 RP single deck mono, gd cond, \$250; ITC standard record electronics, stereo, gd cond, \$450. G Gardner, KLG, 243 W Main, Delta UT 84624. 801-864-4423.

Collins stereo twintape spare parts; PC boards for PB deck & stereo record amp, power supply, relays, switches, etc. \$500/BO. Hank, 818-255-3656.

ITC Premium SP (2), mono, gd cond, new steel cases. \$625 ea; Audicord A Series (2) single play mono, fair/gd cond, \$300 ea. Audicord A Series side by side RP, (2) play slots w/record module in middle, gd cond, needs record amp cards, 550. B Lunderville, Radio New England, 75 Gardner, Hirgham MA 02043. 617-749-1304.

AudiCord A Series stereo R/P deck fair cond, \$450. R Kerbawy, Box 1127, Beckley WV 25802. 304-877-5592.

Audi-Cord A Series R/P dual, needs some work, \$500. R Meadows, Southeastern Sports, 1203 Seaton Rd #117, Durham NC 27713. 919-554-1366.

Gates Compact Criterion Mono PB (3) \$350/ea; (2) SMC 590 R/P, 3 tones, \$200/ea. G Elder, PO Box 869, Covington GA 30209. 404-786-1430.

Audi-Cord A series Dual RP, \$500. R Meadows, 1203 Seaton Rd #117, Durham NC, 27713. 919-554-1366.

ITC RP mono w/tones, \$850; ITC WP mono w/tones, \$500; SMC 721 dual cart player, \$350. G Gaskey, Box 158, Weed CA 96094. 916-938-3828.

Ramko cart winder, \$150. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

ITC RP Series stereo R/P, excel cond, \$1800. G Aycock, Rt 11 Box 458 A, Longview TX 75603. 214-757-5633.

Spotmaster Mod-500C R/P, Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

ITC SP w/rack mount, \$800; ITC RP w/delay & all tones, \$1400; ITC PD-II w/record, \$1000; Beaucart II (2), \$500/ea; & Spotmaster RPD-700 w/delay, \$1000. Clark, Secor Road, Hartsdale NY 10530. 914-693-2400.

ITC WP mono PB, BO. T Driggers, 818 Quail Ct, Healdsburg CA 95448. 707-433-9370.

Tapecaster 700S (5) (2) R/P, (3) P only, just removed from service, spare sec cue electronics, \$600; BE cart winder, virtually no mileage. BO. D Sparano, 518-382-6167.

UMC Beaucart R/P, gd cond (3), 3 tones, spare parts, manual, \$1995/all. B Carr, 1201 Fremont Pike, Woodville OH 43469. 419-837-9696.

ITC PDII mono, gd cond, player, single tone, clean, \$350. G Beecker, 4110 West Bank, Tampa FL 33624. 813-960-8153.

ITC 750 stereo R/P, \$500; ITC 850 stereo R/P, \$500; Scully 280 mono R/P, 75/3.5 ips, \$450; Ampex 350 transport/Inovonics electr, \$450; Teac 7030 stereo R-R, \$200; Wollensak 3M portable R-R, gd cond, \$120. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

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3M/ITC WRA stereo record amp wall tones, J Lombardi, Island Video, 182 Fairchild, Plainview NY 11803. 516-349-0333.

PB only stereo cart machines, must be in gd working cond, college station will pay reasonable price. H Espravnik, WVCP, 1360 Nashville Pk, Gallatin TN 37066. 615-452-8600.

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ITC 99-A/99-B/Omega/Delta R/P units, must be in gd cond, prefer stereo units. T Murray, 100 W 9th Street #306, Rochester IN 46975. 219-223-6059.

ITC R/P mono deck, B Oostenburg, PO Box 6, Coolidge AZ 85228. 602-963-9290.

BE 2000/3000/5000, stereo triple deck or singles, mechanicals must be sound, needed to replace motor w/240/VAC 50 Hz. P Oliver, 89 FM, Stephenson Street, Blenheim, New Zealand. 064 57 88520. FAX 064 57 80389.

Playback & record units in good working order. A Moil, 828 S Getty, Valde TX 78801. 512-278-1102.

Sparta Century, will purchase cart machines, prefer mono, reasonable prices paid. B Mayben, 137 McMurtree Ln, Huntsville AL 35806. 205-721-9393.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Revox PR99 (2), \$650/ea. Mr. Hays, 505-397-4969.

Sony TC-640 7" 1/4 trk stereo reel, vgc, buyer pays shpg. \$50. W Laughlin, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

Ampex AG-350 FT in roll around, \$350; Ampex 351-2, reproduces only, solid state, \$250; Liberty CW-20 cart loader, BO; Electro Sound ES 100-48C cart & cassette loader, BO. D Lundy, POB 408, Heidrick KY 40949. 606-546-6650.

Ampex 351 tube-type electr, modified for Sel-Synde. T Boddie, 12202 Union, Cleveland OH 44105. 216-752-3440.

Technics 1506 2 trk record, 2/4 trk PB, direct-drive quartz-lock, low hrs on head, vgc, \$600. Alan, Calvary Baptist Church, 1380 Valley Forge Rd, Lansdale PA 19446. 215-368-4444.

Ampex 601, 1/2 T machine in excellent condition; \$100. W Dudley, 6919 19th Street, Tampa FL 33810. 813-237-6516.

Otari ARS-1000 (2) 6 yrs. old, gd. cond. \$1000/ea. or 2/\$1600. B Weeks, P.O. Box 107, B Falls VT, 05101, 802-722-4890.

Sony DTC-1000ES U.S. mdl DAT machine, like new. BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Alt 2PM CST.

Ampex AG-440B 1" 8 trk roll-around console, gd cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Alt 2PM CST.

Revox PR-99 (4) used very little, \$5000 or BO, J Phillips, WZOM-FM, 4081-12 Clinton, Defiance OH, 43512. 419-782-8591.

Infonics 200 Series cass Dup 1-10" RR master, 1-4 pos. slave (2), \$1500/ea. T Boddie, 12202 Union, Cleveland OH 44105. 216-752-3440.

teac Syncaset 124, \$200 pls UPS. N Misahaan, POB 335, Lynnbrook NY 11563. 516-582-1338.

Uher 4000 Report-L in good condition with all acc.\$30. W Dudley, 6919 19th Street, Tampa FL 33610.813-237-6516.

Tascam 38 1/2" 8 trk, low hrs, excel cond, \$1875; K Flory, The Production Co, Box 1027, Siloam Springs AR 72761. 501-524-4626.

Tascam 122 MK2 4 trk, 2 chnl stereo, less than 10 hrs, \$700. R Meadows, Southeastern Sports, 1203 Seaton Rd #117, Durham NC 27713. 919-544-1366.

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Otari 4050 audio duplicator cassette, 4 yrs old, \$900. J Jones, 920 Main St N, Southbury CT 06488. 203-264-3666.

Tascam 42B R-R 4 months old, like new, \$2100, \$25 shipping & insurance. D Peluso, 2880 E Flamingo, Ste E, Las Vegas NV 89121. 702-732-2200.

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 FAX: (708) 843-7493

Fostex 3040 outboard Dolby C NR units (2), each provides 4 chnl of NR, \$400/ea. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

Ampex AG-500-2 portable case, mic/line mixing. BO. M Saddy, 141-60 84 Rd 3E, Briarwood NY 11435. 718-846-2062.

Pioneer RT-707 R-R RP, works, \$150. M Meyer, Box 70, Madison WI 56256. 612-598-7301.

Telex 235 & 300 series duplicating equipment. BO. Falk Recgd, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Sony PCM-701ES digital processor/recorder, never used, \$1250. B Foid, Box 1052, El Granada CA 94018. 415-726-4786.

Ampex AG-350 FT mono (2); AG-350 1/2 trk stereo; AG-440 1" 4 trk; AG-440 1" 8 trk; AG-350 1" 4 trk; PR-10 1/2 trk stereo; PR-10 FT. Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

Teac V-530X several cassette racks, gd cond. L Magnuson, 2000 Indian Hills Rd, Sioux City IA 51104. 712-239-2100.

Sony PCM-F1 (2) digital audio processor for recording onto any VCR w/pwr supply in gd cond, \$1000/ea. P Christensen, 3101 University South, Jacksonville FL 32216. 904-721-9111.

AKAI 4000D stereo 3 1/4 - 7 1/2 ips, no manual, \$75. L Spivey, Highway 231 S, Hartford KY 42347. 502-298-3268.

Superscope C-207 LP professional CR, like new, 3 heads, servo control, EQ & bias adj, limiter & more, \$165. D Zimmer, 3055 N Tyn-dall, Tucson AZ 85719. 602-623-2933.

Ampex 351 w/Inovonics amps, \$800; Scully 280B w/amp, \$500; Ampex ATR-700, \$1700; Ampex AG-600 w/carrying case, \$100 & MCI JH-110B w/Russ Lang cabinet (2), \$2600/ea. Clark, Secor Road, Hartsdale NY 10530. 914-693-2400.

Fostex 8753 interface, control any Sony Type 5 recorder w/Fostex synchronizer, \$300. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

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Otari MX5050-85D 1/2" 8 trk low hours, mint cond, calibration tape & extras, \$3000. C Volpe, 540 Stemmers Run, Balto MD 21221. 301-391-6927.

Denon DN 950F CD's (3); Denon CD cases (220); rack mount kit, will sell as is for \$2699. J Hansen, Box 699, St Cloud MN 56302. 612-253-9600.

Ampex AG-440 2-track stereo PB only w/Shaler electr, \$600/BO. G Barnett, Broadcast Centre, Palm Springs CA 92263. 619-329-1104.

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Want to Buy

3M 850, need not work, any cond OK but must have tension arms, need for spare parts. J Lombardi, Island Video, 182 Fairchild, Plainview NY 11803. 516-349-0333.

Inovonics 355 & 900 PS RP 2 chnl amp, must have xformers in play & sync cards. L Beigel, POB 85042, LA CA 90072. 213-466-3595 or FAX 213-466-3596.

Otari 5050 in gd cond, late mdl. K Hedge, Box 351 Pulaski VA 24301. 703-980-2702.

Teac A7030SL, A7030GSL, A3300ST, A3300S. J Parsons, Parsons Electronics, 10375 S C Annas St, North Huntingdon PA 15642. 412-863-9590.

Otari/Revox stereo 2/4 trk needed for production, must have vari-speed, and 10.5 reel capability, must be in gd cond. T Murray, 100 W 9th Street #306, Rochester IN 46975. 219-223-6059.

Viking/Telex RP84 or RP85 electronics. J Parsons, Parsons Electronics, 10375 S C Annas St, North Huntingdon PA 15642. 412-863-9590.

Ampex MR-70 2 trk stereo or mono machine, will consider transport only for parts. C Richardson, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Ampex ATR-700 rack mounts for ATR-700. W Slaten, 424 Grant, Scotch Plains NJ 07076. 201-322-4466.

Teac/Tascam 35-2 or 35-2B 2 trk in working cond, minor repairs needed. W Ahlberg, 11846 Ventura Blvd #306, Studio City CA 91604. 818-509-9100.

Roll-around matching set suitable for housing two Revox. D Sparano, 1-518-382-6167.

Inovonics 355 & 900 pwr dual channel record-play electronics, must have sync xformers on repo cards. L Beigel, Box 85042, Los Angeles CA 90072. 213-466-3596.

MCI JH110 B or C 1/4" 2 track, 7.5-15-30 ips; MCI JH110 B or C 1/2" 4 track, 3 3/4-7.5-15 ips. Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

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.

CONSOLES

Want to Sell

Harris stereo 80 8 ch. stereo control, gd cond. \$1000. T McGinley, WPGC, Box 10239, Washington DC 20018. 301-441-3500.

QRK 5 circuit cards & manuals, you pay s&h. T O'Laughlin, Rt 1 Box 41, Barneveld WI, 53507. 608-924-2001.

GE 10 chnl stereo solid state, no pwr supply, clean, vgc. BO. D Lundy, POB 408, Heidrick KY 40949. 606-546-8650.

McMartin B-802 & B-502, in service, everything works, spare parts and service manual incl. BO. P Wahl, 5558 Hallie Road Chippeva WI 54729. 715-723-1037.

BE 4BEM50-A 4 chnl, \$450 or BO. M Brown, KKR, 503-245-4889.

Collins 212V single chnl remote amp (2) w/case, gd cond, \$25 ea pls UPS. G Kirby, Marysville Bacs, 13813 US 38, Marysville OH 43040. 614-261-8871.

McMartin 502 gt. cond. being replaced by new board. \$500 or BO. B Weeks, PO. Box 107, B Falls VT 05101, 802-722-4890.

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 and Accessories

SEQUOIA ELECTRONICS
 1131 Virginia Ave
 Campbell CA 95008
(408) 866-8434

Ramko DC8M5 8 chnl stereo, all manuals & remote start units, excel cond, \$5000. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

Sphere Eclipse A/B 20 x 16 w/8) 9 band graphic EQ, full patch bay, producers desk, \$6000; Midas Pro Custom Recording, 16 x 8, remix switchover, (8) Pro 5, (8) Pro 3 modules, peak meter, clock/timer, flight case, \$10,500. H Alrich, Box 869, Greenville CA 95947. 916-284-6929.

Tascam M-50 12x8x8, lots of extra features, low hrs, mint cond, \$2400. K Flory, The Production Co, Box 1027, Siloam Spring AR 72761. 501-524-4626.

Gates Gateway II (2) w/pwr supplies & extra I/O modules, on air till end of April, fair/gd cond, \$575 ea. B Lunderville, Radio New England, 75 Gardner, Hingham MA 02043. 617-749-1304.

Tascam M216 16 ch input, 4 subgroup stereo, parametric mid band EQ, exc cond, \$950. D Lasko, 3054 Gold Canal Ste D, Rancho Cordova CA 95670. 916-638-7770.

Speck 16 inputs, 8 busses, outboard ps, easily port, exc cond. \$850/BO. R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-737-5264.

Audio Technics AT4462 6 ch portable mixer, operates on 4 9 volt batts, +8U stereo balanced output, osc, adjustable limiter, intercom system, \$750. D Lasko, 3054 Gold Canal Ste D, Rancho Cordova CA 95670. 916-638-7770.

RCA BC-7A solid-state, never in smoke, \$600. B Brigham, Locust & High Street, Montrose PA 18801. 717-278-2811.

Yamaha MC-1204 12 inputs, EQ w/parametric midrange; Eltom mic power, \$1500. G Desoto, 1117 E El Paso Ave, Fresno CA 43710. 209-432-0937.

Ramko DC-8M (2) 8 chnl mono, LED displays, \$525/ea. G Elder, PO Box 869, Covington GA 30209. 404-786-1430.

Russco 505S good shape, just re-worked w/manual, \$500/BO. V Richardson, 1024 College, Jackson KY 41339. 606-666-4946.

Gates M-6541A Gateway II, gd for parts, needs work, \$300/BO. C Dube, Box 1270, Springfield MA 01102, 413-732-4182.

Electrodyne RCC1608 20x8x2x16, full patching, spare pwr supply, \$1850. W Slaten, 424 Grant, Scotch Plains NJ 07076. 201-322-4466.

Tascam M320 20 input, 4 buss, 8 monitor, mint cond, \$2700. S Wytas, 165 Linden, New Britain CT 06051. 203-224-1811.

Quantum QM-8 8 inputs, 4 busses, quad & stereo mon, lrg triad input xfrms, audiophile snd, Duncan linear faders, exc cond, \$850/BO. R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Quantum QM8 eight chnl, 4 output audio board, \$1100. G Aycock, Rt 11 Box 458 A, Longview TX 75603. 214-757-5633.

Cetec 2008 mixing console, great cond, just taken from service. BO. D Sparano, 1-518-382-6167.

Gates Stereo Producer 4 chnl audio board, stereo, gd cond. L Magnuson, 2000 Indian Hills Rd, Sioux City IA 51104. 712-239-2100.

Tascam M312 12"x4"x2" audio board, BO. R Hiett, Box TV3, Harrisonburg VA 22801. 703-433-9191.

LPB S-13C stereo, 8 inputs, w/manual, excel cond, \$2600. J Glogowski, 107 N Kenwood, Levittown PA 19055. 215-547-6199.

Ampex Mod AM-10 (2); Mod MX-10 mixers (2). Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

Gates Producer Board 4-channel mono, solid state, works, \$200. M Meyer, Box 70, Madison WI 56256. 612-598-7301.

Gates Producer, 4 chnl mono, gd cond, \$110; Gates Producer, 4 chnl mono, as is, \$65. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Gates Dualux II 8 chnl, gd cond, \$1000. Clark, Secor Road, Hartsdale NY 10530. 914-693-2400.

Want to Buy

RCA & WE tube consoles, mixers, amplifiers, speakers, mics, literature. R Van Dyke, Caffrey House, Squires Ave, E Quogue NY 11942. 516-728-1327.

Gates Executive program amp module M5700. R McDaniel, KJRG, 209 Meridian, Newton KS 67114. 316-283-5150.

McMartin B-1082 8 chnl stereo board. L Nelson, WSPY. 708-552-8985.

Harris Stereo 80. G Elder, PO Box 869, Covington GA 30209. 404-786-1430.

CCA-QRK Futura Six any cond, for parts, must have VU meter and 2/3 cards, some slid pots too. G Erway, 3450 SE Martinique, Stuart FL 34997. 407-283-5871.

Gates Gateway, will purchase your console, preferably not working, also prefer in South. B Mayben, 137 McMurtree Ln, Huntsville AL 35806. 205-721-9393.

Parts for McCurdy SS-8600 stereo console, faders, plug in preamps, etc. M Mathis, Box 426, Magee MS 39111. 601-849-2413.

Gates/Harris Diplomat need spares, mic cards, pwr supply & transistorized program amp. D Burton, Box 453, Estherville IA 51334. 712-362-2644.

DISCO & SOUND EQUIPMENT

Want to Sell

EV Sentry II control monitors, walnut, excel cond, \$200/pr. D Lundy, POB 408, Heidrick KY 40949. 606-546-6650.

Klipsch La Scala speakers, Klipsch horns, road cases, fiberglass finish, excel cond. BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Alt 2PM CST.

Fairchild 641 stereo Mastering Disc Sys 740 variable pitch lathe, 542 cutterhead, 644 amp, 645 pwr sup, 602 conax, beta amp, spare tubes, styl, etc. \$2500. T Boddie, 12202 Union, Cleveland OH 44105. 216-752-3440.

Linn LM-2 drum machine w/LH Cooper mid modification, BO. P Cibley, 138 E 38 St, New York NY 10016. 212-986-2219.

Snake 16 phantom-pwr inputs w/ext ps, 250' Belden 19-pair cable w/mil connectors & stainless steel strain reliefs, 10' Neumann XLR snake mates w/box or Belden snake, exc cond, \$850/BO. R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Cooper Time Cube Mod-920-16. Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

Eventide H-969 Harmonizer, \$1500. B Glasser, Box 9917, Canton OH 44711. 216-456-7166.

Binson PE603-TU fair cond w/case, \$75. C Volpe, 540 Stemmers Run, Baltimore MD 21221. 301-391-6927.

Community Light & Sound RS40 4-way speakers (1 pair) w/Community VB790 bass bins, in Anvil cases, excel cond, \$1800 plus shipping. J Kreines, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

Voice of the Theater speakers (2) A-7, w/cross-overs; Infonics cassette duplicator, RC-2; Magnelax tape duplicator, five copy mono & stereo heads, open reel. Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

Pultec EQP-1 excel cond; Furman Sound Le Patch PB-40. Kinura Records, 377 Westward Dr, Miami Springs FL 33166. 305-887-5329.

JBL 4315, 4333, 4343 Loud speakers. R Glenn, 1718 Shenandoah Road, Wimauma FL 33598. 813-634-1940.

EV, JBL or similar for prod room, limited space, ceiling mount preferred. L Maierhofer, 101 Army Blvd, Lewisburg PA 17837. 717-523-3271.

LIMITERS

Want to Sell

Metron 506B-1 Amplitude modulation monitor, gd cond. \$300. C Ratliffe, #1 Radio Street, Wadesboro NC 28170. 704-694-2175.

Texar RFC-1 FM Optimod +5 card, \$300. R Rocks, 27 N 27th Street, Billings MT 59101.

Orban Optimod-FM 8100A/1 Perfect condition, factory specs. \$3000. R Rocks, 27 N 27th Street, Billings MT 59101.

Orban 8000/A excel cond, \$1400. P Swint, KIXQ, 2620 Dogwood, Joplin MO 64802. 417-624-1310.

Orban 424A compressor limiter, BO. R Hays, KYKK, 619 N Turner, Hobbs NM 88240. 505-397-4969.

Orban Optimod 8100A s/n 1408910, used less than 1 yr, pristine wall accessories, \$4000 firm. S Schweiger, WXLO, 146 Worcester Center, Worcester MA 01608. 508-752-1045.

Orban Optimod 8000 perfect cond, taken out of service 3/89, \$1500. P Swint/J Leutzinger, 417-624-1310.

CRL AM NRSC pre-emphasis filter processor, type SPF-300, meets new FCC standards, mint condition, \$450. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-869-1960.

DAP 310 (2) audio processor in gd cond, \$450/ea. P Swint/J Leutzinger, 417-624-1310.

Orban Optimod 8100A/1-FM mint condition, \$3000. R Rocks, Box 1689, Billings MT 59103. 406-248-2681.

CRL FM System SPP-800, SEP-800, SMP-800, SG-800, CC-300A, excel cond, \$4500. T McNally, 1825 Murray Ave, Atlantic City NJ 08401. 609-344-0300.

CRL FM System SPP-800, SEP-800, SMP-800, SG-800, CC-300A, excel cond, \$4500. T McNally, 1825 Murray Ave, Atlantic City NJ 08401. 609-344-0300.

SUPER-GEN

This high-performance FM Stereo Generator has selectable pre-emphasis, overshoot-controlled lowpass filters, digital pilot/subcarrier synthesis and built-in overmod protection. CBS/NAB's "FMX" system is available as a plug-in option.

Inovonics
 SANTA CRUZ, CA (408) 458-0552

Texar RCF-1 #5 card for Optimod, \$300. R Rocks, Box 1689, Billings MT 59103. 405-248-2681.

QEI Stereo Peak Max 10715 limiter Good cond, w/manual; QEI 1073S stereo AGC amp, good condition. BO. V Clough, 225 Green St, Fayetteville NC 28302. 919-486-4991.

UREI 1176LN limiter, \$400 plus shpg. M Holdwin, Anamnesia Studios, 40 South Oxford Street, Brooklyn NY 11217. 718-852-7630.

CRL AM APP 400, PMC 300A, SEP400B, SPF 300, NRSC compliant, in service 2.5 yrs, \$2500. M Tracy, KOAQ, PO Box 1263, Scottsbluff NE 69363-1263. 308-635-2690.

Dorrough DAP-310 AM processor, all complete, working when removed, \$245. D Jack, Mtn. Media. 208-286-7676.

Gates/Harris limiter, AGG unit, \$300. G Elder, PO Box 869, Covington GA 30209. 404-786-1430.

Volumax stereo FM4110 Slimline, good cond, w/book, \$225. T Crockett, Box 10501, Blackburn VA 24060. 703-953-0222.

Mod Science CP-803 composite clippers (2), like new, \$500/ea. R Jesse, 3645 South, Springfield MO 65807. 417-887-9650.

CBS Labs 411 FM Volumax, 2 mono units, use two for stereo, BO. M Saady, 141-60 84

BEE

LIMITERS . . . WTS

Texar Audio Prisms, (2) new. S Mahalick, 22141 Cleveland Rd Suite 310, South Bend IN 46628. 219-674-5577.

Gentner Audio Prism new cond, never rack mounted, \$1400. R Hull, 8236 E 71st Suite 133, Tulsa OK 74133. 918-254-0464.

Apex Aural Exciter II broadcast aural exciter, prof model, balance in/out, rack mount, excel cond, \$750. M Byrnes, 4400 Massachusetts NW, Washington DC 20016. 202-885-1030.

Harris MSP-90 AM processor in very gd cond, \$500. G Meyer, Box 623, Washington MO 63090. 314-583-5155.

DAP 310 peak limiter in vgc, \$300. G Meyer, Box 623, Washington MO 63090. 314-583-5155.

Want to Buy

Orban Optimods 8000A, 8100A, 8100A/1, 9000A, 9100A, 9100B. Hall Electronics, 1305-F Seminole trail, Charlottesville VA 22901. 804-974-6466.

UREI LA-3A or LA-4 prod compressor/limiters. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Alt 2PM CST.

RCA BA-GA or similar tube type limiter. A Weiner, 14 Prospect, Yonkers NY 10705. 914-423-6638.

Fairchild 660 or 670, Teletrex LA2A, LA3, other tube compressors & limiters; also other vintage tube signal processing equipment. J Kreines, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

CRL SMP-800 any model, gd cond. L Maierhofer, 101 Armory Blvd, Lewisburg PA 17837. 717-523-3271.

MICROPHONES

Want to Sell

Shure DY-2 w/Dazon floating stand, \$20 pls UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

RCA 77DX vintage ribbon mic, excel cond, BO: Neumann U-67 vintage tube mic, excel cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Alt 2PM CST.

Altec 639 complete w/yoke & cable stand mounting, gd ribbon, will trade for small dual trace scope. L Beigel, POB 85042, LA CA 90072. 213-466-3595 or FAX 213-466-3596.

AKG N-60 tube condenser pwr supply, w/swap for Sony type CP-2, CP-3A, or CP-3B pwr supply. E O'Brien, RR31 Box 405, Terre Haute IN 47803. 812-877-2663.

RCA 77 DX mt. cond., matched pr. Also 44JR original babs, 750/3 or BO. J Phillips, WZDM-FM, 40812 Clinton, Defiance OH, 43512, 419-782-8591.

Neumann U87 (2), ecel cond w/AC pwr supply, \$2500/ai. F Badaeus, Musik Faktory, 1812 Procter, Port Arthur TX 77640. 409-982-7121, 4-8PM CDT.

Electro Voice RE-20 never used, \$450. R Meadows, Southeastern Sports, 1203 Seaton Rd #117, Durham NC 27713. 919-544-1366.

Telefunken Tube CM-61 very rare, uses std plug-in tube, mint cond w/custom ps, BO. R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Shure SM-89 shotgun mic, w/shock mount & kangaroo case, \$550/trade. D Lasko, 3054 Gold Canal, Ste D, Rancho Cordova CA 95670. 916-638-7770.

Neumann KM-88 rare 3-pattern w/nickel capsule, hot-setup percussion mic, mint cond w/orig case, \$995/BO; Neumann KM-86 3-pattern, mint cond, \$750/BO; AKG D224E (2), unused, \$375/BO/each. R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Shure 330 ribbon bidirectional mic (2), \$175/ea. C Richardson, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Electro Voice RE-20 mic has never been used, \$375. R Meadows, 1203 Seaton Rd # 117, Durham NC 27713. 919-544-1366.

Shure SM-89 shotgun mic, new, \$495. C Richardson, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Realistic Dynamic Uni-directional mics, \$40 ea or 3/\$100. R Meadows, Southeastern Sports, 1203 Seaton Rd #117, Durham NC 27713. 919-544-1366.

Electro Voice (3) 635 mics, \$50/ea. R Meadows, Southeastern Sports, 1203 Seaton Rd #117, Durham NC 27713. 919-544-1366.

Electro-Voice DS-35 dynamic mic. Falk Recdng, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

RCA SK-46 program velocity, new, in original box, \$235. D Miller, 11647 W 83 Terr, Lenexa KS 66214. 913-492-8822.

RCA, Electro-Voice & Shure, send for list. B Davies, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

RCA ribbon mics including (1) 44BX; (1) 77D; BK-11; 74-B; (2) SK-46; Shure 330 ribbon; Dynamics (2) Shure 555W, \$60 ea; EV 611; EV 630; Astatic DN-HZ. Tracy Eaves, 615-821-6099 (evenings).

Want to Buy

RCA 44BX or 77's, vintage ribbon mics. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Alt 2PM CST.

Telefunken ELAM 250s or 251s any cond; AKG C12s and C24s, any cond. J Kreines, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

RCA & WET, etc pre 1960 ribbon, carbon, condenser & dynm, mic's, have mic's & other equip to trade. R VanDyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

RCA-77DX, Shure SM-5B, Shure SM-7, & Sennheiser MD421-U reasonably priced, gd cond. J Emmel, Box 750, Olyphant PA 18447. 717-489-0005.

Will buy or trade for RCA 44A condenser mike no major missing parts please. J Webb, 15117 Hamlin, Van Nuys CA 91411. 818-769-6738.

RCA top dollar and/or trade old RCA movie mikes for RCA (pre-44A) ribbon-field coil mikes such as PB-17 or PB-31 etc. J Webb, 15117 Hamlin, Van Nuys CA 91411. 818-769-6738.

Vintage tube condenser mics especially Neumann/Telefunken/Schoeps/AKG; & classic ribbon mics, RCA 77s/44s, J Kreines, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

MISCELLANEOUS

Want to Sell

Phasemaster T1200A2 110 amp 240 V phase converter, excel cond, automatic starts w/full load, \$6500. A Baxa, WAVV, 11800 Tamiami Tr E, Naples FL 33962. 813-775-9288.

Music video library carefully mastered on 240 1" reels, excel quality. J Nightbyrd, LPTI Inc, 225 Congress Ste 307, Austin TX 78701. 800-333-2152.

Closing/Liquidating an AM station. All studio inventory, production room inventory, xmtr/tower equip inventory and lots of misc equip inventory must go. The list is too large to publish so please call for all the details & prices. J Clinton, WMLC, 601-264-7892.

GE Pacer VHF desk-top G/E base station on iter freq, old but works, w/ldes mic, \$65 pls shpg; GE MVP PY portable radio on UHF freq, no battery, works (2), \$25 ea pls shpg; Lambda LX5-A-5-OV 5 volt 4 amp pwr supply, \$15 pls UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Finebilt record pressing plant, (2) semi-auto rec presses, steam boiler pumps, punches, extruders, trimmers, electro-plating sys, chemicals, supplies, etc. \$12,000. T Boddie, 12202 Union, Cleveland OH 44105. 216-752-3440.

Sony/Econco 6800 w/bag, 100 hrs, \$1700; Econco 6166A/7007 tube, \$1800. M Nowak, WBKB, 1390 Bagley, Alpena MI 49707. 617-356-3434.

Paltex 57200103 A/B roll edit controller SN 1114, 42000. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Sales training video tapes (16), VHS format, 30 subjects covered. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

Conex AS101 audio switchers (2) no lamps; (6) Conex AS401 remote controls, BO. D Eresy, 1457 Main Street West Chatham MA 02669. 508-945-4855 am.

Tektronix 4006-1 Display terminal RS 232 interface, exc. cond. \$150. P Beal, Burem Road, Rogersville TN 37857. 615-272-3900.

Luxo LM-1 multipurpose arms, less base (4) in excel cond, \$50/all. T Devine, WV/LK, 300 W Vine, Lexington KY 40507. 606-253-5900.

RTI Cinescan II film editor, \$500; RTI film cleaner, \$200; Grass Valley 961 synac module, \$20. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

GE VHF monitor, one chnl w/cGuard, 120 VAC, excel cond, \$75 pls UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Bud B25A trans-aire rack blower, 2 sp, rebuilt motor, spare filters, \$50 pls shpg; Blonder Tongue AMT-10 audio modulator for TV chn 10, new, \$75 pls shpg; Melco Labs MAX212 telephone system, excel cond, \$250 pls shpg. E Davison, Multiplex, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Inventory of disposable items including CBS Volumax 400, Harris 994-7993-001 PB, Andrew connectors, Fidelipak Mastercarts, and much much more, too much to list. Call for details and prices. A Kaplan, 609 E Court, Seguin TX 78155. 512-379-2234.

Spectra Pro II light meter for film or still photography, exc cond w/manual, \$100. D Lasko, 3054 Gold Canal Ste D, Rancho Cordova CA 95670. 916-638-7770.

USED GEN SETS

15kW Perkins Diesel Engine \$4200.00
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 100kW Detroit Diesel Engine \$8500.00
 150kW Detroit Diesel Engine \$10,895.00

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 (207)657-3579

Office telephone systems, small key systems to large PBX, several sizes, working well. J Callaghan, Baron Aviation, 1601 N Marginal Rd, Cleveland OH 44114. 216-574-2525.

Belden cable various lengths and types, priced below wholesale. R Kerbaw, Box 1127, Beckley WV 25802. 304-877-5592.

Telex CD2MS w/CD2S and 3 +1 duplicator, \$1700. R Meadows, 1203 Seaton Rd #117, Durham NC 27713. 919-544-1366.

Various pieces of equip including (5) Scully 270's; Sparta AS-30's; Ampex, Harris, Studer, Shiveley, etc pieces also, too numerous to list, write for more info & prices. P Moore, KXFX, 1410 Neotomas Avenue, Santa Rosa CA 95405.

Gentner teleprocessor-telephone audio processor (2), \$200/ea. R Meadows, 1203 Seaton Rd #117, Durham NC, 27713. 919-544-1366.

Low power TV license, VHF-8 in south central Missouri town, growing area, some financing avail. 417-967-2242 or 417-932-4098.

Giant Boom Box covers for the giant boom box manufactured by Rainbow Enterprises, \$1500/BO plus shpg. Tony, WNOK/WOIC, 803-771-0105.

Dale Power Arrestor SPA 200 (2), new & never installed, BO. C Phillips, PO Box 987, Clinton TN 37717. 615-457-2697.

Western Electric T, R, S patch panels, wire wrap or solder connections, Weco 94 N repeat coils & new KS20159 line EQ, BO. R Kerbaw, Box 1127, Beckley WV 25802. 304-877-5592.

Doug Hau 3 chnl signal-to-noise meter, 19" rack mount, works good, \$125/plus UPS & shipping. G Kirby, 13613 US 36, Marysville OH 43040.

Paradyne equip rack, black, 78" tall, 30" deep, fully enclosed, \$175. Lord Broadcasting, 13313 SE 208th, Kent WA 98042. 206-631-2374.

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NEC Electra 16/48 3-year old programmable phone system w/pwr supply & cards for 16 phones, w/40 phones, you arrange installation, \$1800. Alan, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

Dummy loads, Electro Impulse 25 kW FM air cooled, like new, also 75 kW air cooled AM. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

New printer ribbons (25) for Texas Instruments 850/855, \$60/BO. G Barnett, Broadcast Centre, Palm Springs CA 92263. 619-328-1104.

Jerrol Channel Commander II 2 modulator IF-to-channl modules, tuned for T8 & channel 6, \$100/ea. R Anderson, 10 Court, Cynthiana KY 41031. 606-234-1400.

Comrex TCB-1 phone line couplers, \$100/ea; B&W 210 audio osc, \$200; B&W 410 dist meter, \$300; Racal type A-17B1 tower light xmtr, \$200; Kintronic isocouplers, FMC-75, \$2500; FMC-05, \$1000; Eventide delay BD-931, \$800; GE dist meter, \$100; Heathkit oscilloscope 10-4560, \$200; Elgin recorder connectors ERC-19645 (4), \$60/ea; Omega phone system (30) touch tone dialing w/KSU, \$3000. Clark, Secor Road, Hartsdale NY 10530. 914-693-2400.

Solar gas turbine G5-350 225 kW synch gen 3 phase & single phase, 2700 lbs, 730 hrs, \$20,000. R P Ulver, 15521 SW 152 Terr, Miami FL 33187. 305-238-8574.

IBM Quietwriter model 2 printer, w/various type fonts, direct interface to IBM PC's, thermal transfer printer. Falk Recdng, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Small xformers Hi to LoZ already mounted if needed manuals, Ampex, Pultec, Altec others, send for lists. Mr. Oliver, 212-874-7660 in afternoons

Altec 1567 Hi-LoZ mixer, w/xformers, VU meter & more. Gramplan cutter heads 1D feedback; lead screws for 6N presto cutter; Daven attenuator ladders 1020 600-600 patch bays single inputs/patch cords; Sencore transistor tester; other items. Mr Oliver, 212-874-7660 in afternoons.

Executone Encore telephone system, complete w/24 stations, give away price. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

Capps disc cutting needles, new; heating stylus ampere boxes w/VU meters, (2) Meisner mixer, 5 inputs, remote battery operated. Mixers (2) new Harmon-Kardon DPR7's, small transformers (7) 600-80,000 ohms. Some tubes, resistors, cannon 3 prong connectors (M-F). Mr. Oliver, 212-874-7660 in afternoons.

Generator & Transfer Switch, 55 kW 120/208 volt, 12 lead multi-voltage, natural gas engine, U.S. light & power 680 hrs, \$5750. Polly Electric Co., 314-443-7054.

Electro Impulse 25kW FM dummy load, air cooled, like new; also 75 kW AM air cooled. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

Want to Buy

Pre 1960 bdct equip, magazines, catalogs, instruction manuals, 7" & 10" blank recording discs, On-Air lights, RCA & WE audio equip, 16" transcriptions. R Van Dyke, Caffrey House, Squires Ave, E Quogue NY 11942. 516-728-1327.

SMC green racks, 1 or more. L Nelson, WSPY, 708-552-8985.

RCA equip catalogs from mid 60's showing AM, FM, and TV xmtrs, will pay for them or photocopies. W Irvin, 900 Bluefield Avenue, Bluefield WV 24701. 304-327-7114.

Smith Corona Mailcall Letterpack PB equip or service able to transfer dozen mail call letterpack cartridges to standard audiocassette. W Watrous, Watrous Video Prod, 739 S Orange, Sarasota FL 34236. 813-366-3316.

Remote meter for FM transmitter EBS receiver, gd cond. G Meyer, Box 623, Washington MO 63090. 314-583-5155.

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RCA WM-43A cond unknown, BO. D Niccum, KOZA, 1301 S Crane, Odessa TX 79760. 915-333-3101.

Gulf & Western 1000 Sensaphone w/three alarm inputs, direct modular connection to phone line, \$75. R Hardy, 3239 S 90th East Avenue, Tulsa OK 74145-1661. 918-627-2937.

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Want to Buy

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Scientific Atlanta digital satellite rcvr, DPU w/pwr supply & DMX plus cable to receiver, DAT 32. D Royer or M Tinsley, 804-847-1266.

Satellite rcvr set for Satcom 1-R-21. J Corcoran, 509-662-7135.

Scientific Atlanta 7325 75 kHz audio card. B Reece, North Road, Houlton ME 04457. 207-532-6587.

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Moseley TRC-15 remote control, fixable, \$400/BO. M Brown, 503-245-4889.

Comrex PTLX 2-line, like new, \$3500. D Rosema, Impact Radio, 512-837-7725.

Gentner VRC-2000, \$3000 cash. W Cox, WCGA, Rt 9 Box 240E, St Simons GA 31522. 912-638-1100.

Marti RPT2 & RPT25 2.5W & 25W xmters, 450/100 MHz never used; Marti CR-10 RPU rcvr, 450/100 MHz never used, B/O. D Eresy, 508-945-4855 am.

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Moseley SCG-8 92kHz subcarrier gen, 6 months old. K Browall, Box 808, Riverton WY 82501. 307-856-2922.

QEI 811 SCA on 67 kHz, excel cond w/manual. \$475. V Clough, 225 Green St, Fayetteville NC 28302. 919-486-4991.

Moseley SCG-8 & SCD-8 both like new cond, \$1500/both. D Jack, Mtn. Media. 208-286-7676.

Moseley DRS-1 wireline, 20 chnl, digital remote control system w/extra spare parts & boards, \$1250. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Comrex single line PLX II transmit & RLX receive unit, \$990. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Marti AR-10 UHF mobile relay receiver, BO. P Bailon, 1218 Pioneer Blvd, St Paul MN 55101. 612-222-5555.

Sony PCM-F1 (2) digital audio processors for 23 GHz STL system w/pwr supply in gd cond, \$1000/ea. P Christensen, 3101 University South, Jacksonville FL 32216. 904-721-9111.

M/A COM 23 CC microwave radio system, Hughes STX 141 xtrmr, Scientific Atlanta 8350 AGC mtr mon, Lenco distribution amp, Ward Beck distribution amp, Videotek RF demodulator, sell as package or BO per unit. T Pelissero, 1069 Tenth Ave SE, Minneapolis MN 55414. 612-378-1254.

Comrex PTLX 3-line xtrmr (2), new, \$3000/ea. D Stephan, 219 McFarland, Cincinnati OH 45202. 513-241-6565.

Micro Controls RCR-9 system perfect shape, set-up for one telephone pair, \$950/BO. V Richardson, 1024 College, Jackson KY 41339. 606-666-4946.

Want to Buy
 Satellite reception system for Transtar's Niche 29. R Schlosser, WSTV, 320 Market St, Steubenville OH 43952. 614-283-4197.

Gentner SPH-3 telephone interface & Microtel w/AC transformer. Motor Sports Radio, 1285 Zevan, Johnson City NY 13790. 800-462-5677.

950 MHz discrete STL rcvrs (2), rcvrs only. E Allen. 615-894-1023, FAX 615-875-3306.

Comrex LX-T & LX-R freq extender chain, will consider earlier PLX & RLX mdls; any or all parts of chain, Motor Sports Radio, 1285 Zevan, Johnson City NY 13790. 800-462-5677.

RPX xtrmr 450 MHz band. R Castro, 6640 Redwood Drive #202, Rohnert Park CA 94928. 707-584-1058.

Marti late model solid state xtrms & (1) rcvr 161.6770, will trade our tube models or sell outright. L Maierhofer, 101 Armory Blvd, Lewisburg PA 17837. 717-523-3271.

TFT 7615 status & control package for 7610 RIC system. J Stanford, 2228 Gravier, New Orleans LA 70119. 504-822-1945.

STATIONS
Want to Sell
 AM radio station, 1000 W in Albertville AL, possible increase of power to 2500 W, must sell due to illness of owner. Patsy King, Rt 6 Box 1245, Albertville AL 35950. 205-586-4160/5197.

AM & or FM radio station in Central Arkansas, good area, excellent potential. Ask for Vivian, 501-470-1525 or 501-568-5448.

AM CP in dynamic resort area 5kW of pwr on gd freq. J Evans, Rt. 4 Box 242, Knights Academy Rd, Valdosta GA 31602. 912-247-6859.

Equity interest available in AM in dynamic Four Corners area of S.E. Utah, principals only, only station in county, inquiries confidential. P Mueller, Hiway 191 N (6-1), Blanding UT 84511. 801-678-2261.

CP for AM 10,000 W Florence SC area, great potential as religious station, confidential, serious inquiries only, may work w/right buyer to help build. D Moran, Box 1092, Salem VA 24153. 703-389-3631.

AM/FM combo 5000 W AM non-directional, 6000 W FM non-directional, Southeastern NC, low down payment, owner financing avail, \$585K. Wayne, 919-965-4906 (PM's).

1 kW AM in Shelbyville TN established in 1959 on 1580 kHz & still operating under original ownership, all real estate, inventory & equipment included in sales price of \$175K cash or reasonable cash offer. A Wilkerson, Box 340, Lenoir City TN 37771. 615-986-7536.

Class B FM, stereo, Northern CA area, BE automation system, good money maker. R Trumbo, Box 117, Quincy CA 95971. 916-283-4144.

Top 80 Market C-I FM & adjacent market C-III FM, \$3.0 million, excellent western markets w/strong radio revenues. C Strandell, 221 Wil- lowbrook, Clinton MS 39056. 601-924-3087.

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Distressed or failing stations, can take over, no or little cash, let's deal, AM or FM. T Crockett, Box 10501, Blackburn VA 24060. 703-953-0222.

AM or FM's w/little or nothing down & owner financing, will consider other areas. L Haber, Box 136, Woburn MA 01801. 617-246-5634.

LPTV CP's & troubled station, buy or trade or joint venture, send details w/price and terms. J Worrall, 4618 Gabriel Drive, New Orleans LA 70127. 504-241-6634.

In Western Washington looking for FM or AM/FM, must be low priced, bankruptcy, problem stations, or daytimers OK. Lord Broadcasting, 13313 SE 208th, Kent WA 98042. 206-631-2374.

STEREO GENERATORS
Want to Sell
 Harris SCA module, 67 kc for MS15 & MX15 exciter, working, \$200; extender board for MS15 & MX15 exciter, \$35 pls shpg. E Davison, Multiplex, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Harris MS-15R w/manuals, BO. R Hays, KYKK, 619 N Turner, Hobbs NM 88240. 505-397-4969.

CRL SC-800 slightly used, \$650/BO. R Bendheim, PO Box 135, Redway CA 95560, 707-923-2513.

SWITCHERS (VIDEO)
Want to Sell
 Sono-Mag DS20A 6 yrs. old, gd. cond. \$500. B Weeks, P.O. Box 107, B Falls Vt. 05101. 802-722-4890.

Cross Point Latch 6112 w/8 inputs 2ME5 encoded chromo key, downstream keyer, \$2500. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

Crosspoint Latch 6119 special effects gen/switcher, \$1500 plus shpg. M Holdwin, Anamnesia Studios, 40 South Oxford Street, Brooklyn NY 11217. 718-852-7630.

Grass Valley 1400 2 M/E down stream key chroma key, \$895. B Clinger, 401 College, Ashland OH 44805. 419-289-5137.

Crosspoint Latch 6112 8 inputs/2 ME, 5 encoded chromo key, auto fade, downstream keyer, \$2500. D Lahey, 17094 McGuffie, Salinas CA 93907. 408-663-5192.

ISI 821B 20 input master control switcher, \$4000. D Sturzenbacher, 3600 S Westport, Sioux Falls SD 57116. 605-361-5555.

Dynair mini split wipe and key gen, requires external sync gen, \$250. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

Want to Buy
 DP-1 w/AS switcher. L Nelson, WSPY. 708-552-8985.

TAPES, CARTS & REELS
Want to Sell
 Audiopak AA-3, AA-2 (150) assorted lengths, all reloaded w/hw high output tape, new pads, excel cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Alt 2PM CST.

Fidelipac Mastercarts (approx 700) w/MOR music, 2.5-3.5" lengths, gd cond, \$2 ea. J David, KMPL, POB 907, Sikeston MO 63801. 314-471-1520.

Various reels of tapes, 5", 7", 10", OK for background, non-essential use. BO, A Allegra, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

London Music Library 78 RPM, circa 1950. D Eressy. 509-945-4855 am.

Fidelipac Cobalt 100 carts, 50 ea, 40 and 70 sec. New, sold as unit only, \$425 firm. A or S Reis, 308 Eastgate Court, New Lenox IL 60451. 815-485-7368.

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Scotch & Sony U-Matic UCA & KCA cassettes in boxes, excel cond, mostly 30's, some 40's & 60's. (58), \$290. A Allegra, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

IGM big band type music on 10" reels, \$20 and 14" reels, \$30, some never played. F Anderson, 3801 5 Ave South, Great Falls MT 59405.

Audiopak carts AA4-SGS-4, length of carts: 46-75, 41-85, 51-55, 14-105 (152), \$3/ea. M Anthony, 4305 Industrial Rd #120, Las Vegas NV 89103. 702-739-9600.

Audio tapes approx 175, 10 1/2" reels of audio tape, boxes included, 1-mil thickness, you pay shipping, \$4 per reel/BO. T Murray, 100 W 9th Street #306, Rochester IN 46975. 219-223-6059.

Scotchcart II AA-40 (10), never used, \$25. R Meadows, Southeastern Sports, 1203 Seaton Rd #117, Durham NC 27713. 919-544-1366.

Scotch & Sony U-Matic low use cassettes, some 60's, 40's & 30's. (58), exc cond, \$5/ea. A Allegra, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

Ampex 30 & 60 min blank cassettes, (300) 30's, (300) 60's, (600) soft cassette boxes, tapes are master quality, \$300. R Meadows, 1203 Seaton Rd #117, Durham NC 27713. 919-544-1366.

Plastic modular cart racks each holds 10 carts & fit together to form wall of carts, enough to hold 8,000 carts or more, can also hold compact discs. \$350. B Russell, 1657 Hi Drive, Simi Valley CA 93063. 805-584-3690.

Fidelipac 300 series empty shells, (approx 500), unused, 40c/ea. G Wachter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

ScotchCart II dozens of new & gd cond mixed length, BO. Clark, Secor Road, Hartsdale NY 10530. 914-693-2400.

Scotch Cart II AA, mostly 40 & 70 length, exc cond, will trade these 42 tapes for 50 Pro-Carts or similar, will also sell all 42 for \$84. B Gardner, Box 1069, Springerville AZ 85938. 602-333-2080.

Twelve hours of music and life of Elvis, gd cond, 7" reels, BO. G Erway, 3450 SE Martini- que, Stuart FL 34997. 407-283-5871.

Trade 3.5 & 5.5 minute carts for 40's & 70's maybe 100 seconds carts. Tim, 123 The Blvd, Eden NC 27288. 919-623-3118.

Want to Buy
 Tape reel hold downs for Ampex 300.301.302.354. AG440 MR 70 ETC; pwr cords for Ampex 301, 354 & AG 440. Mainline Comm, 100 Poplar Street Portage PA 15946. 814-736-3883.

Music would like to buy 10 to 20 10" reels of big band era music. B Cupit, Box 1129, Vidalia LA 71373. 318-336-7466.

TAX DEDUCT EQUIP
 Need cart machines, phone hybrids, 12+ chnl console, EBS monitor, racks, TTs, CDs, mics, downlink, prod equip donations. J Carlson, KMUD, POB 135, Redway CA 95560. 707-923-2911.

FM Station needs translator, and to upgrade almost everything, tax deductible, we pay shipping. R Bendheim, PO Box 135, Redway CA 95560, 707-923-2513.

Non-profit comm radio station seeks used audio console, RTRs, cart machines, phone couplers, TTs, studio & portable cass & mics for training student volunteers. S Perez, KZSC, Univ of CA Santa Cruz, Santa Cruz CA 95064. 408-459-2811.

Christian organization seeks donation of any prod equip, audio/video for ministering to the elderly. S Lanter, 513-444-3796 call collect.

Kentucky High School seeks donation of used radio equipment for starting FM educational station. D Moore, Nelson Co High School, 1070 Bloomfield, Bardstown KY 40004. 502-348-9046.

Educational FM needs donations of any kind of audio equip in any cond, will issue tax deductible receipt for amount of donation plus shipping cost. Mr. Nielsen, 901-925-9236.

Australias only educational FM station seeks 2nd hand equip: cart machines, RTR, STL, etc. repairable, & adaptable to 240 V/50 Hz, will pay costs. P Olliver, 89 FM, Stephenson Street, Blenheim, New Zealand. 064 57 88520. FAX 064 57 80389.

SMC 510 singles (3) for bdct eng students training, must be in working cond or need minor repair, will pay shipping and send tax receipt. F Smith, 2408 Chamberlain, Chattanooga TN 37404. 615-624-7126.

Used VCR's tape decks, stereos 10" reels, etc. H Saina, 1213 Pine Lane, Chester PA 19013.

Any 1 kW AM xtrmr for bdct eng training program, must be in gd cond or need minor repair, will pay shipping and send tax receipt. F Smith, 2408 Chamberlain, Chattanooga TN 37404. 615-624-7126.

Private school seeks working audio & video production equip, especially consoles & camcorder. Alan, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

Any consoles (2) for bdct eng students training, must be in working cond. F Smith, 2408 Chamberlain, Chattanooga TN 37404. 615-624-7126.

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.

Monte Vista Christian School, would appreciate any donations of used TV broadcast equipment. T Quinn, 408-475-0423.

Want to Buy
 Boonton 250A Need manual and schematics, copy OK. T O'Laughlin, Rt 1 Box 41, Barneveld WI. 53507. 608-924-2001.

McCurdy 14023 extended range meter. J Beahn, 4001 Brandywine NW, Washington DC 20016. 202-364-3868.

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Want to Sell
 Wilkinson 1000A 1976 mdl tuned to 1300KC, BO. B Hearst, WWCH, PO Box 688, Clarion PA 15214. 814-226-5800.

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Tektronix R561B scope w/3A6 dual trace preamp & 3B4 time base, needs repair, \$100/BO. L Albert, WKMS, POB 2266, Murray KY 42071. 502-762-4664.

Tek 1220 spectrum analyzer, 10 MHz-4200 MHz; Tek 547 oscilloscope main frame, sell sep or together, BO. C Springer, PO Box 890, Lamar CO 81052. 719-336-2206.

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RCA Potomac WX-2D field meter w/book, gd cond, AM band only, new bats, \$500. D Jack, Mtn. Media. 208-286-7676.

Fluke 8050A digital multi-meter, like new, \$300/BO. J Claybrook, 530 Beacon Pky W, Birmingham AL 35209. 205-942-9600.

Precision/Paco E-200-C RF signal marking generator, gd cond w/manual, \$75. L Spivey, Highway 231 S, Hartford KY 42347. 502-298-3268.

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Scorec VA62, VC63, TP212 video analyzer, VCR test assc & HV probe, mint cond, w/manuals, \$2050/all. E Kehew, 2907B Cedar Creek, Greenville NC 27834. 919-752-7245.

Gates BC1J Operational, some spare pls, spare tubes, inc. 833's. BO, P Beal, Burem Road, Rogersville TN, 37857. 615-272-3900.

Tektronix rackmount frame to hold WFM's vectors, etc. \$75/ea. A Romanoff, 374 N Ridgewood P.ace, Los Angeles CA 90004. 213-467-1700.

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Tektronix 520A vectorscope, recently calibrated, exc cond, \$4000. R Krangle, 680 Haines NW, Albuquerque NM 87102. 505-842-1418.

RCA BTA-1M 1000watt, AM, Gd. cond. \$2500. C Ratliffe, #1 Radio Street, Wadesboro NC 28170. 704-694-2175.

BK 1035 wow-and-flutter meter, mind cond, w/manuals, \$420. E Kehew, 2907B Cedar Creek, Greenville NC 27834. 919-752-7245.

Harris Transmitter MWI one thousand watts, exc. cond. BO; H Kilgore, PO 1507, Hollister CA 95023. 408-637-7470.

Digimax D-1200 9 digit frequency counter, new w/manual, \$299.95. L Spivey, Highway 231 S, Hartford KY 42347. 502-298-3268.


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McCurdy 14023 extended range meter. J Beahn, 4001 Brandywine NW, Washington DC 20016. 202-364-3868.

Kintronic Power Reduction Kit New, set up to reduce 1KW to 222 wats, easily modified. \$800. P Beal, Burem Road, Rogersville, TN, 37857. 615-272-3900.

RCA 10 kW BTA-10H PCB free, completely rewired, on air, \$12500. C Stone, 234 E Mead- ow, Eden NC 27288. 919-623-9966.

Harris FM 2.5k w/MS-15 exciter, 41 & 67 kHz SCA modules tuned to 95.9 MHz. M Beasley, 300 W Reed, Moberly MO 65270. 816-263-5800.

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McMartin 1977 25 kW FM w/1980 Continental exciter, \$27500. C Porter, Box 498, Carthage IL 62321. 217-357-2170.

Rotron main blower motor assy, new for CCA transmitter, \$100. G Wächter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

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Peter Dahl replacement mod transformer for Gates BC-5P2 AM xmtr, new. W Robinson, 2110 Cliff Road, Eagan MN 55122. 218-452-6200.

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Gates BC-1F AM tuned to 1380 kHz, needs tubes but works on those included, BO. L Reding, 215 N Main, Pleasanton TX 78064. 512-569-2194.

Reliable FM RF amp 200-1000 W output on 20 W drive, w/schematics. E Goetsch, 303 W Prospect, Rhinelander WI 54501. 715-362-6000.

RCA 1964 10 kW FM w/1977 McMartin exciter, \$7500. C Porter, Box 498, Carthage IL 62321. 217-357-2170.

RCA 50 kW BTA-50H excel condition, PCB free, \$39500. C Stone, 234 E Meadow, Eden NC 27288. 919-623-9966.

TTC UST 106A 100 W translator, currently ch 5 in ch 46 out, used 6 months, \$11000. D Sturzenbacher, 3600 S Westport, Sioux Falls SD 57116. 605-361-5555.

RCA BTA1M 20 yrs old, some spares, \$3000. C Porter, Box 498, Carthage IL 62321. 217-357-2170.

Sintronc FM10 10W w/full metering & filters in cabinet 89.3 MHz, \$1000. Clark, Secor Road, Hartsdale NY 10530. 914-693-2400.

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Versaccount V-322 FM Exciter instruction manual or schematics needed. R Schlosser, 320 Market Street, Steubenville OH 43952, 614-283-4747.

Low-band VHF xmtr, chnl 4, 20 Kw & 6, 20 kW or higher pwr w/VSB filter, harmonic filters. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

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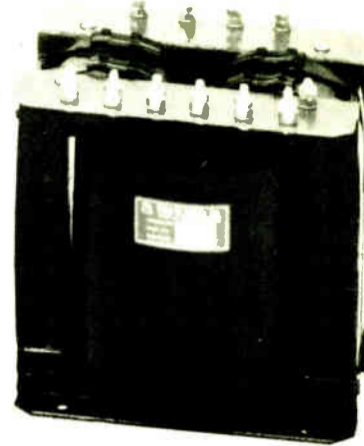
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McMartin older B-910 FM exciter. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

Any 40-100 W VHF & 100-1000 W UHF xmtrs. J Worrall, 4618 Gabriel Drive, New Orleans LA 70127. 504-241-6634.

RF amp for amateur TV station, AM, 450MHz range, up to 1000 W. G Kirby, 13613 US 36, Marysville OH 43040.

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6B4's (15); 80's (2), all check good, never used, \$75. B Crane, Box 340, Lenoir City TN 37771. 615-986-7536.

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Partial List: 6623, 23791, TH150, 6425F, 5604, 6696, 6697, 5681, 5682, 5671, 7804, 3CX10, 000H3, 3CX20, 000H3, 4CX5000A, 4CX35, 000C

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tubes wanted 6072/6072A (no RCA), R Katz, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

RCA 15GP22 CRT. A Weiner, 14 Prospect Dr, Yonkers NY 10705. 914-423-6638.

TURNTABLES

Want to Sell

Rek-O-Kut N-33H 12" TT, \$25 plus UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Technics SP-15, new, full factory warranty, were \$960 list, now only \$490 while supplies last. Call NEBL 518-793-2181.

Gates 6169 solid state stereo preamp, 600 ohms line level out. L Beigel, POB 85042, LA CA 90072. 213-466-3595 or FAX 213-466-3596.

Sony TTS-3000 belt-driven table w/PVA-237 arm, all manuals, as is, \$30. W Laughlin, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

QRK 12-C TT's (2) w/Gray tone arms & carts, vgc, \$130/BO; M Brown, KKG, 503-245-4889.

Russco Cue Master 12" TT's w/Micro-Trak 303 arm, gd cond, you ship, \$250. R Kerbaw, Box 1127, Beckley WV 25802. 304-877-5592.

Scully lathe w/Westrex Davis fluid drive; Westrex 3DIIH cutting system, vacuum turntable & electric variable pitch modifications by Wiegand Audio, \$5000. L Nesman, 3108 York St, Wichita Falls TX 76309. 817-696-1629.

Rek-o-Kut V 3 speed, 16" recording lathe w/105, 120 & 210 feed screws, factory modified for crank feeding & feed-out, \$150. L Nesman, 3108 York St, Wichita Falls TX 76309. 817-696-1629.

Gates 16" TT w/arm, \$105; Gates 12" TT w/arm, \$65; McCurdy SA-136 stereo preamp, \$75. G Wächter, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Russco Studio Pro Model B exc condition, \$350. C Stone, 234 E Meadow, Eden NC 27288. 919-623-9966.

Neumann AM-6Z disk mastering lathe, Westrex 3DIIAH cutting head & electr, variable pitch & depth, incl Scully transfer deck w/preview head, excel cond. S Czaybin, 206i S 44th, Omaha NE 68131. 402-553-1164.

TV FILM EQUIP

Want to Sell

RCA TP-66 projector, optical sound only, \$2240. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Bell & Howell JAN 614 16mm magnetic & optical sound telecine projector, portable, fair cond, \$195. G Ormrod, 432 East X Street, Tumwater WA 98501. 206-352-8028.

RCA broadcast film & slide transfer system TK27 3 tube color camera, TP7 slide island, TP55 multiplexer & (2) TP66 16mm projectors w/spare tubes, BO. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

Retectron 427 film inspection machine, older model, in excel cond, w/cleaning access, \$500/BO. B Schommer, 5023 N 35th, Milwaukee WI 53209. 414-527-3330.

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Modulation Sciences Inc.
115 Myrtle Avenue
Brooklyn, NY 11201

Attention: Mr. Eric Small

Dear Mr. Small:

I was recently contacted by your attorney, Mr. Harry Cole, concerning Modulation Sciences' "Modminder" FM broadcasting modulation monitor. I understand your company has received several inquiries about the validity of FM modulation measurements made with this instrument.

Commission rules currently contain no requirements for FM modulation monitors. Technical specifications and other performance requirements did exist until July 1983 when the Commission, by Report and Order in MM Docket 81-698, deleted them as unnecessary. While the requirements for modulation monitors were deleted, the Commission retained the standards governing FM modulation. See Section 73.1570 of the current Rules.

Mr. Cole stated that the Modminder is designed to satisfy the pre-1983 technical requirements for FM modulation monitors. If the equipment does indeed meet the pre-1983 technical requirements (see the enclosed copy of former Section 73.332), I expect it would produce valid readings of FM modulation. Equipment meeting the pre-1983 requirements is satisfactory for determining compliance with the current FM modulation requirements.

Please let me know if I may be of any further assistance.

Sincerely,

Thomas P. Stanley
Thomas P. Stanley
Chief Engineer

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yasciences Steady-Cam 7" fluid bench system w/gyro stabs internal. 2 heads assorted mounting hardware, 1 charger, 2 batteries, fair cond, \$4000/BO. R Krangle, 680 Haines NW, Albuquerque NM 87102. 505-842-1418.

VIDEO PROD EQUIP

Want to Sell

Panasonic AG1950 (2) VHS editing system w/AG95A edit controller, excel cond, \$1750. J Winslow, Creative Video, 716 Prescott, Endicott NY 13760. 607-754-6767.

CBS Labs 529 image enhancer (2), horz & vert equalizing, BO. M Cramer, WGBA-TV, 1391 North Rd, Green Bay WI 54307. 414-494-2626.

Telemation TSE200VS special effects gen, 6 inputs, 8 wipes & keyer, BO. M Cramer, WGBA-TV, 1391 North Rd, Green Bay WI 54307. 414-494-2626.

Sigma VPA-100 video processing amp, \$50 plus UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Barco CTVM2-38 15" color monitor, rack mount 9 mHz bandwidth trigun type, \$500. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

Amtron AM17 17" color monitor, rack mount, inline gun type, \$200. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

Buhl mobile multiplexer w/(2) Ektagraphic 35mm slide projectors, (2) 100-150 mm zoom lens, (2) projector cases, Sharp RD685 sync recorder, (4) Carousel trays, (2) 80's, (2) 140's, (2) spare 300W quartz bulbs, \$1875. B Hines, IPS, Rd 1 Box 413A, Export PA 15632. 412-468-4115.

ESE ES255 timecode reader, burn-in/window dub unit, \$400 plus shpg. M Holdwin, Anamnesia Studios, 40 S Oxford St, Brooklyn NY 11217. 718-852-7630.

JVC RM86U control track editor controller, \$850 plus shpg. M Holdwin, Anamnesia Studios, 40 S Oxford St, Brooklyn NY 11217. 718-852-7630.

JVC 8250, 5500 A/B roll editing 3/4", Abner editor, like new, low hrs, cables & monitor, \$12600/all. Jack, 203-264-3666.

Sigma CSG355 video sync gen w/bars, black burst, hdr, vdr, etc, \$900 plus shpg. M Holdwin, Anamnesia Studios, 40 S Oxford St, Brooklyn NY 11217. 718-852-7630.

Videotek KV1365 12" color video monitor w/blue gun, \$250 plus shpg. M Holdwin, Anamnesia Studios, 40 S Oxford St, Brooklyn NY 11217. 718-852-7630.

Ball 9" B/W monitors (3), \$15/ea, plus shpg. M Holwin, Anamnesia Studios, 49 S Oxford St, Brooklyn NY 11217. 718-852-7630.

Adda VW-2 frame synchronizer, has freeze framefield, gd cond, \$9000. T Pelissero, 612-378-1254.

Hitachi SU-340 3/4" & portable w/2 batteries inc AC adapter/charger, \$670. D Lasko, 3054 Gold Canal Ste D, Rancho Cordova CA 95670. 916-638-7770.

Moving facility, variety of used equip avail. CDL production switcher, routing switcher, audio and video DA's etc. J Tillery, One North Wacker, Chicago IL 60606. 312-977-3838.

Convergence ECS 195 LM editor w/Type 5 interfaces, excel cond, \$6500. R Peterson, 1801 E 4th Ave, Olympia WA 98506. 206-754-7081.

Adda VW-2 frame synchronizer has freeze framefield, gd cond, \$9000. T Pelissero, 1069 Tenth Ave SE, Minneapolis MN 55414. 612-378-1254.

JVC CR8250 editor, \$3300; RM86 controller, \$900, excel cond, low hrs, B Heatley, 618 Parkside, Buffalo NY 14216. 716-832-5339.

Chyron VP-2 w/6 fonts, excel cond, \$3550. R Peterson, 1801 E 4th Ave, Olympia WA 98506. 206-754-7081.

M1 format prod equip includes RCA Hawkeye Camcorder, Fuji 14xx7 w/2 times extender, AU100S recorder adapter which converts recorder section for use w/lany camera, \$2500. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

JVC/Abner 8250/5550 cables, monitor, mint cond, \$12,500. J Jones, 920 Main St N, Southbury CT 06488. 203-264-3666.

CEL EFX IV DVE w/(2) TBCs, P152 touch screen controller, & P169V routing switcher, mint, sell as complete package, well maintained & recently factory spec'd, \$12000/BO. R Lambros, There's Hope Ministries, 404-939-3182.

Unimedia 9" B&W monitor, \$100. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

HE1 edit controller w/cables, needs minor work, \$300. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

Vid Video Shuttle II converts VO5000 or 5600 to edit source deck, works w/RM440, Convergence, etc, \$500. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

Sony edit cables (2) for Type 5/440, \$50/ea. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

3M NTSC Encore Model CLR encoder RGB to broadcast NTSC color, full sync & color processing, Echo Lab SE-2 switcher/SEG, w/Sony sync gen, Tek RM529 waveform mon, color & mono monitors, cables & books, BO. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

Chyron IIB character generator, \$1000. D Sturzenbacher, 3600 S Westport, Sioux Falls SD 57116. 605-361-5555.

Want to Buy

Grass Valley 906A video AGC module. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Digital timer for TCA TR-60 videotape recorder. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

VVEarly TV cameras & studio equip, also early & pre-war TV sets. R Van Dyke, Caffrey House, Squires Ave, E Quogue NY 11942. 516-728-1327.

Tektronix 1450 or 1450-1 television demod & tektronix TDC-1 tuneable downconverter, VHF band. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

VIDEO TAPE RECORDERS

Want to Sell

JVC CR4400U 3/4 port recorders (4) w/access, \$800 ea/BO; (3) Sony RM-430 edit controllers, \$500/BO; JVC BR-6400U VHS recorder, \$1500/BO. T Quinn, Monte Vista Std, 208 Cherry, Capitola CA 95010. 408-475-0423.

NEC TT 7000 1" VTR w/TBC, low hrs, gd cond, \$8000. D Lahey, Pathfinder Prod, 17094 McGuffie Rd, Salinas CA 93907. 408-663-5192.

JVC 3/4" CP5050U industrial player w/RF output & remote control, \$475. B Hines, IPS, Rd 1 Box 413A, Export PA 15632. 412-468-4115.

JVC CR-4700U 3/4" portable recorder, w/AAP47U AC pwr supply/charger, (3) Nicads, custom case, low hrs, excel cond, \$2095. B Hines, IPS, Rd 1 Box 413A, Export PA 15632. 412-468-4115.

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JVC 4400LU (2) working & (2) for parts, BO. D Aase, KXMC-TV, Box 1686, Minot ND 58702. 701-852-2104.

Panasonic NV9500, NV9200 3/4" edit system w/NV950 edit controller, gd cond; other 9500, 9200 available, \$1000/set. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

JVC 8500LU (2) fair working, (3) for parts, BO. D Aase, KXMC-TV, Box 1686, Minot ND 58702. 701-852-2104.

Ampex VR-1200-B videotape recorder, \$1000. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Ampex VR-1200B 2in quad (2), manuals, test tape, 3 spare heads, \$1500/both. P Badger, POB 104, Birdsnest VA 23307. 804-442-4037.

Sony VO-2610 3/4" RP, \$500; (2) Panasonic NV9100A 3/4" players, \$350 ea; (2) Sony VO-2600 3/4" RP, \$450 ea; Sony VP-1200 3/4" player, \$200, plus UPS. N Mishan, POB 335, Lynbrook NY 11563. 516-582-1338.

Sony 6800 portable w/cover, 100 hrs use, \$1700. M Nowak, WBKB, 1390 Bagley, Alpena MI 49707. 517-356-3434.

JVC BR6400 1/2" VHS R/P, \$850 plus shpg. M Holdwin, Anamnesia Studios, 40 S Oxford St, Brooklyn NY 11217. 718-852-7630.

JVC CR6600 3/4" R/P, \$1000 plus shpg. M Holdwin, Anamnesia Studios, 40 S Oxford St, Brooklyn NY 11217. 718-852-7630.

JVC HR-4100AU 1978 industrial VHS portable w/camera, charger & battery, gd cond, \$150/trade. D Lasko, 3054 Gold Canal, Ste D, Rancho Cordova CA 95670. 916-638-7770.

AU220 portable M1 format recorder like new, less than 100 hrs, w/battery & (2) cases, \$2250. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

RCA HR2 edit recorders (2) w/built-in TBC's, \$2000/ea. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004. 213-467-1700.

Sony Betamax SL0320 industrial beta recorder, excel cond, BO. K Rubel, Box 46245, Chicago IL 60646. 312-929-0191.

JVC CR6600U 3/4", low hrs, nice shape, new drum, \$950. J Kreines, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

Panasonic NV9600 or NV9240 NVA-960 editor, \$1795. B Clinger, 401 College, Ashland OH 44805. 419-289-5137.

Sony VP-9000 SP 3/4" player, 200 hrs, like new, BO; Sony VP-9600 SP 3/4" recorder, 200 hrs, like new, BO. R Hiatt, Box TV3, Harrisonburg VA 22801. 703-433-9191.

JVC CR4400V 3/4" portable recorder, needs fuses, low hours w/pwr supply, \$500/BO. K Rubel, Box 46245, Chicago IL 60646. 312-929-0191.

Sony VO5600 3/4", \$1600/BO; JVC CR4400-U 3/4" portable w/accessories; JVC NV-9300 3/4", \$500/BO; Sony VO 2611 3/4", \$600/BO; JVC CR6300 3/4", \$800/BO; JVC BR-6400 U VHS edit/source deck, \$1200/BO. T Quinn, 208 Cherry, Capitola CA 95010. 408-475-0423.

NEC II 7000 1" VTR, low hrs, extra parts, \$6500. D Lahey, 17094 McGuffie, Salinas CA 93907. 408-663-5192.

Sony VP1000, VP1200, VP2000 players, VO2630 NTSC-PAL-SECAM, VO2850 editor, VO3800 portable, RM400 controllers, BVU200B broadcast editors, BVE500A controllers, cables, tapes & books, BO. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

JVC CP5000, CP5200 players, CR6060U R/P, Panasonic NV9100 players (7), Sony 1/2" EIAJ R/R AV3600 (2), AV3650 editors (2), Panasonic NV3020, NV3160 editor, case of new tape, BO. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

Ampex VR1200, 1200B parts, Mark X heads, audio & ctrl assemblies, erase assemblies, vacuum pumps, blower motors, reel shafts, air filters, manuals & more, BO. J Krepol, 6147 Walker, Philadelphia PA 19135. 215-624-1050.

Marconi MK VII several camera heads, CCU's, encoders & pwr supplies, for parts or repair, \$100/ea. G Spiller, 6829-E Atmore, Richmond VA 23225.

Generic Designs (2) serial to parallel VTR interfaces w/time code reader, will allow Sony U-matic to work w/serial editor, BO. R Hiatt, Box TV3, Harrisonburg VA 22801. 703-433-9191.

Want to Buy

RCA TR-3, TR-4 quad machine, east coast area. A Weiner, 14 Prospect Dr, Yonkers NY 10705. 914-423-6638.

ACTION-GRAM

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