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NAB WRAP-UP
All the Highlights in News, Sessions and Product Introductions

Radio World®
Radio's Best Read Newspaper
May 22, 1991
Vol 15, No 10

NAB '91 Sets a Record

by John Gatski

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(continued on page

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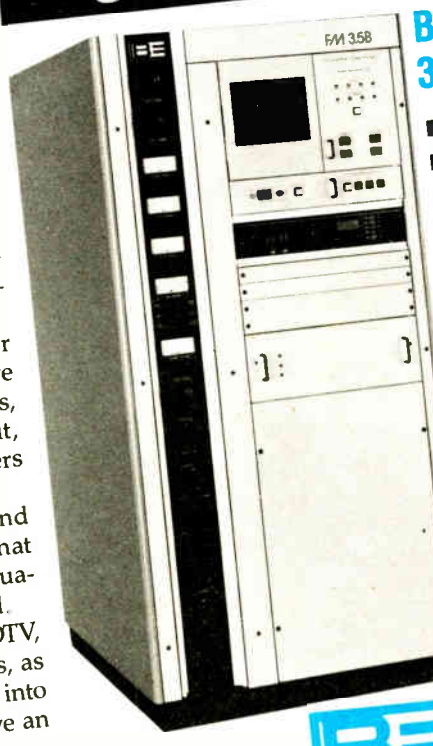

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World Radio History

Air Force Wants L-Band

by Judith Gross

WASHINGTON The U.S. Air Force opposes reallocating L-band spectrum from flight testing to DAB or other broadcast uses, and suggests that broadcasters look to their existing spectrum to accommodate such new services.

In a letter to the NTIA, the Air Force Frequency Management Center said not only that it needs L-band to maintain current aeronautical telemetry operations, but that its needs are actually increasing—at the rate of eight percent per year—in part because of encryption requirements for weapons systems and the replacement of analog with digital systems.

The Air Force noted in its letter that "aeronautical telemetry played a vital role" in the development of the Patriot and Tomahawk cruise missiles used in the recent Gulf war and is needed to continue to provide support for the next generation of those and other defense systems.

The letter said that the bandwidth needed for tests now averages 3 MHz and is "rapidly increasing to 5 MHz and beyond." The Air Force also referred to a letter to FCC Chairman Al Sikes from Boeing last October, which stated that tests at Department of Defense ranges have even experienced delays because of spectral overloading.

The Air Force letter mentioned bit rate needs, interference, and protection ratios of test frequencies under real-world conditions as factors which need to be considered in allocating spectrum for flight testing.

The letter also noted that the Navy has invested $100 million at its Pacific Missile Test Center and that similar operations will be needed on the East Coast to serve the Atlantic fleet. It says such operations are conducted in the 1435-1530 MHz band, the same portion suggested by the FCC as a place for DAB in its WARC (Notice of Inquiry).

"Reallocating any significant part of this band would create a major obstacle to realistic Battle Group testing," the letter said. In addition, it faulted the logic of taking L-band spectrum away from flight testing and replacing it with S-band.

"If it is truly believed that TM (telemetry) users do not need the amount of spectrum currently allocated, then it makes no sense to replace the lost L-band spectrum with additional S-band spectrum," according to the Air Force.

The letter said that the upper end of the UHF-TV spectrum is "almost totally unused" and that spectrum either in the current FM band (88-108 MHz) or the UHF-TV band (500-800 MHz) "would be more suitable for direct satellite broadcasting." The letter made no separate mention of using UHF-TV spectrum for HDTV.

The Air Force concluded that it is "inconceivable that the aeronautical telemetry needs of the nation should be disrupted" while hundreds of megahertz remain unused. It stated "no rationale has been advanced which justifies the proposed reallocation of these resources from aeronautical telemetry to entertainment."

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The FCC is expected to decide its WARC spectrum requests at its mid-June meeting.

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INDEX

KOZT: A Real Do-It-Yourselfer by Dee McVicker 33

In Business, Cash Is King by John Cummuta 34

Workbench 36

PC Programs Prioritize Projects by Tom Osenowsky 41

Taking a Peak at Modulation by Harry Cole 42

Use Musical Contacts by Al Peterson 43

Making the Switch to Digital by Ty Ford 44

A Picture Window to Your PC by Barry Mishkind 46

NAB product overview stories begin on page 15.

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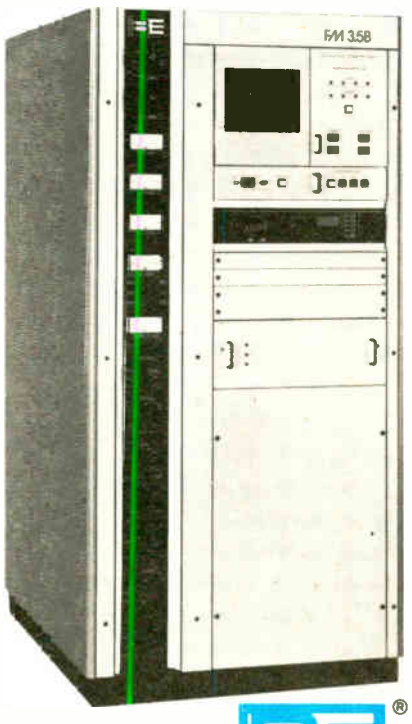

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INDEX

KOZT: A Real Do-It-Yourselfer
by Dee McVicker **33**

In Business, Cash Is King
by John Cummuta **34**

Workbench **36**

PC Programs Prioritize Projects
by Tom Osenowsky **41**

Taking a Peak at Modulation
by Harry Cole **42**

Use Musical Contacts
by Al Peterson **43**

Making the Switch to Digital
by Ty Ford **44**

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NAB product overview stories begin on page 15.

World Radio History

FAA to Ease Some Restrictions

by Arthur Cole

LAS VEGAS In what is considered by many as an easing of tension between the Federal Aviation Administration and the FCC, the FAA has agreed not to enforce some of its broadcast restrictions designed to protect aviation receivers.

In an announcement at NAB '91, the FAA said it would no longer issue hazard determinations on applications regarding AM radio, cellular phones or fixed microwave transmitters.

The development still leaves open the contentious issue of FM radio interference with air navigation receivers, also known as avionics.

"Worst-case" receivers

Broadcasters claim they have been stymied in their efforts to improve service because of what they call an overly conservative FAA computer model used to calculate electromagnetic interference (EMI) to avionics equipment. Broadcasters charge the FAA bases its model on "worst-case scenario" receivers, which are rarely used anymore.

Besides easing up on AM, cellular and microwave restrictions, the FAA has also said it will not request applicants to use filters beyond what is required by the FCC. Instead, broadcasters will be required to notify the FAA when transmission is set to begin so the FAA can establish procedures to verify that no interference is being caused.

"(The FAA) recognize(s) that our rules require that these services may need to employ extra filtering if interference is caused," FCC Chief of the Audio Services Division Larry Eads said. "And both agencies agree that in these special cases ... we do have adequate means of requiring licensees or applicants to take whatever steps are necessary to correct the EMI effects immediately."

In addition, the FAA has also decided to open its computer model to public scrutiny, calling for interested parties to submit comments on the model and the assumptions on which it is based.

"We will provide a computer disk and the model at no cost," said FAA Director of System Maintenance Service David Morse. "The model should be open to the public; out in the sunshine."

Time to make up

The dispute over EMI has been raging between the two agencies for years. At NAB, however, FCC and FAA officials stressed the positive turn the dialogue between the two agencies has taken in the past year or so.

"I believe that FAA and the FCC now have a working relationship that can lead to a solution of this conflict," FCC's Field Operations Bureau Chief Richard Smith said. "I am, for the first time in a long time, optimistic. We are having monthly meetings at the staff level. We've been nibbling around the edge and are starting to make some progress."

A certain amount of entrenchment, however, still is evident between the FCC and FAA, according to remarks at the NAB forum.

"We don't want to change the model just to make a change," FAA Spectrum Engineering Division Manager Gerald Markey said. "We are of the firm belief that the model is on good grounds. It's solid.

"The bone of contention is: 'You are too conservative.' But outside of that complaint, it is a valid model. If we predict interference in an area, there is no question that, with the assumptions made, it is there."

Broadcasters dismissed that contention, however, saying the model has the potential to falsely predict massive interference problems.

"It is nearly universally believed in this industry that the assumptions used in the computer model ... are certainly overly conservative," NAB Deputy General Counsel Barry Umansky said. "In fact, commentators point to major flaws in the FAA's airspace analysis mathematical model that could introduce cumulative errors exceeding 15 orders of magnitude.

"Although the FAA has indeed undergone some changes in recent years, there have been no major departures in the fundamental procedures used in the model or its basic characteristics."

Higher standards

Markey countered broadcasters' belief that it would be relatively easy to mandate higher standards for avionics gear to avoid EMI.

"We would love to have better receivers. We do want better standards," he said. "But we have, just like the FCC has, administrative procedures and economic impact statements. And we also have a public to serve, and if you don't serve them the right way you get your hand slapped."

Discussion also revolved around ways to eliminate the need for EMI determinations altogether, primarily through the use of microwave instrument landing systems (MLS), in the 5 GHz range.

"MLS, to frequency people in the FAA, is the great savior," Markey said. "We would not be having this frequency congestion, let alone interference, if microwave systems had come into being as planned. But because of many reasons—the user not wanting to buy new equipment and the Hazeltine Corp. going under—we've had some delays."

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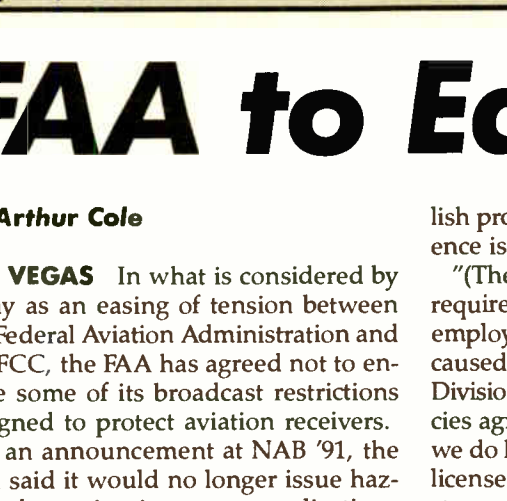

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World Radio History

WARC Rap & Cart Computers

by Judith Gross

FALLS CHURCH, Va. We stumble out of **Vegas** while the FCC stumbles toward **WARC**. Expect a decision on spectrum requests at the **June meeting**.

Looking at what's happening along that front, **you gotta wonder** about the way some decisions are made. For instance ... take the final report from the **WARC advisory committee**.

Now it's crystal clear from all the **footnotes** telling you which segment of the industry **opposes** which portion of what proposal, that nobody can **agree on anything** when it comes to slicing up the **spectrum pie**.

Everybody wants it; each group is especially deserving for its own unique services; the other guy doesn't really need it anyway; and there **isn't enough** to go around. That's all clear.

So the **advisory group** goes ahead and says, well, **L-band** really is the best of the proposals on the table for transmitting **DAB**. Look, S-band (2300 MHz range) calls for too much power and then there's the **microwave oven** problem.

The **UHF-TV** band is spoken for. The satellite companies like L-band. But hey, FCC, you're only offering **32 MHz**. The best guesses on the terrestrial DAB out-of-band systems is for around **60 MHz**. Maybe broadcasters could have a little more?

Then there's the **Air Force paper**. It says: L-band? No way. Not when we used it to help develop the **Patriot** and **Tomahawk** missiles. You remember the Patriot, don't you, the star of the six-week **war in the Gulf**?

Nah-ah. We don't think military interests should have to take a **back seat** to mere entertainment (guess they aren't counting **EBS** and the news which brought us that war).

The WARC advisory report rightly points out, however, that the **aeronautical telemetry** which is in that band now could more easily move to S-band than **broadcasters** could.

We'll see what the FCC says and then we'll see **how much clout** that has when the **State Department** sets its WARC policy in stone later this year.

Oh yes. And the report did ask for **co-primary status** for terrestrial DAB just like the NAB's **DAB Task Force** hoped. That means if you allocate it for satellite DAB uses, terrestrial DAB has an **even chance** in it, too.

And before I get to the **NAB show products**, here's a couple of things I've been **lying awake** thinking about these past few nights:

Japan has gone ahead and chosen **C-QUAM AM stereo** as its standard ... in case you're still keeping score.

If we don't get new spectrum, could **Eureka 147** be an **in-band** DAB system? How about **infinite error correction** and we can put it anywhere: AM, phone lines, even two tin cans with string tied between them.

Is it me, or is the **honeymoon** between Eureka and NAB starting to lose its gossamer quality?

Looks like **Ron Strother** will be able to test DAB on **Shannondale Wireless'** MDS system. The FCC gave it the nod, now can the UHF-TV and L-band approval for his tests be far behind?

And how many more **just-off-the-drawing-board** DAB systems are about to pop out of the woodwork?

All right, now that I've got **that** out of my system, bet you're wondering what was hot at the show.

I got a surprise, but I guess I really shouldn't have, when I saw the **audio computer** taking over the analog sources of the past. From **cart to computer** in only (let's see, one, two, three four, five, yeah that's it) **five** short years.

ITC had DigiForm, a PC-based hard disk system; **Fidelipac** showed a very cart-like Dynamax DCR 1000, which uses 3 1/2-inch floppy disks; **Broadcast Electronics** showed the AudioVAULT and CORE automation controller; and of course **360 Systems** had a ready-for-primetime version of its DigiCart.

Tiny Tim (center), tip-toeing through the NAB...

Getting a little more elaborate, how about a system that **encroaches on the territory** of consoles? At the **Arrakis** and **Harris-Allied** booths was the Digi-Link system from Arrakis. It records and plays onto a hard disk system with a touch screen for control.

Wheatstone showed "Not So Hard Disk," which also uses a computer touch screen but can be operated with a regular keyboard, or one more suited to a **station control room** (translation: "Hands off, Talent!").

Even **Gentner** joined the parade, with a complete PC-based hard disk system called **DAWN**.

Now, a lot of these systems have actually created the **"virtual cart."** The ones that are made to duplicate carts can be controlled from the **computer** or go into a **console input**. The Arrakis and Wheatstone offerings begin to move in the direction of the **"computer console."**

It's interesting to see the **varied approaches**. Some swear by audio data **compression algorithms**; some steer clear of compression. Some include **user-selectable** sampling rates for different quality audio.

When I asked why these **audio computers** were popping up everywhere, the answer seemed to be that the **cost of storage** has come down. What do you think of **ITC's** 24 minutes of stereo at 48 kHz sampling with a system cost of $13,500?

BE offers an hour of stereo at 44.1 kHz sampling for $20,900 plus $2,850 for the 600 MByte drive.

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It was—shades of the '60s—**Tiny Tim**, looking very much like, well, as only Tiny Tim can look, and he was spotted in the **TV exhibit hall**. Yeah, it was really him. Yeah, he signed some autographs, and yeah that *is* a **ukelele** sticking out of his duffel bag.

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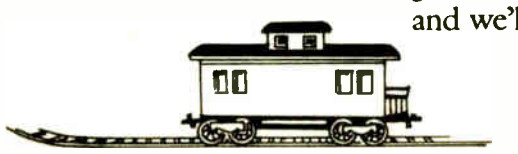

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World Radio History

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What DAB Will Really Mean for Broadcasters

by Jean-Claude Marechal
Director
Radio France

PARIS The digital audio broadcasting (DAB) project, Eureka 147, is full of fascinating possibilities and corresponds well to the expectations of broadcasters.

The transition from analog to digital gives radio the opportunity to present itself on an equal footing with compact discs, in terms of sound quality. This aspect alone is attractive. DAB makes this possible, while offering considerable advantages with regard to conditions of FM reception. I would like to address and stress four particular advantages.

Eliminating multipath

The first is the suppression of disturbances due to the risks of propagation between the transmitter and the receivers. The multiple paths of radio waves are damaged by reflection on buildings or changes in topography. They cause noise or fading.

Digital alone does not eradicate these problems. The coding procedure at transmission, coded orthogonal frequency division multiplex (COFDM), developed in France by the Centre Commun d'Etudes de Teledifusion et de Telecommunication (CCETT) resolves these difficulties. Listeners, whether in a car or on foot with a mobile receiver, or listening to a program with a radio in a fixed place, can take full advantage of the qualities of digital sound without being inconvenienced.

GUEST EDITORIAL

The second advantage is the considerable improvement of the planning of frequencies and therefore, the outlook for a renewed order in the radiophonic world. The coding of sound, marking pattern sub-band coding and multiplexing (MASCAM), developed in Germany by the Institut fur Rundfunktechnik (IRT), allows for the reduction by a factor of two or three the eight-bit rate usually necessary for the transmission of sound. This reduction, in turn, reduces the frequency band. [MASCAM is the most recent identification for the algorithm, which the IRT calls MUSICAM.]

Multiplexing

Next, the COFDM permits the use of a single multiplex of frequencies for national radio networks across a whole country. It also requires that radio program operators share a group of frequencies. For example, 256 in 4 MHz, for 16 programs broadcast from the same place, using the same aerial and transmitter.

Public and private radios will be permanently linked. There will be no more pirate stations' jamming or overstepping of power. As a result of DAB, the order and peace so difficult to achieve in FM will prevail. The listeners will receive a reliable, quality signal.

The third advantage is being able to produce, thanks to the COFDM "single frequency" networks or, more precisely, single multiplex networks of a same group of frequencies. In addition to ease of planning for networks this would bring, it also would allow for the reduction of "shady areas." For example, a valley only moderately served by a transmitter would see its reception conditions markedly improved by a second, or even a third.

Today, these reinforcements would only lead to jamming. With the implementation of DAB, two neighboring transmitters will reinforce each other, rather than work against each other.

The fourth advantage will be—thanks to MASCAM and to the increase in resources it brings—the introduction of data transmission on a larger scale than with the radio data system (RDS). The following will be possible: program identification, search by type of program, access to traffic announcement, teletext and the transmission of images, and regulation of sound dynamics.

These possibilities are fascinating, but the time when we can hope to see them materialize is still very uncertain. A frequency band must first be assigned. It happens that frequency needs are growing, especially with the development of radio-telephone networks, and the competition is fierce. In addition, the conception of the network—terrestrial, satellite or mixed—will influence the choice of band.

The World Administrative Radio Conference (WARC) should announce the attribution of frequencies for DAB in space in 1992. Between then and now, it is in the interest of all the players concerned to convince decision makers, government and telecommunications administrators, of the value of this technology.

In France, the Conseil Superieur de l'Audiovisuel (CSA), Radio France, Telediffusion de France and the builders of receivers want to commit themselves to a strategy of introducing DAB by widespread experimentation. An experimental network with three transmitters already exists in Rennes; a transmitter should be installed at the end of 1991 at the Eiffel Tower to cover the Paris area, and 500 to 1,000 receivers will be manufactured.

Between 15 and 20 years will be needed to ensure that transmission networks are in place and current receivers have been replaced. Broadcasters must therefore prepare themselves to bear not only the cost of investment but also double operating costs, these costs growing, furthermore, with the reserved frequency.

■ ■ ■

Jean-Claude Marechal is the director of Paris-based Radio France.

Radio's New Age

At the NAB show in Las Vegas, one thing was clear: The industry has crossed the digital threshold, and a wealth of new technology will soon be within reach. Those in attendance had a chance to judge for themselves the shape of things to come.

The digital world is exciting for broadcasters, particularly from the standpoint of quality. From the beginning consumer equipment manufacturers have successfully worked to make products that could play recorded audio with a quality superior to transmitted audio. Now the removal of this advantage is within sight.

Broadcasters have been making the move to CDs and DAT for digital source material. And yet, traditional broadcasting's inherent limitations have meant a qualitative difference between the prerecorded and transmitted audio experience.

Now, things are changing. Digital audio broadcasting as a concept has been introduced with some fanfare; it's now on the fast track for development. "Digital" as a buzzword has become accepted jargon in nearly every aspect of broadcasting.

But it isn't all just jargon. This year's NAB show proved that manufacturers have been thinking about how to integrate the technology into their product lines.

Transmission schemes, STLs, exciters, processing equipment, hard disk integration systems, storage and playback devices—all of these and more had their digital debut this year. Although many of the products aren't ready to ship yet, they are *here*.

What's more, these products were not shown by companies with no track records. The best known and most successful manufacturers were among those exhibiting digital hardware; some of their products have been in development for years. The technology has been validated; it's *real*, not "vaporware."

Think about it. A few years from now, one could build a broadcast facility in which every part of the audio chain—from source through transmission—is digital.

This does not mean that broadcasting is going to threaten the recorded music industry. The two will always need each other.

What it does mean is that broadcasters can look forward to a stronger, more positive future. From the looks of things, it may even be the beginning of the next Golden Age of radio.

—RW

QSound's "powerfulness" overkill

Dear **RW**,

I enjoyed the front page article on QSound (**RW**, April 10). Not only was the article informative, but it exposed a number of problems that exist when the process is summed into mono, and when a Phase Chaser is in the air chain.

Another good example of a QSound recording that is mono incompatible is "Rescue Me" from Madonna's "Immaculate Collection" album. Notice how the thunder at the intro and outro disappears when the left and right channels are summed.

It's a shame that most recording engineers don't care about broadcast audio. If they would work with us broadcast engineers and production people, we would direct them to such black boxes as Modulation Sciences' StereoMaxx or the Orban Stereo Expander.

I know that both boxes mentioned above are not as powerful as QSound, but maybe this "powerfulness" is a bit of overkill that is creating these problems in mono.

Robert M. Mugrdechian
Palisades Park, N.J.

Co-channel exploration

Dear **RW**,

I would like to thank you for immortalizing my opinions in the *Readers Forum* for April 24. Several typographic errors crept in, one of which has left the important issue of frequency-locked carriers for co-channel stations unexplored.

If co-channel stations frequency-lock their carriers to each other, for example by derivation from WWV, an interfering station's carrier will not beat-cancel your carrier in fringe areas. Useful fringe coverage can be greatly enhanced for all stations.

Don Stepka
Sound Engineering
Rochester, N.Y.

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Radio World
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World Radio History

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World Radio History

Compression Schemes Outlined

by Judith Gross

LAS VEGAS A call for DAB system testing, the seeds of a battle over compression algorithms and two new DAB in-band systems surfaced at a well-attended Committee for Digital Radio Broadcasting (CDRB) meeting during the NAB convention here.

Despite room changes and the fact that the mid-morning meeting time conflicted with regular convention sessions, a crowd of about 80 came to hear terrestrial DAB system proponents summarize their systems.

The group heard five-minute outlines of systems developed by Eureka 147, Stanford Telecom, Kintel (Power Multiplexing), Gannett-SRI (USA Digital), Mercury Digital and American Digital Radio.

Two additional systems that surfaced were those described by Steven Kuh of LinCom and Etienne Resweber of Synetcom Digital.

LinCom had filed comments on the FCC's NOI into DAB with a summary of a system that could provide in-band DAB not only for FM stations but for AM as well.

Focus on receivers

LinCom's system suggested time-interleaving of signals, similar to American Digital Radio's plan. The original FCC filing also mentioned DMSK and DPSK as two possible bandwidth efficient modulation schemes.

LinCom's focus, however, was more in the area of low-cost receivers. Kuh said that while a high quality signal within 200 kHz for FM stations would be feasible, AM stations might decide to trade off quality for an affordable receiver.

LinCom said it would be able to provide a demonstration of its system to the FCC in the second quarter of 1993 and consumer availability in the fourth quarter of 1994.

Synetcom Digital, a new player in the DAB arena, concentrated on an in-band system for FM, which the company is calling Digital FM-S. Synetcom outlined a plan for encoding digital audio into subcarriers in the baseband of a station's signal, above the L+R portion of the signal.

As for receivers, Synetcom suggested an adaptive antenna array on a mobile receiver to eliminate multipath. It consists of a four-antenna array—a diversity arrangement.

Resweber said Synetcom's system would be easy for FMs to implement by merely switching the stereo generator to a digital generator. He also said the company was working on a DAB system for AM stations.

The beginnings of an AM stereo-like battle over the best compression algorithm surfaced following comments by Bill Spurlin of Christian Science Monitor Radio. Spurlin is working with Ted Schober on the American Digital Radio DAB system. The two favor the ASPEC algorithm over MUSICAM, which is used in Eureka and Gannett's USA Digital system.

A crowd of about 80 came to hear terrestrial DAB system proponents summarize their systems.

Compression battle

A round of ISO tests last summer found the two systems virtually indistinguishable to most listeners at 128 kbps. But because MUSICAM was considered less complex to implement, it is generally considered to have "won" the ISO tests, although the informal verdict was to combine aspects of the two systems. The actual standard has not yet been published.

Spurlin noted that there will be a new round of ISO tests and declared that "at 64 kbps, ASPEC is superior."

Dr. Georg Plenge of the German IRT, which helped develop Eureka, replied "yes, but at 64 kbps the complexity to implement ASPEC is great" and noted that the new round of ISO tests are only for verification of the previous tests.

Consultant Bart Locanthi said that from a technical point of view, "MUSICAM is not the best system," and added that engineers from Swedish Radio decided that none of the compression algorithms met their needs. He also said that during the ISO tests, the ASPEC unit had a hardware defect.

But Tony Masiello of CBS argued that AT&T, which had developed ASPEC, was "not playing fair. They want to keep redoing the tests until they win." Masiello added that AT&T was eager to prove ASPEC's superiority at 64 kbps, even though they are the only ones who need to "scrunch it down that low."

In the end, Locanthi received a round of applause when he urged that engineers not "settle" for a system but choose the best DAB and compression system on technical merits.

There was more agreement on the need for testing all DAB systems. Ron Strother

(continued on page 11)

NAB '91 Sets Record

(continued from page 1)

Williams said that its new Productionmixer brought a lot of potential customers to the booth. He also noted that follow-up contacts were paying off.

Other companies, such as Bradley Broadcast, echoed Williams' post-show analysis.

"I think that compared to other shows in recent years, we ran into more customers," Bradley Broadcast National Sales Manager Neil Glassman said. "Overall, we came back feeling very good."

He said the number of domestic buyers appeared to be down only slightly, but they made up for it with their "serious mood" toward new acquisitions, such as digital audio products.

But, he said, the booth was extremely busy most of the time. "When the closing gun went off, we had to chase them out of the booth," Glassman added.

Marti Electronics Board Chairman and 1991 NAB Radio Engineering Award Winner George Marti said the NAB show should never be held anywhere other than Las Vegas.

"I had more business on Monday here than I did in four days in Atlanta," he said.

Belar President Arno Meyer said traffic was very good at his booth, with a lot of interest in his new modulation monitor, The Wizard.

"International traffic was also very good," he added.

Harris Allied's Dave Burns said it was the best NAB he has ever attended, and his company's best NAB in five years.

"People came prepared to buy and they did buy," he said.

With NAB '91 so successful, Dobson already is looking ahead to the 1992 show. He expects to sell nearly 500,000 square feet of exhibit space.

The NAB hopes to keep the show in Las Vegas and is working on a long-term schedule, he said.

■ ■ ■

Editor Art Cole also contributed to this article.

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World Radio History

RDS Ready for Broadcasting

by John Gatski

LAS VEGAS A U.S. Radio Data System (RDS) for FM broadcasters is almost here, according to comments made at NAB '91.

Unlike digital audio broadcasting which may be as much as 10 years away, Sage Alerting Systems President Gerry Lebow said, "this is a technology that is ready for today."

Lebow said that the first commercial RDS station, WHTZ, has been broadcasting RDS for nearly a year and other stations in Indianapolis and Detroit are being assisted by RDS partner Delco to provide the on-air service.

Lebow also noted that receiver companies, which have been producing RDS receivers in Europe where the technology was first developed, are planning U.S. models.

"Sony is getting ready to bring their stuff here because they are showing it to their dealers," Lebow said.

RDS looks promising

U.S. proponents of an RDS system, including Sage and Delco, believe it holds promise for displaying station call letters, switching between main transmitter and translator, traffic alerts, emergency alerts, scrolling messages, automatic format selection and even as a replacement for the Emergency Broadcast System (EBS).

Other potential services for RDS include synthesized voice traffic and emergency warnings. There also is talk of using the eight-character display for limited advertising, Lebow noted.

RDS is a 57 kHz digital subcarrier that is transmitted on a station's main carrier via an RDS encoder. RDS in Europe is based on the CENELEC standard and provides such services as traffic alerts and messages via RDS displays. In the system, 31 codes are available for transmitting the data. The U.S. version also would be based on CENELEC, but with some code variations, based on conditions that are unique to this country.

These variations include codes to ensure that a receiver can select the different frequencies of two stations broadcasting the same programming; codes for stations with three call letter IDs; and nationally-linked stations carrying different call letters, like NPR.

Format identification

Program Type Codes (PTY) would be used to identify the various radio formats in the U.S., so a listener could merely punch in his or her selection and the radio would automatically seek out stations programmed with the RDS format code.

Lebow also announced the planned installation of an RDS emergency alerting system in Jefferson County, Texas, an area dotted with chemical plants that include Beaumont and Port Arthur.

The $3.2 million warning systems will involve 10 radio stations, three TV stations and a cable head-end to provide RDS-based warning capability.

Unlike EBS, RDS-based emergency alerting initiated from the central station automatically overrides a station's current programming to broadcast the alert. With EBS, on-duty personnel make a decision to manually turn it on based on initial information.

RDS stations, however, can choose to override the RDS emergency alert if they determine it is not appropriate to their area.

During his presentation, Lebow said the FCC will soon initiate a proposed Notice of Inquiry (NOI) about possible changes to the EBS systems, which could include new technologies, such as RDS.

An FCC official later confirmed that the NOI and a Notice of Proposed Rulemaking (NPRM) to shorten the EBS test tones are now being worked out on the staff level.

The National Radio Systems Committee (NRSC) is considering adopting RDS, which is the strongest contender for an FM-based (and possibly AM) digital data system, as a voluntary industry standard. The committee will also consider whether to incorporate RDS-compatibility with the Cue Paging System, which is a subcarrier-based service that is prevalent in the U.S. and Canada.

DAB: Friend or Foe?

by Judith Gross

LAS VEGAS Urging radio broadcasters to unite behind the association's DAB plan, NAB executives presented an updated version of a session first presented at last year's radio show in Boston.

The session—titled "DAB: Friend or Foe?"—drew a standing room only crowd.

"Unless we can put aside our differences, the industry will be fragmented," NAB's DAB Task Force Chairman Alan Box said. He was joined on the panel by Radio Board Chairman David Hicks, NAB Executive VP of Operations John Abel and Senior VP of Science and Technology Michael Rau.

In an effort to acknowledge the controversy stirred by the Radio Board's January vote to endorse Eureka 147 as part of a comprehensive plan to "control and manage" DAB technology, session attendees were handed literature on some other DAB systems.

Abel's presentation also identified DAB "hot spots"—or points of debate.

Three hot spots

The first controversy is over access to L-band (1500 MHz) spectrum, Abel noted. He said that while the NTIA has recommended S-band (2300 MHz) and other government branches oppose giving up L-band, NAB hopes to convince the U.S. WARC position to include co-primary status for 50 MHz of L-band for DAB.

Abel explained that co-primary means that if L-band is allocated for satellite DAB service, it should also be designated for terrestrial DAB. Failing that, Abel said the NAB would "wait to see what the satellite companies do" and seek spectrum elsewhere.

The second "hot spot" Abel identified is the issue of parity. Successful FMs don't want AM daytimers and struggling AMs and FMs to be equal in coverage or signal quality.

Abel said that while parity is "possible" with the Eureka 147 system it need not be "probable." He pointed out that Eureka can be tailored to produce different coverages for different classes of stations.

DAB's future

He also noted that the long lead time between now and actual implementation of DAB on a large scale may change the economic picture in the industry. Even once DAB is here, Abel added, "stations will be simulcasting (DAB and analog signals) for a long time."

(continued on page 12)

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World Radio History

AT&T Gets Into Radio Game

by Frank Beacham

LAS VEGAS In a move to re-enter the radio remote feed market, AT&T announced at NAB '91 a new high fidelity dial-up remote service linking the United States and 10 countries.

Using AT&T's Switched Digital International Service (SDI), a radio station can transmit and receive 7.5 kHz audio signals quickly with a simple dial-up call. Previously, sound quality at that level was available only on satellite feeds or specially conditioned audio lines, according to AT&T.

The SDI system is a fully digital, dial-up, medium speed, 56 or 64 kbps alternative to international private lines. The new AT&T service connects the U.S. with Japan, Australia, France, the United Kingdom, Belgium, the Netherlands, Sweden, Hong Kong, Singapore and Jamaica.

At least six more countries are expected to go on-line this year, the company said. At NAB, AT&T demonstrated the new service by linking the AT&T exhibit booth in Las Vegas with the Kokusai Denshin Denwa (KDD) offices in Japan.

Pay by the minute

Prototype terminals were used to encode and decode high fidelity audio between the Las Vegas and Tokyo sites. The rate to Europe is $2.76 for the first minute and $2.30 for each additional minute. The Pacific is $3.95 for the first minute and $2.50 for each additional minute. The United Kingdom is $2.50 for the first minute and $2.10 for each additional minute.

To use the service, a customer needs a digital connection between his broadcast location and the AT&T network. Such a link is usually furnished by a local telephone company, but AT&T also can set up and coordinate the link, AT&T Product Manager Gregory J. Shaffer said.

When the digital dial-up line is installed, a radio station needs a special modem and codec terminal designed for international service. AT&T announced that Corporate Computer Systems, Inc. (CCS) of Holmdel, N.J., was chosen to build prototype terminals for the United Sates. OKI Company, Ltd. will build a version for Japan.

Specifications for the high fidelity audio terminals were developed as a result of a recent agreement between AT&T and Japan's KDD. According to AT&T, the new AT&T/KDD standards for high fidelity audio will make it easier for vendors to produce compatible terminals and it will allow operating telephone companies to begin implementing the system.

SDI uses the international ISDN architecture, including CCITT #7 signaling protocol. In addition to radio remotes, it can be used for video conferencing, Group 4 facsimile and electronic data transfer.

Demonstrated at the AT&T booth was the new CCS MICRO66i digital audio terminal for use in the AT&T dial-up service. Self-contained in a single 7.5"×8" box, the terminal accepts a broadcast standard XLR type connector for audio input and a second connector for audio output.

Using AT&T's Switched Digital International Service (SDI), a radio station can transmit and receive 7.5 kHz audio signals.

The digital bitstream is interfaced via a standard V.35 or X.21 connector attaching to a customer-provided 66Kb or 56Kb modem or CSU. The MICRO66i unit accepts analog information, digitizes it and compresses the resulting digital data stream through the use of adaptive differential pulse code modulation. The resulting bit stream is sent to either a matching 66i unit or any CCITT G.722 compatible device.

Compatible terminals

Comrex Corporation also showed at NAB a 7.5 kHz Digital Audio Codec compatible with the AT&T system. Priced at about $2,000 per terminal, the Comrex units are available in rack mount and portable versions. SDI is the international extension of domestic AT&T ACCUNET Switched Digital Service.

The total system offers dial-up digital service between many American cities as well as abroad, AT&T's John R. Celli said.

In current applications, AT&T dial-up digital audio remotes would be most feasible and cost effective in larger cities near AT&T digital facilities and where the digital telephone line can be connected and used repeatedly, Shaffer said.

Such "ideal" sites would be broadcast press facilities in stadiums or public meeting sites or in locations where regular remote broadcasts originate. Since it can take as long as four weeks to install a digital line (depending on the local phone company), it is usually cost effective for routine remotes, Schaffer said.

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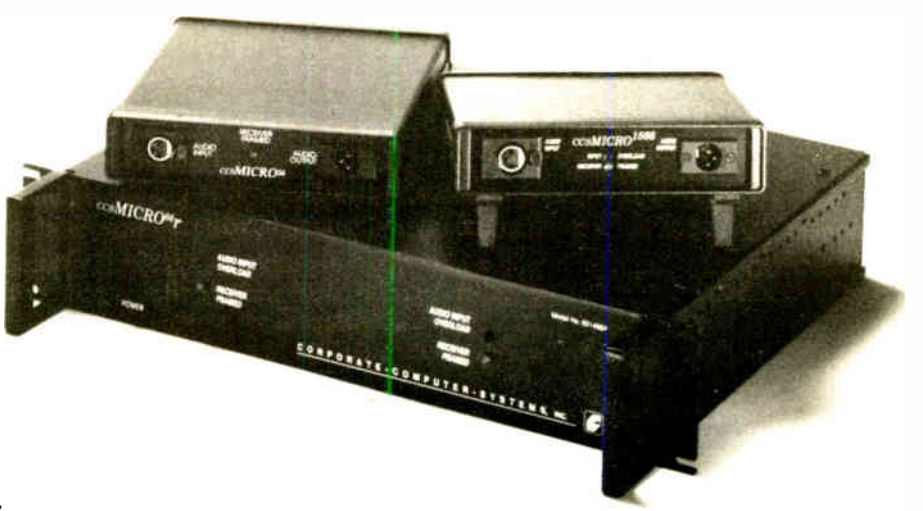

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Circle 24 On Reader Service Card

World Radio History

New Modulation Rule Expected

by John Gatski

LAS VEGAS In a heavily attended modulation monitor session at NAB '91, the FCC announced it will "tighten the rules" defining what constitutes legal modulation.

The announcement comes on the heels of a two-year controversy spurred by Modulation Science's introduction of the ModMinder, a unit that ignores very brief modulation peaks, allowing less-processed stations to gain as much as 4 dB of modulation, according to the company.

Traditional monitor manufacturers, such as Belar, have countered that monitors that ignore peaks are allowing illegal modulation, which can cause receiver interference.

The issue also has involved the FCC, as a result of a 1989 letter written by a bureau chief that seemed to approve ModMinder's use. The FCC also has been criticized for not revealing what its criteria is for evaluating peak modulation.

Because of the modulation monitor controversy, which FCC Mass Media Bureau Chief William Hassinger termed "much ado about nothing" at the session, the Commission reluctantly has decided to take action.

"We are going to take this on head-on, and attempt to put this issue to rest by the end of September," Hassinger told the session audience.

Eliminate the loopholes

Hassinger explained that the Commission will close loopholes and eliminate any gray areas that may give stations a means to overmodulate and claim they are legal. It also presumably will give monitor companies some guidelines in designing their products with regard to peak modulation measurement.

The NAB panel included TFT's Joseph Wu, Modulation Science's Eric Small, Belar's Arno Meyer, Hassinger, FCC Office of Engineering Chief Thomas Stanley, FCC Field Operations Bureau Engineer Chief William Zears and moderator Dennis Ciapura of Noble Broadcasting.

Comments and exchanges between the panelists and the audience were often lengthy and insistent during the session.

Hassinger avoided listing product names when questioned by several audience members about whether the FCC specifically would name the ModMinder as a monitor that produces satisfactory modulation measurements, a conclusion the Commission applied generally to all modulation monitors in a January public notice. The 1989 letter specifically mentioned the ModMinder, but, as indicated in the 1991 public notice, the FCC has declined to do so again in subsequent correspondences.

"I am not going to mention specific names. It would be inappropriate to mention specific names," Hassinger said.

Under deregulation, the FCC loosened modulation monitor rules in 1983, eliminating the type certification process so no monitor actually gets a FCC stamp of approval anymore.

What is legal?

However, many in the industry have inferred from the FCC's recent letters that the ModMinder, and newer products such as the Belar's Wizard, are considered accurate modulation monitors, even if they do ignore brief peaks. (The Wizard's peak weighting feature can be disabled, according to Belar.)

During the NAB session, several CEs called upon the Commission to clarify what, if any, offending modulation peaks are used in deciding what is overmodulation.

TFT's Wu said the industry should get together to form the basis for revising any modulation rule changes.

"I don't think this is an issue that we should let the FCC dictate," Wu said.

He also suggested that the standard could be based on results of the NAB's commissioned test on the effects of processing on receivers.

Hassinger noted that Wu's suggestion for industry input on a rule is the standard procedure the FCC currently follows. He said most rulemakings take into account, and even depend on, industry input.

Belar's Meyer said that even under the present FCC rules, peaks have to be taken into account when measuring modulation. He also said modulation from subcarriers has to be considered.

Include everything

In directing his comments to the FCC, Meyer said, "your rules make no sense unless you measure everything there."

Like ModMinder, Belar can produce a monitor that can ignore the brief peaks "and give you all the modulation you want, but it is not legal," Meyer said.

Meyer noted that processing and loudness are forcing receiver manufacturers to build narrower bandwidth radios, and it is important for stations not to exceed mandated thresholds. He emphasized that receivers need to be taken into account when considering new modulation rule changes.

Modulation Science's Small said the real issue is sound quality, not interference. The ModMinder, he explained, allows stations, such as unprocessed classical formats, the opportunity to become a bit louder, legally, without compromising the audio.

During his remarks, Small also presented charts of several modulation monitor comparisons that had been conducted for his company. Based on those tests and his talk, Small concluded that not all monitors perform as claimed. In his comparison, monitors other than ModMinder were not identified.

The FCC's Zears said stations that are overmodulating usually know it. He said that when he monitors a station and notes any overmodulation, he usually visits the CE. The ones who are hitting 120-150 percent are the ones that usually don't have a meter connected or disregard what it indicates, he noted.

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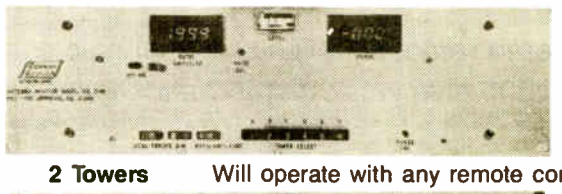

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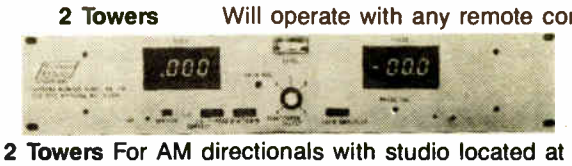

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World Radio History

FCC Plans Study of New EBS Technology

by Frank Beacham

LAS VEGAS In a new show of aggressiveness and enthusiasm, the FCC's Emergency Broadcast System (EBS) office is creating a new computer database of emergency information and proposing an examination of new emergency-warning technology that could be used to upgrade the EBS system.

In an "EBS Forum" at NAB, new EBS Office Chief Robert Browning said the shifting of the EBS program from the Office of the Managing Director to the Field Operations Bureau (FOB) six months ago has brought about new changes.

"We've gone from rotary dial phones to push button phones and computers," he said. Browning and FCC Chief of Field Operations Richard Smith, also announced that the staff is proposing a new Notice of Inquiry (NOI) that will take a broad look at new alerting system technology. That proposal has yet to be presented to the FCC.

The new computer database, which will go on-line this year, will allow state EBS chairmen and vice chairmen to get information via computer modem by dialing up the FCC's EBS computer system. The database will offer information on all licensed stations and state emergency plans, Primary Entry Point (PEP) stations, relay systems, updated map books and a file of all equipment loan agreements for stations.

The proposed NOI would be in addition to the current NOI proposing a possible two-tone alerting system signal that is shorter in duration than the current one. Smith said it would be an overview of current technology and a look at how that technology might be used to improve the EBS system.

"The staff is working on a Notice of Inquiry that would look at new technology that might be available that might offer certain improvements to the present EBS system," Smith said during a post-forum interview. "The one improvement that might be looked at is the ability to remotely turn receivers on from a muted or 'off' position.

"It is really premature to say much more about this," Smith continued. "I caution your readers that this is at the staff level at this point and has not be enacted on by the Commission."

On another emergency broadcast matter, Browning said his office is actively assisting the Federal Emergency Management Agency (FEMA) with the emergency equipping of 30 key continental and seven territorial Primary Entry Point (PEP) broadcast stations. These stations, whose combined coverage area spans nearly the entire United States, are linked by a special radio network with the White House and other government agencies for emergency information.

When the PEP network stations are complete, each will be self sufficient to broadcast emergency information in a national disaster, Browning said.

Schemes Outlined At CDRB

(continued from page 7)

of Strother Communications invited all systems proponents to serve on an advisory group and define a DAB test outline.

He has asked the FCC for authority to test DAB systems at several frequencies and is working with several FM stations interested in testing in-band systems. Strother said such tests could be "cost efficient and equivalent to ATTC (HDTV) tests."

Tests needed

Kintel's John Leonard said all discussions "must end up in an honest evaluation of all systems to deliver one compatible with our way of life." Mercury Digital's Tom Duffy said "we encourage a testing format to see which system performs the best under real world conditions."

Strother concluded the issue of which DAB system is best for the U.S. "will have to be settled in the streets as well as in the lab."

The CDRB ended its meeting with the announcement of a formal affiliation between the committee and the SBE. CDRB organizers had been looking for such an arrangement to help defray expenses and provide support services, according to CDRB Chairman Skip Pizzi.

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Circle 107 On Reader Service Card

World Radio History

High-End Monitor Makes Debut

by John Gatski

LAS VEGAS Inovonics has introduced its new professional program audio monitor receiver, the Sentinel—a monitor based on the NAB's "super radio" specifications.

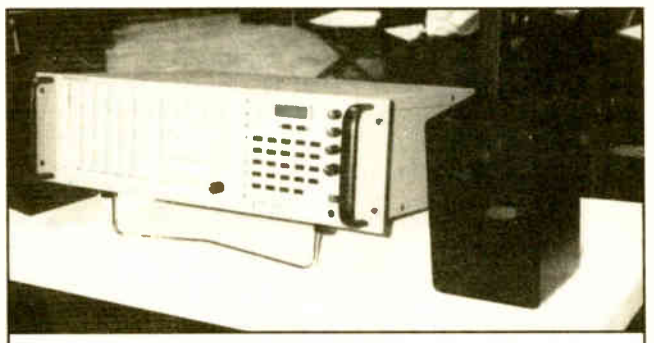
The $5,995 unit is a self-powered receiver that provides numerous measurement features and can be used for off-the-air monitoring by engineers, program directors and management. The company is quick to point out that it should not be used for adjusting and monitoring transmitter operation, but as an all-purpose monitor.

The unit includes bar-graph readouts of total modulation, L,R, L+R, L−R, QDM mono, CBS-specification loudness, dynamic profile, program symmetry, stereo balance and stereo image. The unit also measures signal strength and indicates the presence of multipath.

According to Inovonics President Jim Wood, the receiver section receives NRSC-AM (expanded band, with wider frequency response), C-QUAM AM stereo, FM stereo, FMX stereo, and analog and digital subcarriers such as RDS. The unit can be calibrated in the European-frequency space or the U.S.-frequency space mode and has 24 station presets.

Of note, Wood said the receiver subsections are plug-in modules, which could be changed to add DAB frequencies in the future.

Based on the Sentinel's listed specifications, it can measure total modulation up to the 130 percent F.S. and 13 percent F.S ranges. The left channel/right channel ranges from +10 dB to −50 dB in 1 dB steps, as do the L−R, L+R measurements.



The Sentinel from Inovonics

The QDM (quadrature-derived mono) feature has a phase offset of 90 degrees between channels and sets up a listening environment for the mono mix that can be used for the CBS loudness and the spectral profile meters. The CBS loudness measurement ranges from +10 dB to −50 dB in 1 dB steps, while the dynamic range indicator ranges from zero to +20 dB in .5 dB increments.

In demonstrating the unit from the NAB floor, Wood dialed in an apparently overly processed pop station that showed very little dynamic range. He said the Sentinel can be used for precise setup of processing equipment to ensure the sound quality is not compromised.

The spectral profile is similar to the spectrum analysis feature on many audio equalizers. It shows the energy of four equal octave bands representing the low-to-high frequencies of a station.

The program symmetry allows systems phase checks, and the stereo balance and image give the user an indication of the performance of the stereo generator. The latter indicates the presence of stereo enhancing technology and any stereo image problems, Wood said.

NAB Hears DAB Plan Comments

(continued from page 8)

With the debut of the USA Digital in-band system right down the hall, Abel's third "hot spot" was the issue of an in-band implementation of DAB.

He called it a "positive option," but said that the industry should not make policy decisions about its future based on options that have yet to prove themselves.

He also said the NAB is concerned about AMs being excluded from in-band systems, although USA Digital has said it intends to develop its system for AM stations as well as FM.

One final point made by Abel concerned the status of talks with Eureka partners about licensing the technology. He said NAB is waiting for Eureka to designate representatives to handle the business side of the project.

"The letter of intent expired on April 1," Abel noted, "Now it's up to Eureka. We have no formal indication they wish to work with NAB."

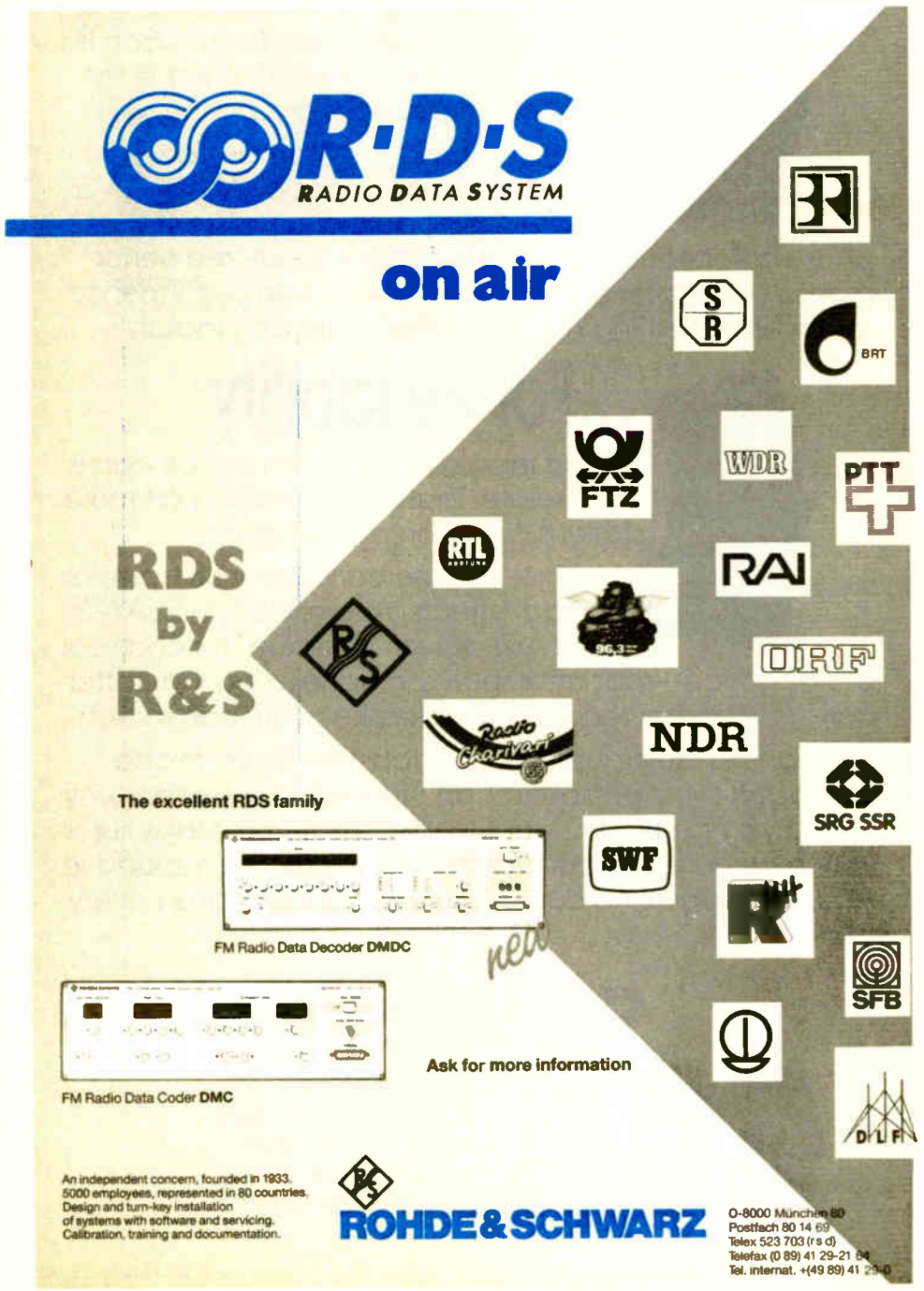
Egon Meier-Engelen, who chairs the Eureka 147 project, said later that the business side of the project should be ready to begin talks "within months." He noted, however, that an agreement between Eureka and NAB would probably not involve an exclusive licensing arrangement.

After the presentation there was a steady stream of questions from attendees. One broadcaster wanted to know how existing stations could be assured a DAB license. Box replied that helping the NAB get industry consensus on its DAB plan would ensure that.

Arthur Kern from American Media criticized the panel for "not including dissenters" to the NAB's point of view. "There's a large number of people who disagree with your point of view," Kern said.

He went on to say that, in light of the in-band systems under development, "if we'd believed in Eureka and marched down that road we would have made the wrong decision." He said that Project Acorn (USA Digital) "makes a lot of sense, and if you have ten objections to it I'll bet they'll be gone in a year."

Kern concluded by saying that NAB is "in a tough political spot" and that the future of the association "might be dependent on how this issue comes out."



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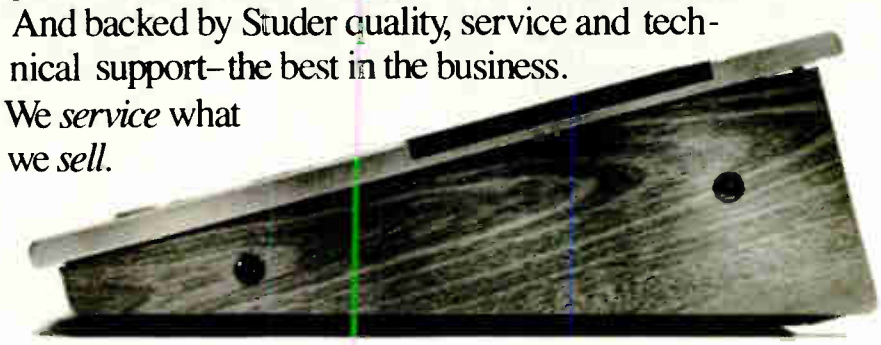

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World Radio History

Improvements Possible for FM

by Thomas R. McGinley

LAS VEGAS The 1991 NAB convention session on FM systems engineering and improvement presented four topics to enhance current FM broadcasting.

The topics included the now-traditional FCC regulations update by Mass Media Bureau Chief William Hassinger; a comprehensive look at the technical future of FM and the use of existing remedies to solve problems by Tom Keller of Broadcast Technology Partners (BTP); computer-assisted optimization of FM transmission path bandwidth performance by Chuck Kelley of Broadcast Electronics; and Jampro's unveiling of a new low-cost multi-user FM antenna by Eric Dye.

Short spaced ruling

One important announcement involved FCC Rule 73.215, regarding new short-spaced antenna sites and the issue of reconsideration. Hassinger said the FCC staff's work and recommendations are completed and that the full Commission should be scheduling a vote soon.

Hassinger also addressed the current difficulties of "doughnut" situations. This involves stations that cause or receive significant interference within primary coverage areas due to intermodulation and blanketing, but cannot move or change facilities to alleviate the problems without creating new ones.

Hassinger said proposed solutions to these situations would continue to be dealt with on a case-by-case basis.

BTP's Keller, who has championed the merits of FMX, presented a comprehensive overview of current FM transmission and reception problems. Keller believes that the only significant improvement DAB would provide over present FM is the elimination of multipath and interference. Audio response with DAB is only marginally better, he added.

He suggested that if broadcasters and receiver manufacturers implement a specific list of improvements to the present FM technology, that multipath and interference problems could largely be solved. This list included:

- Widespread availability and use of diversity receiving antennas.
- Implementation of FMX technology with encoding at the transmitters and decoding in receivers.
- Widespread use of the Walsh decoder in receivers, which reduces first adjacent interference by up to 20 dB.
- Widespread use of a high level multipath blend circuit in receivers.
- Reduction of receiver front end sensitivities by 3 to 4 dB.
- Establishment of an NRSC receiver standard of 200 kHz minimum IF channel bandwidth and specific intermodulation performance standards.
- Implementation of wide bandwidth transmitters and antenna systems, and maintaining minimum AM noise performance by proper transmitter tuning.

Challenging DAB

Keller concluded that if receiver manufacturers and broadcasters would work together to implement all these improvements—which are based on presently available technology using the existing FM band—a new DAB band may not be necessary.

The last several NAB shows have included papers on reducing SCA crosstalk by proper transmitter tuning. Chuck Kelley of Broadcast Electronics continued the string by presenting a computer-assisted technique titled "Effects of Limited Bandwidth Transmission Paths in FM on SCA/RDS Performance."

A computer program called FMSIM, written by Dave Hershberger of Quantics, was adapted to model the impact of a selected filter on a given transmission path regarding group delay and amplitude effects.

Using the program helped verify that merely tuning an FM transmitter for minimum AM synchronous noise may not produce minimum crosstalk components appearing in the SCA/RDS region. Tuning for the most symmetrical group delay response across the passband always produces the lowest SCA crosstalk and minimum multipath effects.

Kelley described an easy method to achieve this by transmitting a full-level 3.5 kHz tone in the left or right channel only, and then tuning for a null in the crosstalk at the output of an SCA modulation monitor.

New antenna ideas

Jampro Antennas' Eric Dye presented a new balanced feed antenna design using the penetrator-type twin V dipole radiator. The model JBBP antenna is a circularly polarized, wideband array with excellent axial ratio and pattern circularity performance, able to accommodate several stations up to 10 MHz apart.

Typical single channel bandwidth is 5.5 MHz for a 1.1:1 VSWR. The JBBP will also work well on high band VHF and UHF TV channels.

The key to the effectiveness of this new design is the novel balanced feed system using conventional hardline components. The usual electrical asymmetries encountered with traditional single-ended feed systems are eliminated, thus the feeder hardware does not become an incidental radiator. The balanced feed allows all arms to radiate equally, ensuring typical circularity performance of ±0.25 dB Hpol and ±0.75 dB Vpol.

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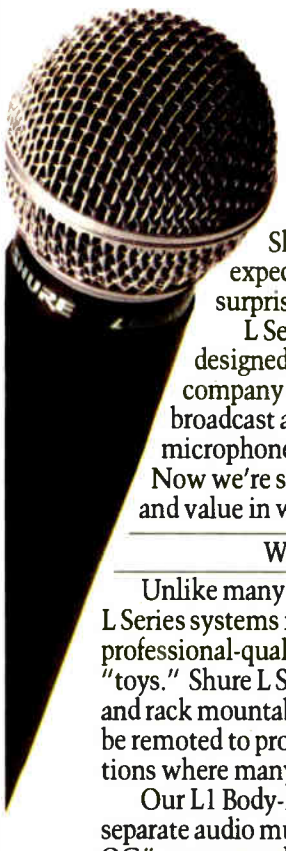

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World Radio History

Maturity in Digital Workstation Arena

by Ty Ford

LAS VEGAS Based on last year's and this year's presence at the NAB show, the number of digital audio workstations (DAWs) appears to be leveling off. Although there were a few new entries, there were an almost equal number of "no-shows."

Software enhancements, faster digital signal processing (DSP) and the use of larger hard drives and magneto-optical disks topped the list of upgrade features.

The AMS AudioFile PLUS

Of note was Otari's arrangement with Digidesign for the use of the latter's software in the new Mac-based DDR-10 two-track digital recorder, and their acquisition of Digital Dynamics and its Mac-based ProDisk 464. Upgrades for the ProDisk 464, which records and plays back from four to sixty-four channels, included faster operating speed, a larger RAM cache, a user-definable auto-save feature and a soon to be released DSP card with real-time level and EQ controls.

With entry-level prices of $20K for the DDR-10 and $65K for the four-channel ProDisk 464, in addition to the company's soon to be released R-DAT machine, Otari has positioned itself as a formidable player in the professional digital market.

Roland's gift

For some time now I've suggested that you should be keeping an eye on developments in the Musical Instrument (MI) market. Roland, one of the top players in that market, made that job easier earlier this year by announcing the formation of its Pro Audio/Video Group.

Of particular interest is its DM-80 hard disk recorder, available in either four- or eight-track versions. The DM-80 features a built-in 24 bit digital mixer with two stage EQ, pan and individual level control. The basic 100 Mbyte four-track system with DM-80-R remote controller ($7,500) provides 19 minutes of track time across four tracks at 44.1 kHz. The present system may be expanded to 500Mb, allowing 90 minutes of 44.1 kHz recording.

Other options include the DM-80F eight-track EQ/pan/fader controller and Mac-based Track Manager software ($1,695) for controlling and editing. The system is also configured to accept large-capacity memory devices—such as magneto optical disks—that can extend storage time to 12 hours.

Sonic Solutions showed its multiple Mac-based recording and editing systems, CD premastering, edit and sound for picture, NoNoise options, and effects. The Mini Editor, Sonic Solution's entry-level system, features SMPTE-based digital recording and editing with variable crossfades and level control ($8,750). The Sonic Expanded four-track editing system, in addition to double the tracks, also allows background loading and unloading.

Including project manager automatic log generation and automatic tape machine control, the unit will run you $16,800. All systems are 20-bit linear PCM input and record up to twenty-four channels in groups of four. Track time varies from 108 minutes to 864 minutes at 44.1 kHz times the number of tracks. Of particular interest is the 4×2 automated level, EQ and dynamics automation.

A new major player

Another new hard disk system on the floor this year was the collection of Mac-based software from Digidesign. The basic software system was created about two years ago; the company has developed into a major player with the previously mentioned Otari DDR-10, and in its own right. Its two-track entry-level Sound Tools system ($3,285) requires a Mac IIci with at least 4 Mbyte RAM, 8 Mbyte preferred.

There are three different I/O modules. The first is standard 16-bit A/D with no oversampling at 32 kHz, 44.1 kHz and 48 kHz. Options are the bi-directional digital interface with 32 kHz, 44.1 kHz and 48 kHz sample rates, AES/EBU, SPDIF and DAT backup software ($1,000); or the optional Pro I/O converter ($3,000), providing delta sigma 64× oversampling at the input and 18-bit, 8× oversampling at the output through Apogee filters.

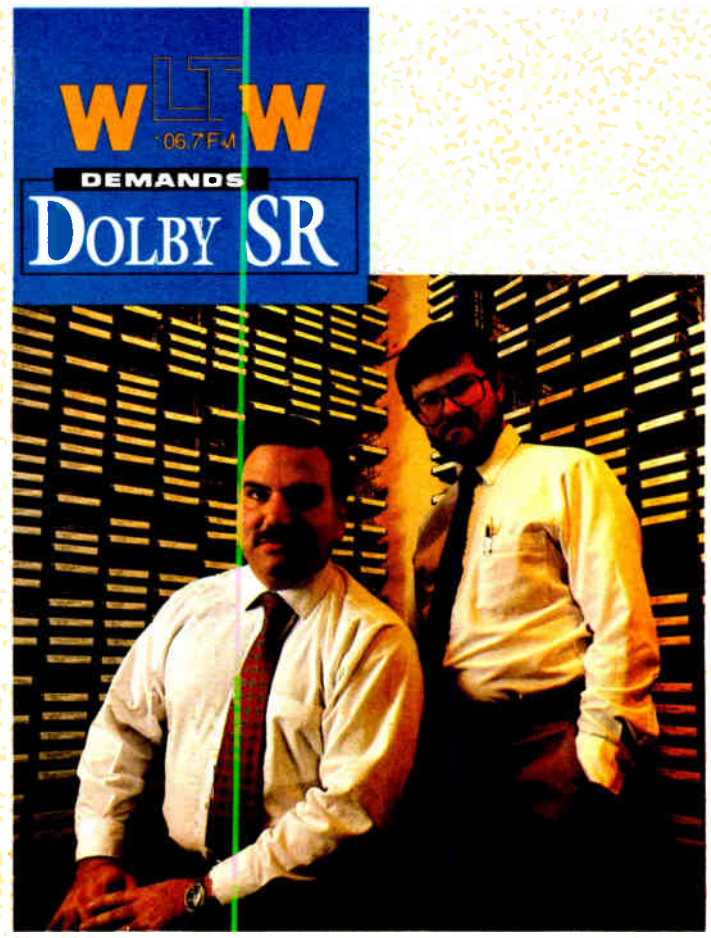
The basic 16-bit Sound Accelerator card features real-time five-band stereo graphic/parametric EQ, real-time compression/limiting/expansion/gate controls, sample rate conversion, pitch shift, and time compression/expansion, all in real-time. FFT waveform analysis displays, 2:1 and 4:1 data compression also top the list of impressive features.

Keep an eye out for an article devoted entirely to the Sound Tools system.

A last debut

The final entry in the "new" category is the DD-1000 magneto-optical recorder from Akai ($13,500). Using removable magneto-optical disks, which offer 30 minutes of stereo per side, the DD-10000 is agreeable with the vast variety of input and output configurations. Although it can be operated by the controls on the front panel, the DL500 remote ($1,000), the DL1000 remote ($2,500) or

(continued on page 17)



Vincent Marchese

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World Radio History

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World Radio History

Workstation Products Mature

(continued from page 15)
remote via a Mac II with at least 2 Mbyte of RAM is suggested. Software for front panel emulation (DD FMac V1.0) and enhanced editing (DD QMac V1.0) runs $695.

One of the best production-oriented features of the DD1000 is the new quick start DL 500 remote box, which lets you control the starts of 10 different elements. Each electronic "page" is like having 10 cart machines at your fingertips. Depending upon how you program the DD1000, successively fired-up audio bits will either cut off the preceeding piece, or overlap it.

Changes to established gear

While most manufacturers were upgrading software and adding options, AKG made its RAM-based DSE-7000 workstation more attractive by lowering the base price by an impressive $9,000. This significant reduction means the 4.4 minute entry-level system went from $37,500 down to $28,500. Additional RAM cards are available for up to 17.5 minutes.

Other manufacturers' moves included Alpha Audio's increase from three to 20 the number of comm ports on the Boss/2, which allows for 32-channel operation.

AMS's AudioFile PLUS upgrade increases the number of outputs to 16 and the number of inputs to eight. The new D-8 8.14+ Issue 02 software for two-input AudioFile PLUS systems provides improved ADR pages, the ability to name a recording while in the record mode, easier defaults, faster event splicing, an improved event list filing system, as well as "compare" and "copy" disk facilities.

Both the Audiflex and Optiflex systems from Ediflex had minor software changes. The Optiflex, positioned for the film/audio market, now records up to 32 channels simultaneously, and offers independent track slipping.

Lexicon showed its CEPEX package with improved time compression, pitch change, vari-speed and sample rate conversion, all in stereo. The Opus console model of the system (not the "e" model), now has more extensive automation for fader, pan, sends, mutes and storage for different mixes.

New England Digital's Post Pro SD make-over consists of a faster Mac (IIfx), up to eight inputs and outputs, a DSP option for 20-bit A/Ds with 64× oversampling and 24-bit EQ and dynamics processing, SDIFM protocols for direct transfer from 24- or 48-channel Sony machines, machine controls for Sony BVH/BVU and Ampex VPR3 machines, a librarian for cataloging on-line and off-line sounds, a 1 GByte magneto-optical storage drive, and Soundroid software for film style editing and Q sheet printing.

Studer's Dyaxis upgrade featured non-real-time sample frequency conversion for 128 different sample frequencies, and snap-shot automation. The Dyaxis also increased storage capability via 300 Mbyte per side magneto-optical drives for archiving. The 320 Mbyte, 640 Mbyte and 1 Gbyte drives allow for 60, 120 or 200 track minutes of storage, respectively.

The Dyaxis system is also available in a four-channel version (the 2+2), which allows for in-sync real-time overdubbing. The newest version of Macmix software provides real-time EQ and level control via five-band parametric or graphic EQ per channel. Once you have created a particular EQ curve, it can be saved and applied to other audio. Two different time-scaling functions allow for compression of simple voice and more complicated waveforms.

The Dyaxis time code reader/generator and synchronizer can be used to lock the system to an wide variety of video and film sources.

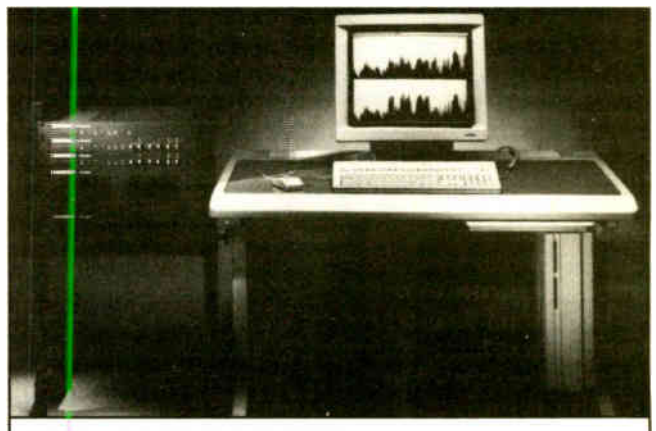
Upgrades to Waveframe's AudioFrame included a faster computer interface, simultaneous 32 input/output capability through a 64-channel buss, dedicated controls for all mixer functions, time compression, real-time EQ and MIDI recordable automation for level, EQ and 24-bit internal reverb. Waveframe also offers the CyberFrame, a more film-style system.

Soundmaster and Symetrix were showing their systems—Symetrix had a room at the Hilton reserved for private demonstrations. However, neither of the systems are ready yet; delivery dates were placed at "later this year." Turtle Beach and Digital Audio Research, which previously had shown its Soundstation II, did not show this year. Instead, DAR is dealing direct with prospects from hubs in New York, Chicago and L.A.

The Soundstation II has been upgraded to 18-bit, 16× oversampling in and out. Storage time is from 120 minutes to 24 hours with eight hours per rack. The system is now capable of real-time four-band EQ, time compression, digital vari-speed and auto-location jog/shuttle via touch screen control.

The one thing I heard too much of at the show was Workstation Bashing. I'm not naming names this time, but I heard an incredible amount of misinformation being weaved into presentations. At best it was ignorance. Which means a lot of manufacturers' reps don't have a clue about the competition. At worst, it was purposeful deceit.

My suggestion is to pursue your choice carefully and don't believe anybody about the abilities of a particular workstation until you see it with your own eyes and hear it with your own ears.


Studer showed its Dyaxis system.

For a closer look at some of the key players in the field of digital audio workstations, see the Aug. 7, 1991 issue of RW.

■ ■ ■

Ty Ford is an independent audio consultant and regular contributor to RW. *He can be reached at 301-889-6201, by MCI mail #347-6645, or via America Online (Tford).*

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World Radio History

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"CAT-LINK solved all our problems in 4 minutes—2 minutes to install each end. Performance has been impeccable."

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Dick Byrd, WZGC-FM, Atlanta GA

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Transparent digital transmission

CAT-LINK encodes the fully processed composite signal, then decodes it at the transmitter. You always get full stereo separation, without the phase or amplitude variations that plague two-channel STLs. Dynamic range is up to 84 dB, and your processed composite signal can use virtually all of it. You hear clear, clean, undistorted audio—all the time.

No audible delays

CAT-LINK's real-time digital encode/decode process doesn't introduce audible delays as data compression can. Jocks can monitor on-air without problems.

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Stations across the country are avoiding 950 MHz problems by using 23 GHz with CAT-LINK. They've stopped worrying about frequency congestion and interference, repeater-induced signal degradation, and fresnel zone clearance fading. 23 GHz dish sizes also reduce wind loading and tower space requirements.

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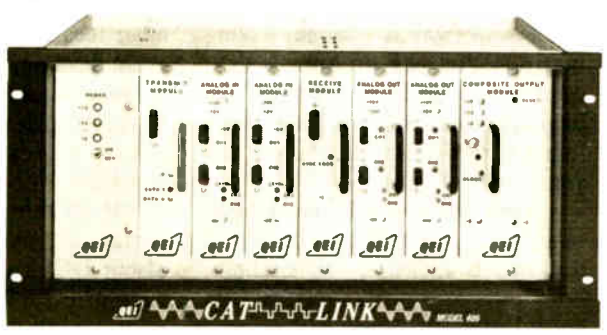

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Circle 34 On Reader Service Card

Innovation Marks STL, Telco and Remote Gear

by Dennis J. Martin

LAS VEGAS The NAB convention has evolved into a forum of new technology. For manufacturers, it often marks the culmination of long, late hours finalizing new products. For attendees, the convention offers a chance to see those new products demonstrated for the very first time. For everyone, it's a glimpse of the future.

This year, new and updated product introductions were evident throughout the exhibit halls. Among the areas enjoying major advancements were STLs, telco-based products (for T1 and dial-up circuits), satellite systems, and transmitter remote controls.

New digital STL

The newest addition to the Moseley STL product line is the DSP 6000 System. One of the attention-getters on the show floor, the DSP 6000 converts an analog STL—like the Moseley PCL 606 or PCL 6000—into a digital CD-quality link.

The standard DSP 6000 encoder converts two analog audio channels (left and right), and one data channel into a spectrally-compact digital FM signal. The decoder provides complementary analog outputs. Two auxiliary program channels and one data channel can be added to the system.

The Moseley DSP 6000 delivers main channel audio from 20 Hz to 15 kHz, ±0.2 dB, with less than 0.01 percent distortion, and a 90 dB signal-to-noise ratio (SNR).

The convention also marked the introduction of a new composite STL system from TFT. The Model 9100 STL transmitter is frequency synthesized, has an RF output of 7.5 W minimum, a baseband response of ±0.1 dB from 50 Hz to 53 kHz, and 0.02 percent THD. Signal to noise is 85 dB, and stereo separation is 55 dB at 1 kHz.

The TFT 9107 is a new composite STL receiver intended to be a companion to the Model 9100 transmitter. It, too, is frequency synthesized, offers a response of +0.1 dB from 50 Hz to 60 kHz, 0.05 percent THD, an 80 dB SNR, and a stereo separation of 50 dB at 1 kHz.

At the Marti booth, upgraded models of STL equipment were on display. The STL-10 Transmitter and R-10 Receiver can achieve an SNR of 80 dB with a received signal level of just 80 μV, and channel separation is also specified at 80 dB.

The Marti STL system has been redesigned to provide an additional 6 dB of audio headroom, and the STL-10 transmitter offers an accurate peak-reading modulation meter.

Surprising more than a few of those in attendance, Dolby Laboratories made a preliminary announcement of its forthcoming digital STL system. Scheduled to be on display at the fall NAB convention in San Francisco, the DP5500 Series DSTL (Digital STL) is slated for an early 1992 delivery.

The Dolby Digital STL will provide analog left and right inputs and outputs, and will use Dolby AC-2 audio coding.

Scala, a familiar exhibitor, was on-hand with its full line of STL, TSL, and monitoring antennas. Scala products are known for their ease of installation and robust mounting hardware.

Radio links are not the only form of STL that are benefitting from digital audio technology. Intraplex is just one company that introduced a digital audio interface for the expanding T1 service.

The Intraplex 4800 DDAT Link—which stands for Discrete Digital Audio Transmission—transmits multiple high-quality analog audio channels as a single, standard digital serial data stream.

Although the basic system transmits two 15 kHz channels, the 4800 DDAT Link can be configured to handle additional channels or for two-way transmission.

The Comrex DXP digital audio codec

Frequency response is ±0.5 dB from 20 Hz to 15 kHz, THD+N is less than 0.01 percent, SNR is greater than 90 dB, and channel separation is not degraded in any way.

Also new at the Moseley booth was the FT1-3000 System, designed for fractional T1 circuits, referred to as FT1. By using a scheme that minimizes spectrum requirements, the new FT1-3000 will reduce operating costs since fractional—rather than full—T1 facilities are used.

Based on principles employed in the new Moseley DSP 6000, the FT1-3000 shares many of the same benefits, including 0.01 percent distortion, 90 dB SNR, and no crosstalk between channels (left, right, auxiliary, or data).

On display at the QEI exhibit was CAT/Link, a real-time digital PCM encoder/decoder designed to exploit the T1 service.

Improved telco remotes

Busy manufacturers, though, have not abandoned broadcasters who need improved audio for remotes. Comrex showed its new DXP and DXR audio compression devices that are designed to use the 56 and 64 kbps data services. These circuits include ISDN, switched 56 telco and fractional T1, and satellite. Using digital signal processing (DSP) technology, the portable DXP and rack-mount DXR versions permit 7.5 kHz duplex audio transmission.

Comrex also featured its 3XP Multiline Encoder. When switched 56 and fractional T1 circuits are unavailable, the 3XP uses multiple standard dial telephone lines to improve quality. One line provides 50 Hz to 3 kHz response, two lines extend the response to 5 kHz, and three lines allow 50 Hz to 8 kHz operation. Real-time audio processing, including noise reduction and automatic telephone line EQ, are standard.

The NAB convention also marked the introduction of the Intraplex 4500 MDAC Multi-Channel Digital Audio Codec. Using 4:1 compression, only 64 kbps is required for a 7.5 kHz audio circuit. Depending upon configuration, the 4500 MDAC can provide 15 kHz audio bandwidth and multiple simplex or duplex channels.

Back at the Moseley booth was the new Musicode 56/64 Digital Audio Terminal. The Musicode 56/64 is also designed to

(continued on page 21)

World Radio History

Processing Enters Digital Age

by Geary Morrill

LAS VEGAS Digital audio processors were front and center for radio broadcasters during the NAB equipment exhibition April 14-18 in Las Vegas. The advent of DSP (Digital Signal Processing) technology has brought a level of sonic performance and repeatability of settings unheard of just a few years ago. Many well-known manufacturers (and a relative newcomer) were demonstrating production models or working prototypes of their offerings.

QEI unveiled the model 710 digital stereo generator.

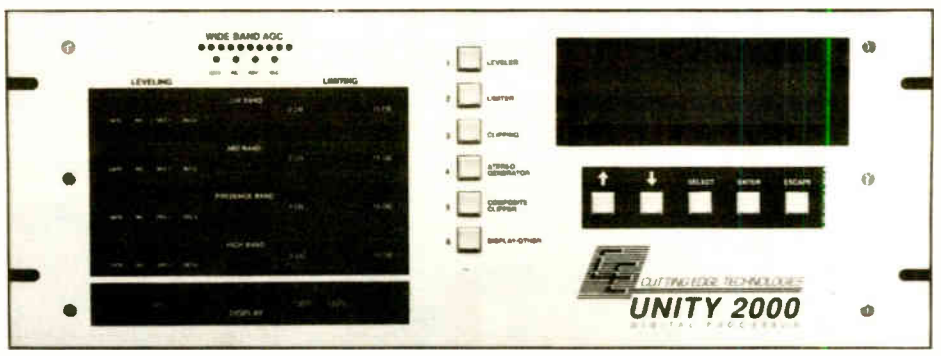
Orban, a division of AKG Acoustics, wheeled out the digital Optimod FM 8200 for its first public appearance at the show. Utilizing what the company calls Modular Variable Processing (MVP) structures, the user can choose to configure the system as either a two-band system (similar to the 8100A) or as a very powerful multiband system. The latter option is a collaborative effort of Bob Orban and Gregg Ogonowski (formerly of Gregg Labs) that adds five bands of downward expansion, compression and clipping for the ultimate CHR station.

The 8200 is field upgradable to the more aggressive five-band option. The unit also allows for optional computer control by modem from any IBM compatible PC, and user interface is achieved with a large LCD display and a series of "soft" keys.

The 8200 can also switch from one processing "set" of parameters to another, allowing a station to "daypart" its processing automatically. Performance from analog input to composite output is impressive: ±0.2 dB frequency response from 5 Hz to 15 kHz, THD and IM distortion of 0.1 percent and separation better than 60 dB (70 dB typical) from 20 kHz to 15 kHz. The 8200, which can be upgraded with software revisions without changing the hardware, starts at $7,400 to $9,820.

Cleveland, Ohio-based Cutting Edge Technologies unveiled its answer for one-box digital audio processing with the introduction of the Unity 2000. Combining wideband AGC, low frequency EQ, digital preprocessor/leveling, limiting, clipping/filtering, stereo generator and digital composite clipper, this powerful integrated system is likely to find a home at many stations soon.

A menu-driven interface allows precise control of all parameters of the Unity, including crossover frequencies, attack and release times and threshold levels of the four-band processing, as well as control of the clippers and stereo generator with one screen and keypad. LED display of leveling and limiting functions in the four-band domain are always displayed, as is the input wide band AGC.



The Unity 2000, from Cutting Edge Technologies

The Unity 2000 uses a "Feed Forward" system (as opposed to feedback in other processors) to maintain processing ratios through a wide dynamic range, and a unique intelligent Time Constant Controller that "learns" the music being played, and adjusts attack/release times accordingly. The digital composite clipper operates prior to pilot insertion.

With all processors active, the Unity 2000 can deliver THD performance of 0.5 percent greater than –70 dB SNR and stereo separation greater than 60 dB typical. The unit is available for shipment with a price tag of $7,995.

Gentner Corp., which debuted its Digital Prizm last year, has added the second half of their one-two digital punch—the Lazer, which appeared last fall in prototype form. Full LCD display shows status of all parameters, and LED bargraphs display multiple function readouts. Twenty-three processing parameters are accessible from the Lazer front panel, giving the user a wide range of control.

Eight preset processing programs (user adjustable) are built into the Lazer, with A/B processing program comparison to allow instantaneous comparison in real time.

The Lazer provides its final limiting without the use of any clipping, eliminating the resultant distortion associated with that technology. It's also upgradable through future software revisions. As a companion to the box, an optical encoder converts your analog signal to a digital data stream that can then be routed to the Lazer (or the Digital Prizm and Lazer combination) via fiber optic link to eliminate RFI completely.

The Lazer and the Prism are fully remotable through RS232 ports by any IBM compatible computer, allowing full control from any location via modem.

The Lazer specs out at better than 65 dB of separation across the audio range, .05 percent THD with 10 dB of limiting in either the tri-band or final limiter sections, and frequency response ±1 dB within the FCC curve for 75 microsecond pre-emphasis. The Lazer, with optical encoder, is selling for $5,995 and the

(continued on page 23)

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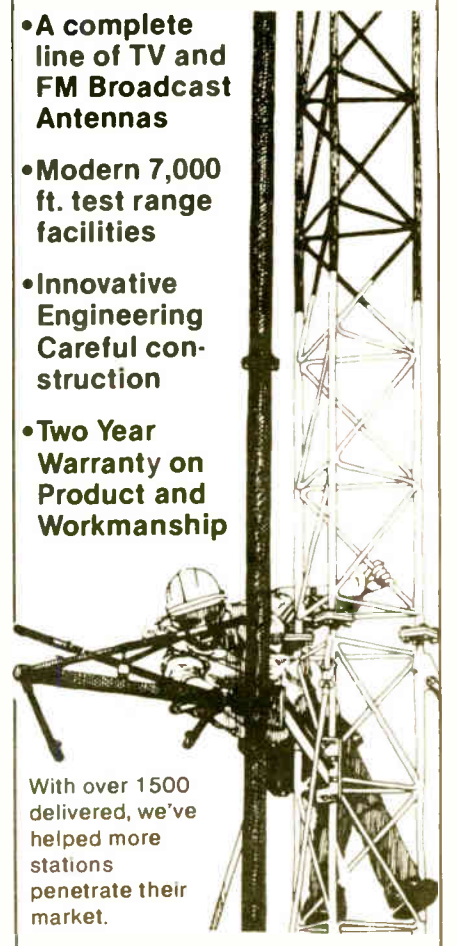

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World Radio History

NAB Addresses AM Concerns

by Tom Osenkowsky

LAS VEGAS Whether on the show floor, in sessions, or in specially-arranged demonstrations, the NAB convention offered items of interest to AM owners and engineers.

Sessions dealing with AM were enlightening, and provided some insight into the future of the band. One such though-provoking session was "AM Systems Engineering and Improvements," held Sunday, April 14.

In this session, FCC Mass Media Bureau Assistant Engineering Chief William Hassinger said the FCC staff is presently digesting the overwhelming amount of comments received as part of its comprehensive plan to overhaul the AM service (Docket 87-267). Finalization is not expected until this fall, despite industry rumors that an announcement would be made at the show.

Also addressed in the session was design of directional antenna feeder units. Ron Rackley of du Treil, Lundin & Rackley, Inc. explained how modern computer techniques such as moment method impedance modeling and nodal matrix analysis can benefit broadcasters.

Using such techniques, it is possible to enhance the signal quality of an AM directional station through improved pattern and impedance bandwidth. Rackley showed dramatic "before and after" results of a traditional phasor and one optimized for pattern and impedance bandwidth.

A source of revenue for many AM broadcasters is tower space rental. Commercial two-way radio users, cellular telephone and paging companies often rent space on a "hot" AM tower. Their transmission lines have to be isolated from the "hot" tower in order to preserve the AM signal. If many antennas are mounted on the tower—one of which may be your FM combo counterpart—multiple isocouplers must be used.

Quarter-stub alternative

Tom King of Kintronics Labs, a manufacturer of phasing, coupling and isolation equipment based in Bluff City, Tenn., presented an alternative to the traditional methods of quarter-wave stub and isocoupler methods. Tom discussed the use of a multi-coax isolation inductor, a single large coil through which all transmission lines pass their RF energy and yet maintain the necessary isolation of the AM signal.

Much attention has been paid to skywave radiation on the AM band in recent years. Skywave propagation is responsible for long-range signal delivery on medium wave bands during nighttime hours. This is why many stations have to leave the air or reduce power after sunset. By reducing the amount of skywave radiation, less interference is propagated and hence the AM band could accommodate more stations during night hours.

Toploading vertical radiators

Timothy Cutforth of Vir James Consulting Radio Engineers presented a paper dealing with toploading of vertical radiators, to achieve reduced skywave radiation and enhanced groundwave efficiency. Two actual station examples were cited: KIAM located in Nenana, Alaska, and KNWZ in Thousand Palms, Calif. In both cases, Tim employed extreme toploading which delivered the required protection to other stations while increasing coverage in the local market area.

Most tower structures are seen but not heard. We often take them for granted. Robert E. Sundius, Jr. of S.G. Communications and Owen F. Ulmer of Stainless, Inc. explained the steps that can be taken to ensure your tower's properly maintained.

The most economical way is to perform thorough, regularly scheduled inspections. Inspection details on the tower foundation, guy wires, guy anchors, ground system, base and guy insulators, tower lighting apparatus, structural members, tower plumb and tension and safety devices were some of the topics covered at length.

A fairly new concept for high fidelity AM broadcasting was presented by George W. Yazell. Yazell demonstrated a Noise Free Radio (NFR) prototype at the 1989 SBE National Convention in Kansas City. NFR provides FM audio quality, occupying no additional spectrum on existing AM stations, using FM techniques dating back to the 1950s.

The Gates Serrasoid and GE Phasitron FM exciters used narrow deviation of a low frequency TCXO, which was multiplied up to carrier frequency, as was the narrow deviation. NFR uses as little as 1 kHz FM deviation of the AM carrier, which is multiplied in the receiver at the IF stage to reproduce ±75 kHz deviation and hence FM fidelity. Over-the-air tests were conducted at WQYK in Florida over a six-month period.

Product introductions

New products for the show were introduced by Harris-Allied, which debuted its Acura line of Antenna Coupling Units. Accommodating powers from 1 kW to 100 kW, the Acura line features

(continued on page 31)

par•a•gon \'par-e-, gän, -gen\ *n* **1:** a fully digital transmission processor for all broadcast environments. **2:** *Featuring:* No clipper, meaning no clipping artifacts; 4-band compressor and 4-band limiter; 9" VGA touch-screen equipped video monitor; factory-loaded sound library; on-air A/B comparison; remote controllable. *User installable options* will include a Digital 10-band Graphic EQ, Stereo Generator and AES/EBU digital I/O.

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Circle 55 On Reader Service Card

World Radio History

Innovation in STL, Remote and Telco

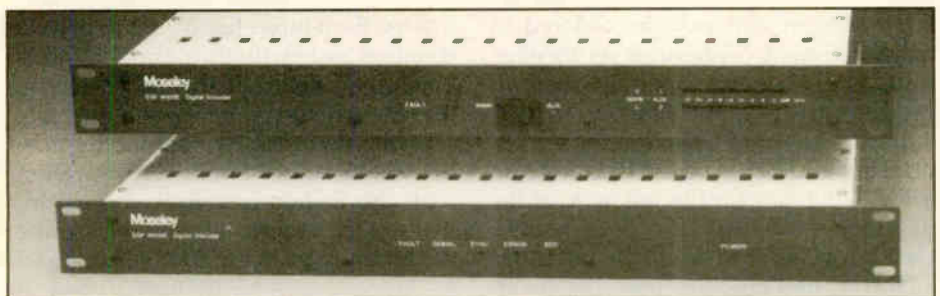
(continued from page 18)

take advantage of the switched 56 kbps lines that are becoming increasingly available in addition to ISDN, fiber optic, and satellite circuits.

Offering full-duplex operation, the Moseley Musicode 56/64 features a response of 20 Hz to 7.5 kHz, THD of 0.8 percent at 1 kHz, an SNR of 66 dB, and a crosstalk rating of more than 80 dB.

CCS was showing its MICRO56 and MICRO66i. The MICRO56 is a digital audio terminal that provides full-duplex 7.5 kHz audio feeds using a switched 56 kbps telephone network circuit. The new MICRO66i is said to be the first digital audio codec designed specifically for international usage.

New at the Gentner exhibit was TeleSwitch, a five-line call director. Compatible with most business phone systems, TeleSwitch indicates line status, and allows callers to be placed on hold, conferenced, routed to a hybrid, or recorded. If more than five lines are needed, multiple TeleSwitch units can be linked.



New from Moseley was the 6000E digital encoder (top) and decoder.

Also on display was Gentner's Digital Hybrid II, an auto-nulling telephone hybrid, and PeopleLink. Described as an Acoustic Telephone Interface, PeopleLink replaces speakerphones for teleconferencing applications.

Telos was displaying its entire line of telephone-related products including the Telos 100 Direct Interface Module and Link devices.

The Direct Interface Module switches lines to a hybrid directly without the need for key phone equipment. The Telos Link simplifies connection of a production intercom system to a dial-up telephone line, and avoids common gain and feedback problems while preserving full-duplex operation.

Communicating by satellite

ComStream announced that a new network has been installed for Novanet-Canada that uses ComStream satellite digital audio products. On display from ComStream was the DT4000 interactive earth station that features the CDA201 Digital Audio Card. The CDA201 takes a digital audio source and compresses it by a 4:1 ratio to minimize satellite transmission requirements.

In an off-air demonstration, the ComStream DBR401 digital audio receiver showed the CDA201 audio card in action.

Automatic transmitter control

Burk Technology—in addition to its eight- and 16-channel remote control systems—was demonstrating the new Model ATS-1000, which offers fully automatic transmitter control. To simplify setup, user-defined functions are entered using a "point and shoot" menu system. Programmed functions may be executed on a time, value, or key-press basis.

Transmitter switching, power and pattern changes, and generator test cycles are just a few of the many sequences that can be programmed using Burk's ATS-1000.

Burk also unveiled AutoPilot™ software for the company's ARC-16 remote control, which enables the user to control up to eight separate sites.

Finally, Hallikainen & Friends' newest offering is a remote control system, the DRC200, which will be available in June. The DRC200 has been designed for control of a single site using a leased line, or multiple transmitter sites using dial-up circuits. It will offer an impressive array of features including 48 single-ended analog inputs, 48 status inputs, and 48 open-collector control outputs.

And that about wraps it up. For a more in-depth look at STL, remote and telco products introduced at NAB, see the July 24 issue of **RW**.

■ ■ ■

Dennis Martin is maintenance engineer for KBIG-FM in Los Angeles, and an occasional contributor to **RW.**

Latest in Cart Decks

by George Riggins

LAS VEGAS So what's new in the analog cart machine world? In short, not a lot. The analog cart machine is viewed as a mature part of the industry.

We saw one new entrant to the market, a British company with the trade name of SONIFEX, marketed in the U.S. by RAM Broadcast Systems of Barrington, Ill.

The SONIFEX machines are of the indirect drive type, using a DC servo motor to achieve high start torque and low wow and flutter specifications.

It seems to me that Carl Martin of Audi-Cord has been in the analog cart machine business from about the time the first patent was issued on the disappearing pressure roller system. Carl is currently producing two series of machines. The DL series has the primary and secondary cue tones; the "S" series adds the tertiary tone.

Broadcast Electronics displayed three series of analog cart machines. The premium Phase Trak 90, the Dura Trak 90A series and the 2100 models.

The major differences between the Phase Trak and the Dura Trak models are the presence or absence of phase correction, Dynafex noise reduction and the tape analysis systems. The Dura Trak units have the same basic record/play circuits and tape transport system as the Phase Trak units, but delete the special circuits previously mentioned.

The 2100C series comes standard with the primary and secondary tones and a Hysteresis Sync drive system. All cart machines from BE are available in either mono or stereo configurations.

Fidelipac featured the CTR90 series recorders and reproducers this year. The CTR10 and CTR100 series are still available.

The CTR90 series now incorporates the Dolby HX and DNRR dynamic noise reduction as standard features on all recorders; DNR is standard on the reproducers.

What can be said about ITC that has not been said before? The Series 1 machines, introduced at the 1990 NAB convention, are reported to be selling quite well, thank you. The same comments can be made about the other analog cart machines being manufactured and sold by ITC. The company is also working on DigiForm, a digital hard disk storage system.

No longer the "new kid" on the block, Otari is a solid contestant for the analog cart machine dollar. The CTM-10 series machines feature front panel record azimuth adjustment and a built-in optical splice-finder.

Two other features found in the Otari units are a front panel head phone jack for off-air monitoring and a varispeed control that allows for a six percent increase or decrease in the speed of the cart.

Micromax by Pacific Recorders & Engineering is unique in the fact that a single record/play unit takes one 3 1/2-inch rack space. Two play machines will fit in the same space. The drive is indirect and the pressure roller comes to a ready position for a quick engage time.

RS-Cart 2000 was designed by Mike Sirkus for Radio Systems Inc. As always, Mike has a surprise or two, adding flutter correction to his bag of tricks. Mike describes the system as an encode-decode process that records a pilot tone on the cue track that is FM demodulated to drive two dedicated all-pass filter time delay networks to achieve up to 50 percent reduction in wow and flutter.

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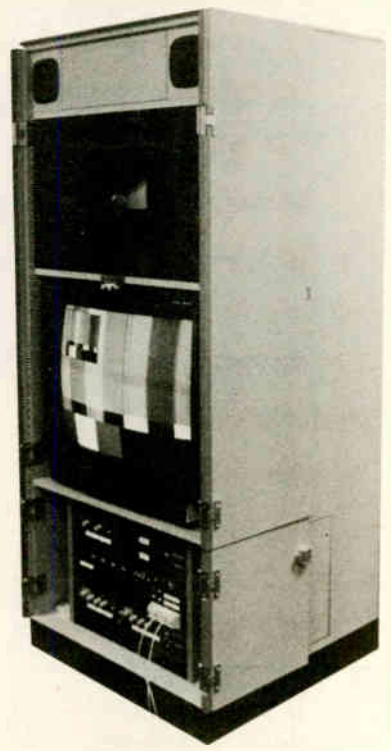

Teleconferencing systems by Broadcast Services/EME

Circle 103 On Reader Service Card

World Radio History

New Console Products Offered

by George Riggins

LAS VEGAS Console manufacturers brought out some new product lines for this year's NAB convention—some even had digital capabilities. And while a number of manufacturers introduced hard-disk systems that emulate many of the functions of today's desks, it was obvious that consoles will remain an important part of the radio studio for some time to come.

Arrakis had audio consoles on display ranging in price from about $2K to about $30K. The company has everything from the SC-TURBO, what you see is what you get, to the fully modular 12,000-TURBO custom creations.

The upgraded 12,000-TURBO series is the result of customer feedback, according to Arrakis' Greg Friedman. Arrakis also introduced DigiLink, a hard disk-based record and replay system.

ATI introduced a dual Mix-Minus Telephone Adaptor this year. This is an add-on module for the company's Vanguard console, to enable the operator to easily mix the incoming phone call with the studio audio. The new box does require an external telephone hybrid signal splitter for each line.

New heights of technology

Prior to the convention, Auditronics had expected to show a digitally-controlled console, carrying the name "Destiny 2000." That project was postponed, however, to give the company the opportunity to introduce its new 800 series to the mixing console market.

Auditronics has incorporated logic circuits in its 800 series consoles. The options and settings are too numerous for a short review, but suffice it to say that there are many logic options and each channel has a proprietary LSI module that is on a plug-in PCB.

Broadcast Electronics introduced the Air Trak 90 console.

According to the Auditronics, this new concept for user selectable control settings is in production for a reasonable delivery schedule.

The newest development by Autogram is the Pacemaker family of consoles. All three frame sizes—six, eight and twelve linear faders—feature two inputs per fader with one or two inputs with eight-switch selectable sources. The six- and eight-mixer models have three VU meters, while the 12-fader has a full complement of six VU meters.

Broadcast Electronics introduced a less expensive offshoot of its Mix Trak console, called the Air Trak 90. The Air Trak 90 comes in four frame sizes, holding six, 12, 18 and 24 linear faders. The power supply is on a separate rack-mounted chassis to reduce heat and any hum produced by the power supply.

BE also had a disk-based storage system known as AudioVAULT, and the CORE 2000, a PC-based program control system, on display at the show.

New to consoles

Fidelipac recently entered the console market with the acquisition of Broadcast Audio of Ranch Cordova, Calif. According to the company's John Fernandez, there have been no major changes to the designs since production was moved to Moorestown, NJ.

The Fidelipac line consists of the IV and VI series. The consoles are modular in design and may be ordered in many different configurations to meet station requirements for either on-air or production studio installation.

Brad Harrison of GLW Enterprises displayed the AIR 790 and the PRO 790 consoles. The names really tell most of the differences between the two models. One is for "air" use while the other has all the EQ and other features that are often desired in the production department. Pricing is between about $15K and $35K, depending on the modules selected for final assembly.

Now, how about a console that is almost waterproof? The new Mariner console from Logitek is meant to take a bath and keep on working. Waterproof switches and pots combined with some manufacturing techniques help keep coffee, soft drinks and other liquid debris out of the working parts. There are three basic frame sizes ranging in price from about $5K to about $12K.

The big news from LPB is a price reduction for the re-designed Citation II console. The Citation II is a slide pot console with three inputs per module. Each channel has a remote start button that follows the input selected.

Hard to find

One had to look twice to find Numark in their location behind the post in the exhibit hall. As Bernard Fryman said, "the booth price was right."

Numark has manufactured inexpensive rack mounted mixers for the mobile DJ, sound reinforcement and college crowd for many years. They have two basic sizes: six-fader and seven-fader mixers. Each mixer has a built in graphic equalizer to go with the normal controls. One other feature is the LED metering rather than the moving vane meter.

Pacific Recorders & Engineering now has the Productionmixer to go along with the Radiomixer. By incorporating many of the same features in the Productionmixer as are in the Radiomixer, PR&E

(continued on page 31)

Circle 121 On Reader Service Card

World Radio History

Processing Enters The Digital Age

(continued from page 19)

Lazer/Prizm package (with optical encoder) is selling at $9,995 through May 31.

The folks at Gentner can also provide a direct digital interface from the Moseley DSP 6000 digital decoder to the Lazer or Prizm and from the Lazer directly into the Harris Digital 50 exciter.

A paragon of virtue

Audio Animation, a relative newcomer to the world of broadcast audio processing, is no newcomer at all to digital audio processing. The company's MUSE system of digital mastering is a standard in the recording industry, and now Audio Animation has incorporated its audio expertise into the Paragon digital audio processor package.

In one box you find four bands of compression and limiting and a ten-band graphic EQ with wideband input AGC. In one of the most unique user interfaces found in an audio processor, the Paragon utilizes a touch screen, one large knob and four push buttons to link it to the outside world.

Paragon allows direct A/B comparisons like many of its contemporaries, but gives the user the option of saving settings to a built-in floppy drive to transfer to another Paragon at another station—great for group operators with similar formats. Paragon is available with optional AES/EBU in/out interface, and a stereo generator is in the works. The system retails for $10,450 with an additional $1,500 for the AES/EBU interface, and the generator is projected at $1,500.

CRL Labs showed its Audio Signature digitally-controlled AGC/compressor/equalizer that gives the user "real-time analysis" of audio density and equalization at the output of the unit. Eight position audio diagnostic metering and four memory recall settings allow user-defined parameters to be repeated.

The unit allows IBM or automation remote control of parameters. CRL is also adding a daypart event sequencer to effect parameter changes automatically. The Audio Signature lists for $5,995 and the sequencer option at $600.

Stereo generating interest

Two new stereo generators also debuted at NAB 1991. QEI introduced its new Model 710 stereo generator, boasting 18-bit D/A converters and a TDS (truly digital stereo) numeric digital signal processing system. With 65 dB of separation and .01 percent distortion specs, the 710 prices out at $3,500.

Also, Aphex Systems completed its chain with the Digicoder PPDM Model 400 stereo generator that the company claims exceeds performance of 18-bit resolution systems, unless the sampling rate is increased to 2.4 MHz. Separation in the Aphex generator is typically 80 dB across the audio passband; the unit will be available in September, with a $3,995 price tag.

New from Lexicon this year was the LXP-15 digital multi-effects processor. The unit has 128 preset effects, and room to store 128 more of your own, whether pitch shift, stereo delay, gate, plate or reverberation.

Lexicon also introduced the 300 Digital Effects System, which the company is targeting for music production, digital mastering and post production applications. The unit comes with a time code reader and event list for quick effects changes as you go. The 300 accepts analog and digital signals in the SPDIF or AES/EBU formats.

For a more in-depth analysis of the digital processing introductions from this year's NAB show, see the June 26 issue of **RW**.

■ ■ ■

Geary S. Morrill is director of engineering for Mid-West Family stations, a group owner of 14 properties in Michigan, Wisconsin and Illinois; he has held that position since November 1985. Geary and his wife Nancy are also proud owners of a new FM allocation in Essexville, Mich.

The Optimod-FM 8200 had its debut at the AKG/Orban/dbx booth.

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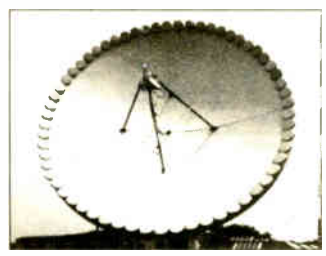
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World Radio History

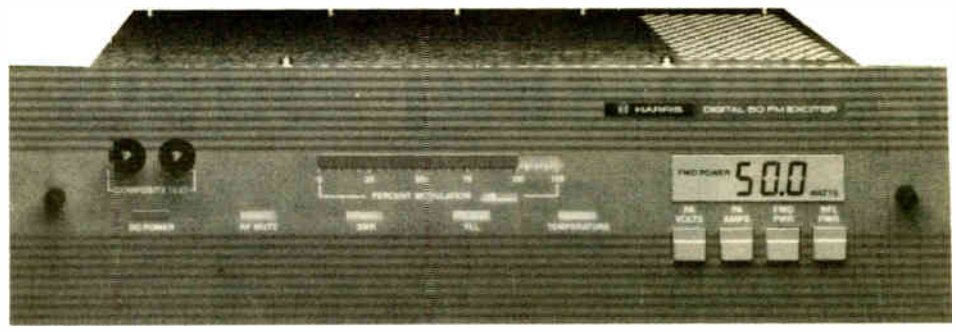
Solid State, Digital Key to FM Products

by Thomas R. McGinley

LAS VEGAS Ever since their introduction about three years ago, all solid state FM transmitters have been appearing at higher power levels, higher operating efficiencies, and more competitive prices. At least eight different manufacturers showed solid state transmitters up to 1 kilowatt at this year's NAB show.

Harris Corporation led the way in the high power derby with a 20 kW model of the new Platinum PT line. Adapted from Harris' solid state TV transmitter designs, the PT FM series is built around additive 1350 watt FET RF modules, each with its own internal driver and VSWR protection. Modules operate in a broadband parallel redundant configuration with no tuning required, so the transmitter will continue to operate should one of the modules fail. They can be removed or reinserted hot while operating.

Power levels up to 10 kW for a single transmitter will be available from Harris this fall with two 10 kW units combined internally to make 20 kW output. Operating efficiency numbers were not disclosed. Harris stresses lower maintenance and repair costs, simplicity of operation, and higher reliability over traditional transmitters, which all suffer from the PA tube being a "single point of failure."



Harris' Digital 50 FM exciter

According to Ron Frillman, VP of Harris Broadcast Products, retail pricing has not been established for the PT line, although he did say the 10 kW model would cost about $100,000.

Breakthrough technology

Nautel Electronic Labs unveiled perhaps the most impressive breakthrough in cost and efficiency performance for high-power solid state FM transmitter technology at NAB '91. The AMPFET FM7 and FM4 boast 65 percent overall AC to RF efficiency.

Both units use combined 1 kW power modules, which contain four Motorola MRF-151G power FETs delivering 250 watts each. If any device should fail, it becomes isolated from the others and the transmitter continues to operate.

The power supply is single phase self-regulating, and delivers a safe 50 volts DC to the power modules. No routine tuning or adjustments are required and the PA is protected by automatic VSWR foldback. The FM7 7 kW model is slated to retail at $40,000 with the FM4 4 kW at $30,000. Both units should be available for shipping by November.

Television Technology Corp. of Colorado featured its solid state FM transmitter line introduced last year, with single cabinet power levels up to 4 kW. The TTC design is similar to Nautel's, using broadband 1 kW power modules that achieve up to 65 percent overall efficiency. The transmitter remains on the air automatically, even after failure of a PA module or the control circuitry with the exclusive "fail-on" design.

TTC uses a rugged ferro-resonant power supply, automatic VSWR foldback, and digital metering throughout. Two 4 kW units can be combined for 8 kW output. The FMS series transmitters are available now with a $32,000 price tag for the FMS-4000, including a two-year warranty.

At least eight different manufacturers showed solid state transmitters up to 1 kilowatt.

Latest Italian fashions

Bext Inc.—an Italian manufacturer of FM and TV transmission products with domestic marketing offices in San Diego—showed an impressive array of FM exciters, translators, and transmitters. The Bext FM transmitter line features solid state power levels up to 1 kW and tube models up to 30 kW.

The power amplifiers for Bext's equipment are built into self-contained rack-mount units with power supply. A complete 2 kW transmitter, including exciter, will fit into 20 inches of rack space. The company also introduced its new HPT series of translators and boosters. In one compact frame, the HPT includes a 20 watt exciter with built-in options of either an FM composite receiver, a 950 band STL receiver, or a stereo generator. Input and output frequencies are programmable from the front panel.

Bext also showed a new 6 watt composite STL system priced under $5,000 and the new PJ250 250 watt solid state amplifier for translators able to increase power under the new FCC rules.

CTE International, an Italian firm marketed in the U.S. by the Beem Company of Arcadia, Calif., presented an all solid state lineup of FM exciters and power

(continued on page 27)

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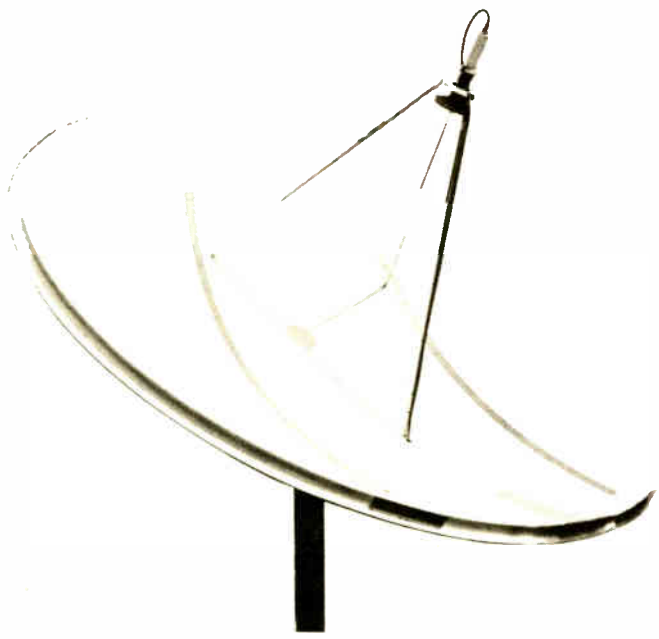

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World Radio History

Mics and Field Gear Abound

by Ty Ford

LAS VEGAS In addition to new mics for production and broadcast at this year's NAB show, there were also several studio/portable mixers that were packed with great features. Alphabetically by company, the action starts with Audio-Technica.

If you've been considering adding some stereo to your remotes or ENG/EFP, check out Audio-Technica's $1,895 Stereo Field Production package. The package includes the AT4462 mixer, AT825 X/Y stereo mic, and AT804 omni mic. The compact mixer features two stereo and two pannable mono inputs. That means you can have a stereo ambience mic, a stereo music source and two separate pannable voice mics happening at the same time.

Audio-Technica displayed a stereo field production package at the NAB.

Each mic/line input has a 20 dB mic pad and a low-cut filter. Each input has a pre-fader headphone monitor cue. In addition to an onboard limiter, "Level-Alert" sends a warning tone through the engineer's headset prior to clipping.

The AT4462 mixer also includes an interruptible feedback (IFB) circuit, tone generator and built-in slate with panel-mounted microphone. In the field it runs on two 9 volt alkaline batteries. If you already like the mics you have, the compact mixer alone goes for $1,395 with strap and pouch.

New from beyer

beyerdynamic showed several mics with studio/broadcast applications. At the top of the list was the MC742 adjustable swivel-head condenser for the studio.

At $3,399, the double diaphragm MC742 adjusts for all stereo, mid-side and X/Y configurations and offers five polar patterns for each diaphragm, a 10 dB attenuator and bass roll-off filter (12 dB/octave below 35 Hz). Remote polar adjustments can be made via the MSG 740 power pack. If you only want to own one very flexible stereo mic, the MC742 is definitely a consideration.

If you're still in search of the perfect mid-priced dynamic mic with just the right bottom, check out beyer's M59 large diaphragm hypercardioid dynamic at $399.

For $795, Crown's Tridundant small diaphragm triple-condenser mic and control box sounds like a good way to reduce the forest of mics that often end up around a podium. The three capsules combine into one cable and connect to a small box that provides three separate mic level outputs and a three-position momentary on/off switch which can be jumpered for each or all of the capsules.

The cascaded phantom power supply delivers voltage to all three capsules unless the ground is lifted on the first capsule. At that point, capsules two and three receive phantom power via optional internal battery.

Crown's Stereo Ambient Sampling System (SASS) uses two PZMs mounted in a "head-like" configuration to approximate the spatial relationship of the human head and ears. If you're into capturing natural sound for your productions, this head-emulator with switchable battery or phantom power may turn some heads. List price is 89.

The Electro-Voice RE38N/D ($460) is a great "tweaker's mic." Its two low frequency adjustments and eight high frequency adjustments offer 16 possible combinations. In addition, the yoke-mounted capsule also allows for infinite mechanical adjustment.

The RE27N/D ($625) is similar to the RE20, but brighter and more open on the top end. Electro-Voice also added four-position switchable EQ to the RE27N/D, giving it more options than the simple roll-off of the RE20. If you've found the RE20 to be a bit "boomy" when it's flat and a little lacking on the bottom in the rolled-off position, check out the RE27N/D.

Sennheiser on horizon

It's a bit early to tell what effect Sennheiser's acquisition of Neumann will have on the mic market, but keep an eye (or ear) out for developments.

This year Sennheiser showed its BF530 supercardioid dynamic with adjustable inlet for proximity control. Equipped with a lockable on/off switch, the windscreen housing of the BF530 slides in and out. For more proximity, simply slide the adjustable basket filter as far down on the mic as you can.

The MKE4032 ($635) is a condenser specifically designed for vocals. Like most supercardioids, it offers excellent

(continued on page 31)

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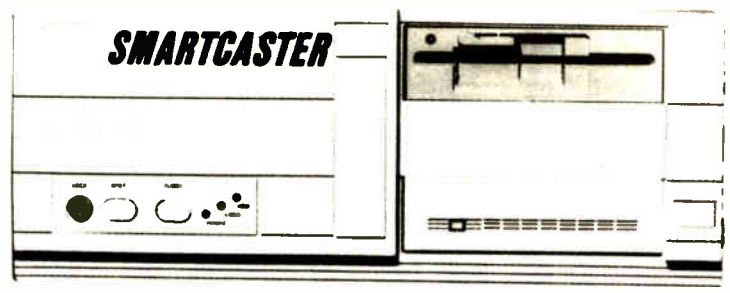

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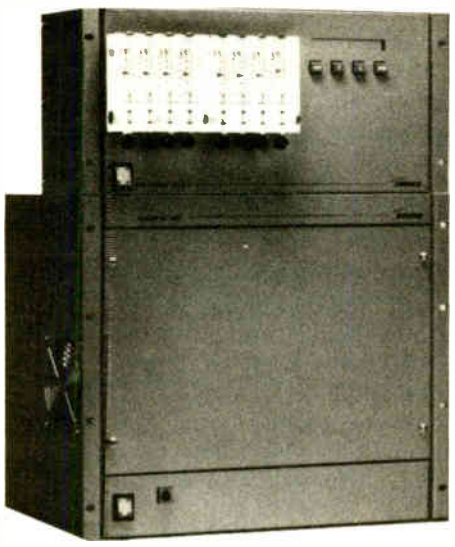
World Radio History

Solid State, Digital Key to FM RF

(continued from page 24)

amps up to 5 kW. Housed in rack style cabinets, the S1000 and VL5000 power amplifiers feature redundant RF output construction for uninterrupted operation in the event of a partial failure, VSWR protection, and an 80 kHz switched mode power supply. The units achieve better than 52 percent overall efficiency and sport retail price tags of $25,500 for the S1000 and $51,500 for the VL5000.



The new DryLine dehydrator from Andrew Corp.

Mouse that roars

Continental Electronics of Dallas powered up the "mouse that roars" from the 500 watt version (model 813A) shown at NAB Radio '90, to a 1000 watt unit (model 814D). This all solid state transmsitter housed in a short rack cabinet includes an 802A exciter and uses two of the MMD 500 watt RF modules. The 1 kW mouse retails for just under $17,000 with 60 day availability.

Continental also announced at the convention that it is developing a new 60 kW FM transmitter, designated the 817B.

QEI Corporation and Energy-Onix, manufacturers of solid state FM transmitters up to 500 watts and grounded-grid tube transmitters up to 30 kW, both displayed samples of their high power models in addition to their self-contained, rack-mounted solid state units.

The Energy-Onix SSA line is new this year and features power levels of 100, 300, and 500 watts, all using broadband Motorola FET devices with built-in VSWR protection and auto power control. The SSA-500 is modestly priced at $6,200.

Both Broadcast Electronics and CCA Electronics showed their well-established lines of FM transmitters and exciters, although neither introduced any new models this year. CCA has chosen to stick with the durable all-tube transmitters in power levels up to 30 kW, using the simple yet reliable grounded grid PA design.

Coincidentally, all three manufacturers of grounded grid transmitters are the only ones to offer single phase AC as an option at power levels above 10 kW.

Omnitronix unveiled the FM10X, a ten watt FM exciter with built-in stereo generator and audio processor.

Towers and breakthroughs

To deviate from the RF spectacle for a moment, a sometimes underestimated aspect of FM equipment—namely, towers—was represented by a number of manufacturers on the floor.

Central Tower, Inc.; Fort Worth Tower, Magnum Towers, Inc.; SG Communications; ERI; UNR Rohn and Utility Tower Company were among the manufacturers representing tower products.

Central Tower showed its exportable tubular/solid bolt-together guyed and self-supporting towers. SG described its complete broadcast tower, antenna, and transmission line turnkey packages. Utility Tower had sample tower sections for AM, FM, and television applications. Rohn and Magnum Towers showed their product lines, and ERI displayed its Lambda antenna sections and the Invisi-Shield ice shield, first seen at the SBE show in St. Louis last year.

Once all was said and done, however, one of the most noteworthy technology breakthroughs in the FM RF arena this year was the Harris Digital 50 FM exciter. Using direct digital synthesis (DDS) with an 18-bit numerically controlled oscillator (NCO), an FM signal is produced that rivals compact disc specs. The old problems of unstable VCOs and PLLs in traditional FM exciters is a thing of the past.

The genesis for this all-digital design came from Digital RF Solutions back in 1989. Harris has delivered that concept into a real-world exciter that sets a new performance standard.

The only device in the Digital 50 that limits its performance capabilities is the A/D converter. As soon as the world adopts a digital sampling and interface standard, this unit will be able to accept the pure digital data stream direct, making all-digital FM broadcasting possible.

The Digital 50 produces 50 watts of power output with rugged wideband FET devices. For "N+1" applications, any FM channel can be selected in 10 kHz increments with no output retuning required. The Digital 50 will be available this fall; early estimates put the price at $10,000.

Another new product this year came from Andrew Corporation, which showed the DryLine™ dehydrator. Available in microprocessor-controlled XT series or the more economical MT series, DryLine uses a patented membrane separation drying technique. The system is built into a two-chassis rack mountable package.

For a closer look at the FM transmitter products unveiled at the NAB this year, see **RW**'s special coverage in the July 10 issue.

■ ■ ■

Tom McGinley is director of engineering for Cook Inlet Partners and technical advisor to **RW**.

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World Radio History

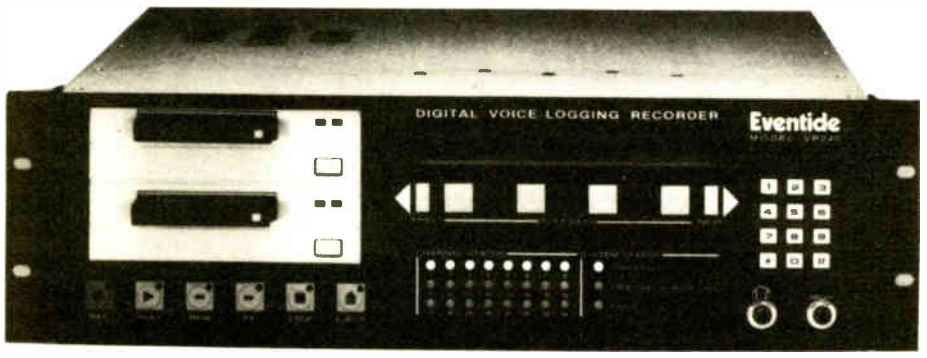
On-Air Use of Digital Grows

by Mel Lambert

LAS VEGAS As was to be expected, digital proved to be *the* dominant technology for just about every facet of radio broadcasting hardware shown at the NAB convention. In terms of recording and replay media, hard-disk, floppy-disk and DAT technologies were well represented throughout the exhibit areas, while digital satellite, hard-wire, backhaul and STL systems were also very much in evidence.

Turning first to several new disk-based automation systems, Arrakis Systems was showing its remarkable DigiLink System, which can be configured for manual, live-assist, satellite and automation from a single touch-sensitive screen display, with a choice of normal 16-bit PCM audio record/replay, or 2:1/4:1 data compression for enhanced storage capacity. Base systems are available with up to 10 hours of stereo audio storage, extending to 140 hours with add-on hard drives.

Broadcast Electronics' AudioVAULT is based around Stacks and Playlists that mimic, via icons, the normal operations of conventional analog cart machines. Stacks holding up to eight "carts" can be pre-loaded in the system's cueing mechanism, and triggered via contact closures from a satellite decoder. Up to eight audio inputs (four stereo pairs) are fully addressable as a digitized signal capable of being routed to any of four stereo outputs.



Eventide showed the Model VR240 digital voice-logging recorder.

BE also introduced the CORE 2000, a PC-based program control system that allows for applications in full automation, live assist and satellite formats.

Computer Concepts Corporation unveiled its "entry-level" disk-based Digital Commercial System, which features a 180Mb hard drive capable of holding up to 170 minutes of mono audio, data compressed using Audio Processing Technology's apt-X 100 4:1 codec. Coupled with the firm's Traffic System, this new, smaller-format configuration provides on-screen display of a station's broadcast schedule, with complete audit capability.

Harris-Allied was demonstrating the MacroMedia Audisk system, which now offers multi-user/multi-tasking functionality, for simultaneous in-load/replay and housekeeping between various interlinked systems around a station, as well as full control of all system functions from any local or remote PC station.

Harris-Allied also showed the new Sentry Systems DS-1 hard disk system. The system is fully compatible with existing controller units, and offers up to 90 minutes of stereo capacity with an optional 700 Mbyte disk (holding up to seven hours of mono with ADPCM data compression). Three operational modes are offered: live-assist, fully-automated and satellite insertion, plus any combination of hard-disk record/replay with reel-to-reel, DATs, carts and CD players.

International Tapetronics Corporation unveiled the new DigiForm Digital Audio Operating Platform, which provides control of up to two recorders and three playback units (optionally 32 automated multi-source changers), with integrated live-assist, satellite automation, program automation and traffic/accounting capabilities.

Production and Programming modes of the DigiForm include touch screen and keyboard control, while On-Air mode is via touch screen with minimal operator controls. An internal 330Mbyte hard drive provides 27 minutes of stereo record/replay; an optional 1.2 Gbyte external drive adds 98 stereo minutes of playback capacity.

Media Touch was demonstrating OpLog and OmniPLAY systems for live-assist automated broadcasting. The systems can control a variety of digital replay sources, including CD players, DAT machines and hard-disk systems.

TM Century showed the UDS Ultimate Digital Studio system, which is now being configured around the 360 Systems DigiCart Bernoulli/hard-drive unit to provide up to 20.8 hours of mono audio file storage, using Dolby AC-2 data compression. The system will also directly control Pioneer PDM435 and Sony CDK-006 CD players for music playback.

Computer Concepts' Digital Commercial System

Wheatstone unveiled the new "Not So Hard Disk" (as they put it), which utilizes a dedicated Disk Playback Console to control cue selection and replay functions, in conjunction with existing

(continued on page 30)

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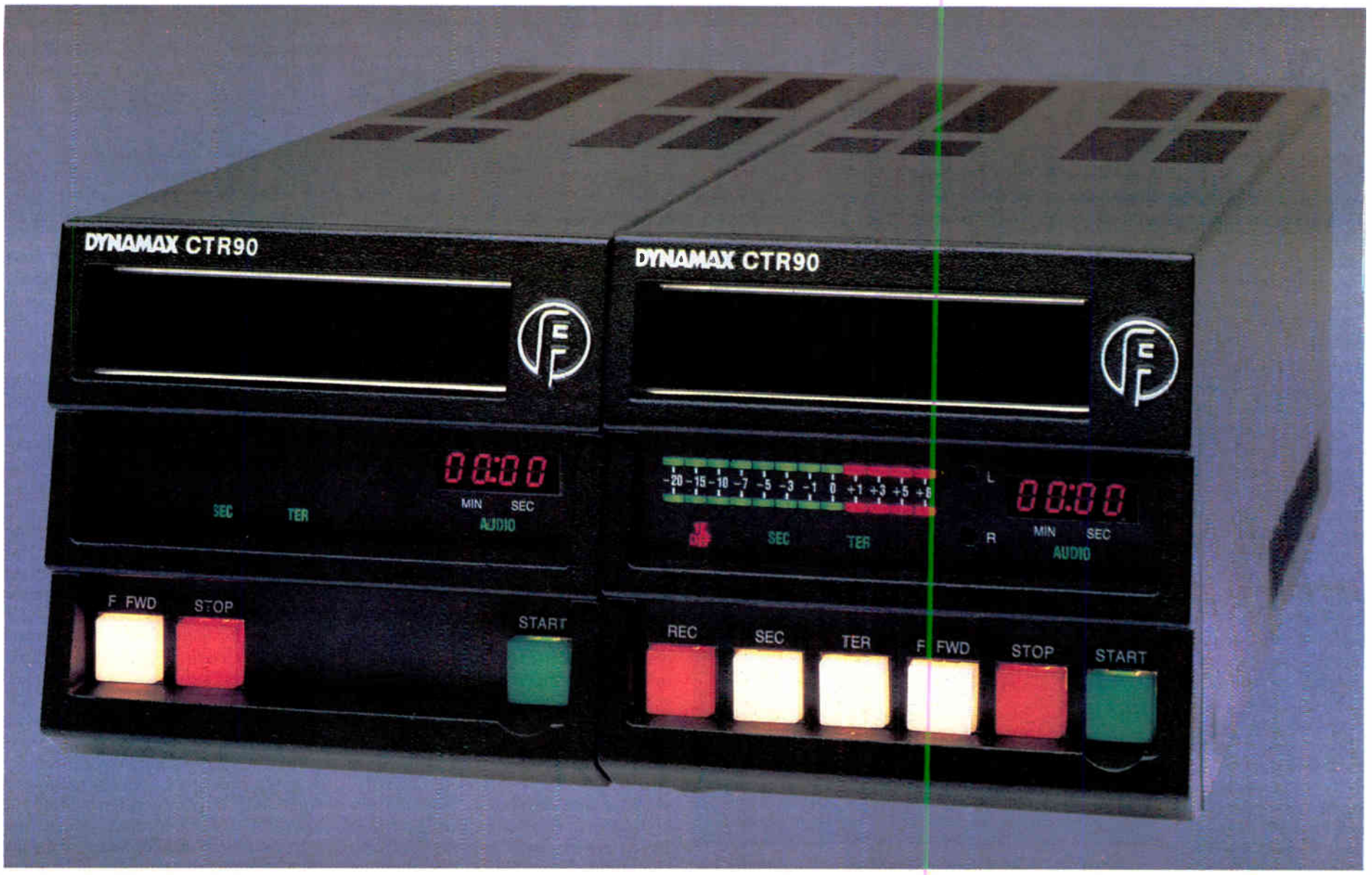
World Radio History



The New Dynamax® CTR90 Series Sounds as good as CD on the air

With a -81 dB signal to noise ratio, the new Dynamax CTR90 Series is the best piece of equipment that we have ever built. And, we're convinced, the best cartridge machine ever built. What's more, the CTR90 Series outperforms other elements of the broadcast chain, including typical STLs, exciters, transmitters, and even the best audiophile quality receivers.

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Dolby HX Pro Headroom Extension originated by Bang & Olufsen and manufactured under license from Dolby Laboratories Licensing Corporation.

DNR is a registered trademark of National Semiconductor Corporation under U.S. Patents 3,678,416 and 3,753,159.

Circle 23 On Reader Service Card

World Radio History

On-Air Use of Digital Gear Grows

(continued from page 28)

console start/stop buttons. A conventional PC-based interface is also available for inload and labeling of each music cut, jingle, ID and cue stored in the unit. Scheduled to be made available by early summer, the system allows up to 40 hours of apt-x 100-encoded audio to be recorded to hard disk.

New from Gentner this year was the Digital Audio Workstation Network (DAWN). A LAN-based system, DAWN links station functions —traffic, programming, accounting, promotions —into a master control system. The workstation uses MUSICAM data compression to store audio on hard disk, providing what the company says is a minimum of 400 minutes of stereo, with a compression ratio of 6:1.

Several companies demonstrated floppy-disk recorders, intended to compete directly with existing analog cart machines. Digital Broadcast Associates unveiled the DigiSpot system, which is scheduled to be made available by the fall.

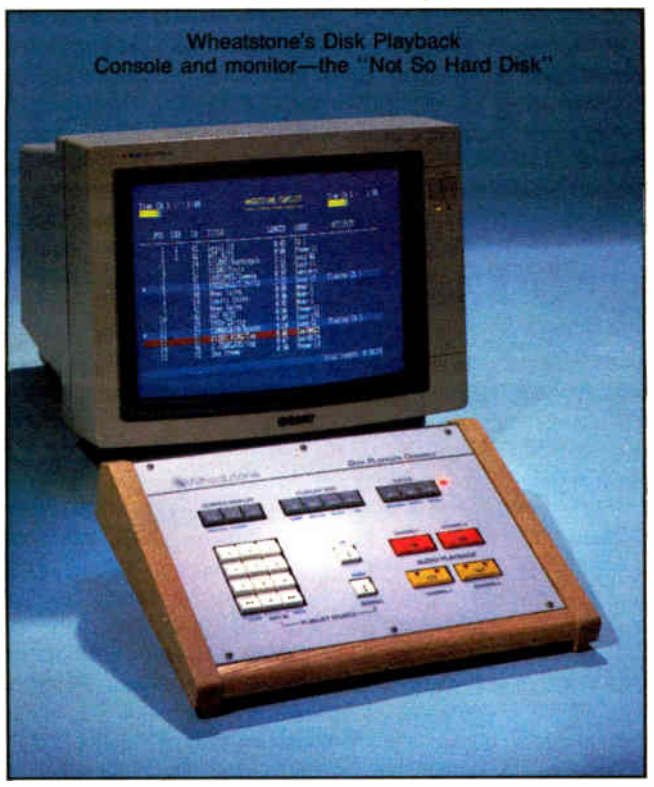
DigiSpot utilizes standard 20 Mbyte floppy diskettes to store up to two minutes of uncompressed stereo music or jingles, with front-panel readout of cut title. In addition to standard operator controls and back-panel interfaces, the system also features an RS-232 serial port for external computer control.

Fidelipac unveiled the Dynamax DCR1000 Digital Cartridge Recorder, which allows up to 120 seconds of apt-X 100-compressed stereo audio to be recorded onto 4 Mbyte floppies; 10 minutes of stereo will be available from 20 Mbyte disks. A Record Module provides analog-to-digital conversion, while stand-alone Master Players handle replay functions.

Additional DCR1000 Sub-Players can also be connected to Players for daisy-chained playback via a single D-to-A converter. A front-panel, two-line by 25-character LCD shows running time, title, cart number and other information.

The U.K.-built Sonifex DX Series DISCART system appeared at the RAM booth. DISCART is a "triple-stack" floppy-disk recorder/player that stores up to 5.5 minutes of stereo audio, also utilizing apt-X 100 data compression. Additional slave units can be added to a recorder/player or player unit for additional capacity. A touch screen interface with hard disk is also available for extended functionality.

The 360 Systems DigiCart, which utilizes standard Bernoulli disks, is now available with several system options for enhanced storage capacity. The HD-200 and HD-400 SCSI-equipped hard drives offer 40 and 100 minutes of mono storage at 44.1 kHz sampling frequencies; several units can be daisy chained for additional on-line storage. Optional Dolby AC-2 Data Compression extends the record/playback time by a factor of 6:1—a fully-configured system now offers up to 80 hours of mono file storage.



Wheatstone's Disk Playback
Console and monitor—the "Not So Hard Disk"

Three companies demonstrated new CD-R, or recordable compact disc units, which allow radio stations to prepare custom CDs of music, jingles, commercials, IDs, etc., for use in conventional CD players. All three units handle automatic recording/editing of the various P/Q subcodes that comprise a CD's table of contents.

The new Denon DN-770R CD cart recorder features AES/EBU and S/P DIF digital I/Os, plus an optional Audio Interface Unit for connection to analog sources. Also shown by Denon: the DN-970FA production CD cart player, designed specifically for production studios, with ±10 percent varispeed, three separate A-B cue points within a CD, and AES/EBU output.

The Studer D740 CD Recorder features both analog and digital I/Os, as does the Yamaha YPDR601 Disc Recorder and companion RC601 Remote Controller. The Studer unit features Write Once (WORM) optical media, which will be stocked at all the company's regional offices. The Yamaha recorder allows seven YPDR601 player/recorders to be daisy-chained to a single controller.

While not offering a recordable format, Harris-Allied displayed the Audiometrics CD10, a CD cart machine. The CD10 features Autolock, a programmable end of message (EOM) indicator, and an advanced linear tracking system.

DAT's news

In the expanding world of DAT recorder/players, several companies unveiled new units, or enhancements to their existing product lines.

Sony Corporation unveiled the new PCM-2700 Pro-DAT, which features four heads for read-after-write capabilities, plus full analog and digital I/Os. Panasonic unveiled a Software Developer's ToolKit for its SV-3900 Pro-DAT, designed to simplify the writing of ES-Bus serial control software for automation controllers and workstations. Yamaha unveiled the new DTR2 DAT machine, available with wired remote and coaxial/optical digital I/Os.

Time code-capable DAT machines were also in evidence. The Fostex DA-20 is now available with a custom-developed Apple HyperCard controller that provides screen-driven assemble editing between two decks. Sony's PCM-7000 Series of recorder/players is available with optional memory cards for assemble/insert editing, and instant-start functions.

A new (as yet unnamed) DAT machine from Otari is based on a heavy-duty transport and head assembly developed originally for the computer-data industry. Availability is scheduled for the fall.

A unique application for DAT was unveiled by Eventide. The VR240 Digital Audio-Logger allows 170 hours of data-compressed audio from up to 24 channel sources to be recorded onto a single 60-meter DAT cartridge (270 hours from a 90m tape). All events are date-and-time stamped for simplified playback search. A dual-transport version includes automated switching for doubled record time.

Compression enhancements

New enhancements in the field of digital audio data compression were announced by several companies. Audio Processing Technology unveiled three new products that make use of its apt-X 100 codec: the ACE100 Digital Audio Expansion Card for AT-compatible PCs; and the SCS100 and SDS100 Stereo Encoder and Decoder sub-assembly boards for OEM applications.

Dolby Laboratories was demonstrating its AC-2 Digital Audio Coder, now capable of carrying two channels of audio at 256 kbps with audio response to 20 kHz. The coder utilizes a newly refined algorithm for the firms' existing DP500 Series encoders and decoders.

Scientific Atlanta was showing the new AD4224 and AD4225 Digital Audio Decoders based on its proprietary SEDAT system (Spectrum Efficient Digital Audio Technology), and designed for plug-in compatibility with existing DAT-32 and DART384 chassis, respectively. SEDAT provides 20 kHz audio response over satellite and hard-wire links at 128 kbps data rates, utilizing a Transform codec, with fully overlapping blocks.

Bradley Broadcasting was also demonstrating a variety of ComStream Corporation's satellite products, including the CDA201 Encoder/Decoder System for use with satellite modem or interactive satellite earth stations at digital bandwidths of 128 kbps, using apt-X 100 data compression.

In the next issue: an analysis of emergent technologies from the NAB convention, and a personal view of their impact upon the radio community. See you then.

■ ■ ■

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

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☐ Its Noise Adaptive Threshold activates microphones for speech but not for constant room noise, such as air conditioning.

World Radio History

Convention Addresses AM Station Concerns

(continued from page 20)
pre-tuned full Tee network design, drop-down bridge shelf, rust-proof enclosure with gold alodyne interior and built-in horn gap lightning protection. Harris-Allied also featured a frequency synthesized Gates 5A five kilowatt transmitter targeted for the international broadcaster.

Constructed with simplicity in mind, the new Gates 5A uses a digital synthesizer, cyclometer tuning controls and eight-band frequency selection throughout the MW AM band.

Kintronics Labs introduced the Kyoritsu KIM-3301 impedance sensor for direct reading of an AM station's power level. Meant for use under the new FCC direct power rules, the KIM-3301 directly reads the load resistance, reactance, VSWR and power.

The Kintronics sensor is an active unit, which can use up to two PCT sensor units for power determination at two different locations in an AM transmission system, such as a tower base for daytime ND operation and the common point for directional nighttime operation.

Broadcasters desiring to upgrade to a new transmitter found a wide assortment of products available from Nautel (just having introduced their first FM transmitter, a 7.5 kW unit), and Harris-Allied showed their digital AM DX Series, as well as the SX and Gates line transmitters.

Established manufacturers such as CCA and Continental also featured their AM transmitter product lines. Low power PSA/PSSA broadcasters can always count on LPB Inc. to fulfill their requirements with solid state transmitters. LPB is well-known for carrier current transmitters and line couplers as well as its numerous worldwide TIS installations.

AM stereo exciters and monitors were on display at Broadcast Electronics and Motorola, both featuring second generation products. Delta Electronics showed an AM stereo exciter of its own, as well as an AM stereo modulation monitor and new audio monitor amplifier.

AM transmission accessories such as coaxial cable, connectors and hardware were displayed by Cablewave, Inc., Canare Cable, and Myat.

In-band DAB for AM

Perhaps the biggest news to come from NAB 1991 is USA Digital Radio's proposal to place a DAB signal within the RF mask of existing AM stations. This simply means that a digital audio signal could be placed on existing AM stations and be heard by special receivers.

Like the NFR system just described, the USA Digital Radio system is compatible with regular AM broadcast audio. According to Glynn Walden, engineering director for Group W, the proposed AM digital signal could theoretically withstand down to 10 dB desired-to-undesired (d/u) signal to noise ratio. AM stations are currently protected to 26 db d/u ratio.

USA Digital Radio hopes to have a demonstration of its AM system up and running for Radio '91 is San Francisco. As for NAB 1991, AM radio is alive and well with the hopes of better prospects for the future.

■ ■ ■

Tom Osenkowsky is a consulting engineer based in Connecticut, and an occasional contributor to **RW**.

Mics Introduced at NAB

(continued from page 25)
feedback rejection. Its larger diaphragm provides good bass response, and the 6 dB rise from 1 kHz to 6 kHz give the MKE4032 the kind of bite that makes a voice track stand out.

The MD422 aluminum voice coil dynamic ($535) looks like a smaller, sleeker 421, sounds somewhere between a 421 and a 431, and offers the five-position EQ switch familiar to 421 users.

On the convention floor, the Shure VP64 omni ($135) sounded more like a cardioid. If you've been looking for a mic with less directionality than a cardioid, but not as wide open as an omni, this may be it.

Telex Communications introduced a new wireless mic system with patented Pos-i-Phase™ true diversity circuitry. The FMR-100 receiver operates in the VHF band between 150-216 MHz. It is designed to complement the Telex WT-60 belt pack transmitter. Together, the package lists for $900. The company also introduced an ultra-small lavalier mic this year.

Also new from Telex was a series of headsets aimed at the high-end broadcast market. The V series includes a monitor headphone as well as single and dual side boom mic headsets.

In addition to its VP88 mid-side stereo condenser ($995), which came out last year, Shure was showing a great new application of its "Smart Mic" system. Now, instead of using specially wired mics, you can get the same results with your own mics and the FP410 "Hands-Off" mixer ($1,595).

As the number of mics open increases, the master gain is automatically reduced to prevent overmodulation and (in live applications) feedback. Built-in linking circuitry allows up to 25 units to be operated together for a total of 100 sources.

Oh, yes . . . you can control it manually, if you really want to.

■ ■ ■

Ty Ford's "Producer's File" appears monthly in **RW**. *Contact him at by phone at 301-889-6201 or by MCI mail at 347-6635.*

FP410 Mixer shown actual size.

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Circle 82 On Reader Service Card

Latest in Consoles

(continued from page 22)
feels there will be little problem in moving from the air board to the production room.

The Productionmixer has added features that include parametric EQ, adjustable gain microphone preamplifiers, pan controls, and two effects/foldback sends before the mix fader.

While not a console manufacturer, Sierra Automated Systems deserves a mention here for its alphanumeric control routing module designed to be mounted in a PR&E console. Sierra introduced the AXC-8 alphanumeric X-Y control panel at this year's NAB; it is the latest addition to the SAS 32000 series routing switcher and mixing system.

Radio Systems, Inc. displayed the RS Series of consoles. This series has three sizes available: the RS-6, RS-12 and the RS-18. All three models feature DC control, peak LED indicators, mid-stage channel patch points, internal talkback system and an external power supply.

Studer Revox introduced its 990 console, a digitally-controlled analog mixing console for on-air broadcasting as well as television and radio production. The standard version comes with as many as 80 input channels, eight audio groups and four stereo masters.

Yamaha has something to fit almost any requirement from a large production mixer to a small portable sound reinforcement or mic mixer. The Yamaha mixers have varying levels of EQ capability, and large frames with as many as 40 in by eight out. At the other end, there is a small frame—four-, six-, or eight-in—with built-in digital effects.

Wheatstone introduced the SP-4X line of consoles this year. The new series is available in 12, 16 or 24 inputs. There are two versions of the 24 input console. The large 24-in has a total of eight mixing busses (four stereo), while the small 24-in has only four mix busses, two for stereo program and two for the stereo audition buss.

I also had the chance to look at some of the studio furniture many of these consoles were seated on. Manufacturers on hand included The Express Group and Murphy Furniture, who showed their product lines.

Another entrant into studio furniture this year was Audio Broadcast Group, Inc. The company had its line of furnishings on hand at the NAB, as well.

■ ■ ■

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.

World Radio History

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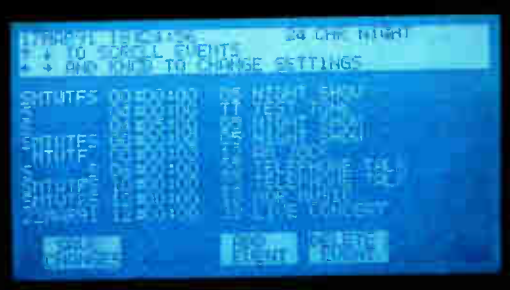

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Circle 122 On Reader Service Card

World Radio History

KOZT: A Real Do-It-Yourselfer

by Dee McVicker

FORT BRAGG, Calif. After spending his entire radio career in Los Angeles and San Francisco, Tom Yates decided to try something different. He decided to buy a radio station.

In December, he joined up with partner Vicky Watts, who came out of banking, and they put their money down on a Class A FM just 140 miles up the coast from San Francisco. The station, KOZT-FM of Fort Bragg, was as small a market as they come and needed some work.

KOZT's cozy storefront studios.

"This is back to the basics," related Yates, who was the first to program notable Los Angeles station KLOS-FM in 1971. "It's a real do-it-yourself kind of thing," he added, describing the renovation of the acquisition as a "low budget clean-up, fix-up and upgrade."

Yates approached renovation from a sound quality point of view. First, he turned his attention to the station's consoles. In the on-air studio, KOZT-FM had been relying on a rotary pot board, a 1970s has-been, according to Yates' major-market standards. His immediate reaction was to replace the console, but financial restraints stopped him.

Instead, he did what he considered the next best thing: He enlisted the help of a good engineer. Fortunately, KOZT-FM, unlike a lot of small market stations, had such an engineer on staff—sort of. Bill Rett, KOZT's CE, is also CE for a Lakeport station.

Rett proved his worth when he replaced a few components and cleaned up the 10-year-old board. The expense was minimal, Yates said, and the on-air studio sounded infinitely better. "The cost was the kind of thing you measure in pennies," he said.

But in the production studio, an old Sparta prototype console, which KOZT's original owner purchased at an audio show many years ago, needed more than an engineer's tool kit and skill. It needed to be retired.

The solution arrived unexpectedly. "I was walking down the main drag of Fort Bragg one day and there in the window (of a music store) is this really good-looking (four-track) Tascam board with a Dokorder four-track (reel-to-reel) attached," reflected Yates. "Got the thing for hundreds of dollars."

Bill Rett began pouring through the manuals and soon came up with several modifications to the semi-pro board that proved effective for radio production.

"It's an interesting job in engineering. He set the Tascam up so we can patch it and use it as a regular four-track production board with all the effects, like the dbx and the parametric (equalizer) and so forth. But it also has the features you're used to for radio production." Some of Rett's console handiwork includes phone outputs, phone inputs and a program feed to the production studio for backup.

With few remaining dollars, Yates upgraded the stations' microphones to Shure SM58s and replaced the turntables with compact disc players. "For on-air, we upgraded to the Technics CD player. (It gives us) excellent quality and it does have auto cue to music," said Yates.

In the production studio, where CD usage is minimal, Yates brought in a consumer-grade compact disc player.

FACILITIES SHOWCASE

"It's one I had in my office in Los Angeles," he said. For recorders, in addition to the Dokorder four-track, KOZT-FM has a Pioneer and two Technics 1500 reel-to-reels, which came with the station.

Yates also decided to keep KOZT's automation system, a Sentry Control Data system with commercial load racked in Instacarts.

With the station located in a 100-year-old Victorian building in old downtown Fort Bragg, and as part of the city-wide restoration of a number of Fort Bragg buildings, Yates also decided to spend as much as possible on building restoration.

A frugal, do-it-yourself attitude helped the California station upgrade on a limited budget.

"The simple thing to do," said Yates, "would be to tear out or cover all the old redwood (throughout the station's Victorian building). But in keeping with the Victorian restoration, Vicky literally stripped 1,200 feet of redwood, with walls eight feet high, and refinished and oiled them."

Is this the kind of change he had in mind when he traded in large-market programming for small-market radio ownership?

"It's long hours and not a lot of money," replied Yates. "But it's fun."

■ ■ ■

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

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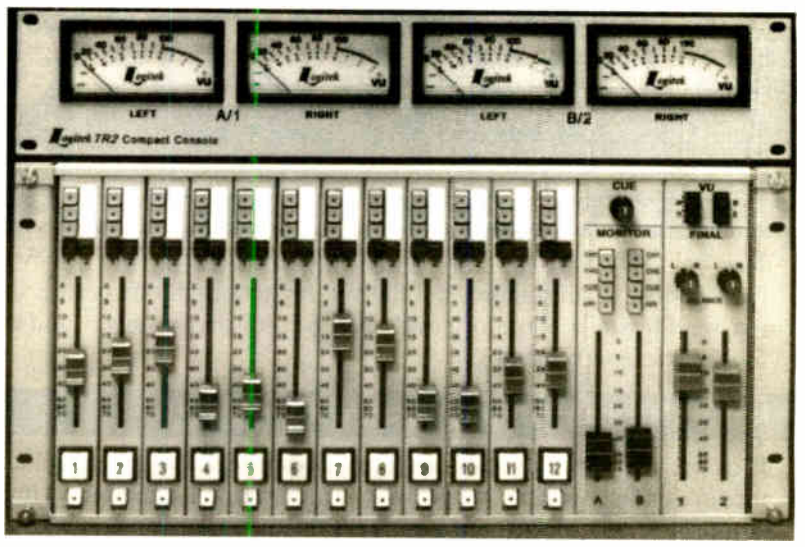

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World Radio History

In Business, Cash Is King

by John Cummuta

DOWNERS GROVE, Ill. Irving Maness, deputy administrator of the Small Business Association, once wrote, "For the small businessman, a good system of financial records can mean the difference between limping along with stones in his shoes and running a good race in the competition for profits."

I'd say it this way: If you unknowingly run yourself out of cash, you're in deep dinosaur droppings.

The standard approach to business record-keeping asks your documentation to provide three key areas of information for you: records of all transactions, protection of your assets and the facts needed for good planning. While these are important, the one shortcoming I find in them is that they all are historical. I never felt comfortable not knowing if I was bankrupt or flourishing, until the end of the month.

Do technical people keep good business records? Not usually. Why not? Because hunting down the elusive hum in the console is a lot more fun than P&Ls (profit & loss statements), balance sheets and general ledgers. Plus, there's the fear of the unknown. Most non-accountants think that their business finances are some kind of mysterious black art that only CPAs (Cost Plenty Always) understand.

Not true. In fact, at the end of this article I'll be recommending a simple, inexpensive PC program that will do it all automatically for you.

Let's take a look at some of these magic documents and see how they work. The first is the profit & loss statement (Figure 1). Once you scan it, you'll see that it's simply, "What comes in minus what goes out."

ENGINEERING MANAGER

Sure, you have to lay it out all fancy, but the bottom line is the bottom line.

You'll notice something I mentioned last month: Your salary is a QST against your income, it is *not* profit. Profit is what's left over *after* you've taken out all your costs, including your wages—and those of your wife, kids or whomever else you should be paying.

Unemployment

If you can't cover all those salaries and still have money left over, you're not really in business—you're just delaying your first unemployment check. The general and administrative expenses are where you can get some of the advantages of owning a business—especially if you run it from your home.

You can pay yourself rent and deduct it from your business income, you can pay your health and life insurance and deduct it from your business income. You can pay part of your utilities and phone bills and deduct it from your business income. In short, the business helps pay many of the expenses that would normally come from your pocket—but then lets you also deduct them from your income, therefore reducing your annual tax burden.

A good exercise with profit & loss statements is to compare them on a month-to-month and annual review basis—i.e., this January compared to last January. This examination will tell you a lot about the relative health of your business and where it's going.

This financial document (Figure 2) used to give me more fits, because I didn't understand what it was showing me. I'd sit there staring at my accountant and say, "OK . . . you're telling me that my liabilities *equal* my assets, right?"

"Yep."

"So that means that I have *nothing*, because I have liabilities that are as much as my assets, right?"

"Nope."

"Well, let me ask it this way. How much more assets would I have than liabilities if I brought another $10,000 dollars into the business?"

(continued on page 37)

Figure 1. Profits and Losses

Sales				**Percent**
Labor Income		$60,000		
Parts Sales		$40,000		
Total Sales			$100,000	100%
Cost of Sales				
Labor Income	$60,000			
Direct Wages	$40,000*			
Direct Wages (including owners)	$40,000*			40%
Gross Labor Profit		$20,000		
Parts Sales	$40,000			
Parts Costs	$40,000			20%
Gross Parts Profit		$20,000		
Total Costs of Labor and Parts Sales			$60,000	60%
Gross Profit			$40,000	40%
General and Administrative Expenses (Overhead)				
Advertising	$2,000			2%
Truck Expenses	$4,000			4%
Office Wages	$8,000			8%
Utilities	$2,000			2%
Depreciation	$2,000			2%
Rent	$4,000			4%
Insurance	$2,000			2%
Accounting	$1,000			1%
Telephone	$1,000			1%
Taxes	$2,000			2%
Supplies & Misc	$2,000			2%
Total Overhead Expenses	$30,000		$30,000	30%
Net profit			$10,000	10%

Owner would pay taxes on the net profit plus his $20,000 wages.
*Owner paid himself $20,000 and the other technicians $20,000.

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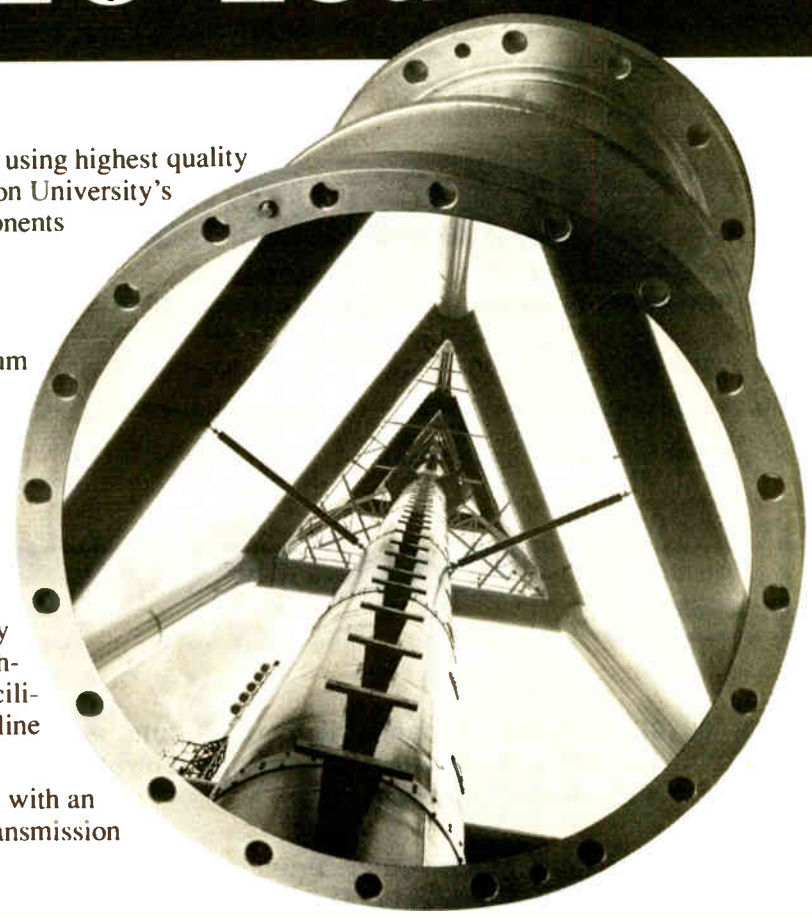

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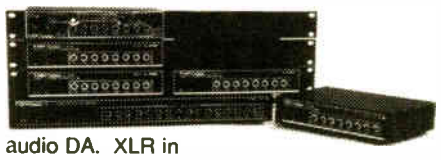

EXAMPLE #1
MODEL: xL4S/8M: Dual 1 x 4 audio DA. XLR in & barrier strip out. Balanced in & out.

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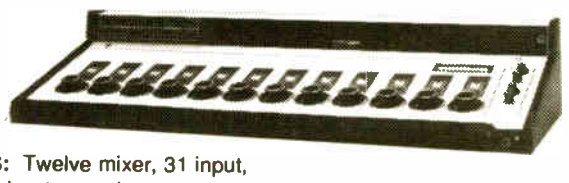

EXAMPLE #2
MODEL: xL12/1S: Twelve mixer, 31 input, stereo/mono broadcast console.

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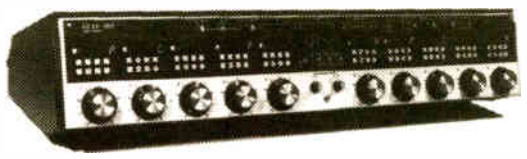

EXAMPLE #3
MODEL: DC38-10S: Ten mixer, 40 input, dual channel out, stereo/mono broadcast console w/ alpha numeric & custom backlighted readouts.

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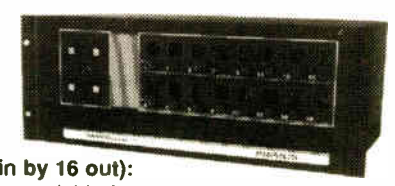

EXAMPLE #4
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WORKBENCH

Beat Summer's Heat

by John Bisset

FAIRFAX, Va. As we say goodbye to "Old Man Winter," a whole new set of engineering problems begins to unfold—those caused by the heat of summer.

There's no question that now is the time to check the operation of transmitter cooling systems and, while you're at it, check for heated components. Rather than using your hand, Solder Absorbing Technology offers a slick and inexpensive means of checking the temperature of components in your system (and should a capacitor go bad and really heat up, you won't burn your hand trying to find it).

The Celsi-Clock is an adhesive-backed circle (see photo) that contains five temperature-sensitive dots. The dots change from clear to a number (which indicates the temperature of the device to which they are affixed) when the threshold temperature for that device is met.

You say you're from the old school and haven't quite mastered the metric conversion from degrees Fahrenheit to degrees Celsius? Then the CelsiStrip is for you. Similar to the Celsi-Clock, the strip displays temperature in both degrees Celcius and degrees Fahrenheit.

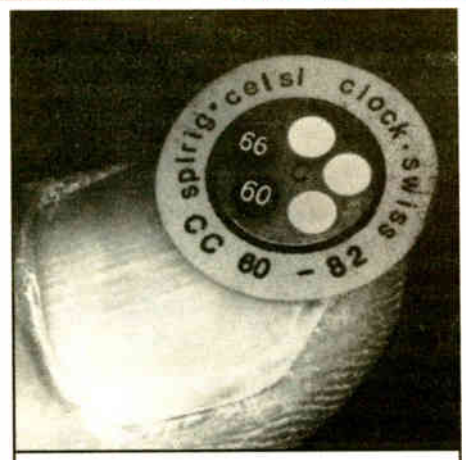
Buy a roll of these stickers, then place them on any and every component that could heat up. Should a failure occur or start to occur, you'll see the change in temperature on the CelsiStrip. There are a full range of temperature indications—from 105 F to 500 F.

Want to try a sample and get more information? Circle **Reader Service Number 78** or contact Solder Absorbing Technology at 800-628-8862 (Massachusetts callers should call collect).

★★★

Harry Thomas, CE at WPHR in Cleveland, wrote in to comment on the test circuit for the infrared remote control devices (**RW** March 27, 1991).

Harry writes that he has used a significantly different method of testing such devices and it involves your local Radio Shack. Next time you go into the Shack, bring your infrared remote control with you. As you walk through the door and "see yourself on TV," aim your infrared remote control right at the camera lens and depress the button.



The Celsi-Clock offers early warning of overheating.

Zzzap! You've just bought yourself a camcorder. No, seriously, if you watch the monitor, you'll see the remote control working as it shows up as a small flashing white light on the monitor screen. The key to all of this working, of course, is that the camcorder must have infrared auto-focus. So there you have it, take your pick—you can either requisition the parts for the little circuit described in the March 27 **RW**, or put in your P.O. for the engineering department's own camcorder (for testing remote controls, of course).

If you don't have an infrared auto-focus camera, take Harry's suggestion and drop by Radio Shack some time and try using theirs. It really works. Barry Thomas can be reached at 216-348-0108.

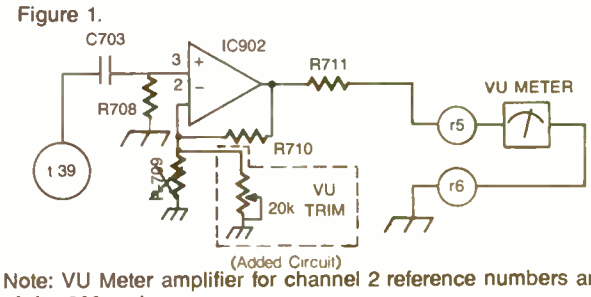
★★★

EZ Communications Director of Engineering Bud Aiello came up with a great modification to the Otari MX-5050BII tape machine. These workhorses are found in many stations, so Bud was probably not the first to experience uncalibrated VU meters. The problem is that when setting the meter outputs, 0 VU on the meter does not always correspond with +4 out.

When the output is set for +4, the meters may read a dB off either way. The problem cannot be adjusted away, as there is no VU meter trimpot. Don't casually adjust the trimpots on the back of the meter board. Those are for the peak flasher LEDs and not for trimming the VU meters. Bud's solution was to replace R-709 and R809 with a 10-turn 20K pot.

The fixed resistors are 16K and connect from the inverting input to ground (see Figure 1). Getting the meter board out to make the modification can take a while, so Bud warns not to expect to make the mod in a half hour. However, the net result is stable, accurate VU indications.

Figure 1.



Note: VU Meter amplifier for channel 2 reference numbers are of the 800 series.

For more information, contact Otari Customer Service at 415-341-5900 or Bud Aiello at EZ Communications: 703-591-1000.

■ ■ ■

John Bisset, a principal with Multiphase Consulting, a Virginia-based contract engineering company, can be reached at 703-379-1665.

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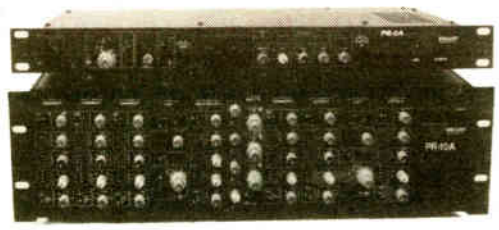

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World Radio History

Handling Your Cash

(continued from page 34)

"None. Your liabilities would increase to equal your assets," he'd say.

Equity is liability

I almost lost my mind thinking that I could never get ahead of these automatically increasing liabilities until I understood that my equity (net worth) was considered a liability to the business because the business "owed it to me."

your transactions (mostly checks you write and deposits you make) just like a checkbook, and the software automatically produces the P&L, balance sheet and cashflow statement for you. In fact, you can look at any one of them any time you want.

The bottom line is that you can maintain a daily awareness of your business' condition and that's what it takes to really manage for success. Of course, the other key is selling your services. Next month we'll finally get into marketing, and it will be worth the wait.

■ ■ ■

John Cummuta is president of Advanced Marketing Concepts, a broadcast management and marketing consulting firm. He can be reached at 708-969-4400.

Figure 2. Balance Sheet

Assets				Liabilities	
Current Assets					
Cash		$10,000		**Current Liabilities**	
Accounts Receivable	$12,000			Note Payable (truck)	$8,000
Less Reserve for Bad Debts	$2,000	$10,000		Account Payable (dist)	$12,000
Parts Inventory		$20,000		Total Current Liabilities	$20,000
				Long-term Liabilities	
Total Current Assets			$40,000		
Fixed Assets				Note Payable (loan)	$6,000
Furniture & Test Equipment	$12,000			Total Liabilities	$26,000
Less Reserve for Depreciation	$2,000				
Total Current Assets		$10,000	$40,000	**Capital**	
Truck	$12,000			Original Cash Investment (stock)	$2,000
Less Reserve for Depreciation	$2,000			Retained Earnings (over the years)	$34,000
		$10,000		Total Net Worth or Total Capital	$36,000
Total Fixed Assets			$20,000		
Other Assets					
Prepaid Insurance & Taxes	$2,000		$2,000	Total Liabilities	
Total Assets			$62,000	Plus Net Worth	$62,000

So the more money that was left over after bills and other costs, the more I owned (net worth). The more the net worth, the more the liabilities . . . equal to the assets (which included my percentage of ownership). Are you confused too now?

The main thing you want to keep in mind about the balance sheet is that it is your snapshot document. You can look at a balance sheet on any day of the month, and it will tell you the composition of your business—how much you owe and how much you own.

You could consider a good checkbook register to be a general ledger of sorts. It's simply a recording of every transaction your business makes, attributing each one to a specific category of expense or income. In other words, each income amount must be recorded as coming from a certain kind of income source, such as rent you might get from someone sharing your office space, or parts you mark up, or labor. Each expense must also be categorized.

Listed expense categories

If you're not sure what categories to channel your income and expenses into, ask your accountant. If you don't have an accountant, I'd suggest you look at a Schedule C from an IRS Form 1040 and see the listed expense categories.

"Quicken" is a PC accounting package that's available almost everywhere computers are sold. It costs roughly $30 and it does everything you'll need to keep track of the average service business. The nice thing about "Quicken" is that you simply enter in

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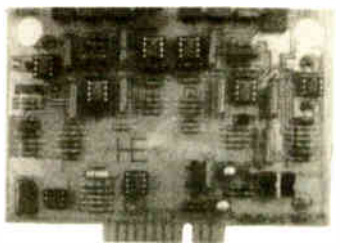
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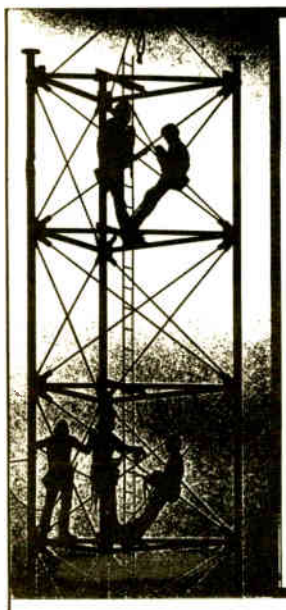

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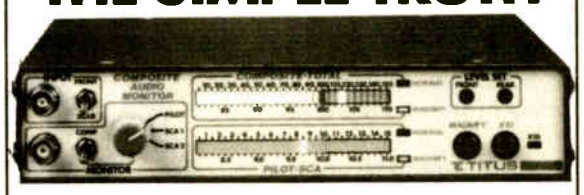

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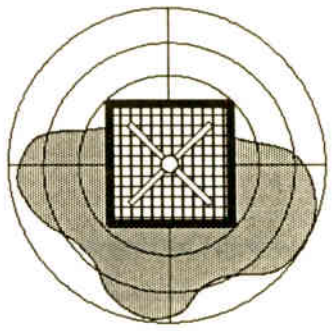

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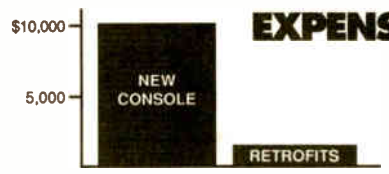

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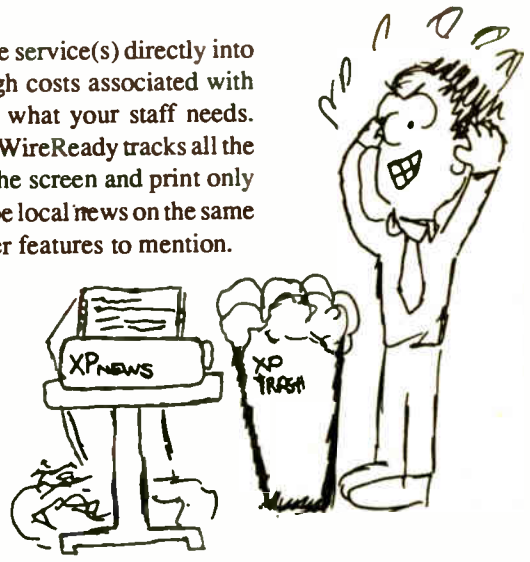

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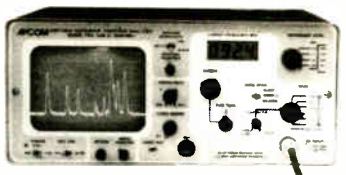

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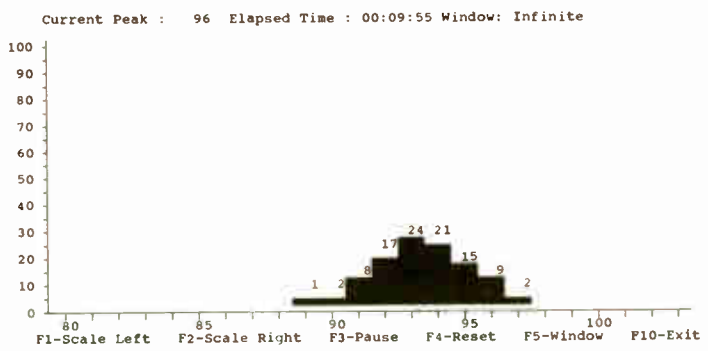

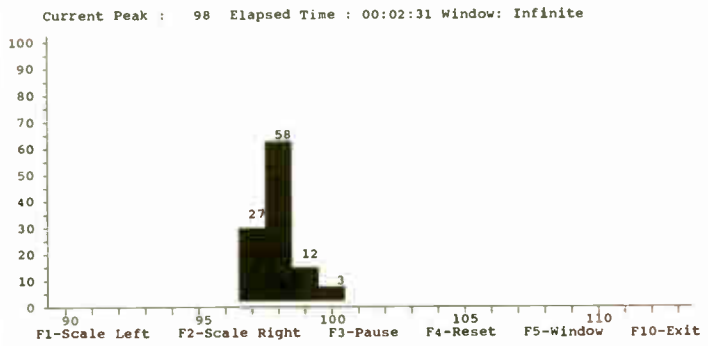

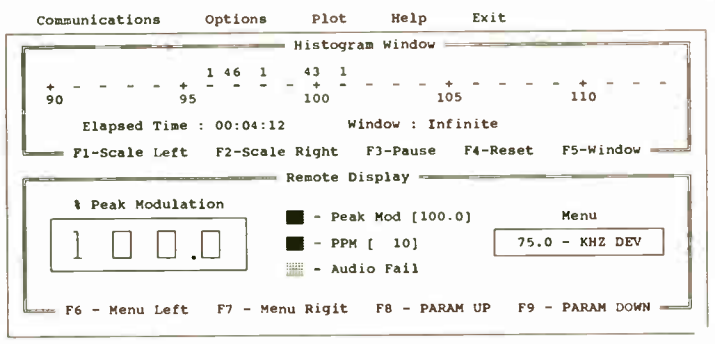

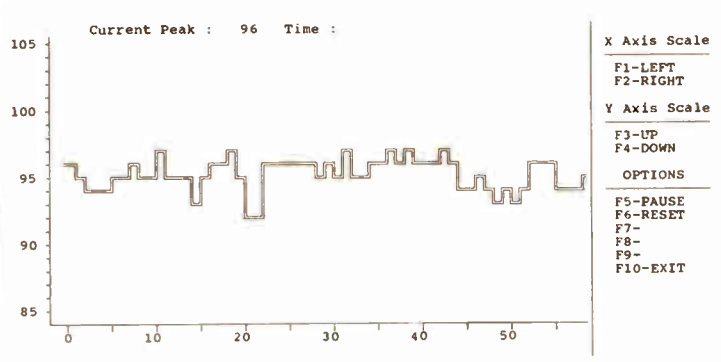

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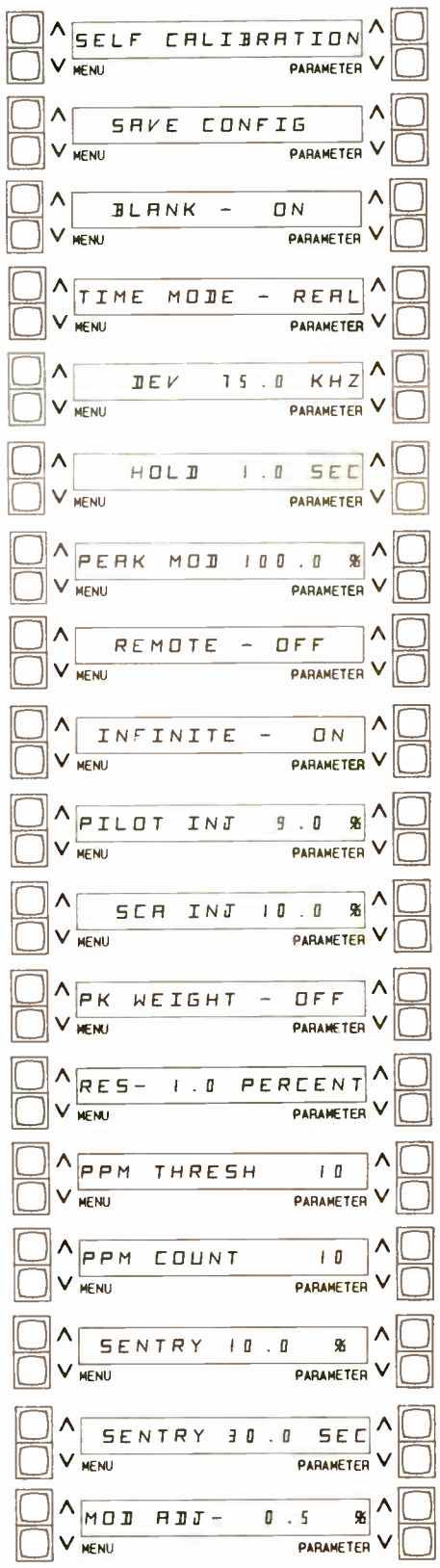

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World Radio History

PC Programs Prioritize Projects

by Tom Vernon

HARRISBURG, Pa. Radio has changed a great deal since I started out in 1968. Back then, facilities usually underwent major upgrades every 10 to 15 years, usually when the equipment began to wear out.

Today, most equipment becomes technically obsolete long before it wears out, stations pull up roots and move frequently, and formats seem to change quarterly. All of this means that there are a lot more facilities being upgraded now than in the past.

Computers can take a lot of trauma out of these activities through the use of project management software. These packages are available for both Macintosh and IBM machines, and will handle all aspects of construction or engineering projects.

The critical path

All packages have some basic features in common, while the more expensive software has extra bells and whistles you may not normally need. All programs ask for some basic information: a list of jobs to be completed, the time required to do each one and which jobs must come before others. Given this, along with the starting date, the software uses a statistical plan known as "critical path" to create a work schedule and show the earliest date the project can be completed.

Pulling electrical wiring cannot be done until all the conduit is in place, thus conduit installation is on the critical path and has no float. If laying conduit is delayed by four days, completion of the entire project will be held up for that long. This software will help you prioritize tasks.

All of this assumes that the necessary resources are always available and interchangeable. Of course this is seldom the case, especially in broadcast installations where many of the construction techniques are specialized and exotic equipment often must be leased. Engineering staff members may only be available for the project on certain days, or for a certain percentage of time.

STATION SKETCHES

Resources, whether man or machine, are input by availability times, and project management software makes sure they're available when needed, and not committed to two things at once.

Throughout the project, you can input actual start and completion times for each task, and the schedule and completion date will be automatically updated. Most packages have a variety of report packages, allowing you to print out work schedules, task relationships and cost analysis.

Planning algorithms

More elaborate software will allow you to handle numerous management situations. Some programs have algorithms to plan schedules when many of the tasks are floating. You also can specify begin and end points in more ways. Instead of saying that Job A cannot begin until Job B is completed, you might want to specify that Job A cannot start until four days after Job B is finished, or Job A cannot start until Job B already is underway.

The more advanced packages resemble large database applications, because that's what they really are. There's a database for human resources, physical resources, tasks, multiple calendars, etc. Integral to many of the larger packages is the ability for these internal databases to be linked to outside databases for their information. Computers are talking to computers more these days.

Project planning software has been around since the late 1950s, when it lived on large IBM mainframes. It has only recently gained popularity as affordable versions became available for personal computers. For the IBM PCs, Symantic Software's Time Line 4.0 claims about 65 percent of the market, and lists for $695.

Also popular is Software Publishing Inc.'s Harvard Project Manager, also selling for $695. The latest version has a FasTrack feature, which the developer claims can get a novice ramped up in about 15 minutes.

On the Macintosh side, Claris pretty much owns the show with Mac Project II, claiming 95 percent of the Apple market. This program costs $499, and its graphical user interface makes it easy to learn and work with.

If you're going to be working in a more structured environment, a top-down program such as Symmetry Corp.'s Keyplan may be more to your liking. Unlike Mac Project's graphical input, Keyplan takes data in outline form. This is a new product, which lists for $395.

Among the more elaborate packages are Primavera System's Primavera Project Planner, an IBM product selling for $4,000, and Project Workbench at $1,275 from Applied Business Technology Corp. Workbench is good for engineering projects because it allows close management of variable resources.

As facilities planning and other large projects become more commonplace in broadcasting as elsewhere, the savvy engineer can enhance his value to the station by developing skills in project management. This software is one tool to do just that. Managing large projects, once a rare nuisance, is now becoming a common activity for engineers.

■ ■ ■

Tom Vernon divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-367-5595.

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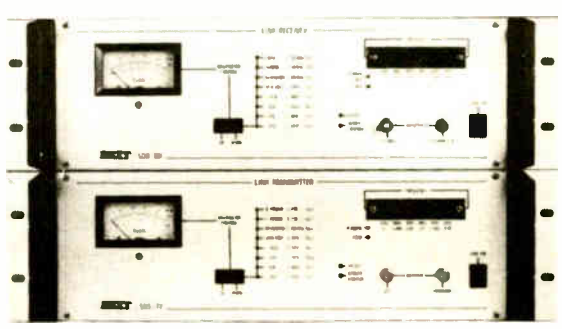

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World Radio History

Taking a Peak at Modulation

by Harry Cole

WASHINGTON Today's text is from the late great Marvin Gaye—"What's Going On?"

We are talking about the measurement of FM peak deviation, and we are wondering why the FCC insists on being so (how shall I say it politely?) *reticent* about discussing peak response time. If you were among the crowd at the modulation measurement panel at the NAB convention (which was probably in the range of 100 to 200 hardy souls), you know what I'm talking about.

Before we launch into the topic, let me first provide a disclaimer. I represent (and have for several years represented) Modulation Sciences Inc. (MSI). Since MSI manufactures the ModMinder, I admit I approach the subject of modulation monitors with something of an attitude.

Bizarre and misleading

The purpose of this article, however, is not to tout the product. What I am addressing is the bizarre and misleading way the FCC has dealt, and continues to deal, with the FM engineering community in this area.

As you likely know if you have read any of the various claims and counterclaims made by FM modulation monitor manufacturers, a monitor's peak response time can make a big difference in what it takes to convince the monitor that you are overmodulating.

The slower the peak response time, the more you can modulate—first, without the need for additional signal processing and, second, without having the "overmodulation" light start flashing. (And, of course, the more you modulate, the "louder" your station sounds to the great unwashed.)

The FCC's rules presently contain no limitations, fast or slow, on peak response time. To the extent that the rules ever contained any such limit, they provided that a monitor's peak response time should be no slower than 10 cycles of 10 kHz. That provision appeared in the type approval specifications for monitors. In other words, even monitors that were blessed with type approval were permitted peak response times of 10 cycles of 10 kHz.

Those specifications (and the whole monitor type approval operation) were "deregulated" in 1983. When they were "deregulated" out of existence, the Commission did *not* say that some "faster" peak response time would be required in the future.

Thrust of deregulation

To the contrary, the overriding thrust of deregulation was to leave the basic substantive standards (including, presumably, the peak response time specs) in place, but to eliminate the mundane "Mother-may-I" hassles of having the FCC sign off on every single piece of equipment at every single station.

In private conversations, senior members of the Mass Media Bureau have specifically indicated to me that this view of the deregulation process is correct. I have asked them to confirm that in writing. They have declined.

COLE'S LAW

My conversations ultimately led me to a January 1991 meeting with very senior representatives of the Mass Media Bureau, Field Operations Bureau and Office of the Chief Engineer; I represented the interests of my above-mentioned client. The meeting was in large measure devoted to the question of peak response time. Following that meeting, the Commission issued a public notice on FM modulation measurement.

In its public notice, the FCC declined to address with specificity the peak response time question. It also declined to identify any particular modulation monitors; instead, the FCC merely stated that its experience showed that "all commercially manufactured monitors with which the FCC is familiar produce satisfactory results which agree substantially with the Commission's rules."

This guarded statement obviously raised two questions: which "commercially manufactured monitors" were the Commission familiar with and what exactly were the "rules" with which they were being compared?

Questions were presented

At the NAB convention, both questions were presented to Mass Media, FOB and OCE officials by Dane Ericksen, formerly an FOB official and now a regarded engineering consultant with the firm of Hammett & Edison. All three panelists declined to give a straight answer. Instead, when they weren't poohpoohing those questions as "a tempest in a teapot," the FCC panelists danced around the issues, ultimately providing absolutely no guidance whatsoever.

You really have to ask what the FCC thinks it is doing. With respect to the term "commercially manufactured monitors with which the FCC is familiar," it is obvious that the FCC must know which monitors it has in mind.

Why not list them? I know from my discussions with staff members—and particularly from my January 1991 meeting with Mass Media, FOB and OET senior officials—that the Commission is familiar at least with ModMinder, Belar and TFT monitors, and possibly others. Since it was the Commission itself that elected to put into issue the identity of "monitors with which it is familiar," the Commission cannot reasonably refuse to provide more specific guidance.

Why not specify?

And as far as the "rules" go, why can't the Commission specify what its peak response time standard is? After all, if the Commission is prepared to bust stations for overmodulation, the Commission must first be able to measure overmodulation. And before that measurement can be accomplished, the Commission must define for its own use exactly what "overmodulation" is. Thus, such specs as peak response time should be available. Why can't the Commission tell us what those specs are?

The Commission will probably beg the question by telling you that the matter is a difficult one and that they intend to launch a rulemaking proceeding sometime in the next year or so to look into it. If they tell you that, ask them what rules and standards they are enforcing *now* and will continue to enforce until any such rule making might be completed (i.e., probably several years from now).

Begging the question

The Commission also may try to beg the question by saying that peak response time is not a factor in measuring overmodulation. But with all due respect, that's crazy. Indeed, if that were the case, then virtually each and every modulation monitor—including those type-approved prior to 1982 and the new, post-deregulation designs—would be ineffective for their intended purposes.

Moreover, the notion that peak response time might be irrelevant would be completely inconsistent with the Commission's own pre-1983 type-approval standards.

If this were just a "tempest in a teapot" (as was suggested at the NAB session), or a grudge match between competing manufacturers, the Commission's repeated refusal to offer guidance might be understandable. But it was clear from the size of the crowd at the NAB panel and from the repeated and insistent questions, that this is a matter of great importance to many engineers.

The broadcast industry is entitled to guidance on these fundamental questions. The FCC's refusal to provide such guidance is incomprehensible.

■ ■ ■

Harry Cole is a partner in the Washington-based law firm of Bechtel & Cole, Chartered. He can be reached at 202-833-4190.

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Circle 36 On Reader Service Card

World Radio History

FROM THE TRENCHES

by Alan Peterson

Use Musical Contacts

Dear Alex,

Middle of May in Connecticut ... seems like forever since the trees were this green. Hope the May billing here approaches the same hue.

An important question was posed to me by a producer. What do you do when there's nothing else left to do on-the-cheap, and there's that one project that absolutely needs a Harmonizer, a sampled effect or a custom synth burst? You know the guys across the street can do it, and you don't want to lose business to them. Do you roll over and let them pick it up?

Not anymore. Alex, may I present a simple five-word formula for enlightenment so effective it should be tattooed to the inside of eyelids everywhere: Make friends with a musician.

What better way to access those neat toys that make all those great sounds on every record in the station? How can you learn the way those sounds are created and stacked? How do you make them work for you? Make friends with a musician.

In 1977, I signed up with my college station WHPC-FM while studying music. Both the station and I made out great—I got my own show, the station got unlimited access to an EMI synthesizer (sweeps & bleeps), free jock shouts done by the Nassau College Chamber Choir and free use of a genuine Chinese Gong.

Some stations guarantee they'll update production gear around the same time pigs get the hang of flight. In the interim, nothing is preventing the determined production pro from striking up a conversation with the keyboard player in the bar band playing up the block.

Gold will be struck if he/she is using a digital reverb or multiple DSP (odds are excellent). You'll hit platinum if they're also using a sampler. Maybe the band gets a couple of mentions on the concert line and maybe the station gets to try out some of that juicy equipment one weekend in production.

And how can you rig one of these babies up to your console without having your CE blow an O-ring? Al's E-Z Home Electronics Course says, "In a pinch, use the headphone out as an auxiliary send."

I switch the 'phones over to Audition, set my source to both Program *and* Audition (my Medalist console can do this), yank out the cassette deck and use the lines back to the console as the Auxiliary Return. In between I patch, say, a super-cheapie digital reverb.

Now, the headphone level controls how hot the signal is going to the reverb and the cassette fader mixes in the wet signal. No headphone monitor? Plug your ear goggles into the deck receiving the signal. Simple, slick, easy to control and undo-able in less than a minute.

In a day and age where a guy like Timmy T ("One More Try") hits the top of the charts with a song cut at home, it really does pay to listen closely to modern music machinery for merely minuscule monetary mention. If ya can't buy, borrow. Make friends with a musician. It could be one of the greatest FREE workshops in audio technology you could ever wish for.

■ ■ ■

Al Peterson is WLAD/98Q's Production Man and a musician who says there's no such thing as too many friends. Write c/o **RW** *and maybe he'll let you borrow his Alesis MidiVerb.*

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World Radio History

Making the Switch to Digital

by Ty Ford

BALTIMORE If you've been teetering on the edge of making the buying decision as to when (if ever) to plunk your money down on a digital audio workstation, it's probably because there are some nagging questions you haven't been able to answer.

Grab your "Indiana Jones" hat and your bullwhip. Join me on the quest to find and return the magic stones ... er ... to successfully negotiate these nine mystical gateways so that you can achieve "oneness" with The Digital Workstation Universe.

Quest #1: How quickly can you learn to use the system? This actually is a double-edged question. To find the answer, you first need to commit to spending the time to learn. Do you have the time? Can you make the time?

If you can't get past the computer front-ends most of these systems use, it's probably wiser to remain in a multitrack, reel-to-reel environment. Be prepared to accept the fact that at some point you may realize this is definitely *not* the system for you. Can you feel good about accepting this experience as part of a larger learning process, or will you let it deter you from forging ahead on a new system?

Warning: There are no shortcuts. Disparaging comments from others about a particular system or claims of its super abilities must be taken with a grain of salt. There is no substitute for your own experience. Know what you expect and don't be satisfied with less. If a system can't do the job, move on.

Consider others

Quest #2: How many people will be able to use the system? Bring others into the search early and note carefully any problems they may have. Although you may have mastered your fear of computers, being the only one in the studio who uses the system will decrease the ability of the system to pay for itself.

Know that a certain amount of time will be spent "selling" the idea, as well as teaching each person how to get the most out of the system. Expect each person to be different. If your least experienced person can't do a simple voice-over on the system, it's a bad sign.

Quest #3a: Where do you put the computer and screen that are usually part of the system? Whether the system has a Macintosh, DOS or other proprietary front end, you may need to rethink your counter space and rack space. Computer monitors, keyboards, mouses (mice?) and proprietary control panels must be positioned to co-exist with your existing setup.

Quest #3b: How do you deal with the added noise these components create? Computer fans and disk drives make noise. If you have a "combo" studio (where the machines and mics are in the same room) find out if the computer can be stored in another well-ventilated, dust-free space.

The AKG DSE-7000's Intel 386 CPU, for example, can be run at least 30 feet from its control panel, monitor and keyboard with several hundred bucks' worth of extension cables.

"Space-hogging" production consoles usually present the biggest problem. Remember that most workstations internalize a lot of channels, which means your console doesn't have to be as big. You may have to consider a smaller mixer like the Studer A779, the Revox C279 or the Mackie 1604.

The setup

The most obvious place for the computer monitor is directly between the audio monitors. But be aware that the emissions from the video monitor can get into your audio, causing a rather nasty buzz. You may have to mount the screen in a grounded metal case to keep stray emissions from getting into your audio.

PRODUCER'S FILE

Dynamic mics make great noise transducers when placed too close to a video monitor. Usually, though, there's a dead spot directly in front of the monitor where noise pickup is minimal.

Quest #4: How quickly will the manufacturer respond when the system goes down? Next-day-air is about as good as it gets unless the dealer or manufacturer is across town. If you can't get a guarantee of a board or component swap any quicker, it's a problem.

Quest #5: Can you actually work faster, or does loading in, processing a mix and backing it up offset any time you might have saved? Sure, non-destructive random access editing is a gas. But if it takes all day to save or back up the system, and more time to "process" a mix, you may actually lose time.

Quest #6: Can you raise your studio rate or attract new business based on enhanced services and time savings to the client, or will the competitive atmosphere in your market force you to eat the cost of the system just to stay even?

I was able to justify a rate hike with one client who normally spent two to three hours a session doing radio spots.

Now he comes in, lays the voice tracks, hands me the music elements and walks out in less than an hour. The one or two hours of time he gains by not having to be in the studio, plus the reduced time it takes me to edit the spots, saves time and money for both of us.

Quest #7: If a lot of your work comes in from other studios, how compatible with other systems is the one you have in mind? These are problems that are still being worked out in the industry. There are no good answers. Simpler projects can be dumped to R-DAT, provided the R-DATs work well with each other.

Quest #8: Have you bothered to figure out how many more sessions each week or how much of a rate increase you need for the system to pay for itself? If you've never bought a big piece of gear (more than $20K), it may be difficult for you to think about reaching that deep into your pocket (especially if you're used to writing off all your acquisitions in the same tax year).

Talk to your accountant about depreciation schedules. Whether you're paying cash or taking a loan, you may have to adjust your sights to realize that the "write off" will occur over a period of five to seven years. Welcome to the big time.

■ ■ ■

Ty Ford is an audio producer/voice talent. Reach him by phone at 301-889-6201, via MCI mail (#347-6635), or via America Online (Tford).

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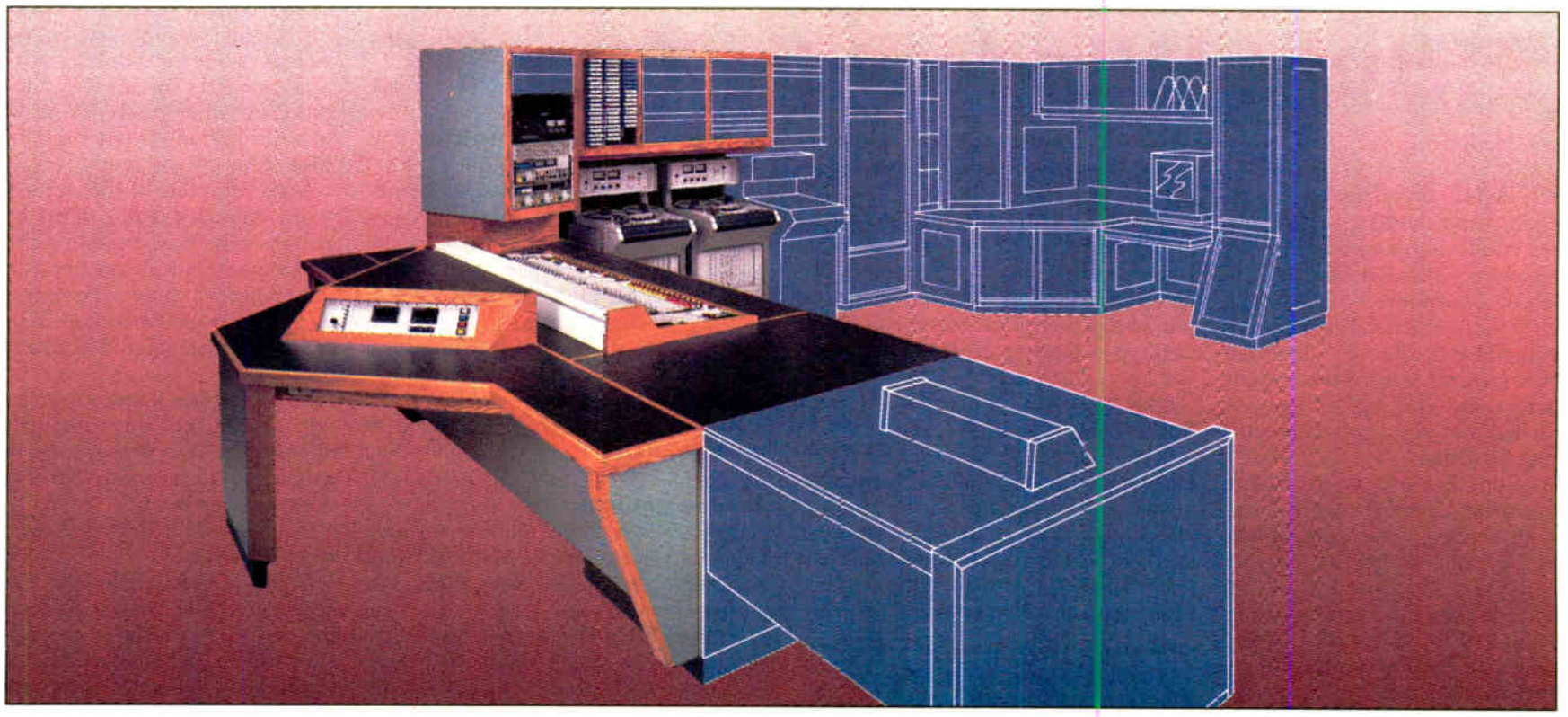

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Circle 45 On Reader Service Card

World Radio History

A Picture Window to Your PC

by Barry Mishkind

TUCSON, Ariz. Over the past year, more than three million copies of Microsoft Windows have been sold. In the fast moving computer field, this is just short of astounding.

What is Windows? It is called a graphical user interface or GUI. It's identified by the little pictures or icons that appear on the screen. By "clicking" on an icon, you can select and start a program without typing anything.

Getting from the A: or C: prompt of the DOS to the icons of the GUI has brought PC users in closer competition with Mac-type convenience. Apple Macintosh users have used GUIs for years, referring to PC users as being deprived.

Easy decision

For many people, it's easy to choose between the textual commands of DOS and the colorful screenful of icons that Windows provides.

Which would you prefer?

Of course, the Windows environment by itself is just that, an environment waiting to be populated. But the power of Windows comes from the ability to cut and paste information between the Windows.

If you have ever wanted to take a graphic chart or a spreadsheet and put it in a letter, for instance, the usual way was with scissors and tape. More recently, several programs have allowed a kind of graphics import.

But as Windows is a graphics-based environment, it's quick and easy to cut and paste from one application to another. Resizing a picture is a snap, and put all together, Windows really brings desktop publishing capability to any office.

Should you convert?

If your computer is used exclusively for one application, such as bookkeeping or music scheduling, Windows is about as sensible as renting a Corvette to move your furniture to another city. It looks good, but doesn't really add anything. In fact, it's like taking a detour.

KEYBOARD CONNECTION

On the other hand, perhaps you do a variety of tasks ranging from word processing to spreadsheets or even newsletters. You may have names, addresses and phone numbers in a personal information manager. And sure, there might be a game or two you enjoy (grin).

Using DOS alone, you likely chafe at having to go through all the technical gymnastics needed to gather everything together in one document. If so, you should probably have Windows.

Applications for Windows are plentiful. Ever since Version 3 was released last spring, programmers have been busy producing versions of their products that work in the GUI environment.

Many of your favorite programs are now, or shortly will be, "Windows aware." And there is a tremendous number of good shareware programs for everything from a personal almanac to databases to telecommunications.

Easy to get into

In fact, Microsoft has made it very easy to get into Windows use. Many software packages are bundled with Windows, sort of a two for one deal.

Further, a listing is provided identifying how to be sure you have the right version of your applications to work the best. And Microsoft itself is offering some amazing bargains to get users into Windows.

Even if you're not now in a position to upgrade all your software, Windows allows you to use them, even exchanging information via a "clipboard," although not quite as easily as with true Windows applications.

There are some people who will tell you to wait for OS/2, an advanced operating system, instead of using Windows. True, OS/2 is more robust and less susceptible to problems and/or crashes. But there are far fewer programs for OS/2 and they are much more expensive as yet.

Actually, unless you really stress your system, Windows will likely serve you well. Eventually an economical upgrade path to OS/2 will appear, but that is still in the future.

Meanwhile, there are several fine add-in programs to help you get the most out of your Windows. FirstApps from hDC and Whiskers from Numbers, Inc. are two of them.

FirstApps are a series of pop-up "MicroApp" utilities that allow you to easily customize Windows. Included among the utilities are a system enhancer, a desktop calendar, alarm clock, screen saver and more. hDC has also a replacement for the File Manager, considered a weak spot in Windows.

If you like your mouse, but wish you could do a bit more with it, try Whiskers. This great little TSR lets you custom program the other button(s), including a "middle button"—even on two-button mice.

And, since one of the neatest things about Windows is the ability to utilize icons to represent programs and tasks, maybe you'd like a huge library of icons from which to choose. Try Icon Pak I or II from Software Workshop. You can select from more than 500 icons for all needs.

As you explore Windows, or find yourself helping others get set up, a good reference book is perhaps the best way to understand the intricacies of the Windows environment.

A good choice

"Using Microsoft Windows 3" by Rose & Person (Que, 1990) is a good choice. Starting with installation and leading up to operation and tips for enhancing performance, this book is filled with examples and mini-tutorials on every aspect of Windows.

Microsoft Press has several excellent books. "Running Windows" by Stinson and Andrews (MS Press, 1990), is filled with "Windows Tips" to help you get the most from Windows.

If you've purchased any Windows application, there is a card offering a free issue of a newsletter from The Cobb Group. Use it. These are excellent aids, answering many questions and isolating essential tips and shortcuts to supercharge your applications.

And the "Windows 3 Companion" by Lorenz and O'Mara (MS Press, 1990) brings to book form the informative, friendly style that characterizes The Cobb Group's newsletters. It is a highly detailed reference book that will leave few questions unanswered.

What do you mean you "don't do Windows?" The 1990s are here. Enjoy it.

More information on FirstApps can be had by calling 800-321-4606; call 509-476-2216 to learn more about Whiskers; Icon Pak I and II are found at 800-762-9550; and The Cobb Group can be contacted at 800-223-8720.

■ ■ ■

Barry Mishkind is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797; FidoNet 1:300/11; or on MCI Mail #325-9883.

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World Radio History

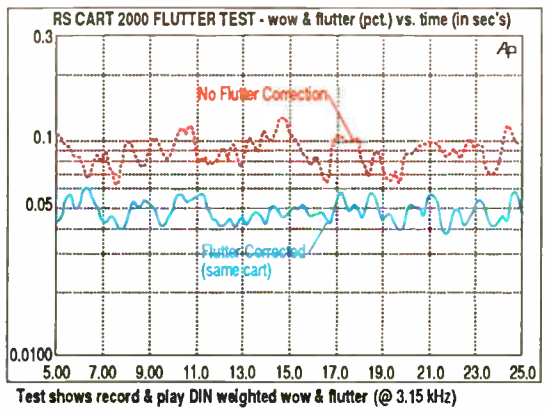
RS-CART 2000

The RS-CART 2000 is the Finest Cart Machine ever designed and manufactured. From major new features like flutter correction, to important details like improved cart hold downs, nothing has been overlooked.

The World's First Flutter Correction.

The RS-CART 2000 is the only cart machine to incorporate active flutter correction. This encode-decode system records a pilot tone on the cue track. On playback, the pilot is FM demodulated to drive two dedicated all-pass filter time delay networks to achieve up to a 50% wow and flutter reduction.

For the first time, cart wow and flutter is reduced to levels rivaled only by the finest reel-to-reel recorders.

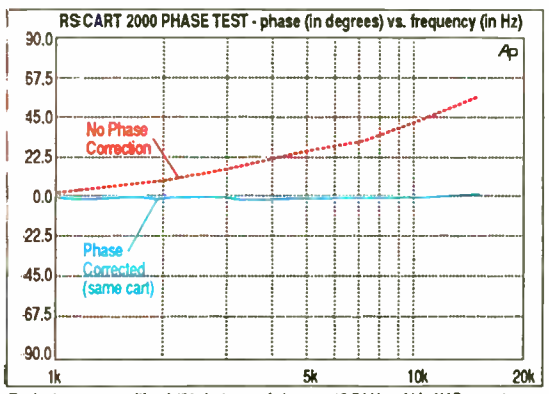


Test shows record & play DIN weighted wow & flutter (@ 3.15 kHz)

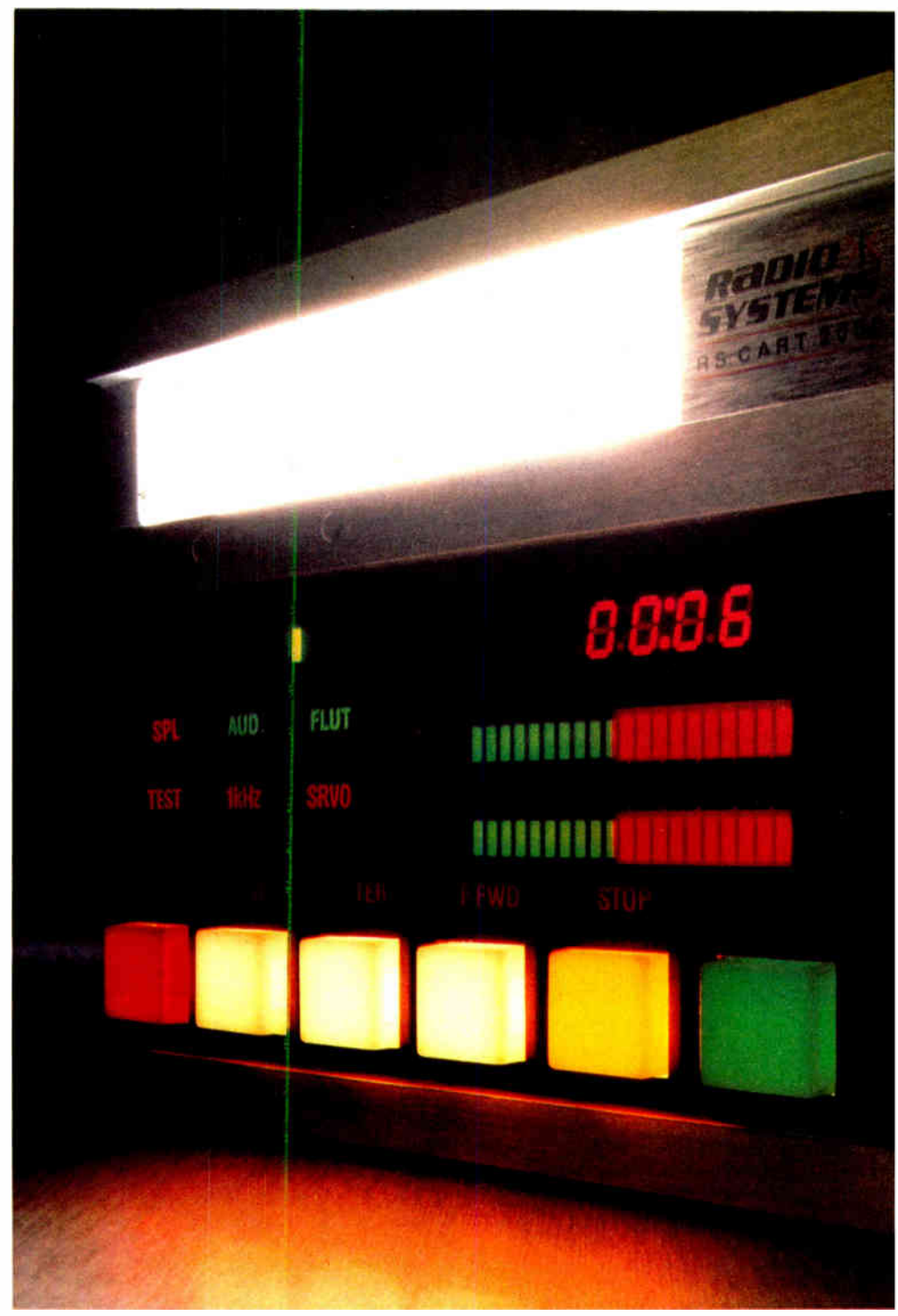
Active Phase Error Correction.

This non-encoding circuitry detects out-of-phase audio by tracking the common left/right audio components of any pre-recorded cart. The RS-CART 2000 is the only cart machine made that uses distortion-free and noise-free, all-pass filter time delay networks to correct phase error. Up to 90° of phase error at 5 kHz is corrected in real time, as the cart plays.

Listeners will immediately notice the cleaner and brighter sound of any stereo cart reproduced on an RS-CART 2000.



Typical new cart utilized (50 deg's out of phase at 12.5 kHz; within NAB specs)



• Splice finder • Timer on all models • LED metering • Front panel azimuth adjust • 1 kHz defeat mode • Fast forward • 3 speeds • Toroidal power transformers • Test noise generator • Cleaning switch • CMOS logic • Flutter correction • Full remote control • 1/2" thick nickel-plated deck plate • Full size solenoid • Nidec direct-drive motor • Ball bearing mounted pressure roller • Active phase correction • 3 cue tones • Peak LED • Buffered, low-noise input stage • Gas Tight mating connectors • Delrin roller cart hold downs • Injection molded tape guides • User programmable logic states • Long life heads • "Electronic transformer" inputs and outputs • Lamp flash logic • Active Phase Meter • XLR connectors • Bias and cue metering

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World Radio History

Feature Shock!

A built-in tape timer displays current tape position in hours, minutes, and seconds, and includes a search-to-cue locator with cue point and zero location memories.

Otari's new MX-50. Built around the premise that you can have everything you ever wanted in a two-track tape machine, and still stay within your budget. For example:

The Transport

—DC quartz PLL capstan motor with front panel selection of operating speeds (from either a 15/7.5 or 7.5/3.75 ips speed pair).

—Capstan speed variable by ± 7% from the front panel, and by ± 50% from SMPTE time-code external controllers via an Otari-standard 37-pin connector.

—Optional remote control.

The Electronics

—Lighted VU meters with peak-reading LED indicators.

—Transformerless active balanced inputs with XL-type connectors.

—Optional Voice Editing Module (VEM) for twice normal play speed with normal pitch.

Otari's MX-50. For whenever or wherever you need a *professional* audio machine at an affordable price.

For more information, call your nearest Otari professional audio dealer, or Otari Corporation at (415) 341-5900.

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10.5" reel size capacity with self-centering NAB hub locks.

± 7% vari-speed.

Capstan speed controllable ± 50% via SMPTE time-code external controllers.

Optional Voice Editing Mode (VEM) for twice normal play speed with audio pitch shifted down one octave for normal pitch.

Alloy deckplate.

Lighted VU meters with peak-reading LED indicators.

Headphone amplifier with front-panel headphone jack and level control.

Optimized record and reproduce heads.

Switch-selectable NAB/IEC EQ with front panel indicator.

Lifter defeat with momentary or locked operation.

Tape drive tachometer for accurate tape time display, and for external synchronizer or controller interface via Otari-standard 37-pin connector.

DC quartz PLL capstan motor with front panel selection of operating speeds.

Independent reel size selectors for supply and take-up motors.

Built-in tape timer display.

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World Radio History

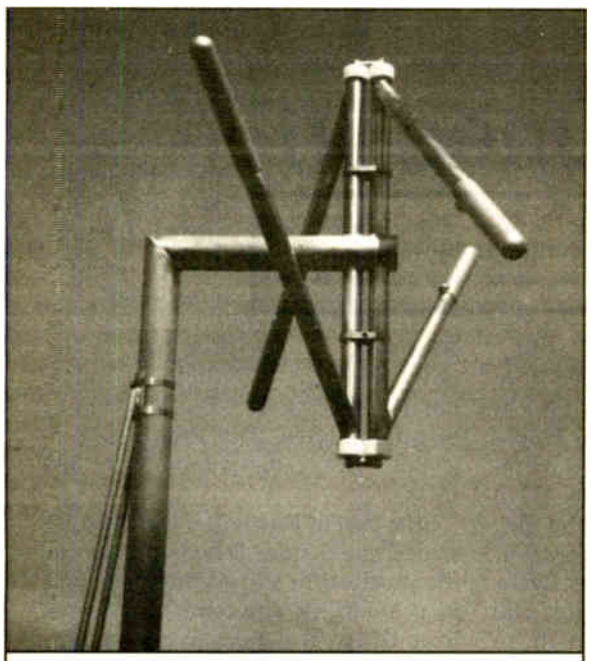
BUYERS GUIDE

Antennas, Towers & Cables

Jampro Passes KJEF Beta Test

by Bill Bailey
GM/CE, KJEF-AM/FM

JENNINGS, La. We got our C2 upgrade for KJEF-FM in late 1989 after the usual allocation squabble. Since 1963, we had operated Class A off of our AM tower close to the center of Jennings, our city of license.



Jampro's JBBP was beta tested upon request by KJEF-AM/FM's Bill Bailey.

Now we had to move 15 miles southwest to protect an adjacent C. While many stations are concerned with placing an "optimized" signal toward a larger market, we were faced with multiple markets across two-thirds of the compass.

True pattern

Few antennas could deliver a true omnidirectional pattern. You would take the thing and twist it around according to pattern studies and/or trial and error until you got the lobes close enough to where you were shooting for.

We had been using a Jampro JSCP two-bay with great luck since 1984 and had some qualms about changing to something else. But we now needed a four-bay for an ERP of 33 kW at 600 feet and a true omnidirectional pattern. So we went shopping.

Engineers and reps all had their favorites to recommend and manufacturers all had the one that beat all others. Everybody talked about the horror stories with the competition's product. The conclusion to these conversations? Still trial and lots of error on the market.

We were ready to stick by the old faithful JSCP and order a four-bay version, when our curiosity was grabbed by a new development at Jampro—the JBBP. This antenna has balanced excitation, eliminating re-radiation from the tower with excellent circularity and pattern symmetry.

Jampro, however, told us *No*. They were still in R&D with this model. I was always a sucker for a beta test, so I talked Jampro into it anyway. Needless to say, the delivery time was a little longer than the off-the-shelf models.

We had a surprise when it arrived. The JBBP didn't look at all like any other antenna we'd ever seen. But then again, we hadn't wanted any other antenna. This antenna was face-mounted on a 24-inch mast oriented just due north. Due south is the Gulf of Mexico, north-northeast is Jennings, west is Lake Charles and east is Lafayette.

USER REPORT

It was too dark

By the time the tower crew had finished the installation, it was too dark to get the Gin-pole off the tower, so they came down and went home. All the connections were in place.

I knew I shouldn't have, but I did. Slowly I brought the power up, checking constantly for reflected. None. All the way up to 18.5 kW—full TPO. No VSWR. Zilch. Even with the Gin-pole and lines hanging through the aperture. How's that for a field test? The transmitter showed broad tuning, too.

On Dec. 10, 1990, "The Star Spangled Banner" ushered in the new operation with a new frequency and new power. In travel tests we covered a much larger area than we predicted, from the Sabine River to the Mississippi. We weren't counting on business from the Gulf, but requests started coming in by radiotelephone from offshore drilling rigs.

In summary, the JBBP met all the criteria we set for the ideal and affordable sidemount antenna, plus a few unexpected extras including minimal downward radiation and broad bandwidth.

■ ■ ■

For information on Jampro's array of antenna products, contact Al Jason at 916-383-1177; FAX: 916-383-1182; or circle **Reader Service 59.**

BUYERS GUIDE INDEX

Jampro JBBP Antenna
by Bill Bailey, KJEF-AM/FM **49**

EZ Hook Pro Audio Test Cables
by Dennis J. Martin, KBIG-FM **52**

Cortana Crows Nests and Stati-Cat
by Clifford W. Koch, Great Empire **55**

Nott, Limited's Unipole Kit
by Mark Persons, M.W. Persons and Associates **56**

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TTC

Spring 1991

TTC's Open Letter to all Broadcasters:

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World Radio History

Recordable CDs Take Center Stage at NAB

by John Gatski

LAS VEGAS Write-once CD recorder (CD-R) technology was big news at NAB '91, with the announcement of professional units retailing for as little as $16,000.

Previous models had been multi-component with encoder and decoder units, costing in the $40,000-$50,000 range.

At NAB, Studer Revox, Yamaha and Denon showed units that are production-ready. Radio broadcasters have expressed interest in CD recorders for storage/playback of spots, jingles, and even pre-production music demos, according to manufacturers of the recorders. Post-production video users also are interested in using them for archiving sound effects.

Denon's DN-7700R retails for $16,000 and offers a "system approach" to CD-R with its $2,500 DN-9770 CD cart player and the $4,000 BU-0170A audio interface with separate digital and analog inputs/outputs.

The D740, from Studer Revox

The Denon CD-R system allows a partially-recorded CD to be played on the company's DN-9770 cart player. Some CD recorder designs allow play compatibility with CD players only after the disc is completed and a table of contents (TOC) has been added.

The DN-9770 also has a "bar code" access feature that allows it to work much like a cart machine in locating specific tracks for such applications as spots or sound effects, according to the company.

Another CD-R unit in the $20,000 price range is the Studer Revox D740. This unit offers full compatibility once the TOC is written.

It includes AES/EBU and SPDIF digital interfaces and flexibility to indefinitely but not permanently mark out a segment if the user does not want it for playback.

Yamaha, which previously had indi-

(continued on page 56)

Wayne Jones

William Hammett

Harrison Klein

Anne Wexler

Tuned In

People . . . **Gentner Electronics Corp.** announced the appointment of **David C. Finley** as director of marketing and sales, and **Daniel P. Marchetto** as teleconferencing national sales manager. Finley will be responsible for worldwide marketing of Gentner's broadcast, professional audio and teleconferencing products. Marchetto will be responsible for domestic sales in the teleconferencing line.

William Hammett and **Harrison Klein** were named managing directors of Hammett & Edison Inc., consulting engineers for broadcasting.

Andreas Koch was promoted from VP of planning to VP and GM at Studer Editech. Also, **Bruno Hochstrasser**, a management board member of the parent Studer Revox AG in Switzerland, was elected to the SEC board as chairman. **Bill Muggler**, financial director of all Studer Revox AG holdings in North America, will serve as president of SEC on an interim basis.

Saul Walker is director of engineering for Otari Corp. after serving as a consultant to Otari for the past 18 months. Walker was instrumental in the development of the Premiere console.

Wayne Jones, founder and former president of Canadian audio test equipment manufacturer Amber Electro Design, has joined Audio Precision. He will be responsible for applications and technical communications.

Anne Wexler was elected director of Comcast Corp., a management and development company for cable, cellular telephone communications, sound and music.

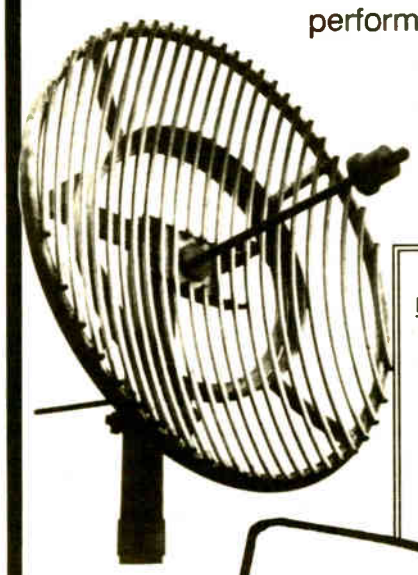
Business . . . **ProMusic Inc.**, is the new agent for Mondiphone music library, offering 14 CDs in a variety of music styles. The ProMusic collection now contains more than 300 titles.

Elite Post of Nashville, Inc. recently added the Studer Dyaxis digital audio production and editing system to its post facility. The company has utilized the workstation on two nationally televised videos, including K.T. Oslin's "Mary & Willie," and Pirates of the Mississippi's "Feed Jake."

The Denon DN-7700R

SCALA

SCALA now offers a complete line of antennas for aural STL/ICR links in the 940-960 MHz band. Since 1954 broadcasters have appreciated the unequalled performance and reliability of the Scala Paraflector™ and Miniflector™ antennas. Now the same Scala quality is available in full parabolic grid antennas from 4 to 12 ft. diameter!



MODEL	GAIN (dBi)	F/B Ratio	FCC Category
PR-450U	20.15	20	B*
PR-450CU	20.15	25	A*
MF-960	16.15	23	B*
GLF4-940	18.5	24	B
GLF6-940	21.9	26	A
GLF8-940	24.5	28	A
GLF10-940	26.5	30	A
GLF12-940	28.1	30	A

*when vertically polarized.

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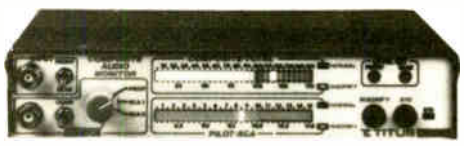
World Radio History

MARKETPLACE

Radio World's Marketplace, a compendium of new and recently introduced radio broadcast products, appears monthly in Buyers Guide.



Composite audio monitor

Titus Technological Labs has introduced a composite audio monitor it calls The Monitor. The unit measures and monitors a stereo FM composite signal, bridging the stereo composite signal output of a stereo generator or a composite clipper, the composite output of a modulation monitor, or the composite output of a stereo FM receiver.

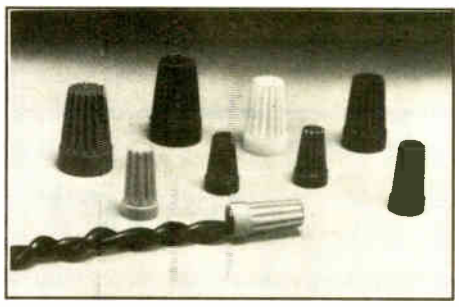
For more information, contact **Larry Titus at 203-633-5472, or circle Reader Service 114.**

Receiver bandpass filter

Optoelectronics, Inc. introduced the APS-204 receiver bandpass filter that separates closely placed radio signals by passing desired frequencies and eliminating interfering signals.

The filter features seamless tuning from 20 MHz to 1000 MHz and constant 4 MHz bandwidth.

For information, contact **Bill Owen at 305-771-2050; FAX: 305-771-2052; or circle Reader Service 61.**

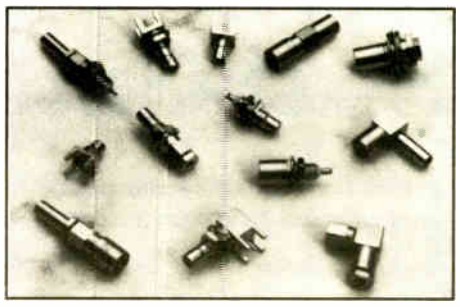


Wire connectors

Eight new P-Conn nut-style wire connectors are available from Panduit Corp. Electrical Group.

P-Conn nut connectors have deep contoured ribs for improved gripping ability and tough nylon housing to resist breakage.

For information, contact **Hans Lustig at 708-990-0220; FAX: 708-990-2556; or circle Reader Service 142.**



Connectors

Applied Engineering Products (AEP) produces SMB, SMC, SMA and microminiature connectors.

AEP also produces 75 ohm connectors. The SMA and SMB connectors are available as surface mountable connectors.

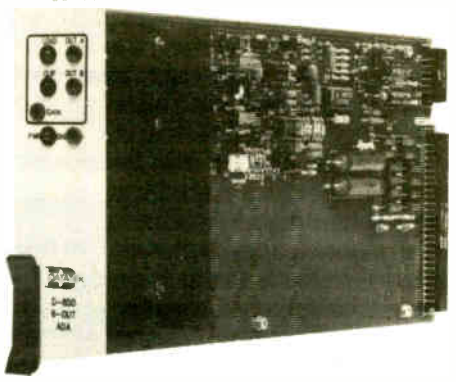
For information, contact **Colin Goss at 203-776-2813; FAX: 203-776-8294; or circle Reader Service 30.**

Audio distribution amplifier

The D-850 audio distribution amplifier from Datatek is designed for use with the D-800 Series 10×1 switching modules. The unit provides six resistive split outputs from a balanced or unbalanced bridging input.

The output level for the D-850 is +28 dBm into a 600 ohm bridging load and +34 dBm into 150 ohm bridging loads. Other features include front panel LEDs, noise level at least 105 dB below maximum output and spring loading connectors on the back panel.

For information, contact **Rick Rainey at 908-654-8100; FAX: 908-232-6381; or circle Reader Service 37.**



Digital audio deck

The DS-DT900N digital audio tape deck from JVC provides accurate synchronization of other equipment by recording SMPTE timecode on the subcode area of the tape.

Other features include XLR analog inputs and outputs, digital AES/EBU inputs and outputs for I/O compatibility, 45-pin parallel and nine-pin serial control ports for remote operation with other equipment.

For information, contact **Matthew Weiner at 201-794-3900; FAX: 201-523-2077; or circle Reader Service 100.**

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POWER TO THE PRESS.

Being the best in broadcast journalism means being the best equipped to gather information. At a press conference, the task of physically gaining access to that information can become an impossible feat for even the most seasoned pro. Whirlwind's PRESSPOWER active press box provides the superior solution.

The PRESSPOWER takes two transformer isolated XLR mic/line inputs and distributes them to sixteen transformer isolated XLR outputs (12 mic/-50dB, 2-line/0dBV, 2-line/variable). Enough so that everyone in the room can get a clean feed. Additionally, a headphone output is provided with a level control. plus, to expedite setup, a 1kHz tone is available.

Powered by four 9V batteries or AC (110/220), the PRESSPOWER can be rack mounted or used with the included carrying case. This makes it ready to go for any situation.

Whirlwind's affordable PRESSPOWER gives you the power to get the news... not waste your time figuring out how to.

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Circle 79 On Reader Service Card

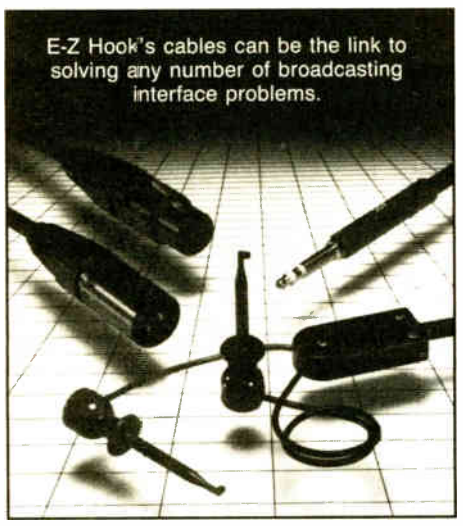
World Radio History

EZ Makes Connections Easy

by Dennis J. Martin
Maintenance Engineer, KBIG-FM

LOS ANGELES The broadcast engineer, perhaps today more than ever, frequently encounters a wide range of dissimilar connectors.

Imagine the challenge of connecting,



E-Z Hook's cables can be the link to solving any number of broadcasting interface problems.

say, a piece of audio test equipment that uses banana jacks, XLR or BNC connectors. At the device-under-test end, we might find a barrier strip or connectors like XLR or phono jacks. Meanwhile, in the studio, patch bays add still more connectors to the growing interface list.

More than a year ago, we began researching sources of cables for some audio test equipment we had acquired. At that time the selection was rather bleak.

Today though, the situation is very different. In response to our inquiry, EZ Hook, a company probably best known for its EZ Hook connectors, has since added a line of pro audio test cables to its catalog. Besides audio patch cords and XLR to XLR cables, offerings now include such varieties as XLR to PJ-310, Bantam and banana plugs, alligator clips and EZ Hooks.

Dual banana

EZ's 130-page catalog contains a variety of specialized cables, including dual banana with separate ground lead for balanced circuits to dual banana, WE-310 phone plugs and alligator clips. As for coax cables, you can choose from RG58C /U, RG59/U, RG62B/U, RG174/U, RG213/U, RG214/U and several others. Coax connectors include BNC, TNC and N.

A common problem for us is identifying which of four test cables is connected to the left or right channel—or the input or output for that matter—of the DUT. EZ Hook, however, offers a simple solution—color coding bands. Supplied as a non-charge option, the bands are available in 10 colors and permit quick visual identification of cable ends.

Sam Wheeler, CE for EZ Hook, explained to me the secret of high reliability. Many of the company's test leads use either a special 22 AWG or 18 AWG wire, he said. Each consists of 65 strands covered with a soft flexible thermoplastic insulation. By having a large number of fine strands, the leads are very flexible and resist breakage.

USER REPORT

Wheeler says that all test cables are constructed from high-quality, long-life materials. EZ Hook's pro audio XLR line uses connectors with strong, integrated strain reliefs and four conductor cable that has a rugged braid shield. The four wires, connected in parallel pairs, improve noise immunity of the cable, he says.

To preserve your test accessory investment, all EZ Hook cables and adapters are designed to be field repairable. Molded parts are screw assembled, allowing easy disassembly, repair, and reassembly.

Custom leads and cables

EZ Hook is one company that cheerfully accepts orders for custom leads and cables. Non-stock lengths and unusual connector configuration test cables can be supplied as special orders without minimum or setup charges or long delays. Few manufacturers today are willing to provide this level of service to low-volume users.

Despite your interconnect quagmire, chances are the exact test cable needed can be supplied from stock or as a custom assembly. EZ-Hook's line of high-reliability products also will increase productivity because you'll be free to troubleshoot equipment instead of intermittent test cables.

■ ■ ■

For information on EZ Hook's line of electronic test accessories, contact Sam Wheeler at 818-446-6175; FAX: 818-446-0972; or circle **Reader Service 56.**

EG&G Presents the FlashGuard Beacon

by Ray Radford
System Development Manager,
Electro-Optics Division
EG&G Inc.

SALEM, Mass. The next time a pilot sees a warning flash from a broadcasting transmission tower, smokestack or other air traffic obstruction, it may be coming from a new warning beacon developed by the Electro-Optics Division of EG&G Inc.

EG&G's new medium-intensity obstruction warning beacon, called FlashGuard 2000, was introduced at the NAB show.

The beacon incorporates a series of technological advances that have made it require less energy and maintenance, thereby reducing continuing costs for the owners of tall obstructions. The unit is smaller than many other warning beacons, to decrease wind stress on the tower on which it is placed; it also emits a narrower beam, thereby reducing ground scatter light.

The FlashGuard also costs less to manufacture and purchase than other strobe-type obstruction warning beacons available.

Radically different approach

EG&G's FlashGuard 2000 beacon is based on a radically different approach (for which EG&G has applied for patent) than the traditional Fresnel lens. The improvements in both design and materials contained in FlashGuard 2000 result in a more efficient and effective light source for day/twilight and night use on towers and other tall obstructions ranging from 200 feet to 1,000 feet. These improvements also translate into lower purchase and operating costs.

The major design change in the FlashGuard 2000 is in the flashhead itself, where a trio of highly efficient linear flashtubes and parabolic reflector assemblies are laid flat in a triangular formation to provide true 360-degree coverage.

TECHNOLOGY UPDATE

The parabolic reflectors tightly focus the light energy and also multiply it—providing a vertical beam spread of only three degrees to five degrees, packed with more than 20,000 candelas of intensity—even though they consume only 160 W for daytime and 30 W for nighttime operation. This compares to 180/50 W for helical flashlamps, and 1,500 W for incandescent beacons with red Fresnel lenses, which are effective only at night.

The use of reflectors rather than a Fresnel lens also enabled EG&G engineers to position the lower edge of the beam to within 0.5 degrees to 1.5 degrees below the horizon to minimize ground scatter light. Reflective optics made it possible to adjust one or all three flashlamp/reflector assemblies easily up or down, to compensate for local terrain

(continued on page 58)

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World Radio History

Italian Antenna Firms Prosper

Co.El., Telesystem, Sira and Others Offer European Design to the Broadcast Industry

by Dario Calabrese

MILAN, Italy The liberalization of the Italian broadcasting industry has given birth in the last two decades to a large number of antenna transmitting manufacturers.

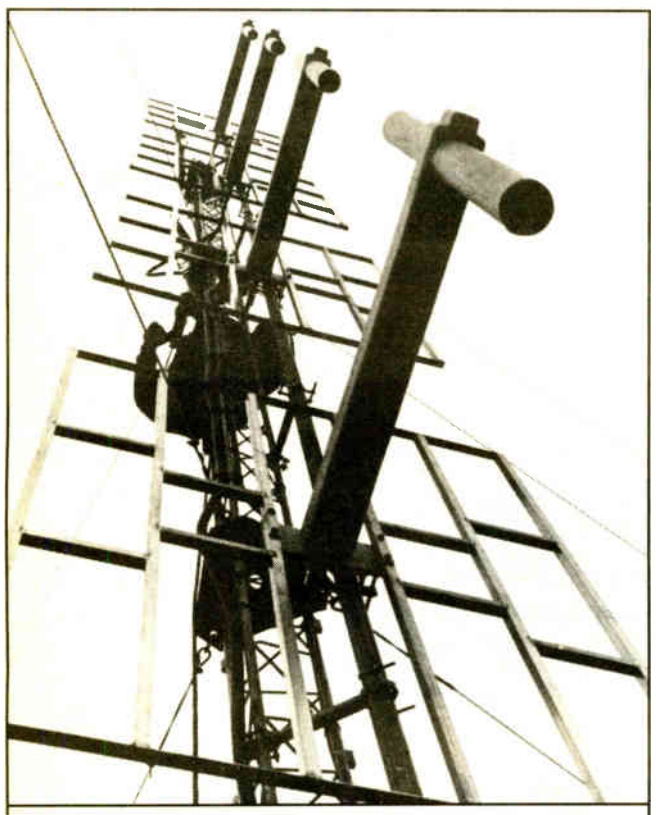
Three companies, Co.El. Spa, Telesystem Srl and Sira Srl, have distinguished themselves by adopting advanced technologies in manufacturing and through widespread use of updated research and development.

SPECIAL REPORT

These three companies are further recognized in Italy for performing acceptance tests at their facilities for all finished products. These tests are conducted in specially built testing grounds with rotating towers to simulate free-space radiation.

Co.El.

The oldest of these three companies, Co.El., is headquartered in the Milanese suburb of Lacchiarella. Founded in 1954, more than 20 years before the liberalization of Italian private broadcasting, Co.El. started building a range of transmitting antennas and accessories. Among the first products were power splitters and combiner filters, mainly for RAI, the government-run broadcasting corporation, then operating as a monopoly.



Panel antennas for FM broadcasting built by Milan's Telecomunicazioni Aldena.

Other customers have since included government agencies and several broadcasters in Eastern Europe and Latin America. When private broadcasting began in Italy in the mid-1970s, Co.El. was reluctant to serve this new market for fear of jeopardizing its good relationship with RAI. However, under the leadership of Marketing Manager Giorgio Curzi, the company began to tackle the domestic market.

Telesystem

A little younger than Co.El. is Telesystem, whose activities started in Arese, a suburb of Milan, in the early 1960s. Telesystem's main market has always been telecommunications, of which broadcasting antennas were a byproduct.

While both Telesystem and Co.El. supply transmitting antennas to RAI exclusively, Telesystem, unlike Co.El, has not given much attention to the broadcasting market, until recently.

At present, Telesystem is negotiating an agreement with a major Italian manufacturer of transmitting equipment for exclusive distribution of its products into the domestic and international broadcasting market.

Sira

The third company, Sira, was founded in 1977, in the Milanese suburb of Caponago. Vittorio Raviola and Ermenegildo Ventura, now respectively president and vice president, started the company at the peak of the private broadcasting sectors expansion. Its specific purpose was as an antenna supplier to the more quality-sensitive among the country's private broadcasters.

Currently, Sira invests more than 30 percent of its income annually in R & D and has expanded abroad. More than 60 percent of its sales come from exports to more than 40 countries worldwide.

Among Sira's most significant installations was an antenna supplied to Kuwait at the end of 1988. This radiating system, subsequently destroyed during the Gulf war, had an E.R.P. of 8,000 kW on each of its two UHF channels and of 1,000 kW on each of its two VHF channels, boasting the highest transmitting power in the world.

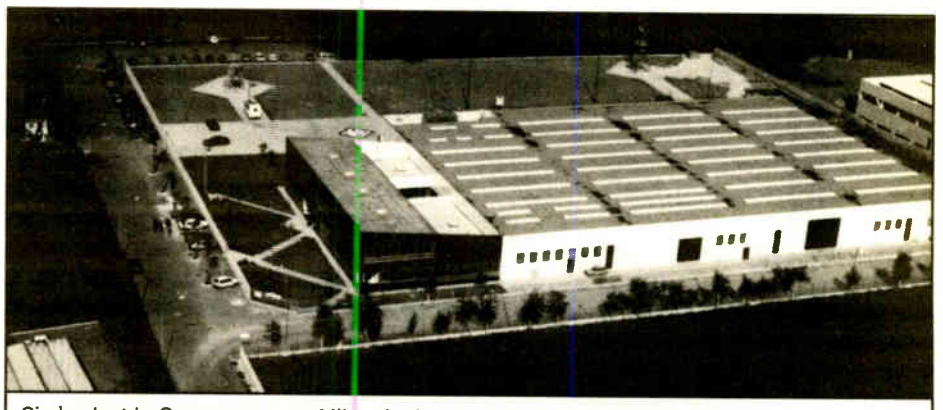
Other antenna transmitter manufacturers on the scene in Italy include DB, Tirrel and Telecomunicazioni Aledna Srl. Their testing generally consists of computer simulation using mathematical models, rather than on-site evaluations.

Manufacturers

DB manufactures a wide range of transmitting equipment, while Tirrel, based in the Southern region of Calabria, has been purchased by Itelco, one of Italy's largest manufacturers of transmitters.

However, Telecomunicazioni Aldena Srl is one of the more prominent among Italian companies that uses simulated rather than actual testing sites.

Telecomunicazioni Aldena Srl dates back to the mid-1950s, when Lionello Napoli started it as a small manufacturing outfit of receiving antennas for RAI's fledgling TV service.



Sira's plant in Caponago, near Milan. In the upper part of the picture, the testing ground with its two rotating towers.

In 1975, when private radio and TV broadcasting started, Giuseppe Napoli, Lionello's son and present owner of the company, converted it to a manufacturer of TV and FM transmitting antennas.

In addition, Aldena has recently started supplying a line of software packages devoted to the design of optimized radiating systems. The software programs can run on any IBM-compatible PC and are available in Italian, French and English.

■ ■ ■

For further details from Telecomunicazioni Aldena Srl, contact: via Civitali, 47 I-20148 Milan, Italy, or call at telephone: +39-2-48705940; FAX: +39-2-48700422.

For further details from Co.El. Spa, contact: via A. Gramsci, 23/25 I-20084 Lacchiarella-MI, Italy, or call at telephone: +39-2-9008029; FAX: +39-2-9008242.

For further details from Telesystem Srl, contact: via Campo Gallo, 9 I-20020 Arese-MI, Italy, or call at telephone: +39-2-9380875; FAX: +39-2-93580453.

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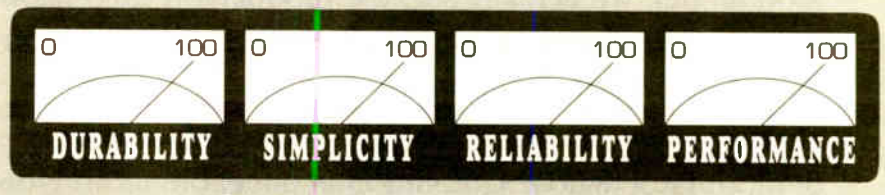

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Circle 129 On Reader Service Card

World Radio History

Cortana Scares Away Lightning

by Clifford W. Koch
Corporate Engineer,
Great Empire Broadcasting

WICHITA, Kan. A broadcast facilities engineer is never sure of adequate lightning protection for FM antennas, transmission lines, transmitters and associated equipment such as STL antennas that are mounted on towers.

We at Great Empire have found good fortune with Cortana protectors, including Crows Nests at the top of the tower and Stati-Cats on the side of the towers.

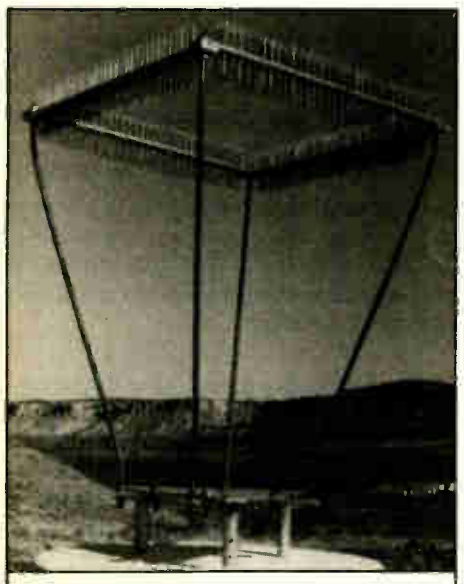
The protected tower must have a path to ground at the bottom end of the tower. For grounded towers supporting FM antennas, this is not a problem. Towers used as AM radiators use the static drain coils and lightning chokes for the ground, which does not affect operation of the AM antenna.

USER REPORT

The first Cortana system we installed was on a 1,154-foot, above-ground antenna. The tower face was five feet wide. The top 80 feet were reduced to a 24-inch wide face to support the antenna of KFDI-FM. Two other FM stations leased space lower on the tower, where the face was five feet wide.

A Crows Nest was installed at the top of the 24-inch face, while a Stati-Cat was placed where the tower changed size to five feet wide above the leased space. Another Stati-Cat was installed below the leased space.

We did experience some lightning



The Stati-Cat was installed on three faces of a Great Empire station's antenna.

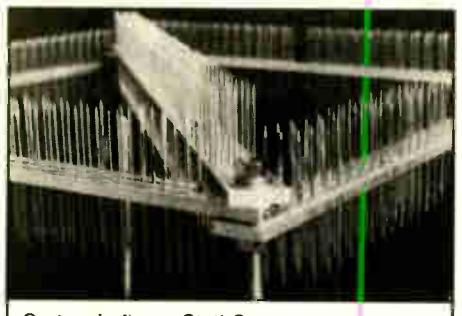
strikes—not at the top of the tower, but lower when lightning would strike from the side. We reviewed the installation with Cortana engineers, who advised that the protected area of the five-foot face should have a Stati-Cat installed on all three faces of the tower. We installed two Stati-Cats with the existing ones and have not experienced any damage since installation.

Cortana protection devices for FM towers have been installed at KWKH-FM, WOW-FM and KTTS-FM. We have experienced no damage at any of these facilities.

The most dramatic example of the value of protectors I have encountered occurred at KTTS-AM in Springfield, Mo. The 1 kW AM facility operated on 1400 kHz, employing a 180-foot, above-ground tower with a Harris SX-1 transmitter. Whenever a storm would approach, the SX-1 would trip off and on.

The transmitter control circuitry would keep a tally of the number of times it would trip off. Most storms would trip the transmitter off momentarily as many as 15 to 25 times.

I installed a Cortana Stati-Cat at the



Cortana's fierce Stati-Cat.

top of the 180-foot tower and we did not experience any more trip-offs due to storms for the next three years, after which Great Empire sold the station (KTTS-AM now is a 5 kW facility operating on 1260 kHz).

Tall towers with long upper guy cables may still need resistors across the guy cable insulators for lightning protection to work efficiently.

Lightning protectors may not be 100 percent effective, but on our towers, it has saved us, and those that lease our tower space, many thousands of dollars.

■ ■ ■

For information on Cortana antenna protection products, call Evelyn Nott at 505-325-5336; FAX: 505-326-2337; or circle **Reader Service 11.**

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Circle 111 On Reader Service Card

World Radio History

Nott Unipole Kit an Ally for AM

by Mark Persons
Broadcast Engineer
M.W. Persons and Associates

BRAINERD, Minn. As a long-time broadcast engineer, I had always believed that AM antennas, by their nature, could not be redesigned.

This, despite the fact that there have always been series-fed towers with base insulators and a few (very few) old slant wire shunt-fed towers that didn't seem to work as well as they should.

But in the Spring of 1987, I saw a unipole on a tower at WEUZ in Eau Claire, Wis. The station engineer reported an increase in antenna efficiency when the unipole was installed.

Bear in mind that the ground system at this station is fair at best and the unipole probably brought the efficiency up from where it was to where it should have been. The station's unipole is a six-wire feed. The tower base insulator has a copper strap across it.

The feed wires are insulated from ground at the bottom. There are tensioning springs and turnbuckles to keep the wires tight at all times.

USER REPORT

Fiberglass rods at about 30-foot intervals keep the wires from swinging in the wind. A horizontal wire connects the bottom of each wire near the base of the tower to the other wires, and to the antenna coupling unit.

The station's audio quality was improved, but a year later I was called in to broadband the antenna coupling network. The results were excellent.

With a few component changes, the input to the antenna coupling network varied only 0.2 ohms in resistance and reactance from 50 ohms zero reactance at 10 kHz each side carrier. That is a VSWR of 1:1.003 and is the best I've ever seen.

I am sold on AM unipoles and Nott, Limited's unipole kits. In fact, I recommend them for any facility changes. The cost of the base insulator, which is no longer required in a unipole installation.

My evaluation is that while unipoles are not necessarily broad in nature, they give more opportunities to get a good broadband match. You have the ability to set the feedpoint impedance by moving a commoning ring up and down. The ring is typically 60 degrees above the base of the tower. The ring connects all skirt wires together and to the tower. Sixty degrees gives about 50 ohms impedance.

Connecting the skirt wires to the tower at this height does not mean the top of the tower is no longer in use. The entire tower continues to radiate the signal with full efficiency. Sixty degrees of electrical height can be anywhere from 102 feet at 1600 kHz to 303 feet at 540 kHz.

Some broadcast engineers set the commoning ring closer to 70 degrees, where the feedpoint reactance is zero. This can be easier to broadband although the feedpoint resistance will be 100 ohms or more.

When the feedpoint impedance is exactly 50 ohms, it is easy to use a capacitor in series with an inductor to zero out the inductive reactance of the antenna. However, there is no control of the exact resistance the transmitter will see, short of adjusting the commoning ring up and down on the tower.

I like to set the feedpoint resistance to something close to 50 ohms and then use a three-coil antenna coupling network to provide the best match at carrier and at the sidebands.

So far, I have installed Nott, Ltd. unipoles on two non-directional antennas. One was with a three-coil coupling network and the other with a series capacitor. Both work exceptionally well.

I built a two-tower directional with a unipole on one tower, which formerly was an FM-only tower. (Yes, that's right, they finally got around to adding AM to their FM station.) I also installed a unipole as a de-tuning device on a new tower that was causing re-radiation problems to an AM directional a mile away.

It was really fun to watch the re-radiated signal get through a null when the capacitor at the base of the unipole was adjusted. The tower virtually vanished electrically and stopped causing problems to the directional.

Three-wire unipole skirts are the most common. Six-wire unipoles, I understand, have slightly better efficiency with a much higher parts cost.

When I first became interested in unipoles, one of my biggest concerns was stability in wet and icing conditions. There have been no apparent problems of this kind reported to me in our harsh Midwestern climate.

Ron Nott did a good job putting together the unipole kits. The only problem I have had is giving him the exact tower dimensions so that his company could fabricate the parts. If you are looking to purchase a unipole kit, I recommend you carefully measure tower leg diameter—leg center-to-leg center face size. You can't do this accurately if the tower is hot with RF. You must shut the transmitter down and make careful measurements.

The only unipole I haven't yet tried is one where two AM stations share the same tower. A typical scenario would have three skirt wires for each station with its own commoning ring to independently set the feedpoint impedance for each station. Ron assures me this can be done, and it looks like I'll get a chance soon to install and tune one.

■ ■ ■

For information on Nott Ltd. products, contact Ron Nott at 505-327-5646; FAX: 505-325-1142; or circle **Reader Service 3.**

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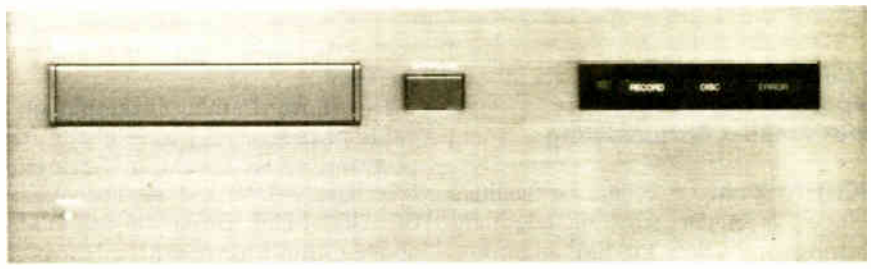

Yamaha's YPDR601

(continued from poge 50)

cated its CD-R would only be in prototype at NAB, actually announced a production-ready version, the YPDR601.

It also is a write-once unit, but can be partially recorded and played back within the unit before the entire disc is full. The YPDR601 also can record five-inch and three-inch discs. Digital input/ouput is possible via AES/EBU or SPDIF.

Yamaha also offers the RC601 remote controller, capable of controlling seven YPDR601s simultaneously.

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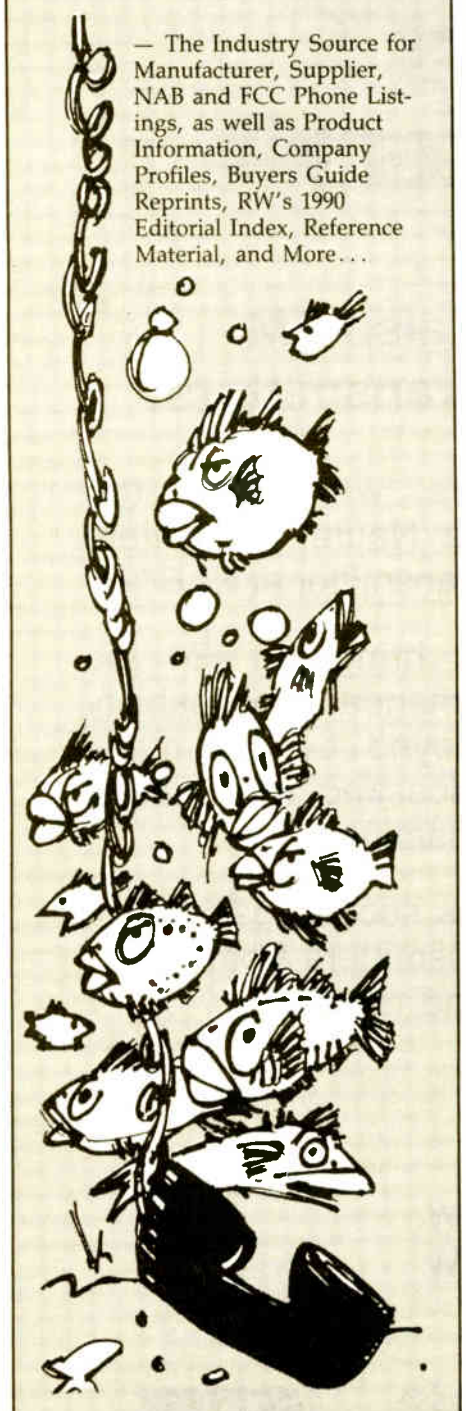

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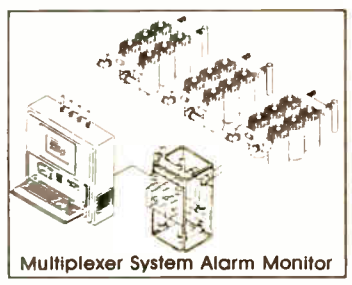

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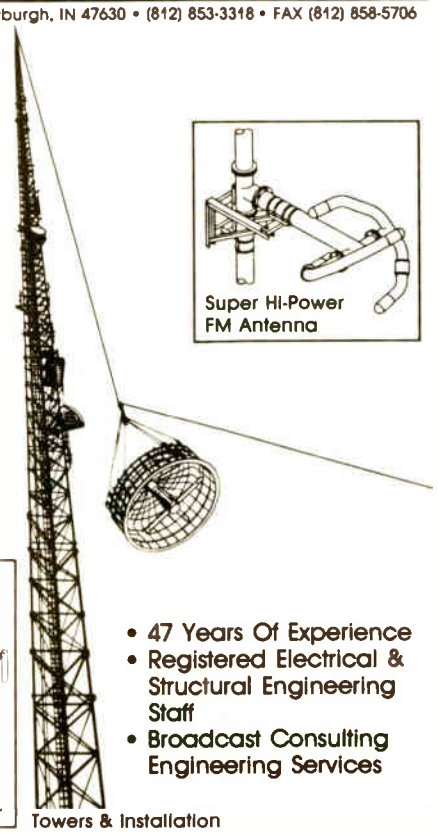

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World Radio History

Choosing Tower Ice Protection

by Thad Jones, President
Environmental Technology Inc.

SOUTH BEND, Ind. Antenna icing potentially can cause both transmission and mechanical problems. Depending upon the antenna design, ice buildup increase the VSWR and ultimately, the VSWR may increase to the point that the transmitter trips off the air to protect itself.

SPECIAL REPORT

Mechanical problems include antenna and related structural damage caused by weight and vibration. Clear ice resulting from freezing rain can spark weight increases, exceeding the structural strength of either the antenna or its components. Milky white rime ice accumulates in irregular shapes and disrupts the wind flowing around the antenna, resulting in vibration. The cyclic stress from the vibration causes antenna components to fatigue and fail prematurely.

At temperatures between 20 degrees and 32 degrees Fahrenheit, and sometimes as low as 0 degrees, water droplets remain liquid in a so-called supercooled state. As these droplets strike the antenna, they instantly turn to ice.

De-icing techniques

Several de-icing techniques exist for antennas susceptible to icing. Currently, most de-icing systems employ electric heat. A well-designed electric system offers the advantages of low initial and operational costs, while providing reliable antenna operation during icing conditions.

Since the 1960s, experiments have been conducted with ablative coatings for anti-icing. These coatings reduce the band strength between the ice and the structure. The lack of strength causes the ice to slough off the structure. Great expense and short service life currently characterize these coatings. When perfected, they could offer the greatest potential for the tower structure.

Without automatic controls, the operating costs for electric heaters can be as much as three dollars an hour. Using this as a basis, operating a heater from October through March costs around $10,950 annually. Using a typical electromechanical thermostat reduces this amount by about 40 percent to $6,750.

Operating costs for manual heater operation vary between continuous operation during the icing season and thermostatic control. Station personnel often forget to turn off the heaters when no longer needed.

Using an automatic control sensing icing conditions reduces operating time to approximately 250 to 400 hours annually. Assuming the higher figure, annual operating costs become $1,200 per year.

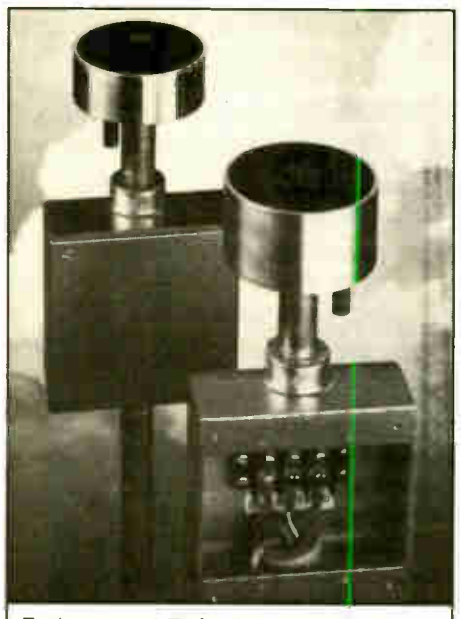
Effective automatic control requires minimizing operating costs without sacrificing antenna performance. This requires that heaters operate immediately upon detection of icing conditions. Allowing any ice accumulation may make a VSWR transmitter trip inevitable since it takes time for heaters to reach an effective de-icing temperature. Heater operation must continue until complete de-icing.

In addition to operating the heaters when required, the automatic control must survive its environment. Hazards include falling ice and the electromagnetic pulse created by lightning strikes in the vicinity. Tower mounted apparatus must be simple to install and check since riggers have little or no electronic training. The cost of climbing a tower makes reliability imperative.

Control systems

Two automatic control systems currently are available to broadcasters. One senses icing conditions and the other detects ice. Both provide a hold-on time that continues de-icing to ensure completion.

The ice detector employs a resonant vibrating reed. Sufficient ice forming on the reed causes a measurable frequency shift. The reed must be exposed to atmospheric conditions in an unprotected manner to detect ice. An auxiliary electromechanical thermostat prevents the ice detector from functioning at temperatures too high for antenna icing.



Environmental Technology manufactures a number of ice-deterring weapons for broadcast antennas.

The icing condition sensor employs a heated moisture detection grid and precision electronic thermostats set at 38 degrees and 0 degrees F. Precipitation occurring between these two temperature limits indicates icing conditions. This product resists lightning's electromagnetic pulse and the damage caused by falling ice.

Transmitting antennas for FM and TV broadcasting employ mineral insulated heaters. These employ magnesium oxide as an insulator, which readily absorbs moisture. A leak as small as a pinhole in the heater's jacket causes moisture saturation of the magnesium oxide during the summer months.

When this occurs, a large ground fault current flows during the first application of power during de-icing season. This boils the water in the heater, thus causing its catastrophic failure. Operating the heater for a few minutes every so often year-round keeps the insulation dry, extending heater life.

Sensing ice or icing conditions is the key to energy savings. The choice of technology depends upon important considerations including reliability, ease of installation and resistance to environmental hazards, including falling ice and lightning and other features.

■ ■ ■

Thad Jones is president of Environmental Technology Inc., which specializes in element protection devices. The company manufactures the APS-3MI control panel, which, used with a CIT-2TV sensor, operates heaters throughout the year to keep their insulation dry. Contact the company at 219-233-2152; FAX: 219-233-2152; or circle **Reader Service 96.**

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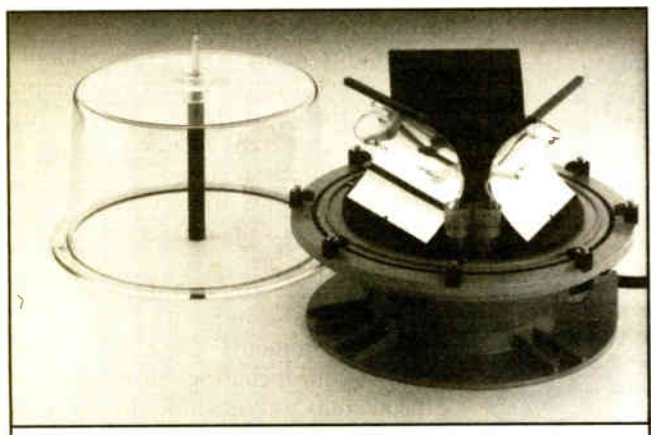
World Radio History

EG&G's New Beacon: The FlashGuard 2000

(continued from page 52)
and obstacles.

These special EG&G quartz flashlamps do not produce UV light or ozone and are series-discharged, all of which eliminates corrosion and degradation.



EG&G's FlashGuard 2000 requires less energy for effective obstruction warning.

Because the beam is focused by these small internal reflectors, the FlashGuard 2000 was designed with a low-profile, clear acrylic cover that is less expensive to replace than a Fresnel lens.

Reduced wind stress

The entire omnidirectional flashhead assembly—with its trigger initiation transformer, safety interlock switch and acrylic cover—projects a surface of only 1.28 square feet, resulting in dramatically reduced wind stress on the tower.

Even the new protective cover itself is an advance. It is made of an advanced acrylic material that is stable to a temperature 60 degrees higher than Fresnel-type lens. It also is unaffected by UV light, ensuring long-term optical clarity. The protective cover's compact size also makes it a smaller target for gun enthusiasts than Fresnel lenses.

Other improvements flowed from the radically different beacon design. For example, the flashhead base is molded from glass-reinforced resins, selected for its load bearing capacity and impact strength. The power supply, encased in 304L stainless steel, is particularly suited to resist severe corrosive conditions.

The FlashGuard 2000 is equipped with EG&G-designed and manufactured linear quartz flashlamps and trigger initiation transformers. It also comes with one of several power supplies providing AC or DC input at a variety of input voltages, for use worldwide.

Every FlashGuard 2000 component and final assembly is tested electrically and optically to ensure compliance with all Federal Aviation Administration specifications for performance and reliability. A certificate of compliance with FAA specifications will be issued with every system shipped.

The sum total of these improvements in design, materials, reliability and performance is, quite simply, that FlashGuard 2000 represents an entirely new generation of obstruction warning beacons.

■ ■ ■

For information on the FlashGuard 2000, contact Ray Radford at EG&G at 508-745-3200; FAX: 508-745-0894; or circle **Reader Service 50.**

BUYERS BRIEFS

Innovations in Antennas, Towers & Cable

ORLAND PARK, Ill. Andrew Corp. now has available riser-rated, fire-retardant versions of its Heliax coaxial cables. The cables are permitted by the National Electrical Code to be installed anywhere within a building, except in ducts, plenums and other air-handling spaces. They are U.L. listed as Type CATVT.

Sizes range from 3/8-inch to 1 5/8-inch for foam dielectric types and 1/2-inch to 2 1/4-inch for air dielectric types. Superflexible foam Heliax cables are offered in sizes of 1/4-inch and 1/2-inch.

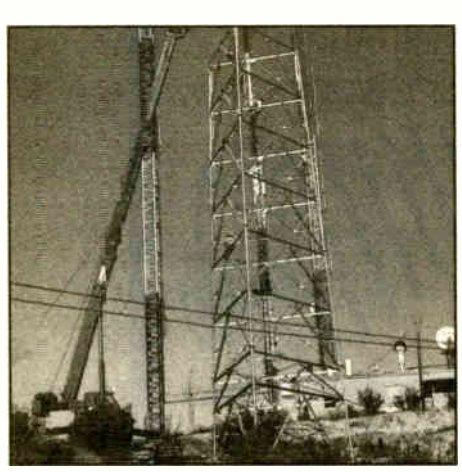
For information, contact Don McSherry at Andrew: 708-349-3300; FAX: 708-349-5943; or circle **Reader Service 104.**

ORRVILLE, Ohio Will-Burt's 25-foot Hurry Up telescoping mast is designed for fast and easy deployment of lightweight antennas and instruments. The portable 27-pound mast can be used to elevate Marti and Yagi antennas weighing up to 20 pounds.

The Hurry Up consists of six graduated aluminum tubes nesting one inside another. The mast is extended manually by pushing up the sections and fixing them in position using quick lock/release collars.

It can be extended to its 25-foot height in one minute or less, the company said. The mast is freestanding, without guywires. Cost of the mast with mounting stand is $1,100.

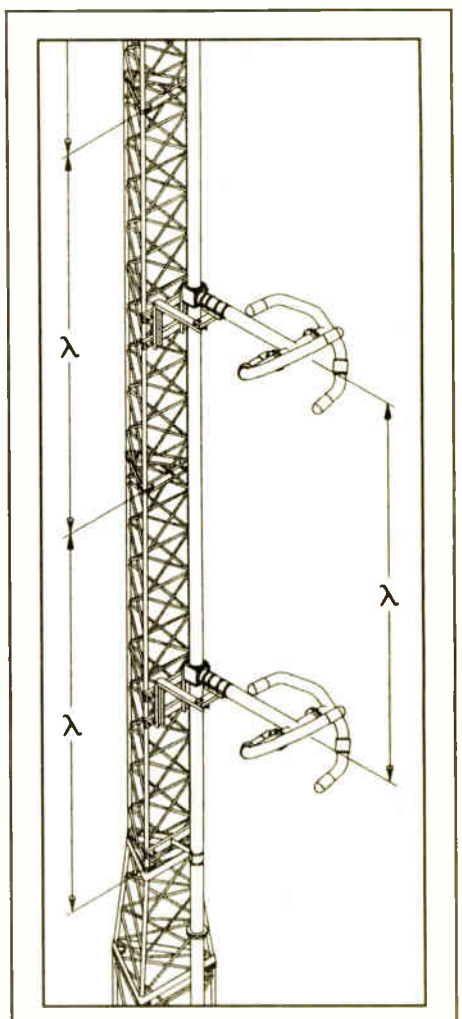
For information, contact Don Barlow at Will-Burt at 216-682-7016; FAX: 216-684-1190; or circle **Reader Service 86.**



OLDSMAR, Fla. SG Communications installs foundations, erects self-supporting and guyed towers and installs all types of transmission lines and antennas.

SGC also provides turnkey antenna and transmission line replacements and the refurbishment of existing antennas.

For information on the company's tower and related services, call Thomas Leschak at 813-855-6669; FAX: 813-854-2263; or circle **Reader Service 13.**



NEWBURGH, Ind. Electronics Research Inc. (ERI) has introduced Lambda antenna mount sections to accompany ERI antennas or any other antenna equipped with flange connections.

The mounting section combines the technology of both electrical and structural engineering with a tress-frame structure—similar to an antenna pole, but at about half the weight and two-thirds the wind load. The Lambda section's overall length is equal to the wavelength of the specified frequency and every section is completely symmetrical relative to the antenna element's mounting position.

Also new from ERI is its Model 1090 FM panel antenna system, with total power handling capabilities of 60 kW per level and 150 kW per system.

ERI designed the 1090 with the technology gained from large, more expensive systems, yet targeted it—and priced it—for medium and small radio markets.

For information on ERI products, contact David Davies at 812-853-3318; FAX: 812-858-5706; or circle **Reader Service 71.**

ADVERTISER INDEX

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Page No.	Advertiser	Reader Service No.
41	360 Systems	53
42	A/V Technology Int'l Inc.	36
39	Acoustical Solutions	69
39	Air System Technologies	64
7	Altronic Research	72
7	ATI	32
20	Audio Animation	55
27	Audio Broadcast Group	15
8	Audio Precision	68
39	Audiomedia Associates	95
11	Audiopak	107
16	Auditronics	44
39	Avcom of Virginia	113
40	Belar	126
41	Bext	97
1	Broadcost Electronics	80
21	Broadcost Services	103
38	Broadcost Devices	109
4	Burk Technology	116
39	Cartwright Communications	83
46	CCA Electronics	29
49	Central Tower	39
17	Computer Concepts Corporation	54
50	Conex	66
3	Continental Electronics	138
9	Corporate Computer Systems	24
24	Cortana	19
3	Crouse-Kimzey	25
25	Cutting Edge	127
24	Dataworld	58
44	Dataworld	21
8	DIC Digital Supply Corp.	27
15	Dolby	41
51	Econco	119
19	Eela	141
38	EG & G Electro-Optics Division	140
52	Ellason Weather Radar	150
56	ERI	47
29	Fidelipac	23
39	Flash Technology	87
38	Gerstman Software, Wireready Division	153
10	Gorman Redlich	5
37	Hall Electronics	67
10	Harris-Allied Bdct Equip	-
6	Harris-Allied Bdct Equip	9,77
24	Harris-Allied Bdct Equip	8,101
44	Harris-Allied Bdct Equipment/Audiopak	7,85
53	Harris-Allied Radio RF Equipment	84
52	Ice Krackers	22
57	Intraplex	136
17	ITC	124
36	ITC	33
46	J Squared Technical Svc.	51
33	J.N.S.	112
19	Jampro	14
38	LDL Communications	62
33	Logitek	40
42	LPB	89
23	Microwave Filter	28
54	Modulation Sciences	129
34	Myat	88
55	Nautel	111
38	Nott, Ltd.	16
57	Omega Studios	17
32	Orban/AKG/dbx	122
48	Otori Corp	92
45	Pacific Recorders	45
18	QEI	34
47	Radio Systems	118
35	Ramko Research	74
12	Rohde & Schwarz	91
28	Rohn Towers	146
27	Russco Electronics	131
39	S.W.R.	42
50	Scala Antenna	52
38	SG Communications	26
39	Shenandoah Tower Service	10
14	Shure Brothers	73
30,31	Shure Brothers	82
26	Smarts Broadcast Systems	70
13	Studer Revox	20
28	Studer Revox	38
22	Symetrix	121
37	Tascam	2
38	Telos	4
11	Tenco Towers	81
39	The Management	12
38	Titus Technology Labs	90
49	TTC	110
36	Valley International	117
2	Wheatstone	60
59	Wheatstone	144
60	Wheatstone	94
51	Whirlwind	79
12	Will-Burt	35

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Wheatstone's **Bright Idea!**

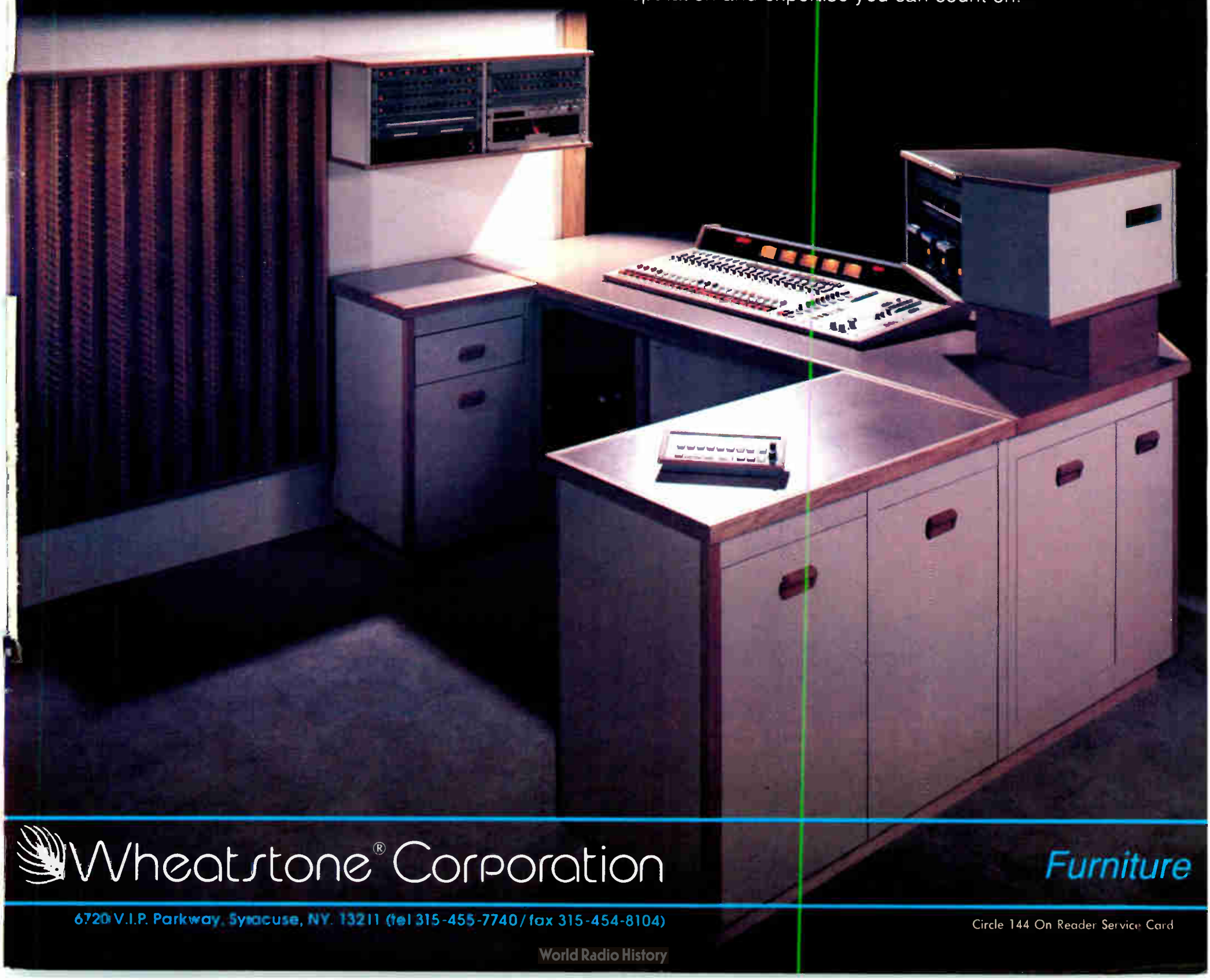
Just When You Thought All Furniture Was Alike

We've wedded the latest precision NC metal components to high grade solid wood trimmed laminated panels and counter surfaces. Added to this design breakthrough is the implementation of true 1-1/2" thick counters and vertical structural panels that put an end to warping, racking and delaminating problems. What's more, our wood trim comes flush to the counter surfaces to eliminate exposed laminate edges (so tempting to idle hands). In fact, the counters are separately trimmed to eliminate unsightly and short-lived formica seams.

Naturally, with all of our experience at building and interfacing consoles, we've worked out the details: like convenient hinged down punchblock panels for easy installation and maintenance, really generous cable pathways between enclosures, and equipment turrets with both back and side door access. Our rackmount base cabinets have mounting rails on both sides, so equipment can be mounted any way desired or even switched at a later date. Concealment doors can be placed on cabinets intended for future electronic installation. Continuous length floor risers assure even cabinet-to-cabinet alignment. We've even included heavy duty ground bonding terminals.

This furniture family is complete, with both stand-up and sit-down versions, angled equipment turrets in two heights (with or without risers), concealed, fully isolated turntable cabinets, auxiliary wallmount equipment cabinets, wall and cabinet mount cart and CD storage, utility and file cabinet pull-out drawers, reel-to-reel tape deck mounts, interview counters—practically anything you can imagine. With this much variety, Wheatstone's rock solid construction and major market look, there really is no comparison.

So contact Wheatstone, the people with the reputation and expertise you can count on.



Wheatstone® Corporation

Furniture

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The Closer You Get...

We Mean It—we really DO provide the quality. performance. technical support. and innovation we promise!

Our model A-500 is a thoroughly engineered on-air console: it delivers the level of performance your clients now expect. and DAB demands. All components are selected for long life—gold bus connectors. gold I O connectors. all gold contact switches. gas-filled relays. triple burned-in integrated circuits. solid state ON OFF lamps. and precision laminated Lexan control surfaces for a lasting. wearproof finish. And we back that up with a 3-year parts and labor warranty. complete with factory support from a technically competent and responsive staff.

We've also handled your special requirements as well with a super family of accessories. including a choice of three different telephone modules. an intercom module. an off-line mixer module for your remote feeds. talent control stations. accessory panels. failsafe power supplies. and auto cart and CD sequencing options.

So take a close look: we've got the quality. we've got the innovations. and you've got our commitment to top-notch support.

The Better We Look!

A-500

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