

Radio Guide

Radio's Technology Magazine

April 1992



Station Stories

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*WXTU-FM
Goes Upscale*

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WARC Tells DAB: Go to "L"

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The Tech-Tipster Returns

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Reader Service #001

World Radio History

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Reader Service #002

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The Guide is Back, and We're Counting On You to Help!

By Ray Topp, publisher



We're back!

And with an all-new staff ready to continue the traditions of **Radio Guide**, as well as introduce a few editorial changes.

We welcome Judith Gross as the new editor of **Radio Guide**. Judith has established herself as a well-informed and effective radio broadcast industry journalist. Here at **Radio Guide**, she will continue to report on the latest radio trends and technical topics. In addition, Judith will help us to establish innovative technical content and direction.

Expansion continues with the addition of Art Constantine as the sales and marketing VP of **Radio Guide**. We are also pleased to announce the addition of George Whitaker as tech-tip editor, Scott Fitzpatrick as Washington Bureau Chief, and Steve Schrader as Radio Guide BBS sysop and columnist.

A Technical Foundation

The entire radio industry is based on the foundation of technology. Nothing else matters much if that support system is taken away or fails to function properly. Opinions and perceptions always vary, but one fact remains: If your technical plant is not in order, then you will always be operating from a deficient position - playing catch-up - no matter how hot your "morning team" may be. **Radio Guide** is here to help you create and maintain your technical facility in the best shape possible.

While **Radio Guide** will not deal with sales, programming or operational topics, we will offer FCC information as well as industry and product news of specific interest to our readers. Even with all of the changes we have in store for you, the pages of **Radio Guide**

will continue to provide the technical articles and tech-tips that you have grown to expect and enjoy. In fact, with the addition of George Whitaker (KSSA, Dallas) as tech-tip editor, we will be expanding this section of **Radio Guide** to the extent made possible by your contributions.

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On pages 19 and 21 you will find all you need to know to take advantage of this industry's most advanced and timely classified ad system.

OK Readers ... Your Turn

Radio Guide's new look is a perfect opportunity for you to make your contribution or let your voice be heard. Maybe you have your own experiences to share in a feature article. Or perhaps you just have a clever tech-tip or two to share with your engineering colleagues. Just want to sound off about something that concerns you, or heap praise for something you're pleased about? How about a letter or a guest commentary?

Radio Guide is your publication, so let's hear from you. Contact Judith Gross if you've got feature-length ideas; George Whitaker with your Tech Tips and me with your letters. Won't it feel great to help someone else solve a problem you've already grappled with? **R.T.**



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Reader Service #003

FCC Eases Ownership Rules

By Scott Fitzpatrick, Washington Bureau Chief

Forget about the 12-12 cap on radio station ownership; in a world where half the stations in the country lost money last year and where LMAs are becoming routine, all bets are off.

Thus the reason why the FCC, without an audible squeak from Congress, managed to raise ownership limits this spring. The body of five, with vocal protest from only Andrew Barrett, now says a single owner can have up to 30 AMs and 30 FMs for a grand total of 60 radio stations overall.

Duopoly rules also fell by the wayside. Depending on the number of stations in a market, a single owner can own more than one AM and FM now. For markets with fewer than 15 stations, an owner can have three stations, no more than two of them FMs, with the total for one market less than 50% of the stations in the market. It goes up from there until in the largest markets of more than 40 stations, a single owner can have three AMs and three FMs as long as the total stays below 25% of the market.

For time-brokering, or LMAs, the Commission said that the station doing the brokering will be seen as an owner in the brokered station. This means that if a station owner has already met the ownership cap for a market (or overall) an LMA agreement is out of the question.

As for simulcasting programming between LMA'd stations, it depends on whether or not the two stations signal overlap. If they do by more than 50%, program simulcasting can only be done 25% of the time.

Quello Says Reduce Fines, Speed Up DAB

As another way to ease up the burden on radio, Commissioner James Quello penned a memo of his own to FCC Chairman Al Sikes. The Quello memo was in answer to a request from Sikes to all Commissioners on suggestions for relieving regulatory burdens.

Quello questioned whether it is necessary for the Commission to levy fines that are six times or more the base amount in order to force compliance with FCC Rules.

Quello also singled out DAB for special consideration, saying that a proceeding should be started to establish DAB service and urging quick action in exploring both terrestrial and satellite DAB. (For more on DAB, see *DAB and New Technology*, this issue.)

The Quello memo also questioned the Commission's role in protecting competitors from services provided by AT&T and urged that both lottery proceedings and MMDS applications be speeded up. It also asked the Commission to root out spectrum violators.

Court Refuses To Hear Indecency Ban

There won't be a 24-hour ban on indecency over the airwaves, now that the Supreme Court has refused to review the government appeal of a lower court ruling. The lower court had ruled that a 24-hour ban on "indecent" programming violates freedom of speech.

The Bush administration had backed the ban, originally proposed by Senator Jesse Helms in 1988. Currently, indecent programming which is not legally obscene, but contains "patently offensive" descriptions of "sexual or excretory activities or organs" is allowed from 8 PM to 6 AM.

Only two judges agreed to hear the case (a minimum of 4 is required). Judge Clarence Thomas, who served on the appeals court that struck down the ban, also refused to revisit the case.

Appeals Court Overturns Gender Preferences

Judge Clarence Thomas' trouble with women may not be over yet. He wasn't yet appointed to the Supreme Court when he wrote the majority opinion for the U.S. Court of Appeals

decision striking down the FCC's policy of awarding preference to female applicants for licenses.

The case involved a new station application in Middletown, MD and ended in a split decision. The Commission is deciding whether or not to appeal. If it does, it would go to the Supreme Court, where the FCC's minority preferences were upheld in a test two years ago. Since that time, however, David Souter and Thomas have joined the conservative majority on the Court.

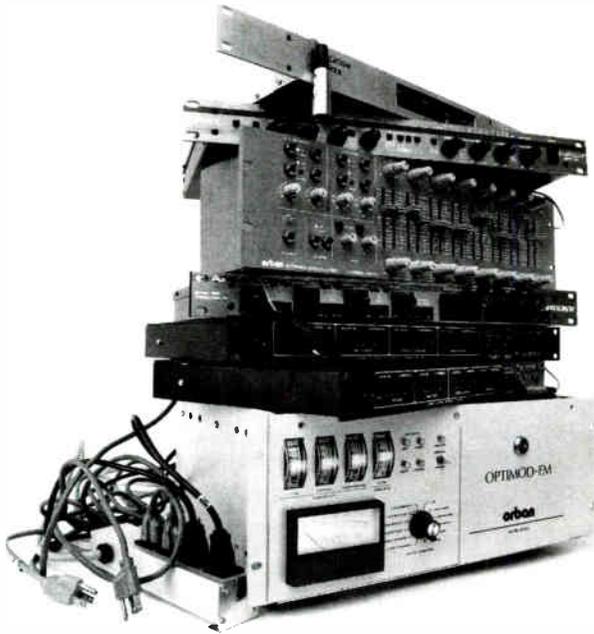
LMAs Only in 6% of Stations

The FCC's recently completed survey of the extent of local marketing agreements (LMAs or time brokerage) showed that of the 284 stations surveyed, only 17 (nine AM and seven FM stations) had engaged in time brokerage. The report was immediately criticized both for the smallness of the sample and the apparent prevalence of small market stations in the survey.

The survey was based on a random sample. Three of the stations were broadcasting programming by another station in the same service and serving the same area. Two carried programming from stations outside their market and 12 of the 17 carried programming supplied by a source not associated with a radio station. Recent legislation proposed by Rep. John Dingell would limit stations to selling no more than 25% of their air time.

Few Tears Shed as FCC Move Derailed

The much-maligned move of FCC headquarters to brand new housing at the Portals, a newly developed complex on the other side of town from its current quarters, was put to rest last month as the General Services Administration cast aside its selection of its development and started the process anew. ■



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WARC Tells DAB: Go To "L"

by Judith Gross, editor

Yessiree...Samurai Wiseacre rides again! I told you I wouldn't be gone for long. But while I was snoozin', all kinds of insanity has been brewing.

It was chaos in paradise there for awhile. We're talking, of course, 'bout sunny, idyllic Torremolinos, Spain, the WARC gathering, where it must have been something in the water, or maybe it was that Spanish sherry. First, it looked like there might not be a DAB allocation, at all, even for satellite.

Europe was talking S-Band, ditto Japan. Canada and Mexico were going around saying L is where it's at and "We hope someday you'll join us..." Our neighbors to the north, of course, want to use L-Band for both terrestrial Eureka DAB and satellite.

As for here in the good ole U.S. of A -- where the "S" word (satellite, not S-band) is a dirty word to local broadcasters, our Air Force had firmly tied the hands of our delegates so L-band was out of the question. We were going around spouting off about the other "S" word (S-band, not satellite), off in our own little corner of the spectrum.

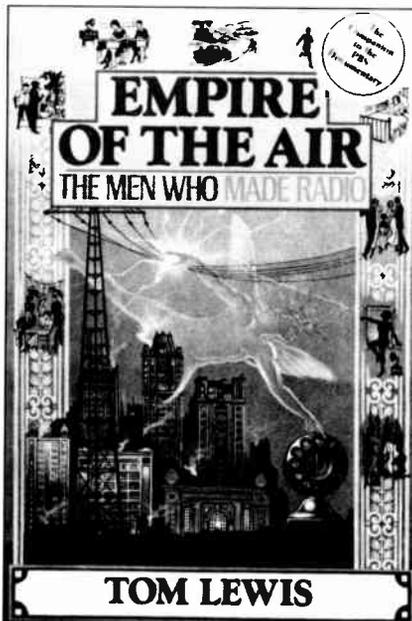
Confused yet? Well so were the delegates, who couldn't agree about even what to order for breakfast until the very last teensy-weensy second, when somehow, maybe smoke and mirrors, Canada and Mexico convinced nearly everybody else to go along with L-band. Everybody, that is, except Uncle Sam, Japan, and a few other guys.

Now we're a mere footnote in the history of WARC '92. Does this mean we'll go back and ask the Air Force for L-Band again? Does it mean we might find another portion of spectrum, like UHF, to squeeze out a slice for terrestrial DAB? Does it mean the satellite guys get the go-ahead while we turn our sights toward in-band? And is Eureka 147 DAB in the U.S., like Genera-

alissimo Francisco Franco, really dead?

Who knows? A mess is what it is. NAB has put the Eureka talks firmly on the back burner for now, they say, and there won't be any bus demo at the NAB show this year. (I guess that means I'll have to nap during the sessions).

Meanwhile in-band proponents have been hard-pressed to get those with the dough to fork over any of it for R&D. Project Acorn seems to have enough cash to keep going, however, and the engineers say the problems for both AM and FM are getting solved, one by one. But don't look for any splashy, and certainly no mobile, demos out in Vegas. Won't happen.



First an Empire, now an NAB celeb.

You think DAB has problems? How about the SBE? It's all but armed revolt among the ranks as the officers decided to raise dues from \$30 to \$55 yearly. Doesn't sound too bad? Tell that to the guy whose boss didn't give him a raise this year.

Here's what's hard to fathom. SBE says one day, "Hey, gang, let's raise money. I know, we'll hold a national convention, just like the big kids at

NAB do! Yeah, that'll do it." OK, so the first year the convention brings in some \$20,000 or so, which nobody expected. Of course, remember that it was held in St. Louis.

Then every year after that, the society manages to lose money on the national meet. This is after hiring what is supposed to be "professional show management." Oh yeah? What's so professional about losing money? I know a lot of amateurs who can do that with almost no training whatsoever.

When you tally it all up, the coffers are light nearly \$60,000. The shuttle buses alone helped tip the scales. And how about \$40,000 to Eddie Barker, who makes his cut whether the show loses money or not. I guess if the convention was a success in other ways, you might want to be more forgiving.

But consider this: last year the Seattle regional SBE pulled in some 2200 attendees, way more than the national one held in Houston when you subtract the exhibitors and their staffs from the official attendance figures. Regional SBEs held in Michigan, where I was privileged to be a speaker in February, and Syracuse, where my old Binghamton buddies hang out with a few brewskis, regularly pull their weight and attract good crowds. So how 'bout it? Should the rank and file have to foot the bill for this national fiasco every year? Tell it to the SBE board.

All kinds of yelling and screaming at the recent NRSC RDS committee meeting, where the lawyers outnumbered the participants. When you get the legal eagles in there, it's all over for sanity, I say.

See, they're trying to come up with a U.S. standard to go along nicely with the one in Europe, but there's just this little problem. Cue Paging already has some 300 stations in the U.S. and there might be a problem for Cue sta-

JG's Earwaves - cont.

tions if the RDS standard stays as is. Cue wants to have its concerns **written into the standard** so it won't lose those stations when the RDS receivers are made. But some **RDS supporters** want the standard to be just like the European one, so receiver manufacturers will see it all as **one worldwide standard**.

The Cue technology was put in an **appendix**, but the Cue folks didn't think that was enough. They brought their lawyers, and the words "**anti-trust**" started to make their way around the room. The Cue folks also wanted to **tape-record** the NRSC meeting, but NAB legal eagles said "No go." Heck, I could have told them **that!**

Anyway, the NAB's **John Marino** and EIA's **Tom Mock** are going to have a go at some compromise language. Hey guys, maybe you should ask the **Canadian WARC delegates** how to get almost everybody in the world to

agree with you. Maybe slip them a **Manitoba Mickey** or something.

OK, sure, I'm going out to **Vegas** again this year. You can catch me at the **DAB panel discussion** in Vegas on the afternoon of **April 13**.

I'll do my darndest to ask all the proponents the **hardball questions**. If you're coming to Vegas you can do your part by getting the **arguments**, uh, I mean discussion, going in a lively fashion. All hecklers welcome.

And I told you all about **Tom Lewis'** great book, "Empire Of the Air," all about the battles between **Armstrong, de Forest** and **Sarnoff** in the early days of radio. Maybe you also caught the PBS and NPR specials. Now Tom is getting to be a pretty **big celeb**.

Comstream, the V-Sat digital transmission guys, (yes, you can do DAB right now, in a sense) is featuring Tom at their **NAB booth, #5504** in the radio/audio hall. So go up, say hi, and maybe he'll autograph your book.

Tom, who teaches at Skidmore College in gorgeous **Saratoga Springs, NY**, another one of my early haunts

(oh, say, about kindergarten or so) has also been nominated for a **Broadcasters Education Association** award, and will be the **Engineering Luncheon** speaker. Way to go, Tom, I guess I can say I knew you when.

If you can't make **Vegas** this year, don't worry, I'll get the scoop and **cut through the jive** to let you know all about the new **toys and gossip**, post-show, so keep reading. And I'm happy to report that this year, I'm **steering clear** of the **one-armed bandits**. I've been robbed blind enough past years. But maybe I can grab **Tom McGinley** for another game of blackjack. No, Tom, the **\$2 tables**. Yeah, they'll get my money, but it'll take a little longer.

Something wacky going on in your neck of the woods? Let's gossip together. Call 703-370-7943; fax 703-212-0838 or MCI mail me at #507-3038. Or write 511 18th St. SE, Rochester, MN 55904. I'm scouting for some nifty doo-dads for you to covet so keep 'em comin'.

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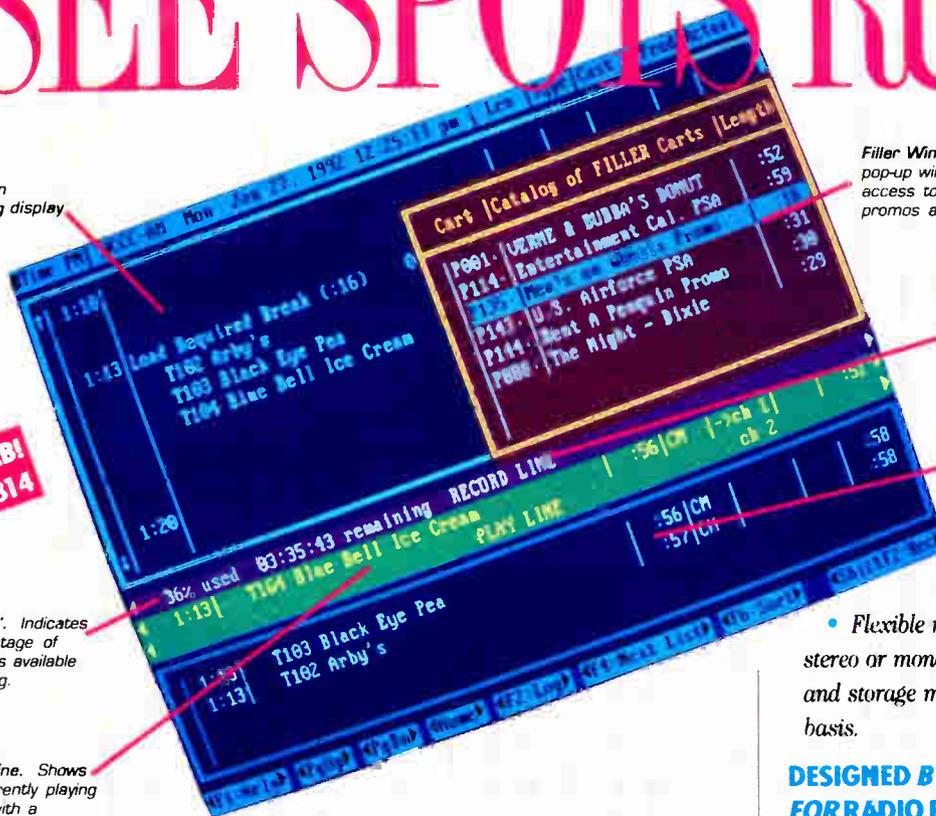
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WARC DAB Decision Swings to L-Band

By Judith Gross, editor

For awhile it looked as if there might be no consensus on a worldwide spectrum for satellite DAB coming out of the World Administrative Radio Conference (WARC). But in a last minute compromise, Canada and Mexico were able to convince enough other countries, including European nations, to back an L-band allocation at 1452-1492 MHz, leaving the U.S. in its own corner backing S-band at 2310-2360 MHz.

Ambassador Jan Baran, who headed up the U.S. delegation, had said just before the start of WARC that there was no room for compromise, since the U.S. military had opposed moving its aeronautical telemetry operations from L-band. But Canada, Mexico, Brazil and Australia all backed L-band, and began a determined effort to convince other nations to go along.

But in an eleventh-hour agreement, European countries backed L-band, and the U.S. was forced to make its position a footnote, asking other countries to coordinate their DAB efforts where there may be conflicts along the border. A number of countries, including Japan, abstained from the voting.

Canada and Mexico want to place both satellite and terrestrial DAB in the L-band region, while in the U.S. terrestrial efforts have turned to in-band DAB solutions. The NAB called the WARC satellite allocation "a threat to local over-the-air radio". But Satellite CD Radio, whose petition for a satellite DAB service began the whole DAB debate, was happy with the WARC allocation and hoped it would speed up action on its FCC petition.

Next step in DAB: A second Notice of Inquiry on DAB is expected for release sometime this spring, much to the dismay of some DAB proponents

who feel some more definite action on DAB would give it a much-needed boost. Also, the FCC has hinted at a domestic conference of some sort to decide on spectrum issues. The Commission's broad language implies that all spectrum slices, even UHF, may be open to DAB discussion once again.

Slow Going For U.S. DAB Systems

Hampered by the sluggish economy, U.S. DAB development by private entrepreneurs has been slower than originally anticipated. Ever since the U.S. military crushed L-band hopes in this country, the rush to come up with a system to rival Eureka has slowed to a more reasonable pace.

Strother Communications, Inc., which has teamed up with Lincom, says it will demonstrate the first adjacent DAB system in some capacity at the NAB convention, but admitted that it is not on the fast track it had hoped when the two first joined forces.

Ron Strother said he is still ready to test first adjacent DAB in a number of cities, but he admitted that procuring R&D dollars in an ailing economic climate is tough.

That sentiment was echoed by Ted Schober of RadioTechniques, who will present a paper on his American Digital Radio System in-band DAB at the convention but probably not have hardware. It's been all-quiet from most of the other in-band DAB proponents, except for EmCee, which has already implemented wireless cable DAB in Mexico.

As for in-band, on-channel, engineers for USA Digital/Project Acorn say work on the system is progressing satisfactorily, on both the AM as well as the FM portions. But with weeks to go

before the Las Vegas show, they were undecided what form a booth demo of the system would take this year. Gannett's Paul Donahue, CBS' Tony Masiello and Group W's Glynn Walden all said it would come down to whether or not to spend large sums of money "just to make an impression at the convention" or to keep channeling the dollars into system development and leave the dog-and-pony show for later.

Meanwhile, this will be the first year in several that NAB will not have a demonstration of the Eureka 147 DAB system. A full day of DAB discussion has been scheduled during the engineering conference, however.

NAB Tests First Adjacent FM

Since some U.S. DAB systems propose allocating an FM station's first adjacent channel for digital transmission, the DAB Task Force Technical Advisory Group (TAG) directed that some tests were in order.

Those tests have been completed, according to NAB staff engineer Ken Springer, who performed them in January and February, and will report the results in a session during the Engineering Conference in Las Vegas in April.

The idea was to determine adjacent channel protection ratios for DAB-type signals on first, second and third adjacents, and to see to what extent a digital signal would interfere with the analog FM signals and whether the analog FM would interfere with a digital signal.

To generate a DAB-type signal, Springer used a PRBS generator to digitally modulate an oscillator tuned

(continued on page-12)

to unoccupied FM channels. Tests were made using both QPSK and 256-QAM digital modulation. The DAB-type signal was then fed to a signal combiner where it was added to an FM signal. The level of the DAB signals were varied, and measurements were taken to determine interference.

In the next stage of the tests, a database of all licensed FM facilities was compared with the test results to determine if DAB signals can be inserted in the band without interfering with existing FM reception.

RDS Dispute Seeks Early April Resolution

The NRSC RDS committee is still hoping to have a draft standard ready in time for the NAB's Las Vegas convention. RDS -- Radio Data System is the system, already operable in Europe, which uses a station's 57 kHz subcarrier to identify a station by call letters and format, display the information on the front panel of the radio, and allow listeners to tune to a station by format.

Right now, the main dispute centers on how to accommodate the Cue Paging system, which is employed at 300 stations, into the standard. There is the possibility that the circuitry used in the Cue system could cause a delay in the automatic switching characteristic of RDS radios, and Cue does not have a problem with language to that effect in the standard.

Cue's main concern is that it's technology be incorporated into the main body of the RDS written standard, so it is not ignored by RDS receiver manufacturers. The NRSC RDS committee had placed Cue's technology in a footnote to the standard instead, and discussion at the last NRSC RDS committee meeting became heated. Now the EIA and the NAB, who coordinate the NRSC, are attempting to come up with a satisfactory way to include Cue in the standard and still keep the standard acceptable to the EBU.

Chapters in Open Revolt Over SBE Dues Hike

Several chapters have called for a dues strike, and some have threatened to pull out of the Society for Broadcast Engineers national organization altogether, over a hike in dues from \$30 to \$55 dollars.

"In case they haven't noticed, there's a recession going on. Some engineers have lost their jobs," noted Sandra Woodruff, who chairs Chapter 47 (Los Angeles). She called for members to protest by either not paying any dues until after the SBE's meeting at the NAB show; paying last year's amount with a "tea bag" (a la Boston tea Party); or if they can afford the increase but are still angry, paying the increase along with a tea bag.

The increase is necessitated by revenue losses, mostly due to the society's national convention. At first the national headquarters told chapters that last October's Houston convention had lost \$20,000. That loss is now placed more realistically at closer to \$40,000, after the national office agreed to a more complete disclosure.

The Houston convention itself lost \$20,000, but an additional \$18,000 had to be paid to the Texas Association of Broadcasters, whose annual meeting was held jointly with the SBE meet, Woodruff reported. The SBE had promised the TAB that it would not lose money due to the joint affiliation; but TAB did report a loss which the SBE was forced to reimburse to the tune of the \$18,000.

Woodruff said that now that the SBE directors are aware of the discontent among members, she expects efforts to resolve the problems to come from the mid-April board meeting.

In Brief:

Gentner Acquires Macromedia

Gentner Communications has purchased the products and technology of MacroMedia, Inc., manufac-

turer of the Audisk hard disk satellite automation system. Gentner said that the operations of MacroMedia would remain in its Northfield, Minnesota location and that MacroMedia President Tim Valley would become a Gentner employee.

Gentner CEO Russ Gentner told Radio Guide that the Audisk system will complement Gentner's DAWN product. "Audisk will allow us to serve the small and medium market while DAWN remains our high-end digital product," said Gentner. Terms of the agreement were not made public.

CCIR Compression Results Due in May

A CIIR working group is scheduled to complete a report on its "compression algorithm bake-off" sometime in May. The international engineering group sought to determine the suitability of various audio compression algorithms in broadcast environments.

The tests included several tiers of applications, including direct-to-listener audio to affiliates for distribution to listeners, and audio for post production and later transmission. They also included "tandeming" or "cascading" of one algorithm several times to determine the effect.

The tests were performed at the BBC and in Canada. Among the algorithms tested were MUSICAM, NHK, AT&T, Dolby AC-2, and Scientific-Atlanta SEDAT. The CCIR is expected to recommend a compression algorithm standard for each type of broadcast application.

NRSC-FM Tests Stir Controversy

The NRSC FM group has the raw data from tests done on how FM receivers react to aggressive audio processing, but whether or not the data is useful is another question. NAB staff engineer John Marino confirmed the current a dispute about the test methodology and that it is unclear whether or not a report of the test results will be presented at the NAB Engineering Conference in Las Vegas. ■

Relocation: A Moving Experience

by Gordon S. Carter, Professional Audio Services

One morning you are busily working on a recalcitrant cart machine that insists that some stop cues, but not all of them, are not good enough for it. You can find no consistency from cart to cart or from machine to machine. In fact, the same cart will sometimes play though and will sometimes stop.

You are on your fourth cup of coffee, and it is only 9:30 AM. In the middle of all of this, you are summoned to the GM's office. When you get there, you also find the PD, Sales Manager, the bean counter and a few other key staff members. After a few pleasantries, the GM quickly gets to the point.

"The rent in this place is killing us. We have a year left on our lease and then we're moving out. We may even move sooner if we can get a good enough deal."

After everyone except you compliments the GM on his forward thinking, he begins to fill in the details. The PD and Sales Manager will work with him as a team to find the right location. The Financial Manager will figure out how to make the budget work out.

And you, the Chief Engineer, will be responsible for planning the entire broadcast center and making the move happen. Of course, you will have to keep the present facility working until moving day so there will be no lost air time. As you try to gather your senses, you object that there isn't enough time to do all of this. "Nonsense," says the GM, "we have a full year. Now, let's all get to work."

Walking out of the room, you wonder to yourself, "What do I do first? How do I proceed? How do I get it all done in time?"

Start at the Beginning

Over the course of the next few months we will look at everything involved in moving a radio station. We'll consider some approaches and techniques to design and build the studios and how to get it all done on time and with no or little lost air time.

When a decision to move has been made, one of the first things that

must be decided is a reasonable timetable.

Simply finding the right location and the right deal may take a year or more, depending on how picky you are and how much you want to compromise. You should allow at least three months to pick a broker or representative and to find a place that fits your needs.

Once you've found a place, closing the deal can take a few weeks to a few months, depending again on a number of factors. If you are renting, it can be completed fairly quickly. If you are buying, however, and need to get financing, getting to closing may take a month or more.

Envisioning the Future

While looking for a new location, be aware of a few possible pitfalls. If you are in a large city or an area near transmitters (your own or someone else's), be sure to check for high levels of RF.

Also, check for possible acoustic problems that may make for noisy studios. Proximity to airports or highways can be a big problem with an open mic. It never sounds good on the air to have a truck shifting through all of its gears while you are giving a newscast.

As you look at possible locations, keep in mind the needs of your station and the possibilities of the building. If you are renting or buying an existing building, column and window locations can make a place acceptable or unacceptable. If you are looking for a piece of property on which to build, you may have more latitude in designing your space.

You should also begin thinking of possible plans for your new facility. While each space will dictate a different floor plan, you should have a good idea of the number and sizes of the various rooms you will need. Here are a questions you should ask yourself.

How many production rooms and studios will I need above my master control room? How big will each room have to be to accommodate people and equipment? Will I need a

newsroom, and how big should it be? Where will I house equipment that is common to all rooms? Of course, these ideas will trigger even more questions as you go along.

Now the Work Begins

The planning portion of the project may take a few days or a few weeks, depending on the size and complexity of your facility. But be sure you have complete plans before you begin any work, especially if you are working with contractors.

These should include construction plans showing all details of any special construction, floor plans showing the location of all equipment and electrical plans. You should have separate plans for electrical power and for audio wiring. The more time you put in during the planning stages, the easier it will be to get things up and running and to troubleshoot later.

Finally you get to the construction phase of the project. If you are doing work in an existing building, this may take six months to a year, again depending on the size and complexity of the project. If you are building your own building from scratch, it may be a year or more before you can move in.

A final word about moving a radio station. Unless you have lots of time on your hands or a big staff, you will most likely need help. In many communities you will need an architect to help get the plans through the local building department.

A good studio consultant can help guide you through all the complexities of your project, from finding a place that is usable, to designing the proper acoustics and equipment layout and wiring in your studios. The fees you will pay for this service may very likely be saved by meeting schedules and having things work as they should. We will look at this in more detail next time.

Gordon Carter is Studio facilities manager at WFMT-FM Chicago, and runs his own audio consultancy, Professional Audio Services. He can be reached at 708-482-4142.

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Call the Radio Guide BBS
at (804) 468-4957

Bits, Bytes & BBS

Broadcast Computing and Bulletin Boards

A Tour of the Radio Guide BBS

By Steve Shrader - AVS Broadcast Services

In a previous issue of Radio Guide we announced the birth of the Radio Guide/AVS Broadcast Services BBS system. The BBS has now been on line for five months and over 1400 callers from all over the U.S. have called to explore the system.

In order to help you make full and productive use of the BBS, this month's column will explain its different areas.

The BBS is divided into four areas or conferences: the Main Message Area, the Radio Guide Conference, the AVS Broadcast Services Conference and the General Files Conference.

Main Message Area

This area is for leaving messages to other users or the SYSOP (System Operator) and is the "gateway" to other BBS areas. When you sign onto the system you are in this area of the BBS.

The commands here will allow you to enter messages, read messages, read the system bulletins, get help with system commands, join (move) to another area of the BBS and sign off ("good-bye"). To move to another area of the system, issue the "J" command and you will be given a listing of other BBS areas.

AVS Broadcast Services

In the AVS Broadcast Services Conference you can enter/read messages, read any special bulletins from AVS Broadcast Services, download broadcast related files and access various FCC Databases and programs.

The OPEN Command presents a menu for access to FCC databases and Programs. You can choose the FM and TV databases, the AM database or the FCC Curves program for calculating FM and TV Signal contours. All of the programs are easy to use and prompt the user for the needed information.

Radio Guide On-Line

In the Radio Guide On-Line Conference, users can enter/retrieve messages to publisher Ray Topp including letters for publication in the RG Forum. Letters for publication in future issues should be addressed to RG Forum, or you can specify whether or not you want your message published.

In the future, some back issues of Radio Guide will be available for downloading as well as a database to retrieve previously published Tech Tips.

Files Conference

This conference is for users to download and upload files. The system has about 20,000 files on-line (yes, that many!) but don't be intimidated. The system has 2 CD ROMS and 250 Mb of hard disk space and an additional CD ROM came on-line on March 1.

This adds 230 Mb of files relating specifically to electronics, broadcast and Amateur Radio as well as the FCC and DOT Amateur Radio Databases.

The selection of files available for download cover a wide range of interests from Algebra to Z networks. Later this year the FCC Rules will be added to the system. A retrieval program for the rules is presently being written to allow scanning for keywords and phrases. After the keyword is found, the user can move directly to the desired rule section.

FCC Terrain Info

In order to acquaint the users with the FCC related programs on the BBS, I am going to explain the use of each one in upcoming issues. This month I will focus on the Terrain Retrieval database.

If you are involved in the calculation of HAAT for an FM or TV station you are painfully aware of the time-consuming process of plotting all those radial points on topo maps. Well put those maps away and let a computer do the work! Instead of taking hours to perform the calculations, you will be finished in seconds.

The program uses terrain data from the NGDC 30-second database which was released by the government a few years ago. This data is accepted by the FCC and is the same data that all computerized terrain retrieval systems use.

The program to retrieve and process the data was written especially for the AVS Broadcast/Radio Guide System by Peter Moncure of RadioSoft.

Terrain Procedure

To gain access to this program, call the system and sign on as usual. At the Command prompt type the letter "J" and then pick the AVS Broadcast Conference. Once you are in this section type "Open 4" or "terrain" and you will be moved into the program.

At this point you will be asked what calculations you want to make. Enter "1" for FM, "2" for TV or "3" for Land Mobile. After you have chosen the service you will be asked to enter your coordinates in degrees, minutes and seconds.

After entering the coordinates you will be asked if the coordinates are correct. If they are, enter "Y" and the program will then calculate heights for the eight primary radials. If you answer "N" you can correct your coordinate entries. After the results of the calculations are displayed you will be returned to the main BBS.

Well that's it for this issue. Call the BBS at (804)468-4957 and experiment. Happy BBSing! Steve Shrader can be reached at 804-468-4344.



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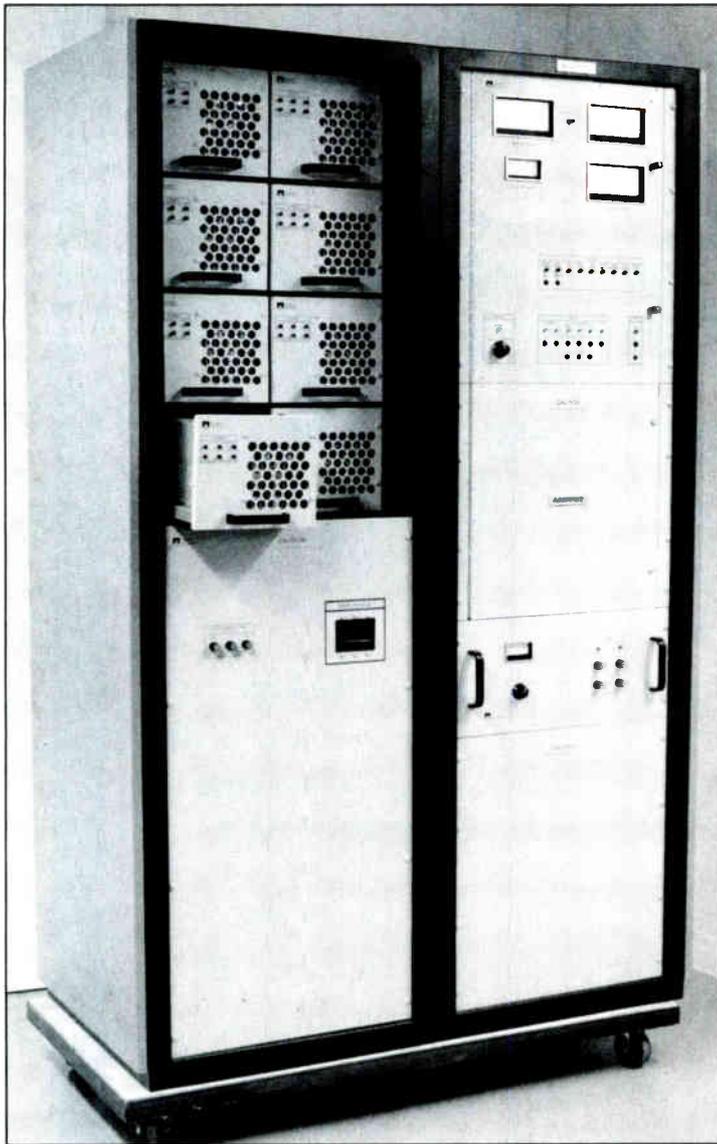
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Contract Engineer

The Business of Radio Contract Engineering

What Goes Around, Comes Around

by Mike Patton, Contract Engineer

In the contract engineering business, as in many other lines of service work, there are three overriding concerns that affect repeat business and most new business: reputation, reputation and reputation. Two recent cases illustrate the point.

In the first one, I had bid on changing the frequency of an FM station which was being required to move to make way for another station's upgrade. After visiting the site, I told the GM that several grounding and cable routing problems with the stations' (co-located AM & FM) transmitter site should be corrected while the "high power" crew was in town.

He agreed and asked me to include that work in my proposal. I also included AM impedance measurements, audio proofs of both stations, and filing the needed FCC forms. Also included in my quote was the charge for services of an expert engineer from the FM antenna manufacturer.

Off in the mail went my quote and I sat back and waited. I heard back from the GM that they were also considering a bid from an engineer who had recently moved to the area. He had a poor reputation from his previous home area (I had made some phone calls) but had very low rates.

There goes this job, I thought to myself. Try as I might, I could not come up with a way to tell this GM about the guy's bad rep without looking like a whining schoolboy tattletale.

Relying on References

I decided instead to emphasize my strong points, saying nothing about any other engineer. I sent the GM a list of my references, including other area GMs, major equipment manufacturers and respected consulting engineers.

I also reminded him that there is nothing that cannot be done a little less well for a little less money, but that you almost always get just what you pay for, or don't pay for. I sent off that list and chewed my fingernails to the elbow, hoping I didn't sound too glib.

Well, it worked. I got the job. And while I was told that my bid was the

cheapest one that included the services of the factory's engineer, I suspect that it was the only one that used that engineer. And I believe that my good references were a large part of the reason I got the job.

Of course there's a down side to all this as well, as you will see in my second example.

Festering Failing

My firm does modulation monitor calibration. I had finally convinced another contract engineer in my area that with his present workload, he would probably get around to repairing one of his stations' FM mod monitors sometime during the next ice age. He agreed to send it to me instead, that very week.

Friday arrived with no word from him, so I decided to call. He said he had bad news and my heart sank. The GM for this particular station had told my engineer friend that he would rather send the monitor back to the factory and pay more for the service than do business with me.

My only dealing with this GM had been two years ago when I built a small Class A FM for one of his relatives. I had only met the man twice, the station had gone together with no problem and mostly within budget, and I had no idea that he was unhappy.

My first reaction was anger, and I was tempted to call and give this guy a piece of my mind. That night I had four separate nightmares about being chased by angry clients. My wife said "Blow it off. It's just one guy. What does he know anyway?" But I could not get it out of my mind.

That next morning, with heart pounding, I called the GM. I wasn't even sure he would take my call, but he did. By the time he came on the line I had calmed down enough to at least stammer my concerns, and could he please tell me why he was so unhappy?

Lack of Communication

It turned out that I had sold the station a piece of used gear which had worked a month and then quit. They

sent it back to me, and I couldn't find any problem with it. Sound familiar? But I had seen this particular piece of equipment fail, so I knew the problem was real.

I kept it running in a corner of my bench for several months, checking it now and then, and sure enough, it eventually failed and had to be repaired. I was pleased with the outcome, but I didn't see it from the station's point of view.

All the GM saw was that the equipment had worked for a month and then spent the next four months in my shop. During this time I was busy with other projects, so I had not bothered to call them with updates.

They ended up having to call me for progress reports, and each call was a little less pleasant than the last. Then finally, after they got "nasty" their equipment reappeared. Of course, now it worked, and while it did not fail again, the damage had already been done: in their minds I was unreliable and unresponsive to their concerns.

I assured the GM that this incident was not representative of how I do business, and told him I would very much appreciate a chance to redeem myself. He had a number of concerns which we discussed and which I apparently answered to his satisfaction, because he agreed to let me calibrate the mod monitor.

Rest assured that I will make every effort to see that this monitor is in top shape and back to him when promised, because if not, I know I will never get another dollar from him. Not only that, but I will also never get a good reference from him to any other GM who solicits his opinion of my work.

Here's the moral of these two stories: Your reputation will come back to haunt you, good or bad. Do everything you can to maintain a good one, and if you detect a problem, do whatever it takes within reason to confront and remedy the problem.

Mike Patton has been in contract engineering in Baton Rouge for the past 12 years. He can be reached at 504-292-4189.

Radio Guide Page-17



Tech-Tips From the Field

Practical Solutions to Practical Problems

1. Remoting the Technics SL-1200 Turntable
2. Digital Timer From Radio Shack Clock
3. Otari MTR-10 Capstan Lubrication

by George Whitaker, KSSA Dallas

Greetings. No, you are not drafted. And, then again, you are. Every reader is being drafted to send in his or her favorite Tech-Tip.

Tech-Tips have always been a very important part of Radio Guide and, as the publication continued to evolve, the decision was made that a Tech-Tip editor was needed to assure that the tips and advice flows smoothly and is as useful as your needs demand. I am very happy to have been selected to prepare this column each month.

Beginning with this issue, each

Tech-Tipster will receive a credit-card size calculator designating him or her as a Radio Guide Tech-Tipster. It's a token of our appreciation for your sharing of knowledge gained in the field. Each person submitting a Tech-Tip will receive a calculator even if it is a long time before the tip reaches publication.

**Send your Tech-Tips to:
George Whitaker, 3505 Daniel Drive, Arlington, TX, 76014.**

don't fret. Items for this column are selected to provide a variety of subject matter as well as being picked for general interest or uniqueness. There are so many good ones to choose from and only a certain amount of space each month.

First off this month, however, I would like to throw in one of my own favorites.

Several years ago I wrote a book called, "Radio Engineering for the Non-Engineer." The second half of the book was made up entirely of Tech-Tips learned from my own experience or picked up from other engineers I came in contact with. With your indulgence, I would like to drop in a section from the book occasionally, such as the following:

Remoting the SL-1200

The Technics SL-1200 is an excellent, inexpensive turntable. However, they do not come equipped for remote start-stop.

This can be added to the SL-1200 by simply lifting the platter off and bridging a normally open, momentary switch across the yellow and orange wires.

To facilitate moving the turntable around, I mounted a mini-jack in the bottom of the case and wired it to the yellow and orange wires. Then I put a mini-plug on the wires from the console remote start pushbuttons.

This arrangement will allow remote start-stop from an ordinary, externally-mounted pushbutton switch from the remote start contacts in an Autogram console or other console with built-in dry contact switches.

(continued on page-20)

To those whose tips I inherited in the file: a calculator will be mailed off to you as soon as they are delivered from the supplier.

In taking over this job, I found a plethora of interesting Tech-Tips that had been sent in over the last year or so but had not yet found their way into the magazine. All of these contributors will be acknowledged and this month's column is, for the most part, made up of items out of this file.

If you know that you have one on file, and it is not in this issue,

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Tips From the Field

continued from page-18

Our next item comes from David Sparano of WVCR in Albany, NY. His number is (518) 783-2990. David's contribution is a:

Digital Count-Up Timer

Here are instructions for an inexpensive digital count-up timer that, for less than \$30, has a huge visible display. It is made from a converted Radio Shack clock (Cat.# 63-805B), and comes in an attractive plastic/metal frame that can be hung on the wall.

Here at WVCR, however, we took one out of its shell, cut the plexiglass face to size, and mounted it in our McCurdy SS7600 where a switching bank had been. Sitting next to the program VU meters, its big 1.8" numerals put to shame the time counters that come with many consoles.

Three simple modifications must be made to the clock to make it work as a timer:

1. The leads from the "12/24 hr. display switch" on the back of the clock are clipped and the switch is removed. The remaining leads are soldered together such that the clock is

permanently in military time, i.e.: midnight is 00:00.

2. Pins 19 and 23 on the main IC are jumpered together and are then, in turn, jumpered to the V+ supply at the circuit trace immediately above the words "Jewel No. 0." These pins may have to be soldered on the component side of the PC board since they have no solder pads and barely protrude below the PCB. This jumper has the effect of placing the display in the "minutes and seconds" mode.

3. A cable is brought in through the back of the clock through the hole where the 12/24 hr. switch was. One lead is fastened to the V+ supply (see above) and the other to the pin 20 trace. This cable is hooked up to an external, normally open switch and is the "reset." When the switch is closed, the power to the chip is momentarily shorted and the clock resets to 00:00. Normally the clock would reset to 12:00 and begin to blink. In this case, the clock resets to 00:00 with no blinking. The power supply appears to be able to withstand extended periods of being shorted. Ours has not failed in over nine month of use.

The story is told around KSSA that the staff one day noticed a bare copper wire running down the hall from my office to the office of the owner. Upon

looking in, they found the owner holding one end and me the other, all the while going about our daily duties. Seems there was a penny lying on the hall floor and both of us grabbed an edge at the same time.

Martin Acuff of Boston's WZLX, (617) 267-0123, discovered some missing words of wisdom and he says:

"Otari MTR-10 Users Take Note"

If you own an older Otari MTR-10, be aware that the technical manual makes no mention of the need to lubricate the top capstan bushing.

The easiest way to gain access to the top capstan bushing is to remove the pinch roller and remove the threaded collar directly over the capstan motor. It is not necessary to remove the motor from the deck.

To lubricate the capstan motor, either use Otari-approved oil (part #PZ9E003) or any high quality light machine oil. Otari technical support notes that new manuals include instructions to occasionally oil the capstan top bushing.

Next Month ...

Next month we are going to take a look at a solution to power supply problems in the S-A digital receiver, an SX-5 fix when the new parts don't look like the old parts and some other goodies from our readers.

As the famous saying goes in our business, "Keep them cards and letters comin' folks." Those Tech Tips, too.

George Whitaker is CE at KSSA Dallas, TX. He has 30 years experience in radio engineering and is a charter member of the SBE. He can be reached at 214-528-1600.

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Calibrating Mod Monitors With Bessel Nulls

by Eric Small, Modulation Sciences

When calibrating your FM modulation monitor, the most accurate method is to use Bessel functions. Using test equipment normally available at radio stations, you can achieve calibration accuracies ten to one hundred times greater than the best modulation monitor. So why use Bessel functions?

At certain combinations of modulating frequency and deviation, the carrier of an FM signal will disappear, leaving all the energy in the sidebands. The combination of modulating frequencies and deviations (modulation indexes) at which the carrier disappears are predicted with great accuracy by Bessel functions.

Before FM

Bessel functions are the solution to a special set of differential equations that, among other things, mathematically describe frequency modulation. Interestingly, Bessel, an astronomer, did his work a hundred years before Major Armstrong invented FM.

From a table of Bessel functions the modulation indexes where the carrier goes to zero can be determined. Modulation index is the deviation of the carrier (peak modulation) divided by the modulating frequency. For example, a carrier deviated to 75 kHz by a 5 kHz sine wave would have a modulation index of 15.

modulating frequency of exactly 31.188 kHz, the first time the carrier disappears the deviation will be exactly 75 kHz, or 100%.

In order to have calibration points at a variety of modulating frequencies, it may be necessary to pass through several nulls of the carrier as the amplitude of the modulating tone is increased from zero to one hundred percent. For example, with a modulating frequency of 8.667 kHz ($75/8.653 = 8.667$), the third time the carrier nulls out as the modulation is increased is exactly 75 kHz.

The elegance of the Bessel function method of calibrating an FM modulation monitor is its simplicity. The carrier is first observed with no modulation applied, then as modulation is increased, a deep null (better than 50 dB) occurs at the exact deviation specified.

The accuracy of the Bessel function technique depends on: 1) the spectral purity of the audio oscillator, i.e., its harmonic distortion; 2) the accuracy with which the modulating audio frequency can be set and maintained; and 3) the ability to resolve the nulling of the carrier.

Real World Problems

There are several practical considerations in using the Bessel function technique to calibrate a modulation monitor. An RF spectrum analyzer is most frequently suggested as the instrument to determine when the carrier is nulled. But few FM stations own an RF spectrum analyzer and not too many even have access to one.

Also, trying to determine a carrier null on the same frequency an FM station is broadcasting a fully modulated carrier can present problems, especially when the work is being

The modulation indexes where all the power goes into the sidebands and the carrier goes to zero (nulls out) are approximately 2.405, 5.520, 8.653 for one, two and three nulls, respectively. To find the modulating frequency where the carrier nulls for a specific deviation, divide the Bessel value for the number of nulls into the deviation you wish to achieve.

Thus, for a 100% modulation calibration point (75 kHz dev.), $75\text{kHz}/2.405 = 31.188\text{kHz}$. So with a



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Radio Basics

continued from page-22

Calibrating Mod Monitors

conducted at the transmitter site using the exciter on the alternate main transmitter.

It must be possible to smoothly and continuously vary the amplitude of the audio tone from full Off to whatever level will modulate the transmitter 100%.

Most broadcast audio oscillators have decade attenuators, but even 0.1 dB steps are not fine enough. A related problem is the need to maintain a great enough amplitude into the frequency counter so an accurate frequency measurement is available at all times.

Solutions

There are straightforward solutions to these problems. Rather than using a spectrum analyzer to determine a null in the carrier, a communications receiver will work well.

The "S" meter of the receiver is a wide range level indicator -- ideal for finding a carrier null. The most important characteristic of the receiver is that it must have a narrow enough bandwidth to separate the carrier from the nearest sidebands.

The first set of sidebands appear at the carrier frequency plus and minus the modulating frequency. So if 8667 Hz is the lowest modulating frequency used, a standard single sideband filter bandwidth of 2.4 kHz provides a narrow enough bandwidth.

Several companies make receivers (super scanners) that cover 88 to 108 MHz with a 2.4 kHz bandwidth and an AM detector. An added advantage of several of these receivers is that they also cover the 950 MHz STL band and thus allow modulation calibration of an STL system.

However, before you run out and buy one of these receivers, consider the problems of making measurements on-frequency with a receiver that may not have 80 to 100 dB of shielding. This may not be a problem if all the testing will take place when the station

is off the air, but if you want to do a calibration during normal working hours, interference from the program-modulated signal that is on the air could pose a problem.

Using receiver IF

One way to avoid interference from signals on-carrier is to derive the carrier from the IF of a monitor or receiver. Virtually all consumer receivers use a 10.7 MHz IF, while most monitors have their last IF in the 1 to 1.5 MHz region.

This approach has the advantage of only requiring a communications receiver covering the IF frequency. Such receivers are common in amateur radio - check with local ham radio operators. Often communications receivers are available for only a few hundred dollars from surplus dealers who serve radio amateurs.

The problems of smooth level control and maintaining sufficient signal into a frequency counter are both solved by building a simple external

(continued on page-24)

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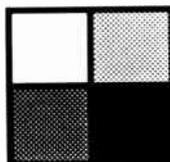
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NAB Booth #10449

Radio Basics

continued from page-23

Calibrating Mod Monitors

attenuator box. The audio oscillator runs "wide open" into the attenuator. The frequency counter is connected at this point.

A ten-turn pot allows attenuating the signal all the way to off with sufficient resolution to make nulling the carrier easy. A simple one-turn pot on the output provides a coarse setting of level so that the maximum resolution of the ten turn pot can be used.

Ten-turn pots are readily available on the surplus market, just be certain that it is of the carbon element type, not wire-wound. A wire-wound unit will not be flat across the wide range of frequencies used in calibration measurements.

Step By Step

The procedure for actually doing a Bessel function calibration follows:

1. Select the modulation level you wish to calibrate the monitor for. Of course, 100% is the most important point, but it is good idea to check calibration at 10% above and below 100%.

Enter the table at "% Mod" and note the four frequencies. As is noted in the table, these frequencies correspond to 100% modulation at 4, 3, 2, and 1 null of the carrier. It is suggested that calibration be checked across a wide range of frequencies to be certain the monitor is flat.

2. Adjust the oscillator to the exact frequency in the table. It is important that you keep a close check on this adjustment, because the frequency may drift and need adjustment.

3. Connect the output of the attenuator box to the wideband composite input of the exciter. It is important that no other signals be modulating the exciter while this test is being conducted. Often, turning off sources

tion percentage you want to calibrate.

5. Set the ten-turn attenuator to the full Off position or disconnect the signal from the exciter. It is important that there be no modulation of the carrier whatever.

6. Center the unmodulated carrier in the passband of the receiver or center it on the spectrum analyzer display. If a receiver is being used, set it for its narrowest bandwidth, which must be considerably less than the frequency chosen to modulate the transmitter. If a spectrum analyzer is being used, it must be set to clearly resolve the first sideband pair from the carrier.

7. Gradually increase the amplitude of the modulating signal by turning up the ten turn pot while carefully observing carrier amplitude.

If this is the first time a Bessel function calibration is being done, use the 1 null, 100% freq. - 31,188 Hz. As 100% modulation (75 kHz deviation) is approached,

the amplitude of the carrier will gradually decrease. At exactly 100%, the null will be quite deep (50 to 60 dB below the unmodulated carrier). At the deepest point of the null, the modulation is exactly 100%.

If a lower modulating frequency is chosen, the carrier will go through more than one null before the desired modulation is reached. In this case, it is necessary to carefully count the nulls as you increase the modulation.

%MOD	1 NULL	2 NULLS	3 NULLS	4 NULLS
85	26,509	11,549	7,367	5,406
90	28,069	12,228	7,800	5,724
95	29,628	12,907	8,233	6,042
100	31,188	13,587	8,667	6,361
105	32,747	14,266	9,100	6,679
110	34,306	14,945	9,533	6,997
115	35,866	15,625	9,967	7,315

such as stereo and SCA generators will not provide sufficient isolation. The best suggestion is to disconnect all unused signal sources from the exciter to insure that there is no leakage.

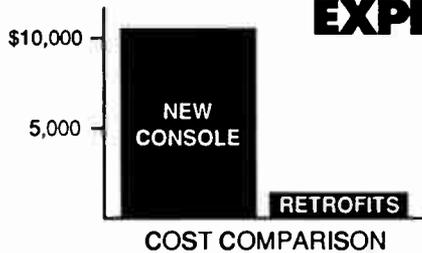
4. Set the ten-turn attenuator for max. output and adjust the coarse pot for a modulation level somewhat more than 100%, or whatever percentage is being calibrated. This is not critical and it is only important that the level be somewhat greater than the modula-



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NAB Engineering Conference

The NAB has put together a full slate of sessions for broadcast engineers at its convention. Panels begin on Sunday, April 12, the day before the convention opens.

All times and speakers are subject to last minute changes; please check convention schedules for verification.

Sunday, April 12

The first session, "Digital Audio Systems," features an Introduction to Digital Audio by Dr. Larry Hinderks of Corporate Computer Systems. Hinderks is a MUSICAM licensee and has been key in development of audio compression algorithms.

Bill Franklin, from Fidelipac, will speak on the company's new Dyna-

max DCR 1000 digital cart machine using 3.5-inch floppy disks, followed by Paul De Wit of Philips Consumer Electronics who will talk about that company's Digital Compact Cassette.

R. Richard Bell of Dolby Labs will discuss RF Design Considerations of a High-Spectral Efficient, Multi-Channel All-Digital STL. Bob Weirather will follow with an update on efforts to develop a broadcast digital audio interface; and Steve Lyman from the CBC will talk about Digital Audio Production: Past, Present and Future.

Later on Sunday, in a session on "Digital Audio Processing" John Stautner of AWARE Inc. will talk about that company's audio compression algorithm; Frank Foti of Cutting Edge Tech-

nologies and Bob Orban of AKG-Orban will each discuss digital audio processing; and Steve Smyth, Hamish Eassie and Michael Smyth from Audio Processing Technology Ltd. will discuss Broadcasting on the ISDN (Individual Subscriber Digital Network).

Grant Davidson and Marina Bosi from Dolby will talk about AC-2, that company's audio compression algorithm; and Gerhard Stoll, of the German IRT, will end the session by tracing the development of MUSICAM.

Also Sunday afternoon, a session on "International Broadcasting" will include several engineering discussions, with a report on WARC by Ben Fisher, who was part of the U.S. delegation to that conference.

Monday is DAB Day

Monday, April 13, is devoted to DAB. The morning session opens with a report from the NAB's Ken Springer on first-adjacent interference tests recently completed.

Skip Pizzi, of the Committee for Digital Radio Broadcast will discuss the Current Climate on DAB. He will be followed by Mark Kady of Delco Electronics, who will address the Automotive Impact on DAB System Needs.

Steve Edwards, from the CAB will report on Canada's tests of the Eureka 147 DAB system. Then Ted Schober of RadioTechniques will talk about his American Digital Radio in-band system.

Perry Spooner from EmCee, follows with a discussion of EmCee's wireless cable DAB which has already been implemented in Mexico. Next will be Dr. Georg Plenge, of the German IRT who will update attendees on developments in Eureka DAB.

In the afternoon DAB session, G. Chouinard and R. Voyer of the Communications Research Center in Ottawa will present Digital Sound Broadcasting. Steve Kuh from Lincom will talk next about the Strother Communications/Lincom first adjacent DAB system followed by Lloyd Engelbrecht of Stanford Telecom who will talk about Terrestrial Delivery of DAB.

Paul Donahue of Gannett will give an update of the USA Digital in-band, on-channel DAB system and Etienne Resweber will give an update of the Syntecom Digital DAB system.

To end off a day of DAB, Radio Guide Editor Judith Gross will moderate what should be a lively discussion among all DAB proponents.

Beyond DAB

In a session on "Maximizing Broadcast Signal Coverage" consulting engineer Richard Biby will give a



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AT NAB SHOW, SEE BOOTH 11607

NAB Conference - continued from page-26

Communications Engineering Tutorial; Stan Salek of Hammett & Edison will provide an Analysis of FM Booster System Considerations; and Bill Ruck, Jr. of KFOG/KNBR will discuss the Mount Diablo Booster System in San Francisco.

Also in that session, Tom Silliman of ERI will present Increasing FM Coverage While Reducing Rooftop RFI Exposure; Ali Mahnad of Jampro will talk about a New Multi-Channel Community Antenna for FM Broadcast; and Hilmer Swanson of Harris Broadcast will discuss a New High-Powered Solid State Transmitter.

Tuesday, April 14

"Radio: Coping With New Technology" will begin with a talk from Brad Dick on Radio in the 1990s: Challenges and Opportunities.

Don Lockett from NPR will discuss Digital Cable Audio; Michael Collins of Motorola will talk about The Expanding Role of DSP in Audio Technology; David Cripe of Broadcast Electronics will offer Improving Transmitter Performance Through Class E Operation; and broadcast consultant Jerry Westberg will present The Dependence of AM Stereo Separation on Transmitter Load Phase.

In the afternoon, "Broadcasters' Rules of the Road" will start off with Richard Smith, chief of the FCC's FOB, who will talk about FCC Enforcement Efforts: Not Business as Usual Any-more.

Jim Zoulek of the FCC's field office in Los Angeles will present Beta Testing a Self-Inspection Program; John Windle of Stainless Inc. will discuss Changes in Structural Standards for Communications Towers; and Richard Rudman of KFVB, who chairs the SBE's Frequency Coordination Committee will talk about frequency coordination.

The Sage I System for EBS will be presented by Jerry Lebow of Sage Alerting and Bill Ruck of KFOG/KNBR will discuss the Future for EBS; the FCC's John Reiser will address WARC-92: What Is It and Why Should I Care? The session will end with all presenters

joining in on a discussion about Dealing With a Changing World.

Wednesday, April 15

A session on "AM and FM Improvement" will begin with a report from Denon's Robert Heiblim on the long-awaited Denon/NAB SuperRadio. Karl Lahm will present an FM Technical Study; and Dietmar Kopitz of the EBU will give an RDS Update.

Tim Cutforth, a consulting engineer with Vir James will talk about improving intermod distortion in your AM transmitter; Geoffrey Mendenhall of Broadcast Electronics will offer

Optimization of FM Performance by Tuning for Symmetrical Group Delay; and Ogden Prestholdt will talk about The Towers Industrial Park Project at KTNQ.

That afternoon, Noble's Dennis Ciapura will moderate "Reducing Station Operating Costs." Patrick O'Hare, of Cost Analysis, Inc. will discuss How to Reduce Power Costs.

Steve Pilling of Telecom Consultants will address How to Get the Most Out of Telephone Services; John Sullivan of Econco will explain How to Obtain the Greatest Number of Tube Life Hours; and John Jensen of Kinetech will talk about Demand Side Energy Management.

Thursday, April 16

The last morning of the convention will be a departure from past years. A full day of engineering workshops is on the roster.

Workshops being held concurrently are "Fiber Optics," chaired by Otto Claus of Claus & Associates and featuring a hands-on splicing; and "FAA/FCC" featuring representatives of both agencies.

The remaining workshops will feature: "Satellite Uplinks," and "Contract Engineers." The Contract Engineering session will be moderated by John Bissett of Multiphase Consulting and feature Mark Persons of Persons Associates; Grady Moates of Loud and Clean; and Mike Patton of Mike Patton & Associates who writes Radio Guide's Contract Engineering column.

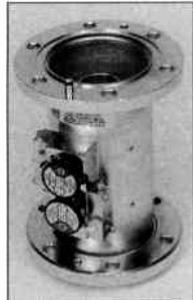
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Reader Service #019
See us at NAB Booth #12905

1992 NAB Exhibitor List

The information in this listing was obtained from those NAB exhibitors who responded to our questionnaire. *Radio Guide* is not responsible for any omissions or errors in this listing.

360 Systems Booth #1018

Featured Products: Enhancements to the DigiCart digital cart machine replacement.

AKG/Orban Booth #2800

Featured Products: AKG microphones and headphones, dBx audio processors, Orban over-the-air audio processors.
New Products: AKG will introduce C390 modular condenser microphone series.

Altronic Booth #11129-11130

Featured Products: Coaxial dummy loads rated from 1kW to 1.5 mega-watt.
New Products: Expanded air-cooled line.

Amber Electric Design Booth #4806

Arrakis Systems Booth #1702

Featured Products: Will show the Digilink hard disk audio system.

Aphex Systems Booth #1902

Featured Products: Digicoder FM stereo generator, 320 Compellor, 9901 Parametric Equalizer.
New Products: 9901 Parametric EQ.

Audi-cord Booth # 3227

Featured Products: DL Series cartridge machines, S Series cartridge machines.

Audio Animation Booth # 1624

Featured Products: Paragon digital audio transmission processor.
New Products: FM generator option card for Paragon.

Audiopak Booth #2326-2327

Featured Products: Audiopak A-2, AA-3, AA-4 audio carts. Lubricated tape formulas 605, 613, and 614 for custom loading carts and cassettes.

Auditronics Booth #3900

Featured Products: 210 Series broadcast on-air consoles. 310 Series broadcast on-air and production console. 400 Series broadcast production console.
New Products: 800 Series broadcast on-air console. 850 Series broadcast on-air and workstation console.

ATI Booth #12203

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Audio Broadcast Group Booth #4206

Audio Precision Booth #3900

Autogram Booth #4527

Avcom Booth # 12903

Featured Products: Portable spectrum analyzers, and sweep generators.
New Products: NASA-1000A network and spectrum analyzer.

Belar Booth #3920

Featured Products: FMM-2 FM modulation monitor and FMS-2 Stereo monitor, FMMA-1 Wizard modulation monitor, RFA-4 frequency agile digital RF amplifier.
New Products: AMMA-1 AM Wizard AM modulation monitor.

Benchmark Media Systems Booth #11301

Featured Products: MF-1 modular module MicroFrame, LA-1 1-in/2-out line amplifier for the MF-1 MicroFrame.
New Products: MP-1 1-in/2-out mic pre-amplifier for MF-1 MicroFrame series.

BEXT Inc. Booth #3918

Featured Products: P2/P10 programmable exciters, TEX-20 PLL 20 watt programmable FM exciter, PTX-30 30 watt programmable FM exciter, PTX-80 80 watt programmable FM exciter, LC-STL composite aural STL system, SD-STRL composite aural STL system, HPT-FM family of transmitter/translators for 88-108 of 945-953 MHz.

New Products: Equipment upgrades and addition of MosFet technology to our line of amplifiers.

Bradley Broadcast Booth #1024

Featured Products: Ashly Audio products, AKG DSE-700, Middle Atlantic Products, Telos Systems products.

Broadcast Electronics Booth #2312

Featured Products: AM-1 AM transmitter, FM transmitters, AudioVAULT digital audio storage device, CORE 2000 program automation, AT-90 modular on-air console.
New Products: AM-5 5500 watt AM transmitter.

Broadcasters General Store Booth #5426

Featured Products: "News Director" news edit workstation controller, "Tailor" 10-band dy-

amic comp/limiter, SMO-900 stereo modulation optimizer, Telos Systems digital hybrids, Cellcast RBS-400 remote cellular mixer, CRL Audio Signature, Gentner Logger, Gentner Prism, Cutting Edge Technologies Unity 2000.

New Products: Rodman/Brown "Desk Jockey" PC based automation and digital storage and retrieval system.

Broadcast Supply West Booth #1620

Featured Products: Audio Arts consoles and studio furniture.

Burk Technology Booth #4812

Cablewave Systems Booth #1924

Featured Products: FM and STL antennas, high-power Flexwell transmission line, RF connectors, pressurization equipment.
New Products: Microwave parabolic antenna.

CCA Booth #2208

Featured Products: FM35000G 35kW FM transmitter, FM50F 50 watt exciter, FM12000G 12 kW FM transmitter.
New Products: FM35000G, FM50G.

Circuit Research Labs Booth #4208

New Products: Will introduce the Modulation Signature, an advanced limiter and stereo generator in a single rack-high unit, designed to work in tandem with the microprocessor-controlled Audio Signature processor.

Coaxial Dynamics Booth #12905

Communication Data Booth #10449

Featured Products: 1990 population count, real-world propagation studios, 3 arc-second terrain data on CD-ROM, on-line services, FCC and FAA databases for PC.
New Products: Real World propagation workstation, land use and land cover data on CD-ROM.

Computer Concepts Booth #4814

Featured Products: DCS Digital Commercial System.
New Products: New digital editing option to Digital Commercial System.

Comrex Booth #13101

Featured Products: Talk Console complete talk studio, Digital Audio Codecs for high-quality duplex audio on 56 or 64 kbs telco, broadcast frequency extenders.
New Products: Talk Console

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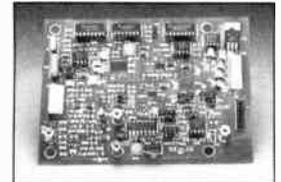
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Reader Service #020

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Comstream Corp.
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Continental Electronics
Booth # 3418

Featured Products: AM & FM radio transmitters, high-power MF & SW transmitters also available.

Corporate Computer Systems
Booth #5108

Featured Products: Micro-56, Micro 56 75kHz digital audio codec. CDQ-2000 Musicam stereo codec.

New Products: Micro-66R rack-mount dual rate codec with high frequency boost.

Crouse-Kimzey
Booth #5410

CTE International
Booth #5424

Cutting Edge Technologies
Booth #5426

Featured Products: Unity 2000 digital processor, Dividend composite filter.

New Products: Daypart scheduling & RS-232 interface for the Unity 2000.

Dataworld
Booth #1626

Delta Electronics
Booth #2826

Featured Products: AM Stereo exciters and monitors, and operating impedance bridges.
New Products: Delta model ASE-2 low-cost AM stereo generators.

Denon America
Booth #4909

Dielectric
Booth #1708

Featured Products: Variety of FM ring and panel antennas, transmission line, filters, coaxial motorized switches, patch panels.

Dolby
Booth #4514

Econco Broadcast
Booth #4624

Featured Products: Rebuilt power transmitting tubes and klystrons.

Electro-Voice
Booth #19656

Feature Products: Electro-Voice 635A, RE50, RE20, RE27N/D and RE38N/D microphones.

New Products: Electro-Voice 635A/B (black) and RE50/B (black) microphones.

Elenco SRL
Booth #5418

Energy Onix
Booth #3604 and 3704

Featured Products: MK Series single tube FM transmitters from 1.5 to 50 kW.

New Products: "The Legend" series solid state 100 to 10,000 watt FM broadcast transmitters.

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Eventide
Booth #1422

Featured Products: H3000B Ultra-Harmonizer, VR240 digital audio logger, HS395 internal sampling board, BD1002 digital video delay, BD980 advanced broadcast delay, BD941/BD942 broadcast audio delays.

New Products: HS395 sampling board.

Fidellpac
Booth #1920

Featured Products: DCR-1000 digital cart recorder.

New Products: MX-series audio consoles.

Gentner
Booth #1712

Featured Products: Digital Audio Workstation Network (DAWN), Digital Hybrid I, Lazer, People Link System-1 duplex tele-conference system.

New Products: Digital Hybrid I.

Hallikainen & Friends
Booth #2224 & 2225

Featured Products: DRC200 transmitter remote control, DRC190 transmitter control system, TEL171 digital telemetry update for Moseley TRC-15, ITO177 computer interface for the TEL171, TVA Series audio mixers.

New Products: DRC200 transmitter remote control system.

Harris/Allied
Booth #2218

Featured Products: Marantz CDR600 Compact Disc stand-alone record/playback system. Moseley DSP-6000 spectrum-efficient STL. Harris Gates One and Gates Five-FA, 1kW and 5kW (frequency agile) polyphase PDM all-solid state MW transmitters. Harris PT5FM 5kW solid state Platinum Series FM transmitter. Harris HT10FM and HT35FM 10kw and 35kW single tube FM transmitters. MacroMedia Audisk digital audio storage and automation system. Audiometrics CD10 CD cartridge machine. AKG DSE7000 16-bit RAM based digital audio workstation.

Henry Engineering
Booth #5500 (Radio Section)

Featured Products: Matchbox and Twinmatch interface amplifiers, USDA mini-DA, Micro-mixer 4-input stereo mixer, Superrelay light/replay controller, Logiconverter CD/cart machine remote interface.

New Products: Digistore digital audio storage unit for telephone "information lines."

Holiday
Booth #11607

Featured Products: Broadband isotropic RF field strength meters, VLF and ELF field strength meters, body current meter.

New Products: Body current meter and 3-axis ELF magnetic field meter.

Inovonics
Booth #1418, 1419, 1420

Featured Products: "The Sentinel" all-mode station monitor receiver. Inovonics full line of processors and FM stereo generator.

New Products: "David" An elegantly simple FM processor/generator.

Intraplex
Booth #5206 & 5207

Featured Products: PT/PR-150 compact disc quality digital audio coding and transmission. 4500-MDAC multi-channel digital audio codec for satellite and terrestrial fractional T1 transmission.

New Products: TDM-163/165 T1 "Smart Mux" multiplexer terminal for terrestrial and satellite transmission of network, fly-away, studio-to-studio, simulcast, and satellite transmission of digital program audio with remote control of transmission parameters.

ITC
Booth #1208 (North Hall)

Featured Products: Digidcenter multi-function Digital Audio operating platform. DPR-612 digital program repeater. Series 2 audio tape cartridge machine. Series 1 and 99B Series audio tape cartridge machines. ITC audio switcher system.

New Products: Series 2 audio cart decks and DPR-612 digital program repeater.

Jampro
Booth #3824

JNS Electronics
Booth #1420

Featured Products: D-Mux digital aural program multiplexing, RFM-8180 synthesized FM monitor receiver.

New Products: D-Mux multiplexer and LD-8020 digital audio level meter.

Kintronic
Booth #4824

Featured Products: AM/MW multiplexed antenna system, iso-couplers, antenna tuning units (for AM expanded band), AM air-cooled dummy loads, AM/MW directional antenna system, open-frame and vacuum RF contactors.

LDL Communications
Booth #19258

Lightning Eliminators
Booth # 16206

Featured Products: Complete line of lightning prevention and protection equipment including dissipation array systems, spline ball ionizers, chem-rod grounding electrodes.

Lightning Master
Booth #11062

Featured Products: Structural lightning protection for towers and buildings, transient voltage surge suppression equipment.

New Products: Transient Eliminator series of transient voltage surge suppression equipment.

Logitek
Booth #4820

LPB
Booth #1918

Featured Products: Citation II audio console, Citation II audio console series, low power AM transmitters. Carrier current broadcast systems. Travelers Information System installed and on display.

MacroMedia
Booth #4401

Marti
Booth #2624 & 2625

Featured Products: STL and remote pickup equipment.

Media-Touch
Booth #5203

Featured Products: Mediadisk networked PC mass storage digital audio system along with OpLOG and OmniPLAY automation/live assist studio control systems.

New Products: Mediadisk Digital Audio

Micro Communications
Booth #19043

Featured Products: Antennas, coax transmission line and components, interdigital bandpass filters, RF switches.

New Products: FM interdigital bandpass filters. Constant impedance bandpass combiners.

Modulation Sciences
Booth #5118

Featured Products: RDS, a low cost full-featured EBU compliant Radio Data System generator. FM Modminder, digital peak modulation monitor with PC remote operation and modulation analysis software. StereoMax, professional Spatial Image Enlarger for FM and AM Stereo. CLD-2504, Composite distribution amplifier (1x4) for radio and TV.

New Products: PROceiver, RDS.

Moseley
Booth 3424

New Products: PCL 6060 STL for high RF environment. CDQ-2000 digital audio for video STL. FT1-3000 digital audio for fractional T1 applications. Digital stereo generator for DSP-6000.

Murphy Studio Furniture
Booth #1920

Featured Products: Avante-Garde Series and Elite Series studio furniture.

Myat Inc.
Booth #5407, 5408 and 5409

Featured Products: 12", 50-ohm transmission line. 4-year catalog anniversary.

National Supervisory Network
Booth #5209

Nautel
Booth #4520

Featured Products: Will show the new line of solid state FM transmitters.

Otari
Booth #2806

Pacific Recorders and Engineering
Booth #3812

Featured Products: Radiomixer air console. Production mixer production console. Micro-max cart machines. Turnkey studio systems, studio furniture, accessories and peripherals.

New Products: ADX digital production system.

Panasonic Pro Audio Systems
Booth #18019

Featured Products: WP-1000 series Ramsa power amplifiers. Ramsa ENG wireless UHF mike system. Ramsa WR-844 series 4-buss mixers. Ramsa SV-3900 computer-controlled DAT.

New Products: WR-S4400 series, WP-1000 series.

Potomac Instruments
Booth # 2626 and 2627

Featured Products: AT-51 audio test system. FIM-21/22/41/71/72 field intensity meters. RC-16 and 1500 remote control systems. SD-31/FX-31 synthesizer-detector. QA-100 Quantal analyzer. SMR-11 synthesized monitor receiver.

QEI
Booth #4518

Featured Products: The CATLink T1 STL.

Radio Computing Services
Booth #1426

Radio Systems
Booth #4826

New Products: RS-Squared Dolby 'S' processor, RS-24 mixing console and RS master clock system.

RAM/S.A.S
Booth #5114

New Products: SAS 32000C professional communications system with display, IFB, and mix-minus conferencing.

Scala Electronics
Booth # 15715

Featured Products: Antenna and accessories for broadcast auxiliary systems, microwave, translators, LPTV and off-air monitoring.

Sennheiser
Booth #18169

Featured Products: MD422 upgrade of MD421-U, HMD25 broadcast monitor headphones (supraaural) boomset, KMS140/150 hand-held vocal mikes.

New Products: KMS-140/150, TLM50.

Sescom Inc.
Booth #16502

Featured Products: Sescom will calibrate its 24th year of business and will display five new product categories. They are Books, Iso-Series hand-held test equipment, Field-Pro, and audio SIP's. New 40-page catalog is available for distribution at NAB.

Shively
Booth #2102

Featured Products: Complete line of FM broadcast antennas and such related gear as branched and balanced multi-station combiners, rigid transmission line and pressurization equipment.

Shure
Booth #11901

Featured Products: FP410 potable automatic mixer with Shure IntelliMix. VP64 hand-held interview microphone.

Sony
Booth #11711

Studer Revox
Booth #3406

New Products: Will introduce the D780 R-DAT; the 990 console; Dyaxis II Multichannel Digital Audio Workstation; Dyaxis Lite with new hardware controller; Dyaxis MacMix software upgrade; Studer Digitec NUMISYS digital audio cart replacement system; Studer Digitec DS-D analog and digital routing switchers and Studer Digitec DS-D matrix control system.

Featured Products: The Studer D740 CD Recorder, professional CD players, reel recorders and the 962 professional mixing console.

Symetrix
Booth #1424

SWR
Booth #15730

FM antennas, LPTV antennas, high-power TV antennas, rigid coax components and waveguide.

Telos Systems
Booth #1024

Featured Products: Telos ONE digital hybrid, Telos LINK for interfacing RTS and ClearCom intercom systems with dial phone lines, Telos Direct Interface and Telos Key Systems.

New Products: Telos 100 DELTA full-duplex hybrid.

Tennaplex Systems
Booth #15715

Featured Products: Antenna, combiners and coaxial hardware for TV and FM broadcasting.

New Products: Wide band panel antennas.

TFT Inc.
Booth #2508

Featured Products: FM booster/Reciter. Shortened tone EBS system. E-Alert receivers. 884 and 844A FM stereo modulation monitors with P.M.D.D. Frequency agile STL transmitters and receivers.

New Products: IF Interface STL

TTC
Booth #15725

Featured Products: FMS4000 FMS series solid-state FM transmitter. 8090X CD-quality FM exciter. FM25000J J-series high-power FM transmitter.

Wheatstone
Booth #5000

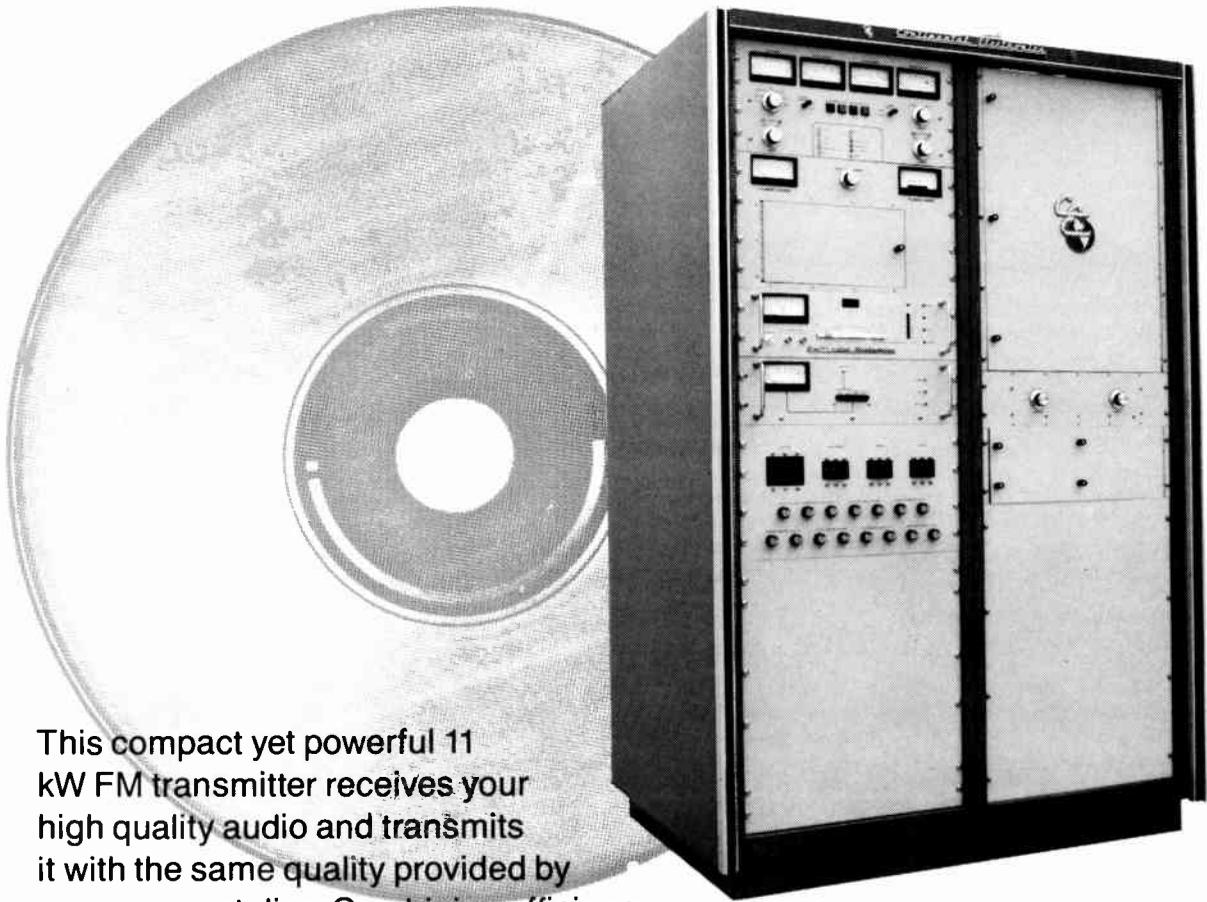
Yamaha
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Featured Products: MAX-2 remote broadcast mixing console.

New Products: Max-Z portable mini remote broadcast booth, folds up and fits in a car.

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Station Stories

Radio Station Installation Reports

WXTU Goes Upscale and Uptown

By Judith Gross - editor

After ten years squeezed into two studios and only 3500 square feet, WXTU-FM, Bala Cynwyd, PA, was ready for a change. The station, in this Philadelphia suburb, was riding the crest of a surge in country music's popularity.

Owner Beasley Broadcast began looking for a suitable place to relocate WXTU, and found what corporate DE Kevin McNamara describes as a "slightly more prestigious address" further up City Line Avenue.

But it was more than just a move. It was also a chance for McNamara to look ahead and plan for the future. Now, with the completion of two studios and a newsroom, he is ready to begin work on an all-digital production studio and has even had the foresight to include computer networking in his wiring scheme.

Clean and Simple

"We wanted to make it the best we could with the money we had, and keep it simple, too," McNamara explains. He began modifying the third-floor of an 11-story building for sound isolation. The building had previously housed radio stations, so one immediate advantage was a satellite mount already affixed to the roof.

"We couldn't take satellite feeds in the old building, so that was a plus," notes McNamara. The studios themselves required window treatments and Kinetics flooring for isolation.

"The studios are not on springs but they are isolated," he says.

The first stop as you enter from the reception area is the engineering area, insuring McNamara easy access to the four studios.

The control room is the showcase, and the largest of the four with three mic set-ups. McNamara chose the Wheatstone A-500 console and went with Wheatstone furniture as well.

McNamara said he liked the per-

formance of Wheatstone consoles, which he also used in the news and production studios, and the look of the console together with Wheatstone furniture. As part of his working with Wheatstone, he ended up using the company's DAs as well. "Wheatstone gave me a lot of options to work with," said McNamara.

Newsroom Back-Up

The newsroom acts as a back-up control room, so a Wheatstone A-500 and Wheatstone furniture went in there as well. McNamara added three

ITC Delta cart machines and two Denon 950 CD cart players as well.

For the main production studio, he chose a Wheatstone SP-5 board. He added a Tascam 8-track, two Otari 50-50 2-tracks, a Technics CD player, ITC 99 cart machines and a Yamaha SPX-90 effects unit.

"We didn't invest as much money in it as we might have," McNamara says,

"we're looking to move toward digital technology and I can't see investing too much in analog right now."

The move took about a month and a half and was done one studio at a time. WXTU made the switch during the last hour of its afternoon drive and the afternoon jock drove over to finish the show in the new studio.

The production studio was finished next, then the newsroom. But McNamara is going to take his time on the second production studio, which will be, he believes, the road to the future.

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WXTU Goes Upscale & Uptown

Digital Tomorrow

The station's digital future will be born in a second production studio, which right now houses equipment moved from the old facility.

McNamara said he is looking to add a digital workstation, such as the AKG DSE-7000 and is interested in trying out the new Fidelipac Dynamax

DCR1000 digital cart machine, which puts audio on 3.5-inch floppy disks.

"This is definitely the way the industry is going, and we want to begin moving toward it," he says.

McNamara's vision of the future extended to his wiring and master control. "We have five runs of coax and ran lots of other cable. Eventually,

I'd like to be able to put in a LAN (local area network), maybe Unix-based" says McNamara, who right now uses a Novell PC network.

To extend his belief that one day the station will be digital, he also installed a color monitor in the control room, which could become part of an automated computer at some later date.

Some Added Benefits

There were a couple of other features WXTU was able to add in the move. One is the ceiling Pivotelli mounts for speakers, that McNamara notes puts the on-air talent in the near field of the monitor and keeps them from cranking things up too high.

Then there was the one-hop STL advantage the station gained in the move. The transmitter site stayed the same, but the move put WXTU in the clear of some downtown Philadelphia buildings.

All the equipment at the transmitter stayed pretty much as it had been before the move, according to McNamara. He did recently add a Belar Wizard digital modulation monitor, which he said he likes because of the remote access via computer.

And he recently bought an EBS monitor from MTS, which he likes because it monitors AM, FM and NOAA. But he found the remainder of the RF chain, including processing, to be up to the hot county sound the station seeks.

And, with the move, McNamara notes that the station's attitude, both on-air and off-air has changed. For example, he bought a 3-line Comrex so WXTU can start doing more remotes, which were scarce when they inhabited old studios.

"What we did was bide our time for awhile and then we saw this move as being necessary to help keep country music hot in this city," McNamara explains. "We came up with very cost-effective solutions that got us what we needed. If the station is a happy place to work it's going to sound happy, too. ■

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Transmitter Site

Installation and Repair at the TX Site

How To Size Up a Used Transmitter Bargain

by Ernie Belanger, Energy-Onix

I was handed the challenge of a lifetime several years ago, the opportunity of a radio station start-up, and like many start-ups today this one was under-capitalized. My equipment decisions were based on the experience and knowledge I had then, but if I knew then what I've learned since I wouldn't have made certain decisions.

One morning, a van rolled up and the transmitter which was rolled off of it looked clean and appeared to be in reasonable shape. But before this unit was air-worthy it took 15 hours, several hundreds of dollars of replacement parts including relays, diodes, capacitors and a plate blocker, plus a

good half week's work of troubleshooting.

I thought I had done my best to repair this "apparent shipping damage," then, within one hour of finally being turned-on, one of the rectifier stacks gave us a preview of Chernobyl. What made matters worse was the four-hour drive to the nearest airport for the emergency parts every time something burped. In fairness to the company that sold us the transmitter, I must tell you that the parts were covered by their guarantee, but we had to pick up the labor bill.

After some very long days we finally got this prop from "Road Warrior" working. But it was not the end of our problems. Forty eight hours from sign-on - bam - off the air! The 22-mile trek to the transmitter site, made at breakneck speed, revealed that the high voltage wiring was brittle and had split, arcing to the cabinet.

We were off the air for about four hours as I frantically tried to locate proper wire to rework that part of the wire harness. I finally reached an engineer in a city about 70 miles away who let me scavenge from his

back-up transmitter and allowed me to save the day.

A week later the high voltage contactor bought the farm, a couple of months later the bearings in the blower bit the dust, the tube sustained major heat damage and the plate blocker melted, shorted out and finally took the transmitter off the air. There were several other problems which developed, but you get the idea.

Little Shop of Horrors

In my career I believe I've seen more used transmitters than every station owner and most engineers. I've seen those "just off the air" transmitters which arrived as a cabinet and mere boxes of parts: like the 1 kW Gates AM we bought from an east cost station and then sold at a loss. This was advertised as "currently being used as a back-up," but it looked like something from a high school science project gone haywire.

This single transmitter took more than 150 man-hours and several thousand dollars worth of parts, which had to be bought at a premium price because of transmitter age, before it could be turned on.

Purchasing a transmitter which is advertised as "reconditioned or rebuilt" may not be ideal either. These terms have no clear definition and, like the word "healthy" used with food, the terms "rebuilt or reconditioned" can be defined any way the user of the word wants to define it.

To one person "reconditioned or rebuilt" might be more aptly defined as "repair and retune." To another it may mean a unit which has truly been rebuilt with everything in accordance with my law of what to look for in a rebuilt or used transmitter.

(continued on page-36)



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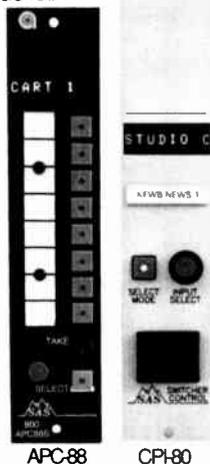
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Transmitter Site

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out you may be left holding the bag when it comes to worn parts which should have been replaced but just made it through the warranty period.

Ernie's Laws

Keep in mind that simply seeing a transmitter working on-air does not necessarily mean it is in compliance with FCC rules nor does it mean that the unit is free from the type of defective parts which I've outlined in my horror stories.

My experiences have led to the development of Ernie's Laws of used transmitters:

1) Every transmitter available on the used or rebuilt market is there for one of four reasons (a) it's old and the technology is obsolete; (b) it's old and worn out; (c) it's old, has a history of trouble and the station was tired of spending good money fixing it or (d) it's old and the station sold it when it increased power.

The main point is it's old! If it was worth keeping the current owner would probably keep it as a back-up. Like most used cars, if it's for sale you have a 95% chance that it has major problems which are expensive to fix.

2) Old transmitters shouldn't be placed directly back in service unless they have been 100% properly rebuilt. If you decide to purchase a used transmitter or a rebuilt transmitter the following items must be checked out and found or put in good working order:

Wire Harness: Over the years other parts may have been replaced but rarely the wiring harness unless there was a fire. As the harness ages it becomes brittle, the insulation cracks and there is an extremely high risk of wire related problems including fire. The cost of a complete wiring harness is several thousand dollars. It should be replaced if the transmitter is more than seven years old.

Moving Parts: Parts such as the blower, contactors and relays all should be replaced even if they do work. Why? Reliability. Contactors and relays pit and stick, blowers have bearing problems and can seize up

causing overheating which causes further damage to the aging parts, may destroy tubes and could cause a fire.

RF Components: Tuning controls, sliding assemblies, vacuum caps and blockers become worn, cracked and unreliable. The replacement of these parts can range from one thousand to a few thousand dollars.

Transformers and Chokes: According to Peter Dahl, a major supplier of these parts to the broadcast industry, insulation begins to dry out and crystallize after seven years. Change these units at the seven year point, saving the older units as an emergency spare.

Capacitors: The major danger here is PCBs! EPA regulations, both state and federal, must be taken into account. In some cases stations have paid heavy fines for having these still on board and not properly marked or contained. You can be in violation even if you did not know the unit contained PCBs. Therefore, it is important to replace all oil filled caps in transmitters built before 1979.

The replacement and proper disposal of PCBs is an expense which can approach a thousand dollars. In some cases, disposal alone is over five hundred dollars. Other small electrolytic capacitors used in circuitry that is more than four years old should also be replaced as these dry out and change value.

Parts: One problem as transmitters age is the decreased availability of parts. Some transmitter manufacturers used proprietary parts. Once a transmitter is four or five years old many manufacturers no longer stock exact replacement parts and if a replacement part is avail-

able it may be a substitute which requires creative adapting to work like the original.

One More Problem

Even if you do go through the work and expense of bringing a used transmitter back to life there is another problem over which you have no control: the cost of operation.

Most transmitters manufactured before 1980 have deplorable power consumption figures. Some run at 50% overall efficiency but more realistically the overall consumption figures range about 40-45%. And don't forget the cost of tube replacement.

Sure, I'm in the business of selling new transmitters now, but it would be hard for even the most suspicious engineer to ignore increased power efficiency, VSWR foldback and protection, automatic power level control, solid state IPAs, and the myriad other advances that have evolved over the past few years and which are lacking on used transmitters.

Ernie Belanger is VP marketing at Energy-Onix. He can be reached at 518-828-1690.

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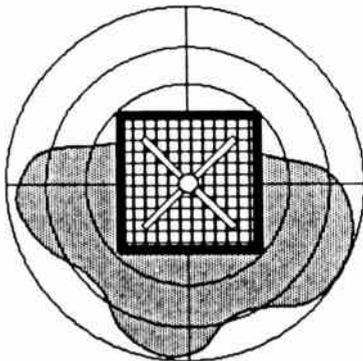
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Reader Service #026

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Product Guide

Products & Services for the Radio Industry

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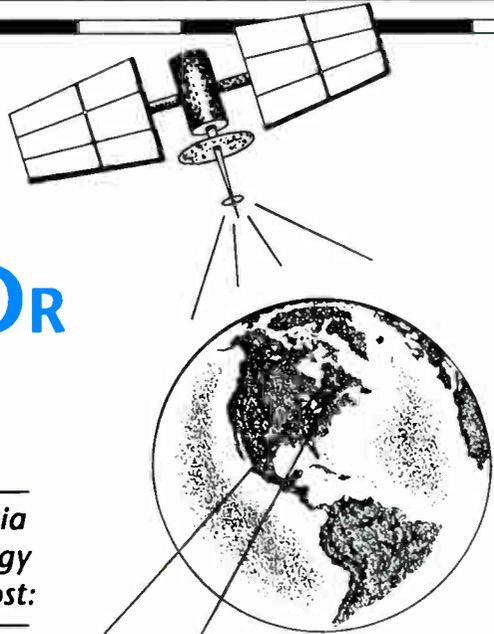
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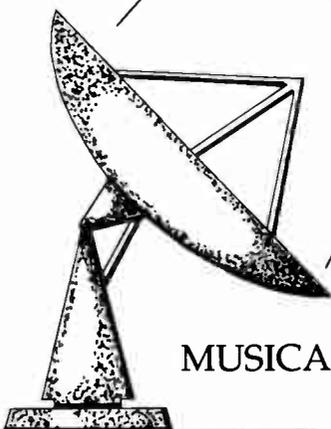
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Equipment Report:

Orban - Optimod FM 8200

Reader Service #034

Optimod Fast-Forwards Digital Age

by Howard Mullinack, AKG-Orban

Creating a sound that holds and attracts the largest possible audience is the bottom line in this business. GMs, PDs and CEs who have put the Optimod FM on the air will testify to the strong, solid, high quality signals it has helped them achieve.

The Optimod-FM 8200 Digital audio processor takes the Optimod standard to an even higher level. The 8200 carries on the tradition of louder, cleaner and brighter audio.

Digital signal processing improves the Optimod sound with high-frequency and peak controls that are not achievable in analog circuitry. Two years of 8200 development time were spent on achieving the most effective peak control on the market.

The Optimod-FM system integrates the stereo encoder with the audio processor to achieve the highest average and peak modulation levels with the least amount of audible compression and peak limiting.

Orban's several patented distortion-cancelling clipping systems control peaks to prevent over-modulation without the "peak limiter sound." Peaks are controlled precisely, with no audible distortion and no effect on the average level.

Optimod-FM 8200's use of digital integrated circuits increases its reliability and ease of service. Proven, modular components and stringent reliability testing deliver maximum system uptime.

Each Modular Variable Processing (MVP) structure is the software equivalent of a dedicated processor. In a typical 8200, one MVP acts as a two-band processor, another as a multi-band processor, and a third MVP functions as a transparent protection limiter.

Optimod-FM digital offers a wide degree of flexibility. Many stations set the controls to one of the built-in factory presets. Each MVP structure can be adjusted with just one control: Less or More.

Using Less-More precisely tunes all of the processing parameters together to produce more or less processing, with all the parameters ideally set.

Or, you can create a custom sound by using Full Control to fine-tune each parameter individually. Then store the adjustments for it as a Station Installed Preset. Save up to 32 presets to recall at any time, either from the front panel, by remote contact closure, or by computer interface.

A station can experiment with presets and return to the original setting if the sound

is not what is desired. Once a preset is stored it can be easily recalled.

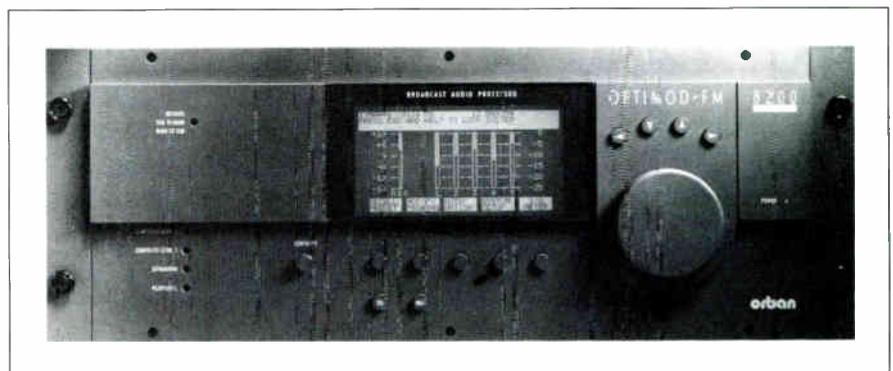
Automatic Preset Switching is ideal for dayparting, allowing stations that broadcast different formats to optimize the processing to programming throughout the day.

A large LCD makes set-up adjustment and programming the Optimod-FM 8200 easy. The screen clearly shows all metering functions. Help is always available at the push of a button. There is no need for a complex instruction manual: step-by-step instructions are on the screen.

MVP structures and the control system program are stored on a plug-in module, making the 8200 easily upgradable by adding DSP cards.

With Optimod-FM 8200 digital audio processing a station will enjoy a clear, bright open sound, ideally processed to a station's format today, with the ease of adapting to new technology tomorrow. It's an investment in the digital future.

For more information contact AKG-Orban at 510-351-3500.



Equipment Report: *Cutting Edge Technologies - Unity 2000*

Reader Service #035

Unity 2000 is Smart Processor

by Frank Foti, *Cutting Edge Technologies*

The Unity 2000 is designed around new and innovative signal processing concepts. Be aware of digital "clone" products. These "re-packaged" 10-year old analog ideas are now being touted as the latest and the greatest!

The Unity is built around techniques that utilize advanced signal processing algorithms, not the same old analog designs reshaped in a digital model.

Based on advanced processing technology, both the preprocessor and the limiter incorporate the revolutionary "Intelligent Time Constant Control" that actually learns the music and adjusts attack and release time accordingly. And, the time constant controller works in real time.

RMS timing circuitry generates only the amount of processing needed by the average music level, eliminating the problem of over-reacting gain control circuitry audible in other audio processors.

Through the use of "Feed Forward" technology, the Unity 2000 provides a constant processing ratio, which gives the user a "sweet spot" at any level of signal processing. The clipper offers a range of +/- 5 dB, and includes a phase linear low pass filter which allows no overshoots.

The digital stereo generator provides better than 50 dB of stereo separation with no need for adjustment due to analog drift. The fully user-selectable composite clipper is pre-pilot inserted, which eliminates the risk of stereo separation loss due to pilot re-insertion.

The digital Unity 2000 comes complete with a selectable low frequency equalizer; a 4-band leveler/preprocessor; a 4-band limiter; a distortion-controlling clipper; a stereo generator and a selectable composite clipper.

One keypad and LCD display control all component functions. Digital control allows you to implement precise, exact con-

trol over all processing variables.

Plus the Unity 2000 comes complete with processing presets for AOR, AC, Country, CHR, Urban, Country, Jazz, Easy Listening and Classical. Or, program your own and save the results.

Other features include adjustable time constants and cross-over frequencies, memory storage for 50 processing settings, daypart scheduling that allows 50 events to be programmed, an RS232 port for remote access, unauthorized user protection, modular architecture for easy updating and a port for ancillary devices.

For more information call Cutting Edge Technologies at 216-241-3343.



Equipment Report: *Circuit Research Labs - Audio Signature*

Reader Service #036

A Flexible Processing System

by Bill Ammons, *CRL Systems*

When we began marketing the Audio Signature processor two years ago, we said that "it was like designing your own audio processing." That theme holds even more true today. Processing must be interactive and very flexible to stand out in today's competitive marketplace. It must be easy to use, and be cost-effective. The microprocessor-based Audio Signature is a combination of the best analog and digital technologies married together.

When we first introduced the Audio Signature, software was supplied with the unit that allowed full control from an IBM compatible PC or modem. Processing parameters such as crossover frequencies, equalizer settings, and processing density could be easily controlled from a remote location. Plus you could store 4 complete processing programs in the Audio Signature's memory.

During the last year we introduced the Real Time Even Sequencer, (pictured above the Audio Signature) which allows full daypart processing of the Audio Signature. The new timer allows up to 26 different processing

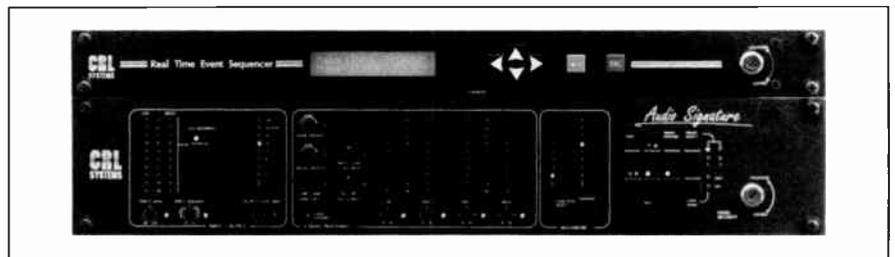
programs to be stored, and allows up to 200 timed events over a 7 day clock. In addition to daypart processing, the timer can be controlled by 5 remote input terminals. This allows you to process by source (i.e. one contact input from console logic, one from network source, etc.), rather than time of day. We have had strong demand for this system from educational and brokered stations that have very diverse programming sources.

Our newest entry in the product line is the Modulation Signature (not pictured - see at NAB 92). It is an advanced limiter and stereo generator packaged in a single rack

high unit. The Modulation Signature is designed to team up with the Audio Signature, and our Real Time Even Sequencer, to form the most flexible audio processing system on the market. In many cases the Modulation Signature will be used at the transmitter site, while the Audio Signature will be installed at the studio.

The Modulation Signature features drift-free performance and impressive stereo specifications. In addition, the unit also features processed left and right audio outputs, great for monitoring just before stereo encoding.

Call CRL Systems at (602) 438-0888



Radio Guide Page-41

Equipment Report:

California Digital - DigiMod 2000

Reader Service #037

DigiMod 2000 Upgrades Optimod

by Paul Donahue, California Digital

DigiMod 2000 version 6.0 is designed to be a wise investment in audio processing by improving a station's audio quality while maximizing the value of existing equipment and systems. It has been developed for FM broadcasters who want the most from their Orban Optimod 8100.

With the advent of digital source material, stations were previously unable to take maximum advantage of the clarity and openness found on CDs and DAT with their older analog processors. We found that using a standard Optimod with an XT chassis began to reveal shortcomings in the Optimod.

The standard 8100 two-band input compressor circuitry was designed in a predominantly analog audio world of 1980 and is improved on with the DigiMod to deliver new digital audio sources. The DigiMod 2000 permits the FM broadcaster to maintain a competitive edge in the digital 1990s.

DigiMod version 6.0 adds additional on-board limiting for greater loudness over previous versions. This is developed in a feed-forward, stereo enhanced mode which creates a wider stereo image than is possible with the original Optimod system.

Precision matching of the digital control module and LDR gain reduction elements allow higher compression ratios, tighter bass and better mono tracking.

The California Digital package consists of three circuit cards which will transform your Optimod into a digitally-controlled three-band processor. Our design approach uses premium-grade analog op-amp circuitry and advanced digitally-controlled gain reduction to "turbo-charge" your standard Optimod.

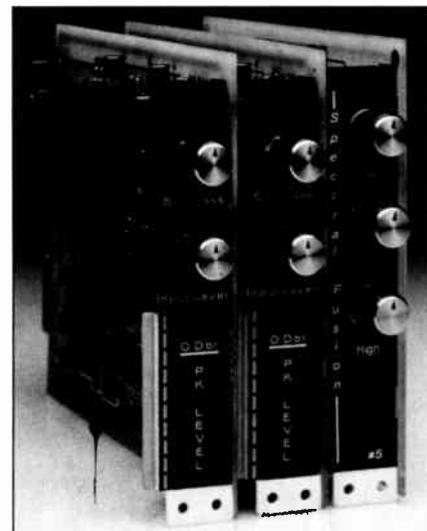
DigiMod gives the station's programmer and engineer more complete control over the sound signature of the station to develop a distinct personality. Flexibility and control is made possible through simple adjustment of our proprietary Spectral Fusion (TM) controls.

The version 6.0 Spectral Fusion controls allow you to effectively mix the correct amount of compression or limiting in each band of frequencies to compliment most preprocessors.

DigiMod is designed to work effectively with most types of multi-band preprocessors and we are pleased to offer set-up suggestions. Many users back off the density of preprocessing after enhancing their system with the DigiMod. Let your ears be the judge.

In summary, the DigiMod 2000 was designed to meet the processing needs of a radio industry in transition from analog signal sources to digital signal sources and processing.

For more information on the DigiMod 2000, contact California Digital at (805) 523-2310



Equipment Report:

Aphex - Compellor Aural Exciter

Reader Service #038

Compellor Combats Listener Fatigue

by Marvin Caesar, Aphex Systems, Ltd.

One of the biggest and most costly misconceptions in broadcasting today is "louder is better." Indeed, the first impression of two signals, one louder than the other, is that the louder signal is better.

If, however, that louder signal was made louder by heavy processing: compression, multi-band compression, multi-band limiting, clipping and composite clipping, then the listener will soon be fatigued. And this is when the station will lose the listener...and money.

We all have multiband gain riders built into our hearing. When we are presented with an unchanging frequency response with no dynamic range we will turn "down" the signal.

In order to avoid this response, the audio must have at least some short term dynamics. That means that there will be moments when the audio will not be as loud as other moments. That seems like an obvious statement, but explaining it to a PD can be frustrating.

The Compellor, Aural Exciter, Dominator and Digidocder were all designed with these principles in mind. The Compellor, however, is an essential part of any processing chain regardless of the processing after it.

The Compellor is a combination of COMPRESSOR and levELLOR. The levelling has a high ratio but very slow time constants. The compressor has a low ratio with faster time constants.

The levellor responds to long term changes, thus providing a platform around which only a small amount of compression is needed to handle shorter term dynamics.

The control circuits include two "brains" which keep the gain control frozen for as long as possible. This makes the Compellor a fixed gain stage for most of the time as compared to other gain control devices in

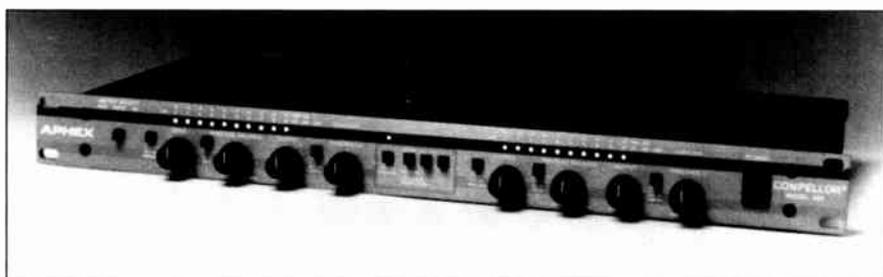
which the gain is constantly modulated according to the level of the input.

When there is the need for a gain change, the "brains" adjust the time constants dependent upon the texture of the input. For example, audio that is already processed will cause the Compellor to have a slower release time than for audio that is unprocessed.

The "sound" of the Compellor is that of extremely well ridden faders. The Compellor should therefore not be used as a loudness box, but as a way to make those loudness boxes work more predictably.

Digital processors, in particular, will benefit by having a Compellor feed them a higher level, limited dynamic range signal.

For information on Aphex call 818-767-2929.



Equipment Report:

Audio Animation - Paragon

Reader Service #039

Paragon-Transmission Software Upgradable

by Steve Metzger, Audio Animation, Inc.

Advancements in signal processing technology are occurring in some unusual places these days. Tucked in the foothills of east Tennessee is Audio Animation Incorporated, a small company whose "paragon-transmission" (yes, lower case), a fully digital broadcast signal processor, is breaking new ground.

Released less than ten months ago, the paragon-transmission is a PC based, digital signal processing platform in which every aspect, including audio processing and control functions, is software configured.

The operating software is loaded and used via a 3.5-inch floppy disk drive which also allows virtually unlimited functional and sonic updates. An example of the ease with which the paragon-transmission can be updated is the third version of software which is to be released prior to the Las Vegas NAB show this month.

This update, which is always free to users of the product, will change a number of the user functions as well as some of the sonic characteristics of the filters. Responding quickly to feedback from those using the paragon-transmission, version 2.2 will include a wide variety of additions and enhancements over previous releases.

The basic architecture, which includes the fully digital control of "on-air" A/B comparison; customized setups; saving and recalling; a four band compressor and limiter; wide band AGC and peak controller will remain the same but there will be other changes and improvements.

The 10-band equalizer which was a feature of past versions of software will now become a six-band fully parametric with continuously variable frequency control on all bands. There is even a new graph feature which allows the user to plot the current equalization curve on-screen.

These features show how the paragon-transmission may be continually updated via software where, in the past, hardware modifications were required with analog processors, if they were possible at all.

In addition to functional improvements there's an ongoing improvement in digital filters which will provide users with the ability to custom-tailor the sound of a station.

Version 2.2 software has addressed certain areas which were of particular interest to users in the field. Loudness, which is an issue for aggressive processing, was at the top of the list. Improved algorithms coupled with the non-clipping peak controller, deliver competitive loudness with fidelity.

Within 2.2, a newly added stereo image controller (L-R and L+R) allows the user to adjust the stereo soundstage width and create

a more spacious effect. Other sonic and functional features include stereo strapped processing; de-emphasis control and setup file import, export and archive functions.

Dennis Ciapura of the Noble Broadcast Group summarized it by saying, "Years from now the entire system can be updated and configured by inserting a floppy." Scott Wyrick of WIMZ radio in Knoxville says, "The thing I like most is that no hardware changes are needed."

The reality of digital processing and control is that new benefits can be added which were not available in analog systems. The fidelity, versatility, ease of functionality and obsolescence protection through software of the paragon-transmission provide stations with a powerful tool to fully discover those benefits.

To find out more call Audio Animation at 615-689-2500.



Equipment Report:

Inovonics - Model 250

Reader Service #040

Programmable Processing

by Jim Wood, Inovonics Inc.

With the development and introduction of its Model 250, Inovonics pioneered in two aspects of broadcast audio processor technology: programmability of the processing parameters and use of quasi-digital PWM (Pulse Width Modulation) for program signal gain control.

Inovonics' 250 is a L/R-correlated stereo broadcast processor combining the dynamic control functions of slow, gated "gain-riding" AGC, multiband compression and graphic equalization.

It also offers either split-spectrum peak control for preemphasis protection in FM and TV or matrixed asymmetrical limiting for AM mono or stereo transmission.

Recognizing early on that optimum processing for broadcast is not always a set-and-lock-down function, the 250 is targeted to those applications involving station format changes and to accommodate audience profiles which vary during the day.

Normal, "static" programming permits an operator to preset all processing parameters for up to five distinct and separate call-

ups. As required, these may be instantly selected by a simple manual switch closure, by a time clock or by station automation.

Alternately, the plug-in static programming assembly may be replaced with a computer interface option, placing all processing parameters under continuous control via an RS232 bus.

This provides more comprehensive remote control, either by direct computer access, by more sophisticated station automation or by modem.

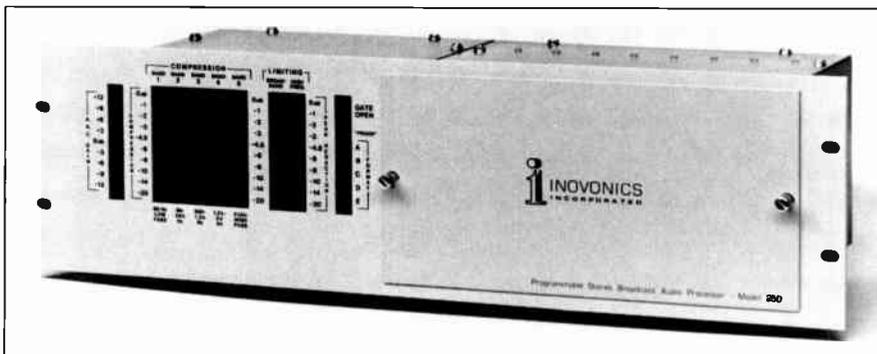
The feedforward/PWM method of gain control was unique to the 250. This proved

so successful that it is now employed exclusively in the entire line of Inovonics broadcast processing equipment.

Since it's a binary On/Off system, noise, coloration and distortions associated with VCAs and other traditional analog attenuators are eliminated.

Moreover, nearly any gain reduction transfer function may be generated, from abrupt to "soft-knee," giving the means to minimize audible processing artifacts.

Call Inovonics at 408-458-0552.



Equipment Report:

Gentner Broadcast - Lazer

Reader Service #041

Lazer Heralds Digital Future

by Paul Anderson, Gentner Broadcast

Lazer, from Gentner Broadcast, is the first (and as of this writing still the only) 100% digital DSP limiter/stereo generator for FM broadcast.

There are other processors which are at least partially digital, but the digital stereo generator in Lazer provides stability that is not available with analog stereo generators.

There are no separation, pilot phasing or other adjustments that might drift and compromise the performance of the Lazer stereo generator. The digital stereo generator in Lazer provides excellent separation and stereo performance without adjustments.

Lazer provides both flexibility of adjustment while allowing ease of use through pre-programmed sets of parameters. In this way, if you want to fine-tune and tweak parameters, you have full freedom to do so. If you have experience with audio processing, Lazer allows you a very wide range of parameter adjustments.

In contrast, if you just want to get on the air quickly and easily, you can select one of the eight pre-programmed sets of operating parameters. These are pre-set for a variety of possible formats and they allow you to get on the air without worrying about how to tweak the processor.

Even if you do not have a lot of experience with processing, the structure of Lazer allows you to experiment and easily compare new parameter settings with previous settings. And if you don't like the results of your experiments and you want to return to your original settings you can do so in just moments.

Processing parameters in Lazer are set by numeric values on the display screen so it is no problem to duplicate them. This makes it a snap to return to previous values after experimenting and it makes it easy for consultants to prescribe precise processing values for clients.

A certain set of parameters will always produce the same performance from Lazer and there is none of the uncertainty of using analog controls. There is no need to "set this knob between 5 and 6" as is the case with analog processors.

Lazer has a very flexible AGC patterned after the well-known Gentner Prism II FM. This AGC makes Lazer a competitive stand-alone processor with all the transparency and loudness you want. For very aggressive program density just add pre-processing such as the digitally-controlled analog Prism II FM or the Gentner digital Prism.

In addition, three-bands of limiting in the Lazer gives better performance without the risk of bass smothering the mid-range or other possible problems which may occur in a one- or two-band limiter.

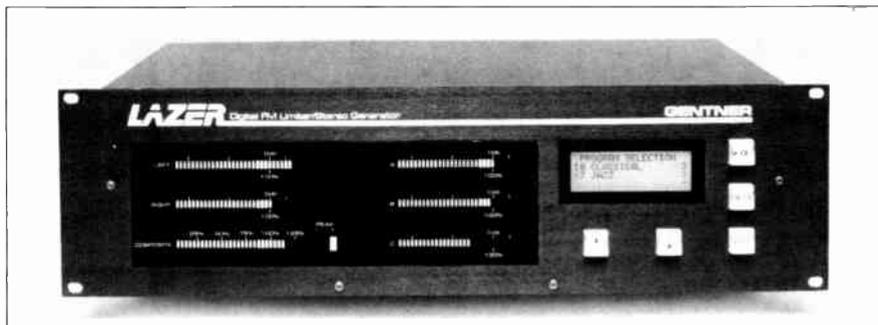
Lazer is built with the future in mind. In addition to the analog composite output to feed your present exciter there is also a parallel digital output port to feed a digital exciter.

The A/D converter for Lazer is also a separate box, called the Optical Encoder, which feeds Lazer with fiber optic cable. Converting to an all-digital audio chain requires only a change in the Optical Encoder. There is also a digital SCA input for digitally-generated SCA signals.

The operating structure of Lazer is determined by software, like a PC for audio processing. With a PC, the programs you run make a difference and the same is true of Lazer. The software-based structure allows for improved processing procedures in the future, with no need for add-on boards to change the way it works.

The Lazer from Gentner Broadcast is the processor of the future, ready to use today. It provides the clarity and openness you have always wanted without giving up the loudness that competition requires.

For more information call Gentner at: 801-975-7200.



Equipment Report:

Hnat/Hindes - Ultramod UM-2000

Reader Service #042

Ultramod UM 2000 an All-In-One Solution

by Steve Hnat, Hnat/Hindes, Inc.

The Ultramod UM 2000 is a self-contained FM processing system incorporating a split-band stereo audio processor with an ultra-transparent digital stereo generator.

Modulation control is provided by a unique, low second-harmonic feedback clipper which provides high levels of modulation without the masking effect of second harmonic energy.

The audio processor section is an ultra-transparent AGC that preserves dynamic integrity while maintaining the modulation peak envelope is at its maximum level.

Unlike other processors which use multiple cross-overs to alleviate release time

deficiencies, the Ultramod's integrated release seeks its own level of long and short term release, dependent upon program energy duration.

Low frequency energy is processed separately with this same concept: separate low-frequency clippers are employed along with filtering to provide the best sonic reinforcement possible without subjecting the main signal to crossover phase shift.

The stereo generator is a digitally-synthesized format incorporating buffer-isolated multiplex ports and 4-bit resolution of the 38 kHz subcarrier.

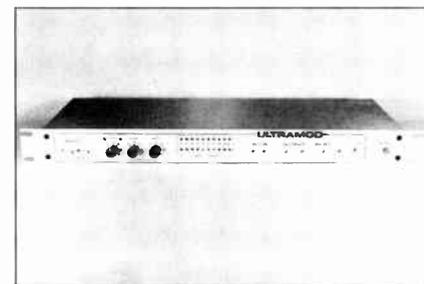
Pilot frequency is digitally derived and always in step, requiring no adjustments. Large-scale integration is used to hold down the cost without sacrificing performance.

There are two composite outputs, along

with a separate pilot output to make it easy to interface with the Hnat/Hindes, Inc. CP-2013 composite processor.

You can expect simplicity of set-up and sonic integrity from the Ultramod UM 2000, a timely product for today's cost conscientious broadcaster.

To find out more, call Hnat/Hindes at 203-935-9066.



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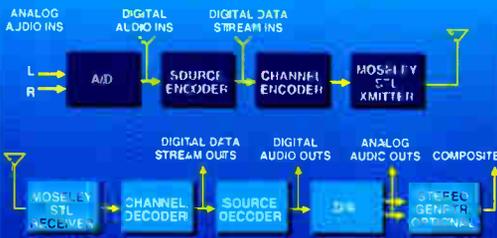
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3. Circle below. (NOTE: Circle no more than 15 numbers.)

001	026	051	076	101	126
002	027	052	077	102	127
003	028	053	078	103	128
004	029	054	079	104	129
005	030	055	080	105	130
006	031	056	081	106	131
007	032	057	082	107	132
008	033	058	083	108	133
009	034	059	084	109	134
010	035	060	085	110	135
011	036	061	086	111	136
012	037	062	087	112	137
013	038	063	088	113	138
014	039	064	089	114	139
015	040	065	090	115	140
016	041	066	091	116	141
017	042	067	092	117	142
018	043	068	093	118	143
019	044	069	094	119	144
020	045	070	095	120	145
021	046	071	096	121	146
022	047	072	097	122	147
023	048	073	098	123	148
024	049	074	099	124	149
025	050	075	100	125	150

The Digital STL Advantage

- CD-Quality Audio
- Higher System Gain
- Constant SNR
- No Crosstalk
- No Background Noise
- No Phase Distortion
- Degradation-Free Multiple Hops

Open Architecture



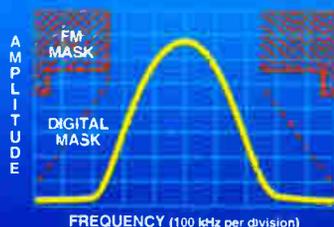
Open and optimal partition of source and channel coder. AES/EBU allows for end-to-end digital connectivity.

25 dB higher system gain translates into significant savings on antenna and transmission line costs.

A new transmission technology that has the power to deliver CD-quality audio and solve your STL problems.

The DSP 6000 can operate in existing FCC channel allocations from 100 kHz to 500 kHz with existing analog radios.

FCC Spectrum Compliant



Instant Payback



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Introducing the first spectrum efficient CD-quality digital STL system. The DSP 6000 Digital Transmission System consists of the DSP 6000E source and channel encoder and the DSP 6000D source and channel decoder, and any Moseley digital-ready transmitter and receiver. The encoder and decoder can also be easily interfaced with any existing Moseley PCL 606/C or PCL 6000 series STL. The system can convey up to four 15 kHz CD-quality audio channels and two data channels, and has a built-in V.35 modem interface for

fractional T1 applications! The DSP 6000 source coder is characterized by peak level preservation, low coding delay (3.8 ms), excellent bit-error immunity, and multiple encode/decode capability. The channel coder offers spectral efficiency, constant envelope, error detection capability and perturbation tolerance.

The DSP 6000 System offers broadcasters the digital transmission advantage, continuing the Moseley traditions of innovation, reliability, and most of all, value. Call us for a color brochure with all the facts.



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