Published twice a month

Radio World®

Buyers Guide
Program Audio
Processing
See pages 35 to 46

Vol 12 No 12 | June 15, 1988 | $2.00 Per Copy

Call To Halt AM Sync Ruling

by Alan Carter

Washington DC ... Several trade groups called on the FCC to slowdown or halt proceedings on AM synchronous transmitters, a process already delayed a year because of problems in obtaining data on transmitter tests.

The Association for Broadcast Engineering Standards (ABES), in comments filed in May on the use of multiple synchronous transmitters by AM broadcasters, recommended that the Commission suspend or terminate further proceedings until test results on the transmitter use are more complete.

The NAB also asked the Commission not to issue a rule making until there is "significant and consistently positive data" on experimental operation of the transmitters.

There was, however, support for a rule making from the Corporation for Public Broadcasting (CPB).

"Just as some states have designed statewide noncommercial television or FM radio networks, with strategically located transmitters to cover the entire region, noncommercial AM licensees could expand their coverage with multiple synchronous transmitters," CPB wrote.

Already used in Europe, synchronous AM transmitters were one of the FCC's top priorities for improving AM. The Commission called for an investigation into the system's technical operating standards.

But testing at KROL, Laughlin NV, and at KKOB, Albuquerque NM—two stations the FCC granted experimental licenses—have been plagued with problems in synchronizing the main broadcast transmitter with the remote sites.

Because of those problems, the Commission granted extensions for comments and reply comments three times from the original deadline on 4 May 1987.

The argument

In its filings the ABES contended there are inherent problems with synchronous transmitters including interference to the main transmitter signal and resulting poor signal quality. This dates back to 1929, the group stated. "To date, it does not appear that those problems have been overcome."

The group noted that test results from experiments at synchronous transmitter facilities including Albuquerque NM, are incomplete, even with three extensions.

"What scant information there is regarding the development operations suggest that the experience thus far has not been positive," ABES stated.

One report, the group continued, describes signal distortion as might be expected from the interaction of the main transmitter and synchronous transmitter signals. They concluded that the synchronization problem is unsolved.

ABES argued that based on what data there is available, a "truly synchronous" AM transmission system that is economically feasible and capable of reducing innate technical inconsistencies has not been designed.

With regret

Because of the problems in obtaining data on the transmitters, the NAB in its comments "reluctantly" concluded that it is premature to move with a rule making.

"Rather, we believe the Commission should encourage additional experimental efforts—and grant additional authorization—to garner more informa-

(continued on page 3)

Draft NAB AM Study Released

Washington DC ... The impact of a yet unofficial study on AM assignment criteria that is circulating broadcast engineering circles is being judged as quite significant.

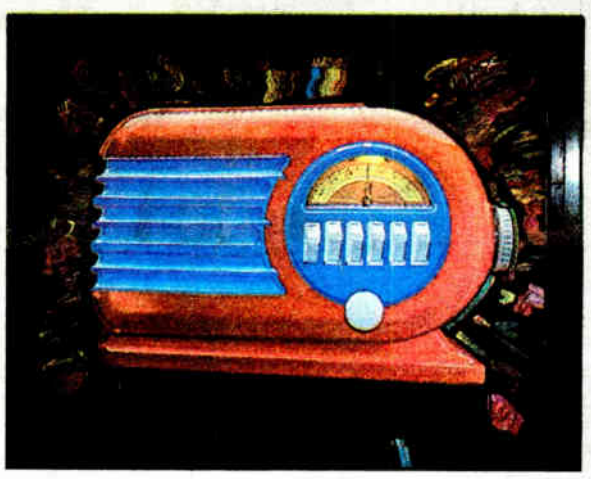
The report, "AM Technical Assignment Criteria," compiled by Harrison Klein of the San Francisco-based consulting firm Hammett & Edison, concluded that no single protected contour is appropriate for all circumstances, and that "differing requirements should be accommodated by the Commission's allocation scheme."

It also noted that man-made noise such as power lines, industrial machinery and noise-generating appliances has become a more serious allocation consideration.

Other conclusions included the point that existing protection ratios do not prevent adjacent channel interference, even on narrowband AM receivers. The report recommended that new ratios be calculated to better reflect present and future considerations, including use of the National Radio Systems Committee (NRSC) standard.

A draft version of the report was released at a May Radio Advisory Committee (RAC) meeting. Copies also have been sent to NRSC members. Now, engineers are awaiting the results of a psychoacoustic listening test to determine audience tolerance for interference conducted by B. Angell and Associates of Chicago.

(continued on page 7)



Radio Has Its Day

—see Earwaves page 4.

Anti-Copy Deal Near

by Charles Taylor

Los Angeles CA ... Japanese and European audio equipment manufacturers, weary of delays in the debut of R-DAT technology in the US, have met to discuss a standard anti-copying process that, if approved, could help the product reach American store shelves by year end, according to Marantz President James Twerdahl.

The process, known as Unicopy, is one of several second-round efforts to develop a device that will prevent consumers from making copies of the digital technology without degrading the original sound quality of the recording.

The Recording Industry Association of America (RIAA), which represents major recording companies, has insisted since DAT's development in late 1986 that the new technology would have to include a device that prevents consumers from bootlegging digital recordings. RIAA claims that the music industry already loses about $1.5 billion a year from home copying.

CBS Records developed one anti-copying system intended to settle the issue, but the National Bureau of Standards shot it down in F

REGULATORY NEWS

Groups Support FM Algorithm

by Alan Carter

Washington DC ... Broadcast engineers in comments and reply comments generally supported an FCC proposal to standardize the FM propagation algorithm, but not without some amendments.

The FCC in February issued a Notice of Proposed Rule Making, Docket MM 88-56, that would designate the algorithm used in its computer programs as the official standard the Commission would use for FM propagation calculations.

Establishing the algorithm as a standard, the FCC noted, would help resolve discrepancies in predicted field strength values.

The FCC stated that it decided to propose its own algorithm standard over those used by broadcast engineering consultants because the other programs "do not always agree with each other or with the Commission's program because they are based on different algorithms."

Agrees with "concept"

Among the comments, the Association of Federal Communications Consulting Engineers (AFCCE) endorsed the "concept" of a field strength prediction method that can be implemented by means of a computer program to support the traditional use of the FM and TV propagation curves contained in the Commission's rules.

The AFCCE, however, expressed concern about international agreements related to the proposed changes. "There is sufficient confusion now with respect to power and antenna height for stations located near the Mexican border. We do not need to create a similar situation with regard to Canada."

CBS supported the Commission's proposal so long as it provided "grandfather" protection to any adversely affected station that required it and if the FCC continued to offer copies of the algorithm to consulting engineers and other interested parties.

Pepper & Corazzini, a communications law firm in Washington, supported the proposal with some reservations. The group also recommended a grandfather clause and suggested the FCC make any proposal consistent with the development of the "more economical" personal computers.

Commission endorsement

Calling for a more far-reaching proposal, Communications General Corp., consulting radio engineers, suggested that the Commission establish a software package "by furnishing or endorsing" one.

In backing the proposal, the Washington engineering firm of Lohnes and Culver stated that a method should eventually be adopted that includes the effects of terrain over a more reasonable path length, including propagation beyond line-of-sight.

Crawford Broadcasting supported the proposal, but with a suggestion of its own.

Rather than stating that a specific algorithm be used in predictions of field strengths, Crawford recommended that the Commission publish tables of data derived from its own use of the specified algorithm with a sufficient number of data points that a reasonable accuracy can be achieved in interpolation of this data.

Cohen and Dippell, a consulting engineering firm in Washington, supported the move to have a standard algorithm but opposed use of the FCC model. The group said the program is not an accurate mathematical portrayal of the present FCC curves as discrete step functions appear.

Like Lohnes and Culver, Cohen and Dippell also questioned international implications near the Canadian and Mexican borders.

Detailed expectations

In replay comments Cohen and Dippell recommended specifics of a proposed algorithm. Their comments said it should be easily understood, an accurate portrayal, yield realistic and repeatable results, be portable, be uncomplicated in its methodology for predicted signal values and capable of being published in the FCC rules so that it will be a standard of reference in terms of law and be administratively convenient.

Another company, Comp. Communications Inc., "generally" supported the proposal but raised questions including

(continued on page 11)

INDEX

FCC Clips

FCC Grants Power Requirement

The FCC has modified rules allowing Class A FM stations to provide the same range of coverage from very high antenna sites as they currently may provide at low antenna sites.

The ruling responds to Eric Hilding's petition for reconsideration of the FCC's action in the Second Report and Order concerning the minimum power requirement for Class A FM broadcast stations.

Hilding claimed that rules adopted in the Second Report and Order prevented Class A FM stations from using relatively high, thus desirable, antenna locations.

He requested a revision to permit any Class A FM station, regardless of its effective antenna height, to operate with less than the normal minimum power, provided that the coverage provided equals or exceeds that of a Class A station operating with the normal minimums.

The FCC amended its rules to permit any Class A station to operate with less than 100 watts, provided that the resulting reference distance equals or exceeds six kilometers.

For more information, contact Jay Jackson at the FCC at 202-632-9660.

Communications Act Reprints

The Government Printing Office will reprint a new edition of the Communications Act of 1934 and related statutes, which sold out in April. The publication, put out by the House Energy and Commerce Committee, can be ordered now.

The 365-page manual, "Compilation of the Communications Act of 1934 and Related Provisions of Law," contains major communications bills enacted into law in recent years.

It can be ordered for $11 from the Superintendent of Documents, Attention: Government Printing Office, Washington, D.C., 20402. To order by credit card, call 202-783-3238. The publication stock number for ordering is 052-070-06473-1.

FCC Appointments

Noel C.R. Gunther has joined the FCC as mass media legal assistant to Commissioner Patricia Diaz Dennis. Since 1985, he primarily has been a freelance writer for national newspapers and magazines. He is co-author of "Beyond Boardwalk and Park Place," published by Bantam Books in 1986.

Melanie Haratunian has been appointed legal assistant to Carl D. Lawson and Gerald P. Vaughan, deputy bureau chiefs of the Common Carrier Bureau. She joined the Commission in 1985.

And the new assistant chief for technology of the Field Operations Bureau is Michael J. Marcus. Before joining the FCC in 1979, he served in the U.S. Air Force as a project officer for underground nuclear test detection research and worked at the Institute for Defense Analyses on electronic warfare policy issues.

Circle Reader Service 37 on Page 34

Audiopak Returns to Production

by Alan Carter

Winchester VA ... Audiopak, the start-up company that was the old Capitol Magnetics Products Division of Capitol Industries, is in production assembling broadcast carts, according to President Nick Krassowski.

And distributors contacted nationwide reported that orders are being filled on time.

Cart assembly is ongoing here at the old Capitol facility with plans underway to start coating and slitting tape, said Krassowski, who with a partner bought the division in February.

In mid May, injection molding machines had been in operation, at an outside firm, for about a month, he noted. Krassowski said he set up his injection molding machines off site to focus on coating, slitting, milling and assembly.

By the end of this month or first of July, Krassowski said he hopes to have the assembly operations in new facilities, about eight miles away. By the end of September, he plans to have the coater in operation.

Moved by October

Krassowski's timetable calls for Audiopak to be in full operation in the new facility by the last of September or first of October. The injection molding machines, however, would not be on site until next year.

Several distributors of Audiopak carts said they have had no problems in receiving shipments.

"It was the crisis that wasn't," said Northeast Broadcast Lab (NBL) Sales Manager Criss Onan, Glens Falls NY. "We have not experienced a slowdown of any type or of any length."

At Allied Broadcasting, Richmond IN, Dave Lumpkin, who is responsible for inventory control and purchasing, said he recently received an order in less than a week.

"We've been having real good luck lately," Lumpkin said. He noted some slowdown during the initial transition, however.

Good reports

Crouse-Kimzey GM Mark Bradford, Fort Worth TX, had a similar story.

"We're getting product," he said. In particular, Bradford is pleased with Audiopak having hired Gordon Stafford, a former Capitol sales rep, as sales VP. Bradford said Stafford was his rep when Capitol owned the operations.

Broadcasters General Store VP Chris Shute also said there has been "very little change, if any" since the new owners took over.

Shute also said he finds Audiopak easier to work with since it is a small company rather than part of a worldwide corporation, as the division was under Capitol.

Bryant Ellis, owner of Broadcast Cartridge Service (BCS), Huntington Beach CA, supported other distributors' comments. "We're not having any problems; I hope it continues."

The story was the same from Broadcast Supply West marketing VP Tim Schwieger. "At this particular time, we haven't had any problems." He said he had an increase in orders and deliveries were coming "like clockwork."

Neil Glassman, sales manager, Bradley Broadcast, Baltimore, also reported success in receiving shipments from Audiopak. The company's shipments were coming "as good if not better than when (the division) was owned by Capitol Magnetics," he explained.

Contact Audiopak at 703-667-8125.

FCC Asked to Halt AM Sync Ruling

(continued from page 1)

tion on the possibilities and problems relating to synchronous AM transmitters," the trade group wrote.

"Upon submission of a substantial record on the acceptable functioning of these experimental facilities, the Commission then should issue a rule making notice aimed at making this technology available generally to AM broadcasters."

The NAB acknowledged that it listed synchronous AM transmitters among the concepts that it believed could contribute to an enhancement of the AM band. It also noted that it would like to see the transmitters used to provide enhanced service within a station's regular service contours.

But the association concluded that the experience of the two experimental stations called for further study. "The record thus far established on synchronous transmitter experimental use does not demonstrate consistent success with this technology, and therefore, does not support issuance, today, of a Notice of Proposed Rule Making," the NAB stated.

The association concurred with the ABES, according to the filing, in urging the Commission to defer issuance of an NPRM until "sufficent experience" has been obtained from experimental authorizations that will "permit the drafting of definite rules which will protect adequately both the AM listener and affected stations from interference."

Support for rule making

CPB, however, supported the use of synchronous transmitters by noncommercial AM stations as "a means of serving areas that could not be reached with a single transmitter, either because of interference or terrain limitations."

The group noted its studies reveal public radio only reaches 80% of US residences. It considered the AM spectrum as an avenue of expansion "considering the virtual gridlock that has been permitted to develop in the reserved FM spectrum, exacerbated by the severe limitations imposed by the rules protecting against potential FM interference to Channel 6 reception."

On technical aspects, the CPB urged the FCC to permit licensees the "greatest flexibility" in designing synchronous systems, "within the necessary interference restrictions."

FCC docket is MM 87-6. Contact Gary Thayer, 202-632-7010.

Voices From The Hallowed Halls

by Judith Gross

Falls Church VA ... The movies have their **Oscars**, TV has its **Emmies**, and now, at last, **radio** has its very own measure of excellence.

Emerson Radio, a company which does a lot more these days than just make radios, decided the first medium had been **ignored long enough**. The company inaugurated the **Radio Hall of Fame** in a black-tie event at the **Empire State Building** in my old stomping grounds, the Big Apple, and of course *Earwaves* was there.

The blue-ribbon selection panel boasted some very big names. How 'bout **Mel Allen**, the voice of the Yankees? And **Dick Clark**, America's oldest teenager. There was also **Howard Cosell, Casey Kasem, Pierre Sutton** (president of Inner City Broadcasting) and yes, even **Walter Mondale**.

Don Imus, the New York DJ who had a hold on creative put-downs until Howard Stern moved to town was MC; **Alison Steele**, one of the first females to succeed in big city radio and **John R. Gambling** of that famous radio family dynasty were the presenters.

But hold on a minute, it wasn't all DJs, programming and New York. There was an award for **technology**, and it went to (who else?) **Guglielmo Marconi**.

Everbody seemed to realize *none* of the rest woulda happened if he hadn't taken Hertz's principles and turned them into the **wireless**.

Marconi's granddaughter, a surprisingly youthful **Allegra Figg**, accepted the award and posed with a picture of her famous granddad.

☆☆☆

Many of the inductees into the Hall of Fame are **original radio greats** and unfortunately not around any more, so surviving relatives showed up to graciously accept. **Mrs. Edward R. Murrow** spoke on behalf of her famous newscaster husband, **Groucho Marx's son** was there, **Arthur Godfrey's son** also Alana Freed, **daughter of Alan Freed**, the man credited with being the father of Rock and Roll.

Granddaughter of "The Father of Wireless"

J.G.'s EARWAVES

It just goes to show, as **Cousin Brucie** (a radio great who is still around, thank goodness!) said on accepting his award for Personality Radio, that "this Hall is long overdue, and it's about time **radio was recognized** for the great medium it is." Couldn't agree more, Cuz.

And **Himan Brown** who got the Mystery/Suspense award for *The Inner Sanctum* and that spine-chilling creaking door, and who is now producing for NPR and VOA, added that **radio's Golden Age** is still here.

"It's a vital living thing, it's not something that's in the past, it surrounds us still."

It was a great day for radio. Even the **world of art** participated. **Peter Max**, the pop artist of the '60s created a commemorative painting for the Hall of Fame: a splashy, wildly colored rendition of a **1930s art deco radio** (see cover photo).

The Radio Hall of Fame is a **temporary exhibit** in the Empire State Building, and Emerson is still seeking a **permanent home** for it. In the meantime there are plans to take it on tour.

I'll be offering input to the good folks at Emerson on possible candidates for **future recipients** of the **technology award**. Got a suggestion for a suitable candidate? Let me know ...

☆☆☆

Speaking of contests, don't forget **RW's** asking for a name for **AM noise** or incidental modulation in FM transmitters.

Remember **there's** an HP calculator and mug waiting for the winner. The only entry so far is Joel Bump's **Amplipath**. Can you top it?

Latest word on the 19 studio refurbishing at **VOA** is that it's **behind schedule and over-budget**.

A report from the Office of Inspector General was verrrry interesting. Details in the next **RW** ...

In addition to the psychoacoustic **listening tests** asking folks how much interference they can stand to listen to in AM, the NAB is doing **more AM studies** to try to see what's going on with AM and hopefully how to help.

Bill Moyes of a company called **The Research Group** is putting together focus groups and doing a person to person survey to find out why people have **stopped listening**.

The NAB Executive Committee heard the latest **bad news** about AM, and it's really gloomy. The **loss in listenership** in the past year alone could be anywhere from **7% to as much as 15%**. That's in just a single year.

And it's not just the teens who have tuned out. Apparently AM is now losing the **40 and 50 year olds** to FM. NAB is spending lots of moola on this project to find out what people are saying/thinking/believing about AM and what it will take to **get them back**.

The study wasn't included in **NAB's budget** for this year by the way, nor was the money they're putting into HDTV stuff. So when the NAB board meets later this month a **membership dues increase** may be one thing they reluctantly have to tackle.

Shining moment for radio's "Cousin"

I've talked about **amusing ways** stations promote themselves in the past, everything from bras to heavy metal. Now from **WGBH-FM**, the public station in Boston, comes two concepts to market the programs *Morning Pro Music* and *All Things Considered* from Mintz and Hoke Advertising.

One billboard says "None of the Hits None of the Time." And a TV spot lets listeners know that "If you added up all the hours you spend **driving to work** it's entirely possible to have spent the equivalent of **puberty on Route 128** ... which might explain a lot about Massachusetts drivers"

Hmmm, Puberty on 128, eh? I guess there are *worse* places for it.

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

Circle Reader Service 2 on Page 34

OPINION

Readers' Forum

Got something to say about *Radio World*? Any comments on articles? Call us at 800-336-3045 or send a letter to Readers' Forum (*Radio World*, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776).

Stop Cop? Stop Kahn!

Dear **RW**:

I just read in the latest *Earwaves* that Leonard Kahn is reportedly working on his own R-DAT anti-copying system . . .

Please, you can't let this happen! Think of the charges, countercharges, patent infringement lawsuits! Think of all the mudslinging all over again! We will *never* see R-DAT. You guys have got to save us!

Tom Nichols, CE
Little Rock AK

Is super radio enough?

Dear **RW**:

Commissioning noted electronic designer Richard Sequerra to develop prototypes of a "super" AM-FM table model should yield interesting designs worthy of further consideration.

Most engineers are familiar with Sequerra's work for Marantz and later his own firm and the legendary Model One. But the problems of AM reception today are not so much receivers but the overall state of the spectrum and the listener's environment.

How interesting it is to read of proposals for units with rotating antennae, tuning indicators, push buttons and so forth.

We have dozens of such receivers, some in elegant consoles bearing the great names of American radio manufacturers: Zenith, RCA, Philco and half-a-hundred others.

Or, recall the great "custom" manufacturers of the '30s: E.H. Scott, McMurdo-Silver and Lincoln. With a little work, competent technicians can get these babies humming as they did 50 years ago.

But as we tune the Scott Philharmonic for example—a 30-tube chromeplated jewel with its 50 watt amplifier, three-way speaker system, variable IF bandwidth (selectivity), tuning indicator, expansion circuitry and an elegant dial—state of the art in its day, we can't avoid the ugly little truth about AM. The spectrum is a mess.

And the ambient noise level of our neighborhood mars reception unceasingly.

We have at hand three wonderful 30-year old specimens of West Germany's radio production art: large, wood multi-speaker table models from SABA, Nor-Mende and Grundig.

They tune standard broadcast, the European long-wave (why this country still has not recognized the long-distance capabilities of long-wave is beyond me!) and VHF/FM (87-100 MHz at the time in

(continued on page 18)

Radio World

Vol 12, No 12 June 15, 1988

Publisher: Stevan B. Dana
Editor: Judith Gross
Buyers Guide: Marlene P. Lane
News Dept.: Alan Carter, Mgr.
Charles Taylor
Production Editor Alex Zavistovich
Circulation Mgr.: Marion Alsup
Advertising Coord.: Simone Leeser
Production Dept: Jean Barnes, Mgr.
Gina R. Rosario,
Jeanne Pearson

Radio World (ISSN: 0274-8541) is published twice a month by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone: 703-998-7600. Application to mail at second-class postage rates is pending at Falls Church VA 22041 and additional mailing offices. POSTMASTER: Send 3579 forms and address changes to Radio World P.O. Box 1214, Falls Church VA 22041.

Advertising Sales Representatives

East Coast
Ernest Robitel **516-671-2502**
Midwest
Steve Dana **800-336-3045**
West Coast
Patricia B. Macsata **415-786-2198**

Free subscriptions are available to professional broadcasting and audiovisual equipment users. For address changes, send current and new address to RW a month in advance at the above address. Unsolicited manuscripts are welcomed for review; send to the attention of the appropriate editor.

More Data And Time Required

The FCC's desire to proceed with synchronous AM transmission as a priority in its AM improvement program is well-intentioned.

When the commission first authorized two AM stations to experiment with synchronous transmission hopes ran high that enough data would be obtained in the alloted time period to initiate a rule making.

Unfortunately technical problems of one sort or another have led to numerous delays and the granting of several extensions on the deadline.

Now, more than two years later, there is still not enough information available to know if synchronous AM can be accomplished and whether it will enhance the band or succeed.

The FCC's decision to stand fast on the most recent comment deadline forced many concerned parties to file comments without sufficient information on synchronous transmission.

This is regrettable, because any new idea needs strong industry encouragement and there has to be more solid technical data on synchronous AM before it will get the support it needs.

It would be a mistake to authorize synchronous AM transmission without fully knowing its effect on existing stations or without proof that it will enhance the AM broadcast service.

On the other hand, it would be sad to see the idea abandoned when more time and perhaps a few more experimental authorizations might shed enough light to pave the way for its success.

Synchronous AM is an idea which has been tried successfully in other countries and it may be another step along the road to AM improvement.

But the FCC should hold off any action on synchronous AM until the technical problems can be solved and more facts are available.

The commission should extend the time for experimenting with this technology until, as the NAB commented, there is "significant and consistently positive" data available to proceed with a rulemaking.

Allowing an idea with good potential to stumble out of the starting gate would only add another disappointment to AM's struggle to thrive again.

—RW

The Survival and Future of AM

Guest Editorial

by Robert L. Deitsch

Detroit MI . . . I read the Guest Editorial by Jeff Loughridge (15 May **RW**) with a sense of sadness.

The very first issue of **RW** featured a lead story about the WABC tests of the Kahn-Hazeltine AM Stereo System. I remember Steve Dana coming to New York to discuss the subject with Winston Loyd and myself at ABC corporate headquarters. The original tests were performed by my staff back in 1979. I fear that many of your readers were not then in the business or familiar with your publication. It is easy for those without knowledge of the past to be lost in the short-sightedness of the present. I am convinced that this myopia condemns AM broadcasting to oblivion.

I would like to think that I have been a friend to Leonard Kahn over the years and that the wisdom of Gene Roddenberry, full of trite platitudes and aphorisms, is not the way by which your readers judge the world. The publication of Leonard's letter on March 15 was never intended by him; you were copied as a courtesy. Nonetheless, it is certainly not my intention to become bogged down in an argument with Mr. Loughridge. Those of us familiar with both the laws of the United States and with the many patents issued to Mr. Kahn know that he has been involved in the type of conflict which plagued Major Armstrong. He is the real friend of the AM broadcast service. History will judge him kindly.

I want your readers to understand that the true problems for AM are first, frequency response; second, interference; and third, distortion. If there is no improvement in these areas, the question of stereo will be meaningless. Two channels of unacceptable sound are, at best, no better than one.

The NRSC has been working on standards which affect all of these areas. Their recommendations would narrow allowable audio bandwidth, lessen particular forms of interference, and thereby cut down on perceived distortion. The first of these is not necessarily a desireable goal, but is probably needed to allow the others. It does create a narrower frequency pass band than the existing FCC rules; however, considering the receivers which are likely to be available for home use, does not place an anchor around the neck of AM broadcasters.

How does the AM Stereo question impact on these areas? Well, to understand this issue we must consider that the greatest single contributor to interference is the AM carrier itself. When ABC evaluated the various AM Stereo systems in 1979, we found that **only one** . . . the Kahn-Hazeltine . . . allowed for the reduction of carrier level. The vision of the future stressed by ABC then was a world of single and double sideband suppressed carrier broadcasts. The problem is that all of the current envelope detector AM radios won't work with sideband broadcasts. Could we be as bold as the British in their elimination of VHF TV channels? They assigned all existing broadcasters new UHF frequencies and said that in ten years there would be no VHF transmissions of TV. If the FCC were to mandate the use of synchronous detectors in all new AM radios sold in this country we could do the same. We would immediately have better AM radios and ten years from now we could reassess and take pleasure in a vibrant and thriving AM industry. We could immediately begin to reduce the allowable carrier by 10% per year. New radios would seem to improve as time went by. Old radios would get worse. We could begin saving money on our electrical bills. The power in the carrier is wasted energy! It is cheaper to operate sideband.

Or, we can attempt to apply band-aids to AM's problems, and slowly bleed to death. The choice is yours. Before you opt for Motorola stereo, try to become a visionary. Enlightened self-interest is what has made us great. Trust in the free enterprise system. Don't sacrifice our future for what will surely be a Pyrrhic victory. Embrace the work of the NRSC; support multi-system AM Stereo receivers; and begin to climb out of the past into a bright future.

Robert L. Deitsch was an engineer for ABC for twenty-one years before joining Geater Media in 1985. He can be reached at 313-398-7600.

ALLIED

The *FULL SERVICE* Broadcast People

SUN——MUTUAL——ABC——WESTWOOD ONE——RKO——CBS——UNITED STATIONS——NBC

AFFILIATE DIGITAL PACKAGE. . . $8774

Here's What You Get:

SATELLITE RECEPTION OF DIGITAL RADIO NETWORKS
FAIRCHILD DART 384 with COMTECH 3.8M ANTENNA

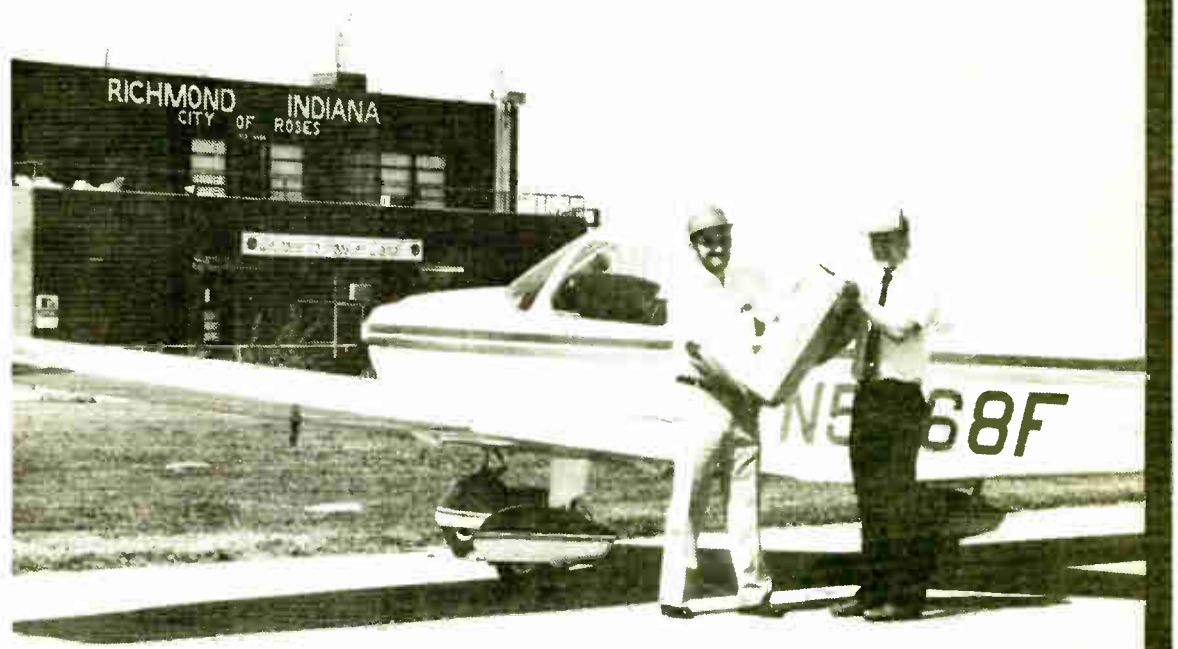
Qty.	Description	Unit Price	Amount
1	Comtech 3.8 Meter Antenna System. Rated Gain: 42.9dB. Includes 65 Degree LNA, Cable LNA to Downconverter, 200 Feet System Cable (RG-6), and Domestic Shipping Crate	$2685.00	$2685.00
1	Fairchild Dart 384 Digital Receiver with 4 Frequency Downconverter, Chassis, BPSK Demod, Decoder, De-multiplexer	5195.00	5195.00
1	Fairchild 15kHz Dual Program Module	800.00	800.00
1	Fairchild 7.5kHz Dual Program Module	800.00	800.00
1	Fairchild 3kHz Voice/Cue	190.00	190.00
		Total List Price	9670.00
		ALLIED PACKAGE PRICE	$8774.00
		FREIGHT & TAX ADDITIONAL	

LEASE FOR LESS THAN $200/MONTH

(WITH APPROVED CREDIT)

CALL ALLIED FOR TERMS AND DETAILS

Prices subject to change without notice



NOBODY DELIVERS SATELLITE GEAR FASTER THAN ALLIED

TALK TO CARL
OR JEFF

317-962-8596

ALLIED
Satellite Equipment

AM Study Judged Significant

(continued from page 1)

Consulting engineer Karl Lahm of Fairfax VA, said Klein's findings on adjacent channel protection are significant.

"The protection standards that have been used for first adjacent channels for the past 40 years are totally inadequate in protecting stations from interfering with each other, and (it shows) that the AM band has been set up on a false premise," Lahm said.

Longstanding concern

"The kind of interference concern that a lot of us have worried about for years—adjacent channel—the concern is certainly justified," he added.

Lahm said statistics Klein presented are similar to those he found in a "much simplier analytical model" he conducted last December.

Lahm predicted two reactions among broadcast engineers.

"People who have been aware of the limitations on the interference that occurs to them are going to look at it and say, "Yes, this recognizes what we've been concerned about all along,' " he said.

On the other side, some broadcasters will be concerned about a loss in their coverage map with the more accurate calculations.

Lahm said the report will be a "very valuable" tool for the FCC.

"I think it demonstrates that AM is in a worse state than the Commission thinks it is," he said.

The report will give the FCC some "useful quantative information" to direct how it can adapt broadcast rules, he suggested.

Every piece critical

Capital Cities/ABC Radio Allocations and License Manager Ken Brown would not single out any one section for its importance.

"Every piece of it has some critical implications," Brown said. "What all this will lead up to is a better handle on what interference conditions actually are."

Brown also stressed the importance of the Angell report to the Klein findings.

"What was acceptable to people in 1920 and 1930 is not acceptable now," he said. "I think it's quite apparent by the beating AM is taking against FM, that something about AM is not acceptable.

"Before you fix anything, you have to know what's broke. This and the Angell report together will lead to primary determinations of what's broke.

"This is gut level, real basic, absolutely critical information."

Brown explained the interrelationship of the two reports.

He said the atmospheric and man-made noise findings by Klein lead directly to minimal usable field strength, and combined with the acceptable co-channel signal-to-interference ratios—which will be in the Angell report—calculations can be determined.

"You need both, this and the Angell report," he continued, "to come up with co-channel allocation criteria."

On the issue of a freeze in establishing AM stations based on the report, Brown said there is evidence for some but not a total freeze.

"We certainly could talk about freezes of applications within the 50% (RSS) exclusion at night," he said. "I think there's good evidence that the 50% exclusion is bad. You wouldn't have to stop all applications but you could pull some lower levels."

As for the state of the AM band, the Klein report proves what some broadcasters have argued all along, Brown said, and problems others have not thought about.

NAB Science & Technology VP Michael Rau said the Klein report definitely showed the AM band is in a worse state than broadcasters thought.

Ratifies listeners' opinions

"I think it tends to ratify what we've been hearing from listeners and other people about AM interference," he said. "We weren't able to say why people were complaining about interference or (why they were) saying interference on the band is bad and needs correcting."

Rau specifically cited the first adjacent channel protection ratio conclusion on determination of protection ratios.

"What I hope it means to the future of broadcasting is strong evidence for change in the first adjacent channel protection ratio."

"What I hope it means to the future of broadcasting is strong evidence for change in the first adjacent channel protection ratio," Rau said. "I think it goes to the future of broadcast much more than in the present. It argues for a change in the FCC standard."

The FCC standards need to be accurate to measure "interference that occurs in the real world," he explained.

Both Rau and NAB engineer Stan Salek agreed that the Klein report supports a freeze on new AM applications and other changes the assocation called for in its first filing on the AM review.

"Any station that's being allocated using the existing adjacent standard is probably causing more interference," Rau said.

Salek said, "It shows that we're on a course where we are not looking after the best interest of the band. There are certain benefits to adding new stations or more diversity, but if everyone has to take a hit because of the antiquated techniques to determine whether a new station can fit into a particular area is warranted or not, we're just playing games."

Salek also pointed to the weaknesses Klein found in the existing protection ratios.

"This means that on a regulatory standard, you can drop in new stations where it seem OK, but in practice they would cause significantly more interference than was thought," he said.

For information on the Klein report, contact the NAB Science & Technology Department at 202-429-5346.

Listeners Are Not Satisfied, AM Test Says

Washington DC ... Preliminary word about a psychoacoustic listening test on AM commissioned by the NAB indicates that the public is not satisfied with the level of interference that exists on the band.

The test, conducted by Chicago-based B. Angell and Associates, revealed that adjacent channels do not provide a level of satisfaction that exists for co-channels, according to NAB Science & Technology VP Michael Rau.

The NAB released draft preliminary material on the study on 3 June, in time to be used for comments on the FCC's technical review of AM due 17 June. Rau said it would be part of NAB's comments.

He said the Angell test "dovetails nicely" with the Harrison Klein report on AM assignment criteria that also will be part of the NAB's comments. A draft report of the Klein study revealed significant findings on degradation of the AM band.

Rau said NAB's comments to the FCC will be a "very strong statement. We aren't going to hold anything back."

DAT Firms Consider Unicopy

(continued from page 1)

was found that the process was not effective.

Since then, the RIAA has said it would sue any manufacturer who markets R-DAT in America before the copying issue is settled. The machines have been available in Japan since March 1987.

The Unicopy anticopying device already has been approved by Japanese and European manufacturers in one round of discussions.

Seven companies, including Philips, Sony and Toshiba, convened to find an acceptable copy protection process for the American market, and have viewed Unicopy as a compromise between RIAA's desire for protection and the consumer's ability to tape recordings for home use.

The Unicopy system, according to Twerdahl, allows recordings to be made on DAT recorders from compact discs, however, subsequent recordings cannot be made from the DAT tape to another DAT tape. The CD to DAT transfer imparts a digital code that prevents copies.

The group of seven companies plans to present its consensus to the Business Roundtable, a consortium of 16 European and Japanese audio companies.

"Since the seven companies are among the largest in the world, to me, it's kind of a foregone conclusion that the Business Roundtable will adopt the recommendation," said Twerdahl, who recently returned from a trip to Japan.

The decision then will be considered by the International Federation of Phonogram and Videogram Producers (IFPI), the European counterpart of the RIAA.

If approved by IFPI, production for the US market should proceed. Because companies already have basic units designed, it probably will take only four to six months to integrate the agreed-upon circuitry for the American marketplace, Twerdahl said.

Even though the decision may finally get DAT rolling in the US, Twerdahl feels it's a compromise. "We're against counterfeiting and against pirating, but it's our point of view that it's wrong to have any kind of device which inhibits consumers' rights to make copies for their own personal use," he said. "We think the decision would be wrong, but it is probably better than nothing."

The Home Recording Rights Coalition, a group of consumers, retailers and manufacturers formed to fight restrictions on home recording hardware and blank tape, supports the view that consumers' rights would be invaded by anti-copying devices.

Such a requirement would "intrude unnecessarily into consumers' rights to buy and use an exciting new consumer electronic product," the organization has maintained.

Despite the tug of war, Twerdahl is hopeful that R-DAT sales will begin during 1988. "I think that the groundswell to open DAT is getting stronger than it's been in the last year," he said.

Once the machines do get a green flag for US sales, they probably will cost between $1,000 and $1,500, at least initially.

"Once the US market opens up, the production capacity will go way up. As production goes up, prices will come down. It just kind of takes a step at a time," Twerdahl said.

He also expects an increasing number of professional-use-only models to appear on the market, primarily from Sony, Matsushita—the parent company of Panasonic, Technics and National—and possibly from some smaller companies. These units, he said, will cost in the $4,000 to $8,000 range.

Marantz, meanwhile, is poised to appoint dealers/distributors for its own R-DAT players by the time sales begin, and currently is involved in negotiations with a number of candidates.

One acknowledged firm is Systemation, a broadcast automation vendor in Decatur, IL, which might be designated to sell DAT equipment to radio stations.

No decisions on dealers/distributors are expected to be announced until a definite delivery date is set for the product.

For details, call Marantz, 818-998-9333.

FM Extension OK'd

by Alan Carter

Washington DC ... The FCC has extended the comment deadline on a Further Notice of Proposed Rule Making that would revise minimum distance separation requirements for FM broadcast stations on IF-related channels.

The Commission in mid-May extended the comment deadline from 13 May to 12 July, with the reply period extended from 31 May to 27 July.

The Consumer Electronic Group of the Electronic Industries Association (EIA/CEG), with support from the NAB and Greater Media, filed for the extension. The FCC acted on CEG's request, filed first.

The groups argued that results from tests of commercial FM broadcast receivers conducted by the Commission's laboratory were not available.

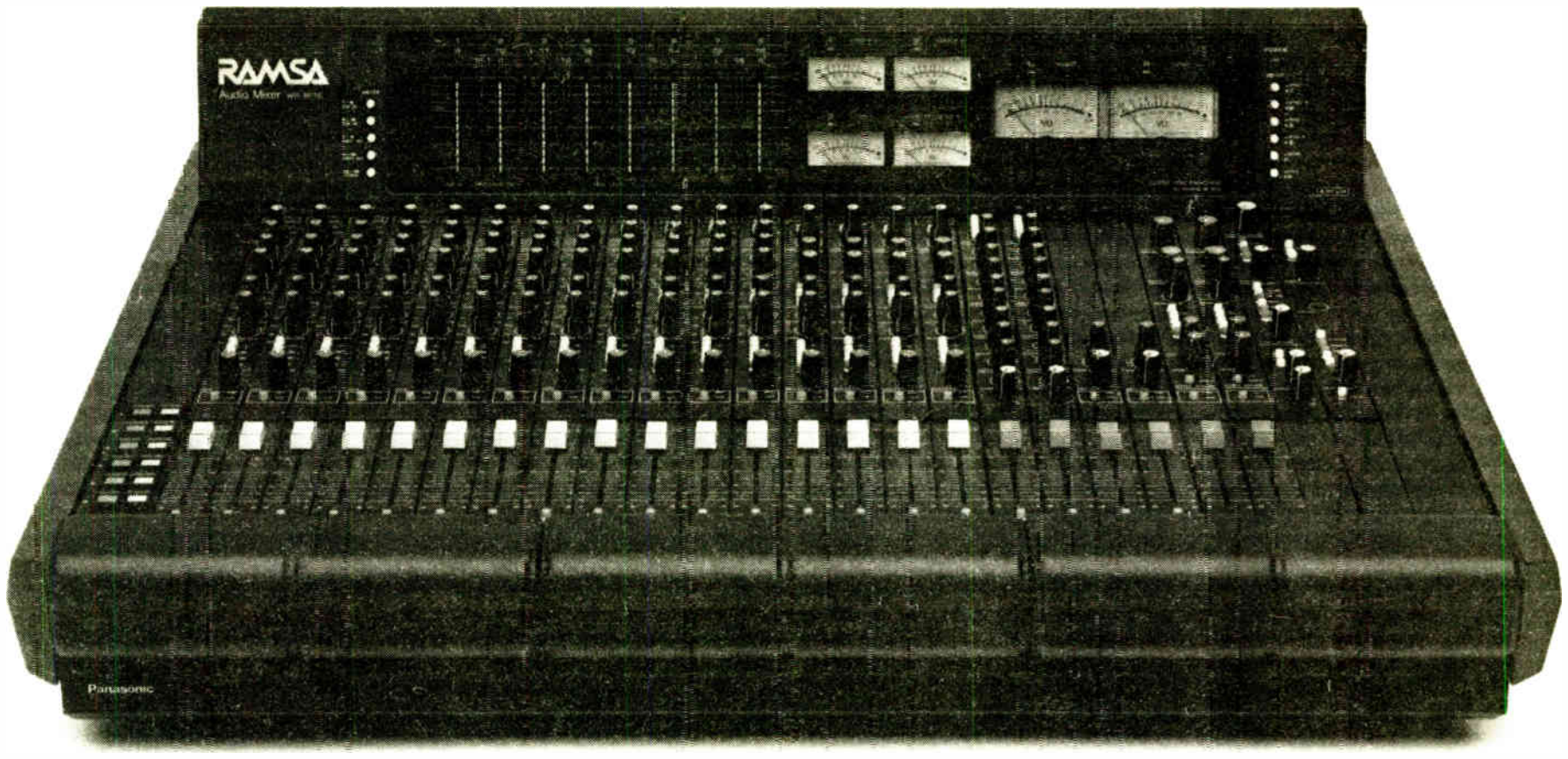
Greater Media noted that these results were "critical to any assessment" of the Commission's proposed IF standards. CEG stated that it would need time to review the results and correspond with parties overseas.

The proposed distances have been calculated to prevent overlap of the predicted 36 mV/m (91 dBu) contours of IF-related stations, regardless of the station class.

Several broadcasters, however, generally supported the FCC's proposal.

Key Broadcasting, licensee of WQSR-FM, Catonsville, MD, called for the

(continued on page 29)



The Ramsa WR-8616. Broadcast quality...Just ask KAPT, KEYI, KVET and KPEZ/Austin TX, KTXF/Harlingen TX, KBOR/Brownsville TX, WCTS/Minneapolis MN, WKHQ/Charlevoix MI, WFUR/Grand Rapids MI, WMMQ and WITL/ Lansing MI, WMAY-WNNS/Springfield IL, WPXT-TV/Portland ME, WRCQ/Hartford CT, WIOV-FM/ Lancaster-Reading PA, WHME/South Bend IN, WKJN/Baton Rouge LA, WLWI/Montgomery AL, WGUL/Tampa-St. Petersburg FL, and WSSL/ Greenville SC. Or for more information, contact us at 6550 Katella Avenue, Cypress, CA 90630.

RAMSA

Panasonic
Industrial Company

Circle Reader Service 1 on Page 34

NAB Against Senate Transfer Tax

by Alex Zavistovich

Washington DC ... The National Association of Broadcasters, continuing its opposition to a transfer tax on spectrum licenses, has urged the Senate to consider alternate means of obtaining funding for public broadcasting.

Speaking to the Communications Subcommittee of the Senate Committee on Commerce, Science and Transportation in late April, NAB CEO Eddie Fritts criticized Senate bill S. 1935, which would create such a licensing cost.

The bill's sponsor, Sen. Ernest Hollings (D-SC), intends to use proceeds from the tax to create a trust fund for public broadcasting.

"NAB remains strongly opposed to the legislation," Fritts said. The tax would lead to friction between commercial and public broadcasters, and would be an unfair additional tax burden for broadcasters, he said.

The association reiterated its original suggestion for an alternative to the transfer tax—a 2% to 5% excise tax on broadcast receivers, as suggested in 1967 by the Carnegie Commission.

The excise tax was included by the NAB in a white paper released the day before Fritts' testimony. The paper, titled "Broadcasting: Our Foundations Revisited," was included as an attachment to Fritts' testimony.

In his testimony, Fritts stated "it is inequitable to tax commercial broadcasters to support their public competitors."

That taxation is unfair, he said, because commercial broadcasters already assist their noncommercial counterparts in other ways, and pay their fair share in taxes and other fees.

By approving the bill, Fritts warned, "the current cooperative state between commercial and public broadcasters could be permanently ended," and voluntary assistance from commercial broadcasters "would diminish rapidly."

Fritts also opposed any legislation that would tax users of the broadcast spectrum, saying it "is an incorporeal asset with no intrinsic worth." Broadcasters' investments in the frequencies give the spectrum its value, he contended.

A tax on spectrum, Fritts speculated, could cause licenses to be treated more like property, undermining public interest programming at the station level.

Commercial broadcasters must remain profitable to adequately meet their public interest obligations, Fritts explained. He objected to a tax that would add to the cost of such public interest programming.

NAB CEO Fritts, before Senate.

As an alternative to the transfer tax plan, NAB stated its support for excise taxes imposed on receivers.

"The Carnegie proposal still is the fairest and least costly means to achieve a permanent federal funding vehicle for public broadcasting," according to the NAB.

"The cost to those who listen to and view public programs would be but a minute fraction of what their counterparts in most of Europe and the other leading nations of the world pay to support their public systems."

Although the Electronic Industries Association had no official comment on the matter, the group—which represents receiver manufacturers' interests—has opposed the suggestion of an excise tax since it was first proposed as an alternative to the transfer tax.

For more information, contact the NAB at 202-429-5350.

Audio Link Completed by IDB

by Charles Taylor

Los Angeles CA ... A new full-time digital audio link between the US and Europe has been established through a partnership formed by IDB Communications Group Inc., based here, and British Telecom International Inc. (BTI).

The service, International Digital Audio Transmission (IDAT), is the first full-time trans-Atlantic digital audio link available for broadcasters' use, according to the company.

"This service breaks new ground for trans-Atlantic broadcasts," said Jeffrey Sudikoff, president of IDB. "We can meet radio stations' needs for anything from voice quality mono transmission to 15 kHz stereo with the capacity of IDAT's digital audio service."

IDAT offers full-time and occasional service bridging North America with the United Kingdom and Europe, via IDB's teleport facilities in Los Angeles and New York and BTI's facility in London.

The link offers studio quality sound and cuts standard trans-Atlantic audio transmission rates by more than 35 percent, Sudikoff said. A 15 kHz audio signal from London to IDB's teleport in New York is $11 per minute.

In addition to the IDAT link and teleport facilities in Los Angeles and New York, IDB operates a network of transmit/receive earth stations in 33 cities across the US and Canada.

IDB is the West Coast contract earth station for digital audio transmission on Satcom 1R, the standard for distribution used by CBS, ABC, NBC, and Westwood One/Mutual.

Satellite Beams AM Across US

by Charles Taylor

New Orleans LA ... A satellite hookup between two radio stations in Louisiana and Nebraska has made possible the broadcast of an overnight program with virtually no fading across most of the continental United States.

Program material from the Dave Nemo "Road Gang Show," targeted at on-the-road truckers, is fed from midnight to 5 AM (CST), seven days a week, from WWL-AM's studios in the French Quarter here to KRVN-AM in Lexington NE.

Because the stations are adjacent—WWL at 870 and KVRN at 880—the Galaxie II satellite broadcast creates the effect for listeners of a broad-band signal. Actually, the audio signal is digitally synchronized so it modulates each station's 50,000 W transmitter in unison.

The link is the result of more than a year of planning between Hugh Burney, director of technical services at WWL, and Vern Killion, KRVN's director of engineering.

KRVN, a cooperative station aimed at and owned by 3,500 farmers and ranchers, was broadcasting only during the day, so it seemed a good opportunity to serve another market, Killion said.

For WWL, the joint transmission enabled the station to fill in some gaps in its coverage area. "Our signal was covering most of the central continental United States, but there was a weakness in the Rocky Mountains and beyond," said Burney. "Here was this station setting out in Nebraska that wasn't running at night and could."

The satellite at work

The simulcast process is relatively simple, according to Burney. "We take our program and feed the output from the studio to a satellite uplink, which is handled by IDB, a company well-known in the satellite business," he said. The program then is beamed 22,000 miles by IDB to a satellite, then beamed back to an uplink at KRVN's transmitter, 950 miles from WWL's transmitter.

Before broadcasting its own signal, WWL feeds it through a Lexicon time delay system to match the slight delay in receipt of the satellite signal at KRVN, allowing simulcast airplay.

"We're getting near-perfect timing on the delay of the WWL signal now so it matches ours," said Killion. "You can notice a slight hollow sound on the voice, but the music sounds perfectly synchronized."

The stations began the simultaneous overnight broadcast 1 March to a faithful national audience. The "Road Gang Show" has been on the air for 17 years, and is well known for providing interstate road and weather conditions to drivers across the country and in parts of Canada.

The simulcast splits on the half hour for local spots and for network newscasts. Because WWL is signed with CBS and KRVN is with ABC, the news cannot be simulcast.

Positive response

Response to the expanded signal has been wholly positive, said Killion. "We've received quite a few calls here from all over the West—from southern California, Washington, Oregon, Idaho and southern Canada. People love it."

He also is pleased with the quality of sound. "The way the two stations complement each other is really nice. There's no sideband splatter with the stations beside each other. It's going to become even more apparent once we get broadband NRSC receivers from the industry," he said.

For the future, Killion would like to see the cooperation of WLS in Chicago (AM-890) and WCBS in New York (AM-880) to create satellite capability for simultaneous programming in the event of national emergencies. The stations could create a sort of super-band network, Killion said.

Meanwhile, though, he is pleased with the current effects of the effort between WWL and KRVN. "We're serving a unique market and we're offering a unique service to that market," he said. "We're also utilizing a new application with new technology for something that's already been there."

"I also think," Killion said, "that this is a good example of how AM radio isn't dead."

For more information, contact Hugh Burney at WWL at 504-529-4444 or Vern Killion at KRVN at 308-324-2371.

Algorithm

(continued from page 2)

inverse interpolation problems, metric versus English curves, selection of number of base points, selection of interpolation procedures, specification of accuracy and algorithm versus computer program.

Consulting engineer Karl Lahm of Washington in reply comments pointed out that initial commenters had little support for the unmodified use of the current FCC computer program.

Lahm noted specific evidence of anomalous results with the proposed algorithm and questioned the extent of permissible use of the copyrighted material contained with the algorithm.

Lahm called for a FCC-industry committee to test and redefine a standard algorithm method before the Commission makes a decision on the proposal.

For further information on the docket, contact Jay Jackson at the FCC: 202-632-9660.

Real World AM Noise Monitoring

by **Joel Bump**

Part III

Canyon Lake CA ... Theoretical discussions of AM noise are quite easy to follow. Nice, neat pictures are possible and very uniform waveforms can be generated by analysis of sine wave modulation of a single stage transmitter.

In the first two installments of this series we have built a foundation to understand the generation of AM noise from a theoretical point of view.

In the real world of an operating FM station many other factors come into play affecting AM noise and the perception of AM noise, or amplipath.

The transmitter is inherently more complex than our analysis to date and unquestioned techniques of transmitter tuning and AM noise analysis may be altogether invalid.

Also ongoing complaints about amplipath may come from a time salesman wearing pink socks, not to mention that anytime you need to look at AM noise, or adjust for it, a trip to the transmitter is required.

And this, of course, may be complicated by snow, washed out site roads, a hornets' nest near the transmitter door or by a re-arrangement of the engineer's priorities by other station staff members!

In progressing toward effective implementation of AM noise control in the real world, let's look at what to expect from your FM transmitter, as well as measurement techniques which work and those which don't.

Stages of AM noise

In the last issue, we looked at the formation of AM noise waveforms. In transmitters, there are typically two or more stages of amplification, each coupled to the next.

Each stage has its own sideband characteristics and different degrees of coupling with other stages.

These sideband reactances are interactive through the transmitter, thus producing different levels of AM noise at different points in the system.

Although no single stage, such as an exciter, should in itself be producing objectionable levels of AM, the important concern to the engineer is the resultant AM present at the output of the system.

A mistuned antenna or one with poor bandwidth is certainly capable of producing amplipath.

In proper tuning adjustment, most transmitters are capable of minimal AM noise performance of −40 dB, while many can make −55 dB or better.

Figure 1 is a drawing of a waveform produced by an operating transmitter under program modulation. This transmitter exhibits a nicely centered passband with sloping skirts.

Figure 1. AM Noise in Transmitter with Centered Pass Band

Centered Tuning

More typical is the waveform of Figure 2 which may also be at an acceptable level below the carrier, but results from a tighter rolloff on one sideband somewhere in the transmitter.

These waveforms are typical of what is viewed on the oscilloscope output of the Radio Design Labs ACM-1 AM Noise Monitor, and the waveforms relate directly to those covered in the first two parts of this series.

Ideal samples

Ideally I would like to see every AM noise sample taken from a loop located in front of the transmitting antenna on the tower.

Of course there must be no other signals which could couple into our sample, nor any bandpass filtering in our sample which might generate amplitude shifts in our equipment.

Together with the prohibitive length of sampling return line, cost and interfering signals, this simply isn't practical.

The antenna and transmission line generally are not a source of variations in the AM noise levels. A mistuned antenna or one with poor bandwidth is certainly capable of producing amplipath.

As good practice the antenna should be swept and properly tuned and VWSR should be monitored regularly for any changes.

Antenna bandwidth must be sufficient for the weather conditions expected at the site.

With a properly operating antenna the usual variations in AM noise which the station experiences are from the transmitter.

More obstacles

It is the forward wave which is of concern, as this is the signal leaving the antenna.

Over many years of observing AM noise, and on studying many dozens of transmitters, I have had the best success with a directional forward sample loop in a line section just prior to the transmission line.

Figure 2. AM Noise in Transmitter with Frequency Offset Pass Band

Off Center Tuning

Any sample of AM noise must be taken following the harmonic filter and preferably after any notch filters.

Jacks typically labelled "Monitor" are often found on the side of some directional couplers and commonly in the PA cavity of the transmitter.

These are worse than useless for any AM noise monitoring because they contain currents or harmonic material other than the signal travelling toward the antenna.

The presence of any of these interfering signals into our AM noise sample port very quickly interacts with our sample, particularly since we are trying to measure signals from 25 dB to 70 dB below the carrier level!

As these various erroneous signals add and subtract at various phase angles from our fundamental signal new AM is produced.

This can override the real reading, or worse, can shift the null in our transmission tuning.

I am not surprised to see an erroneous sample port cause a *worsening* in AM noise of 20 dB or more at its null! Often the second harmonic content is so strong as to mask any null of the main carrier.

Certainly the null of the second harmonic AM cannot be expected to occur at the same tuning and loading positions as that of the carrier frequency.

Regardless of the method used for measuring AM noise, isolating a correct sample port is a prerequisite.

Mod monitors

The two most common methods I have seen used by engineers trying to quantify their AM noise are the modulation monitor and the diode detector.

"FM modulation monitors give an entirely inaccurate reading of the amplitude modulation component of the FM station's carrier." This is a quote I noted from a talk by Lloyd Berg of WUSA-FM at the recent NAB convention Engineering Conference.

What are the various problems which prompt engineers to make these observations about mod monitors?

First is the difficulty of matching the sample line to the input of the monitor. Some monitors terminate the line with standard resistors, which cannot exhibit a precise 50 ohm impedance at 100 MHz.

The resulting mismatch in the sample line (which itself is rarely a good 50 ohms!) produces standing waves along that line, which will affect the AM noise reading and null.

I have often found a 15 dB difference between the actual null, and the indicated null on such monitors. This can make the difference between acceptable and very poor amplipath performance.

Second, some monitors have IF stages with passband characteristics which produce AM levels much higher than the transmitter under test, making them useless for synchronous AM noise measurements.

"Off-the-air" monitors located at the studio always have this problem, and cannot be used to measure AM noise.

Third, most monitors employ some form of deemphasis, thus removing some of the higher frequency peak material from consideration by the noise metering circuitry.

Fourth is the metering circuitry itself. I have heard many engineers describe the metering action of most monitors as RMS, or semi-RMS metering. This may be the result of the meter, the circuitry, or both.

Approaching RMS

As a monitor approaches RMS in its indications of AM noise, severe inaccuracies occur. This is best demonstrated mathematically by studying Figure 3.

Here we have two passbands shifted in frequency to produce two different AM noise patterns.

With the same modulation, waveform "B" is generated by bandpass "B," while waveform "A" is produced from a centered bandpass.

This is representative of a situation which very realistically could occur over a relatively short time in an actual transmitter.

As the properly tuned transmitter

(continued on page 14)

ONE DAY THERE MAY BE OTHER CONSOLES FOR $5995 THAT CAN DO ALL THIS...

OPERATIONAL FEATURES

- Three output busses
- Mix-minus
- Remote control, pulse/holding for A/B inputs
- Assignable DA outputs *
- Remote channel on/off control
- Total cart machine logic interface *
- Turntable synchronizer interface *
- Adjustable peak LED indicators
- Full metering
- Four auxiliary inputs
- "Headphone follow monitor" logic
- Talkback circuitry internal
- Programmable muting busses
- Timer on all models
- Clock on 18-channel console
- External tally-lamp control *

* *Available Option*

TECHNICAL FEATURES

- .02% distortion (20 to 20KHz)
- -88dB noise THD (+4dB out / 0dBv input)
- Excellent overload headroom
- Penny & Giles faders
- Quick disconnect input connectors
- I.C. socketing throughout
- Fully connectorized sub-assemblies and switches
- Plastic overlay captioning
- Total DC/VCA control
- Metal wrap-around case
- Microphone/ consumer/ line level on any input
- Insert patch points on every channel
- 2 year parts and service warranty

MODELS & PRICING

RS-6	6 Channel	$3995.	complete
RS-12	12 Channel	5995.	complete
RS-18	18 Channel	7995.	complete

RADIO SYSTEMS INC.

5113 WEST CHESTER PIKE ■ EDGEMONT, PA 19028

215/356-4700 ■ FAX 215/356-6744

800/523-2133

(IN PA 800/423-2133)

Circle Reader Service 23 on Page 34

Amplipath Measuring Methods

(continued from page 12)

passband shifts to that of "B" it is very evident that the peak AM noise has increased, thereby producing IM baseband distortions in the receivers and causing amplipath and crosstalk.

If we were observing the AM noise over this period with a fast peak reading measurement device we would see the AM noise change from −39 dB to −32 dB. This would have taken our amplipath performance from reasonably acceptable to clearly unacceptable.

Had we been watching this same shift on an RMS reading device, we would have seen an *improvement* in AM noise from −45 dB to −46 dB, since the RMS energy actually decreased.

Not only is the RMS indication wrong, it will not yield a specific null at the actual null in peak AM content. I have found many transmitters unwittingly severely mistuned as a result of this phenomenon.

The table under Figure 3 summarizes the above data. The value of −32 dB for the peak AM noise content was chosen only as a relative reference. All other values are referred to this level.

Half-wave rectifier

The other common method of reading AM noise involves a half-wave rectifier, measuring the AC and DC components of its output with an oscilloscope.

I have found this to work well, and it is an adaptation of this method which I used in the design of the ACM-1 for Radio Design Labs.

Without proper application, however, this method is also prone to pitfalls.

First, the same difficulties in impedance matching can be encountered as described earlier. Presuming that this has been resolved, linearity remains a difficulty.

As an example, I did several interesting measurements for this article using a common RF diode from a local retail electronics store.

With this diode and suitable capacitor connected to the output of a 100 MHz RF generator being amplitude modulated exactly 10% (−20 dB), I recorded modulation levels indicated by the DC carrier and AC signal seen on an oscilloscope connected to the output of this detector.

The non-linearities become very apparent by considering the recorded date in the table under Figure 4.

Despite the non-linearities this detector method has been used effectively to isolate a null in AM noise.

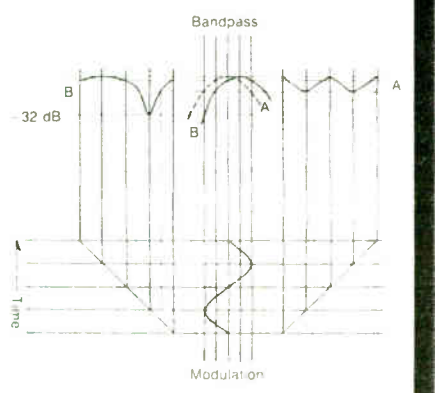
Without a precise value of peak AM noise accurately known, however, the engineer is still at a loss to know if the null found is indeed an acceptable level.

In the next issue, we will examine the everyday needs of FM transmitter maintenance.

We will consider how the engineer can make a significant contribution to real world improvement in signal consistency and how engineering time can be put to the most effective use.

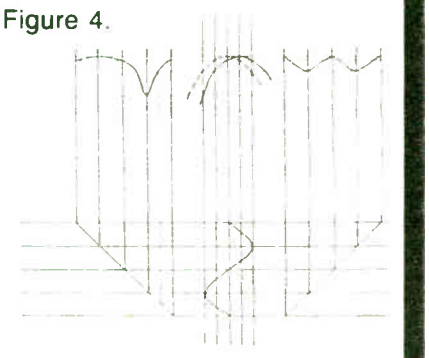
Joel Bump is a radio engineering consultant in Southern California and responsible for the design of Radio Design Labs' ACM-1 Noise Monitor. He can be reached at 714-244-3440.

Figure 3. Disparities between Peak and RMS Values of Typical AM Noise Waveform



Waveform	Peak Excursion	RMS
A	−39 dB	−45 dB
B	−32 dB	−46 dB

Figure 4.



Waveform	Peak Excursion	RMS
A	−39 dB	−45 dB
B	−32 dB	−46 dB

Detector Input	Detector Output Indicated Modulation
1 Vp-p	32.4 % (−9.8 dB)
2 Vp-p	16.75% (−15 dB)
4 Vp-p	12.6 % (−17.9 dB)
10 Vp-p	10 % (−20 dB)*

*Correct Reading

Resolving Interface Problems

by **Bill Higgs**

Louisville KY ... In an old story I once heard a driver on a lonely stretch of highway became hopelessly lost.

Seeing a farmer driving a mule, he stopped and asked directions to a nearby town. The old farmer scratched his head, mumbled to himself for a moment, and replied, "You just can't get there from here!"

Many of us find ourselves in much the same predicament. While the engineer's dream is a "plug-together" system, many smaller stations must integrate newer equipment with older technology. Faced with various pieces of equipment of various vintages, the task of getting from A to B can be formidable.

"Interfacing" has become a rather popular buzzword in both technical and social circles. Basically, it means to put together two or more devices (or people?) so that they work together in an efficient manner.

In broadcast engineering, it usually means the connection of devices to each other so that they function properly, communicate well and don't destroy each other.

Two kinds of interface problems we encounter are control and audio. The problems surrounding audio interfacing have been extensively covered and several manufacturers sell audio interface devices. In this article, we will look at several control connection problems and the ways around them.

As an example, many older transmitters were designed for dry contact closures for remote control circuitry. These circuits are based on the 120/240 volt mains, and usually float above ground.

Many budget-conscious stations have installed dial-up remote control equipment because of increasing line charges. Most of these units operate through either open-collector or TTL outputs, and are ground referenced.

BottomLine—Broadcaster—

Similar situations are encountered when connecting older reel-to-reels, cart machines and turntables with modern consoles or automation controllers. A simple on-air light is a classic example.

The usual configuration for a remote control unit or similar device is the open-collector output. Typically, this is the collector of a 2N2222A or similar NPN device which appears as ground when actuated.

Several manufacturers simulate this with an IC—either a 7407 TTL chip or a special interface device. The idea is simple—the output line grounds when the channel is activated and floats when not.

Alternatively, a relay can be placed between a low positive voltage and the open collector such that the relay will be actuated when the channel is called. In some instances, however, the current requirement is too high for the transistor or IC.

Figure 1 shows the addition of a heavier transistor while still retaining the open-collector feature. A high voltage transistor can be used for DC voltages up to 125 volts or more.

The 2N3055 shown can handle substantial currents at reasonable voltages. A relay may be placed between a ground referenced power supply and the collector.

Often it is necessary to switch a positive voltage rather than a negative voltage. A PNP transistor is necessary for this.

The 2N2955 shown in Figure 2 is good for up to about 40 volts, and higher voltage versions are also available. If a relay is desired here, it is placed between the collector and ground.

A word about relays: The voltage spike when the field collapses can be substantial. To protect your transistors, either original or added, always use a 1N4006 in reverse across the coil.

Also, it should go without saying that a separate power supply should be used for relays. This will avoid spikes on the line (microprocessors rather dislike this), and also will not tax the equipment supply.

Occasionally, it is desirable to invert a control output; that is, the collector is open when the control channel is activated.

CMOS Hex inverters (4049's) are inexpensive and ideal for this purpose as shown in Figure 3). The "B" series will handle up to 15 volts with ease. Don't forget the pullup resistor at the input—otherwise the action is slow and unpredictable.

This handy chip also allows us to avoid one relay in a latching configuration. Figure 4 shows an R-S Flip-Flop made from a 4049. Any of the inverters on the chip can be used.

With this circuit, one control channel will latch the relay or other output, and the other control channel will unlatch it.

Next month, we'll look at interfacing TTL and other logic outputs to older equipment and also examine handy devices called optoisolators. Until then, may your only interfacing challenges be with the staff!

Figure 1.

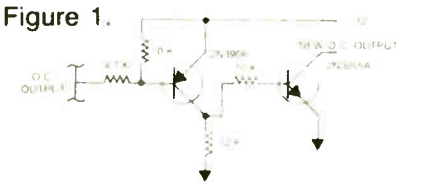


Figure 2.

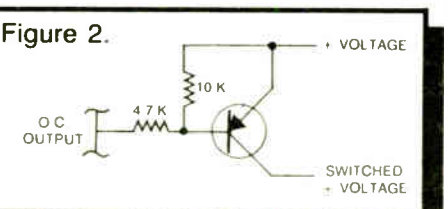


Figure 3.

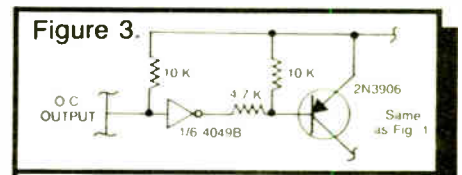
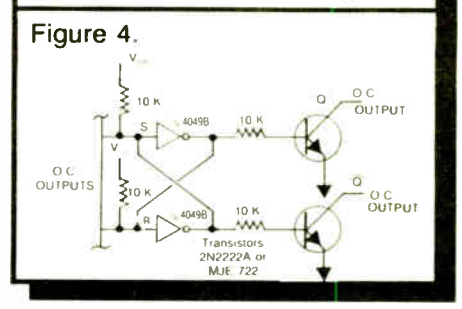


Figure 4.



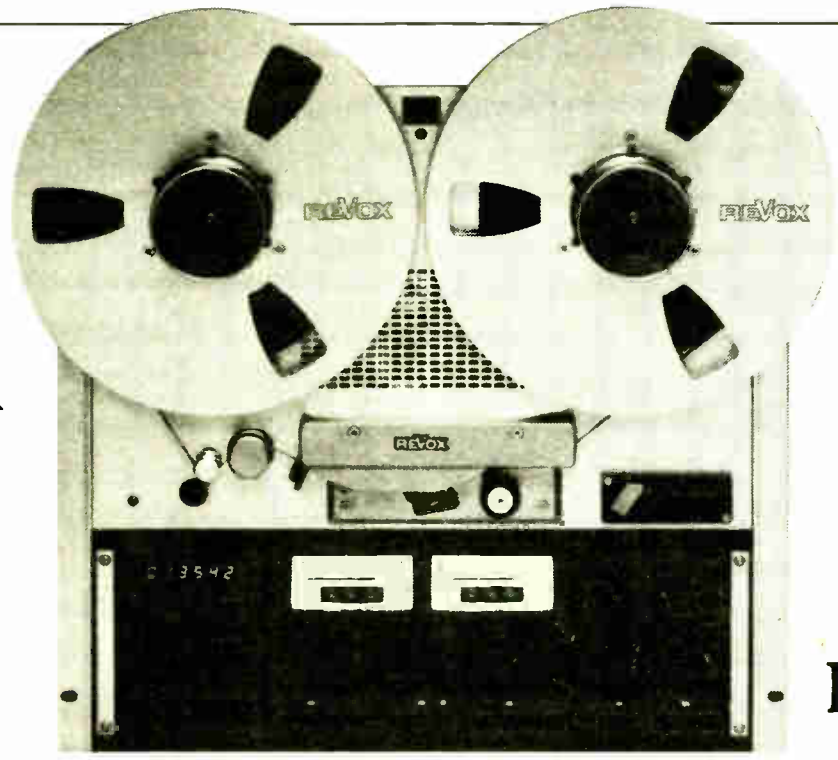
Bill Higgs has been CE for WXLN/WFIA for six years and has also done station consulting work. He has a PhD. in Theology which helps explain his patience with small market radio. He can be reached at 502-583-4811.

ALLIED

The *FULL SERVICE* Broadcast People

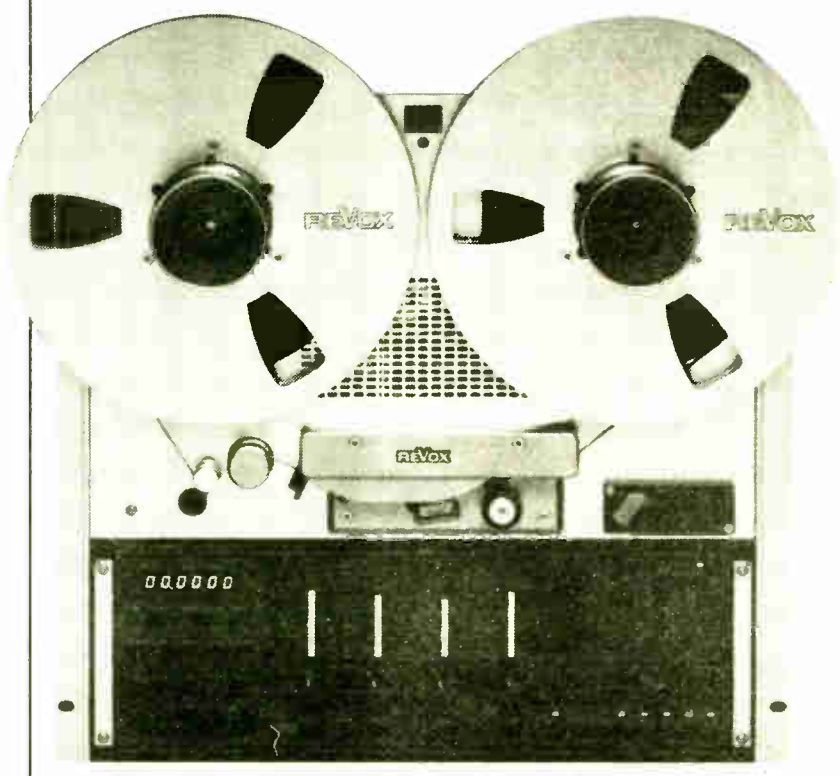
REVOX

WIN...
PLACE...
SHOW!

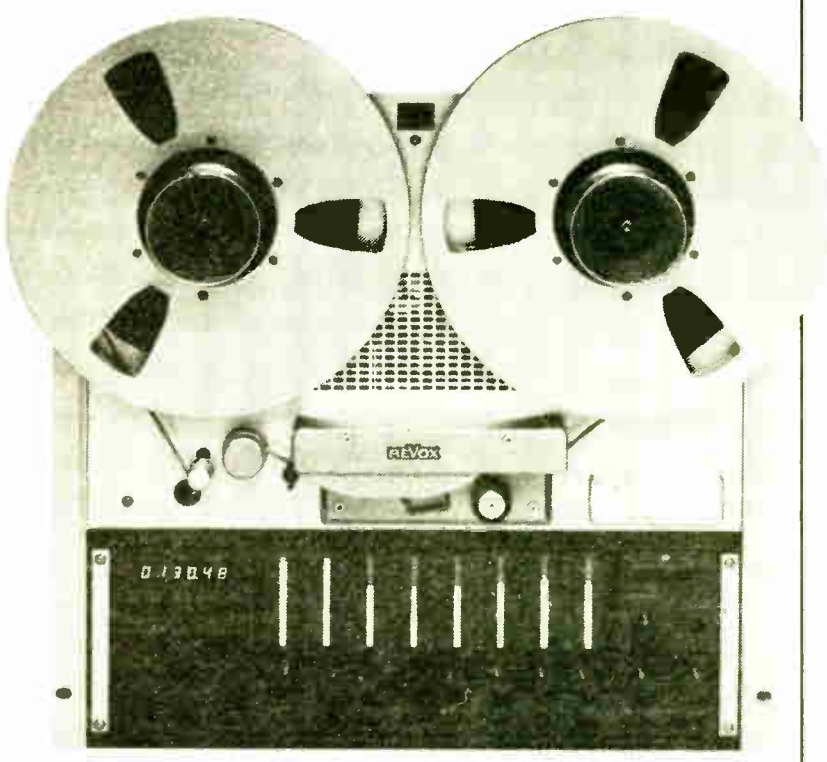


1. 2-Track Stereo
MODEL 270

3 Precisely For Broadcasting



2. 4-Track, ¼"
MODEL 274



3. 8-Track, ½"
MODEL 278

This is the latest series in a time-honored and proven succession of world-class analog tape recorders from Studer-Revox. The 270 Series represents the latest, affordable technology. Your Allied salesperson has all the details and pricing.

ATLANTA, GEORGIA
404-964-1464

LOS ANGELES, CALIFORNIA
818-843-5052

CHICAGO, ILLINOIS
312-470-0303

RICHMOND, INDIANA
317-962-8596

DALLAS, TEXAS
214-423-8667

SEATTLE, WASHINGTON
206-838-2705

RICHMOND HILL, ONTARIO, CANADA 416-731-3697

USED EQUIPMENT DIVISION
317-962-1471

BROADCAST SYSTEMS DIVISION
714-752-6664

SATELLITE EQUIPMENT DIVISION
317-962-8596

NIGHTS/WEEKENDS EMERGENCY
317-935-0455

ALLIED
Broadcast Equipment
P.O. BOX 1487 • RICHMOND, IN 47375

Join Our FAX Network • Prompt Response on Your RFQs
FAX 317-962-8961

Log In...Bulletin Board Modem...317-935-0531

RF Issues Key In EEPA Sessions

by Alex Zavistovich

Alexandria VA ... The biological effect of electromagnetic fields—particularly those generated by power lines—was the focus of the fourth annual meeting and symposium of the Electromagnetic Energy Policy Alliance.

The symposium, held 20 to 22 April at the Radisson Mark Plaza Hotel here, also addressed topics including research on the health effects of extremely low frequency (ELF) fields and the link between emissions from power lines and cancer.

Utility companies in attendance

This year's event drew about 100 people and was attended by power utility companies and other allied industries, where once electronic communications concerns were the only groups represented, according to exiting EEPA President Barry Umansky.

Umansky attributed the increased interest from utility companies to a study by Dr. David Savitz of the University of North Carolina School of Public Health. That study suggested a link between 60 Hz magnetic fields—which are present in power lines—and childhood cancer.

For broadcasters, the increased interest in nonionizing radiation demands a change in "behavior towards RF exposure," said Umansky.

"It is important (for broadcasters) to have a track record of safety, caution and compliance to minimize the risk of litigation" if national standards for RF emissions are set, he added.

Regulatory update

A regulatory update, moderated by NAB Engineering, Regulatory and International Affairs Director Ralph Justus, was presented during the symposium.

Norbert Hankin, of the Environmental Protection Agency, provided a possible time frame for EPA action on an RF exposure standard. The standard will be a public exposure guideline and will not address occupational exposure, he said.

A draft is anticipated by November, with reviews of comments expected by June 1989, and a final document prepared by August 1989.

Although no absorption rate was specified, the guide will likely be some variation of the current American National Standards Institute (ANSI) standard of 1,000μW/cm^2. In 1986, the EPA suggested possible limits of one-fifth, one-tenth, or equal to the ANSI standard.

No power line or 60 Hz recommendation will be made, according to Hankin, although he added that the issue has come under increasing attention at the EPA.

Another presentation, by Christopher Dodge of the Library of Congress, discussed power lines and health issues. Dodge noted "increased public and scientific concern ... about the possible health consequences" of exposure to fields from power lines.

Although US and Western European studies have suggested some link may be possible between power line fields and leukemia or similar cancers, Soviet studies have shown no relationship, he said.

Dodge commented that Soviet science is usually quicker to connect electromagnetic fields with health disorders.

The possibility of a link between certain cancer and RF fields has also prompted some Congressional interest, Dodge noted. Statements by a number of cancer specialists were made during a House of Representatives hearing in October 1987, he said.

Consulting engineer Jules Cohen addressed the problems encountered in broadcasters' meetings with zoning committees and citizens groups.

Many of these civic groups ask licensees whether they can guarantee that RF emissions at a site will not have any detrimental effects, Cohen said.

Cohen maintained that such a guarantee cannot be made. He said one cannot prove the negative, which is an argument lost on zoning and citizen groups.

Health effects addressed

The balance of the symposium addressed the continuing question of whether electromagnetic fields pose any long-term health effects.

Jonathan Charry, president of Environmental Research Information, Inc., noted that "it is unlikely at this point that sufficient information exists to carry out a comprehensive risk assessment" regarding nonionizing radiation.

Past research has suggested that ELF fields have no more ill effects for humans than DC exposure. More recent studies, however, contradict such findings. The overall picture, he said, is uncertain.

However, Thomas Tenforde of the University of California's Lawrence Berkeley Laboratory maintained that evidence from laboratory and epidemiological studies indicate that "static magnetic fields exert minimal health effects."

These conclusions are mirrored in some cases by increasingly relaxed whole body guidelines for occupational exposure, he said.

A presentation by Ezra Berman of the Developmental and Cellular Toxicology Division of the EPA discussed the effects of pulsed magnetic fields on chick em-

(continued on page 19)

Translator "Abuse" Stirs Debate

by Barry Mishkind

Salt Lake City UT ... The National Translator Association held its Annual Convention and Technical Seminar in Salt Lake City, in early May.

Over 125 attended a program which addressed the benefits of TV and FM translators, as well as the technical and regulatory problems faced by translator operators.

The informal atmosphere contributed to a good exchange of thoughts and most every question that came up received an answer. About 20 manufacturers and distributors came to both share in the technical seminars and display their products.

Keith Larson, who heads the FCC's Low Power TV Branch, and Alan Schneider, Chief of the Auxiliary Services Branch, spoke each day to the group, outlining current FCC policies as well as offering suggestions on how to fill out and process applications in the most effective way.

Year of transition

Larson, who has been at the FCC for 15 years, the last two as Chief of the LPTV Branch, referred to the last year as one of transition.

He said the huge backlog of LPTV applications has largely been eliminated, and new applicants seem to be mostly "serious" applicants rather than speculators. Processing times are greatly reduced for this service.

Larson also announced a new policy to deal with terrain shielding effects which will open up possibilities for translators that might not qualify under strict mileage separations.

Not anonymous anymore

Schneider opened his comments by pointing out that "FM translators are no longer anonymous to the decision makers at the FCC."

He indicated that the Notice of Inquiry soon to be issued by the FCC will be a comprehensive review of the FM translator service.

Many questions have been raised about various aspects of the FM translator service in several petitions before the FCC. Some abuses have been alleged, and also some harrassment.

Schneider indicated that the NOI will be a careful, perhaps slow, process covering virtually every section of the rules relating to translators. Comments will be solicited from all concerned parties.

At the same time, he said, the FCC has no intention to kill off translator service, or reduce service to isolated or underserved areas. Still, he stressed, such service will remain secondary.

Schneider also announced a new version of forms 349 and 350, relating to translator operation.

While the National Translator Association basically does not involve itself in questions other than the technical operation of TV and FM translators, a spirited debate continued throughout the seminar between those promoting the idea of a "low power FM service" with local origination, and those who felt it might endanger the existing services rendered in isolated areas.

John La Tour of Power DuPree Broadcasting was one who forcefully made the case for allowing such low power FM stations to operate, bringing narrow appeal formats into areas that otherwise would not have such choices.

La Tour, whose company operates 40 translators, said that as translator operators "we seek freedom from the tyranny" of archaic FCC policy. Stating that "the hallmark of democracy is choice," La Tour argued that choice is good and more choice is better.

Mike McKenzie, of Communications Investments Corp., chose to emphasize the way translators "have opened up the world" to many people that are screened by mountains from primary services. McKenzie said that these were "a valuable service that should not be reduced."

As the debate continued in the evening, it became clear that there was a division between those who saw LPFM stations as a cost effective way to provide additional choices to the listening public and those that felt an LPFM service would simply provide more fodder for the speculators.

The NTA board, however seemed disinclined to take sides in this debate at the present time other than opposing the current freeze on applications.

More pressing issues for the NTA included dealing with cable companies that pirate from translators (sometimes killing the base from which operating contributions come), and the problems caused by the US Forest Service, as they try to make a "profit" on site leasing.

Many full power FMs and TVs also said they face a situation where the Forest Service has been arbitrarily proposing tremendous increases in fees charged for site use.

For example, in some cases the government will pay landowners in some areas $100 for an entire missle site lease, then turn around and demand $450 or $500 for a translator.

There are several committees working on this, both on the state as well as national levels. Some progress was noted in getting the attention of members of Congress.

Tours of KSL and KUTV television stations and further tutorials on topics such as antennas, interference, lightning protection, field strength and path loss, and FCC forms contributed to a full program.

Next year, the National Translator Association is set to meet in Medford OR.

Barry Mishkind, aka **RW***'s "Eclectic Engineer," is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797. The National Translator Association can be reached at 307-856-3322.*

Readers Forum Letters

(continued from page 5)

Europe) bands.

Each receiver has an easy-to-read tuning eye (recall that RCA pioneered the 6E5 tube in 1935 but "eye" tubes are but a memory today) *and* a built-in ferrite antenna rotatable with a knob on the front!

One of these receivers has six speakers; they all have separate bass and treble controls and listening to AM and FM on all of them is a treat. Recall that their IF bandwidth is narrower than ours to accomodate the 9 kHz European channel spacing on AM.

Nothing is new in this world—we merely rediscover previous developments and advance the art incrementally with subsequent inventions.

Any new thinking on AM and FM reception is welcome of course. Maybe an inexpensive design will overcome certain reception problems. But to us it seems like too little way too late.

The best kept little secret of contemporary receiver art is probably on the shelf in your local discount store: the General Electric SuperRadio II (model 7-2885F).

Get out a fifty dollar bill and buy one! It's the best AM-FM portable in its price range we've ever used. On AM, it's a fantastic performer coming darned close to being as sensitive as our Potomac Instruments FIM-21 field intensity meter.

And like its FIM cousin, it is battery-operated (so it can be isolated from utility networks and their attendant noise) and has a large ferrite rod antenna. Rotate the receiver for best reception or null out interference.

The dial is accurate, there are separate bass and treble controls and both a woofer and tweeter are provided, and all for $50 dollars! The SuperRadio has been around for several years and it includes a good FM section as well.

But like any good super AM receiver, this General Electric portable just reveals all the ugly faults of the AM spectrum: the increased ambient electrical noise, destruction of the clear channels and 107 slots bursting at the seams.

Remember the 1946 statement by the FCC commissioner who said that with some 900 stations then on the air, AM was saturated and any future stations should be placed on the then naiscent FM spectrum.

Remember?

A. M. Germond
Englewood NJ

Engineers Tackle Signal Issues

by Alex Zavistovich

Las Vegas NV ... Broadcasters attending the radio engineering session during the NAB convention heard a range of ideas for radio signal improvement in both the AM and FM bands.

Besides an NAB report on FM transmission issues before the FCC, a technique for overcoming coverage problems due to weather inversions also was described. Another paper suggested ways to make optimum use of tall FM structures as AM radiators.

Other papers during the session discussed the proximity effect in fields emanating from AM towers and factors affecting the stability of AM antenna patterns.

John Marino, VP of engineering for NewCity Communications, updated attendees on the work of the NAB FM Transmission Subcommittee.

Among the issues the subcommittee is investigating is power increase for Class A stations trying to serve an expanding community. Although the group disagrees with a current New Jersey broadcasters petition requesting blanket increases, Marino said the subcommittee supported case-by-case increases.

In the matter of directional antennas for FM stations, the transmission subcommittee endorses a panel radiator to achieve a directional pattern. However, Marino pointed out that use of directional antennas in the northeast US has been a "miserable failure" and requires further study.

Subcommittee research also addresses FM propagation, Marino noted. While the FCC has standardized an algorithm for modeling coverage patterns, he suggested a more accurate program, including terrain shadowing, could be a "very useful tool."

Marino also commented on the need for cooperation from receiver manufacturers to reduce multipath problems, and touched on the possibility of forming an "inter-industry" group to discuss FM concerns, similar to AM's National Radio Systems Committee.

Bert Goldman of Shamrock Broadcasting discussed use of FM vertical diversity transmission to overcome temperature inversions. These thermal phenomena can partially defract radio waves and can cause loss of coverage if the broadcaster transmits above the inversion layer.

To determine an inversion level for Shamrock's KZFX-FM in Houston, radiosonde readings are made at 6:00 AM and 6:00 PM daily in surrounding areas. At each change in temperature rate or direction, a reading is taken, which enables inversion levels to be plotted.

The inversions can be detected by filtered receive antennas at the 1,000 and 2,000' levels on the KZFX tower. During an inversion, the latter antenna—which ordinarily receives more relative signal than the former—will have less signal than the 1,000' antenna.

Alerted to the inversion by an alarm, the tower operator can switch to the lower auxiliary antenna until the inversion is corrected. An air-driven coax switch allows for quick change from one antenna to another.

A discussion of the optimum use of tall towers for AM was presented by Ogden Prestholdt, a consultant to Washington DC-based du Treil, Lundin and Rackley.

According to Prestholdt, "The success of FM broadcasting and the FCC's action in Docket 80-90 has led to an increase in the construction of tall towers for FM." These towers, if located near an AM site, can be useful as AM radiators, and even provide more "vertical aperture" than needed by AMs.

This extra aperture allows for high gain with minimal or no high angle lobes, according to Prestholdt. The preferred vertical pattern would be the highest gain possible without high angle radiation, which could cause nighttime fading or nearby interference.

Such a pattern could be gained by matching current distribution and vertical pattern of a quarter wavelength antenna, to obtain maximum gain with no minor lobes.

Symposium

(continued from page 17)

bryos, a study conducted at six laboratories in Canada, Spain, Sweden and the US.

The study, according to Berman, found that "very low level, very low frequency pulsed magnetic fields apparently, and inconsistently, contribute to increased abnormality incidences in early embryonic chicks, without apparent concomitant changes in maturity."

Following the symposium, the EEPA's Umanksy stepped down as president. He had served two terms.

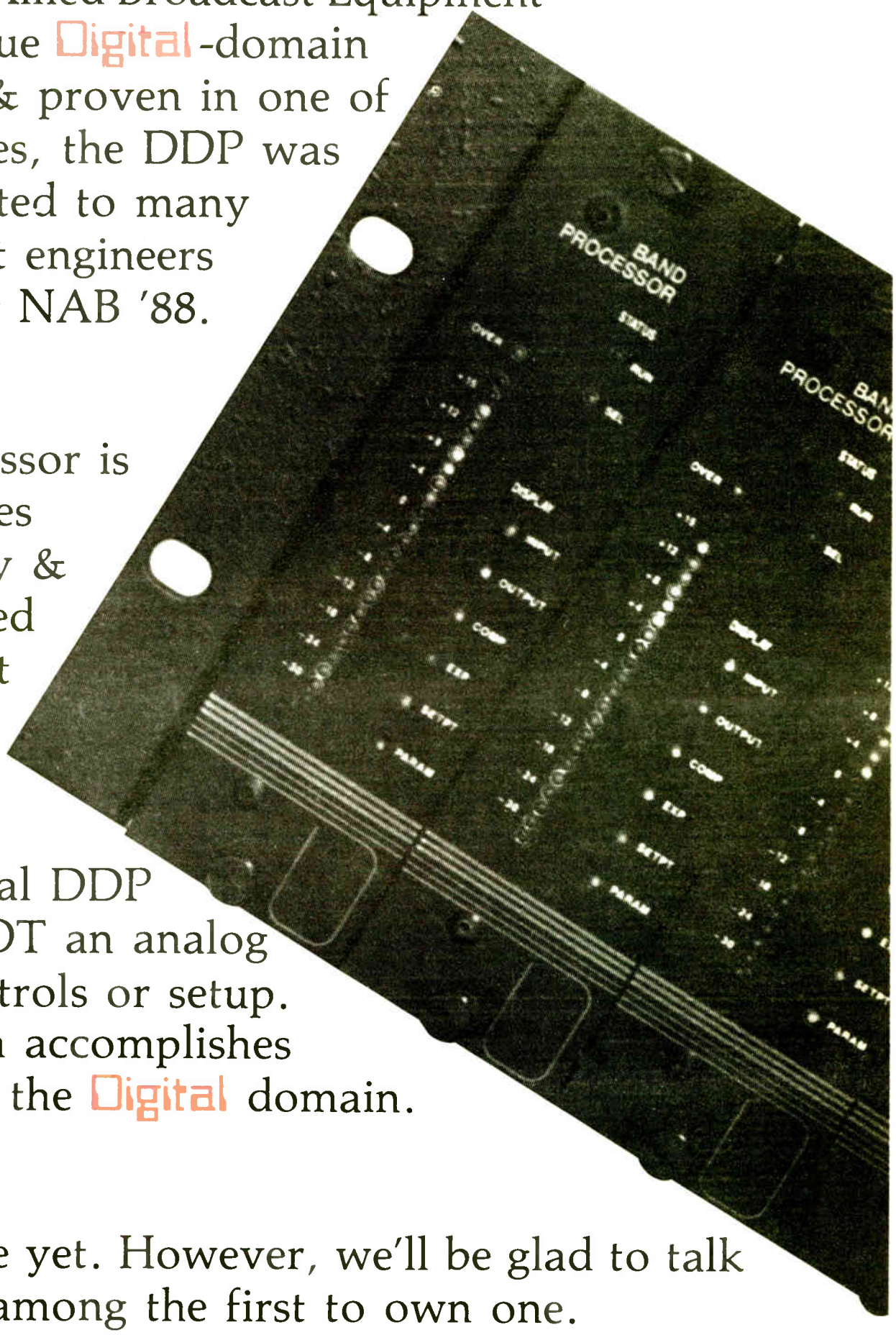
He has been succeeded by Jay Brandinger, a research scientist with SRI International.

For more information, contact the EEPA at 202-452-1070.

DDP NEWSletter #1

"To process you right into the '90s"

Valley International & Allied Broadcast Equipment proudly announce a true Digital-domain processor. Conceived & proven in one of audio's best laboratories, the DDP was successfully demonstrated to many enthusiastic top-market engineers & programmers during NAB '88.



This true Digital processor is now in Beta testing sites throughout the country & is expected to be offered for sale within the next four months.

The Valley International DDP Digital processor is NOT an analog device with digital controls or setup. It IS a processor which accomplishes precision processing in the Digital domain.

The DDP is not for sale yet. However, we'll be glad to talk with you about being among the first to own one.

ONLY FROM

ALLIED / VALLEY INTERNATIONAL, INC

ATLANTA, GEORGIA 404-964-1464
CHICAGO, ILLINOIS 312-470-0303
DALLAS, TEXAS 214-423-8667
LOS ANGELES, CALIFORNIA 818-843-5052
RICHMOND, INDIANA 317-962-8596
SEATTLE, WASHINGTON 206-838-2705

Advantages of High L-C Ratios

by Tom Osenkowsky

Brookfield CT ... In last month's installment we touched upon the advantages of high L-C ratio series networks. Let's examine two cases where a higher ratio was advantageous. Figure 1 shows the ± 10 kHz common point that was considered to be "broadbanded."

By using an equation (Eq. 2, 15 May **RW**) we calculated a series network of an 80.1uh coil and a .0004947uf capacitor (+j402 and −j402 respectively) to cancel the sideband reactances.

Figure 2 shows the reduction in sideband VSWR. I again point out that no substitution can be made for the capacitor although in this case a .0005uf would produce adequate results. Normally, a vacuum variable would be necessary.

RF Reader

We place our series network at the input to the common point and can use part of Xl on the CP matching network as part of the XL of the series network to reduce component count.

If we were using a plate modulated transmitter, the "horseshoe sideways" impedance curve (as represented on a Smith chart) would be rotated to "horseshoe down" by the transmitter's output matching network (nominal −225° phase shift).

Figure 1.

FREQ.	Z	VSWR
640	57+j10	1.26
630	50+j0	1.00
620	42−j11	1.34

Figure 2.

FREQ	Z	VSWR
640	57+j0	1.14
630	50+j0	1.00
620	42+j0	1.19

The load at the plate of the tube, which is the voltage generator in this case, would be optimum.

When looking at the non-DA case, or the DA case where the phasor is located in the tower field, the total load system phasing must be considered referenced to the plate or RF combining point.

The goal of broadbanding is to place an optimum load at the voltage or current generation point. In a high-level modulated or grid modulated transmitter this is the plate of the final RF amplifier tube(s).

In a solid state transmitter the point where all RF modules are combined, generally at a low impedance value, would be where an optimum load should occur.

An optimum load can be described as one which produces equal sideband powers with minimal VSWR. A sideband power equal to 25% of carrier power should exist.

Since plate measurements often involve high impedances it is frequently more convienent to measure at the transmitter terminals.

This is *not*, however, the place to have symmetrical sidebands (the exception being the Nautel 1kW transmitter which has a 180° output network phase shift).

Some consider an optimum load to be resistively flat with zero reactance across the passband. Figure 3 shows a simple Tee network designed to transform a common point with 50+j0 ±20kHz from carrier (a dummy load).

Notice the plate impedances and attendant sideband powers. Although the CP was flat the transformed plate load was not optimum. Keep in mind that this is a simple Tee network example. Transmitter output networks are generally more complicated.

Figures 4 and 5 demonstrate the usage of a tuned trap in the shunt leg of a Non-D ATU. In this particular case the high L-C ratio actually helped reduce sideband VSWR. The phase variation was less as well.

If you are mathematically taking into account the transmitter output network, the impedance slope must be at the transmitter input terminals.

Neglecting the transmission line between the ATU and transmitter can be a costly mistake when measuring out at the ATU and assuming no phase rotation has occured in the line.

Second, actual phase shift measurements must be in the form of input voltage to output current. Using toroids to measure at the transmitter plate can be dangerous due to the high RF and DC voltages one can encounter.

Don't retap the power supply for lower plate voltage ... the plate impedance will change, thus disturbing the network termination and the phase readings will be erroneous.

Using an oscilloscope can produce erroneous results as well since you will then be dealing with voltage phase shift, not current phase shift. The two terms become synonymous only when a 1:1 VSWR is achieved.

Tom Osenkowsky is a radio engineering consultant and president of MASTER Software, and a regular **RW** *columnist. He can be reached at 203-775-3060.*

Figure 3.

FREQ	RESISTANCE	REACTANCE	PHASE	VSWR	Psb %	Rel fs
980	523.32	+J 4.21	− 40.79	1.15	28.66	5.35
985	541.54	+J 4.48	− 41.90	1.11	27.70	5.26
990	560.41	+J 3.93	− 42.98	1.07	26.76	5.17
995	579.90	+J 2.47	− 44.01	1.03	25.87	5.09
1000	600.00	+J 0.00	− 45.00	1.00	100.00	10.00
1005	620.67	−J 3.57	− 45.96	1.03	24.17	4.92
1010	641.88	−J 8.34	− 46.88	1.07	23.36	4.83
1015	663.56	−J 14.42	− 47.76	1.11	22.59	4.75
1020	685.65	−J 21.92	− 48.61	1.15	21.85	4.67

Figure 4.

FREQ	RESISTANCE	REACTANCE	PHASE	VSWR	Psb %	Rel fs
1470	31.43	+J 23.63	− 86.78	2.10	25.41	5.04
1475	37.29	+J 22.15	− 87.61	1.79	24.78	4.98
1480	43.89	+J 17.29	− 88.39	1.48	24.65	4.97
1485	48.71	+J 10.38	− 89.19	1.24	24.55	4.95
1490	50.00	+J 0.00	− 90.00	1.00	100.00	10.00
1495	46.83	−J 8.83	− 90.84	1.21	25.77	5.08
1500	40.11	−J 15.88	− 91.74	1.51	26.94	5.19
1505	33.22	−J 19.23	− 92.69	1.85	28.19	5.31
1510	26.60	−J 19.74	− 93.76	2.26	30.30	5.50

Figure 5.

FREQ	RESISTANCE	REACTANCE	PHASE	VSWR	Psb %	Rel fs
1470	30.69	+J 23.36	− 88.10	2.13	25.79	5.08
1475	36.57	+J 21.81	− 88.59	1.80	25.21	5.02
1480	43.19	+J 16.98	− 89.06	1.48	25.07	5.01
1485	48.22	+J 10.22	− 89.53	1.23	24.81	4.98
1490	50.00	+J 0.00	− 90.00	1.00	100.00	10.00
1495	47.60	−J 8.95	− 90.48	1.21	25.36	5.04
1500	41.65	−J 16.55	− 90.96	1.50	25.92	5.09
1505	35.31	−J 20.71	− 91.46	1.81	26.34	5.13
1510	28.94	−J 22.09	− 91.98	2.19	27.29	5.22

High Power FM Power

Before you purchase a high power FM transmitter, ASK:

Q. ***Which manufacturer has offered leadership in high power FM since 1961?***

A. ONLY HARRIS. Since we introduced our first high power FM transmitter in 1961, we've been the *only* constant force in the business. Some companies have come. Others have changed hands. And a few have gone completely.

As the high power FM industry's most solid player, Harris will give you the industry's strongest safety net. You can count on us for top confidence that service and parts will be available *tomorrow* for the product you invest in *today.*

Q. ***Which manufacturer combines a continuing record for innovation in FM with a broad range of high power FM transmitters?***

A. ONLY HARRIS. From the first solid-state FM exciter to our revolutionary IPA, functional innovation is more than a Harris tradition. It's a principle we've applied to an extensive range of compact high power FM transmitters. We have *new* 20, 25, 30 and 35 kilowatt models. And they're available in dual configurations for FM super powers!

At *every* power level you'll get a competitively-priced transmitter engineered for years of top performance, low-cost ownership, and easy operation and maintenance.

Q. ***Which manufacturer has provided 24-hour technical service since 1975?***

A. ONLY HARRIS. Because we were the first company to understand your need for service on *more* than a 9 to 5, Monday through Friday basis.

Total approaches to RF system problems are always available from our specially-trained RF systems service engineers — even if your system went on the air before they were born! Your engineers can get answers to over 90 percent of their technical questions by phone. And the service is free to our customers!

You can also phone us 24-hours-a-day for parts — even for products we no longer manufacture!

If you use our toll free parts priority hotline — 1-800-422-2218 — we'll even pay for the call!

We take our service commitment seriously. Because we know that if you're off the air, everything stops. Except the expenses.

Q. ***Which manufacturer offers formal technical training?***

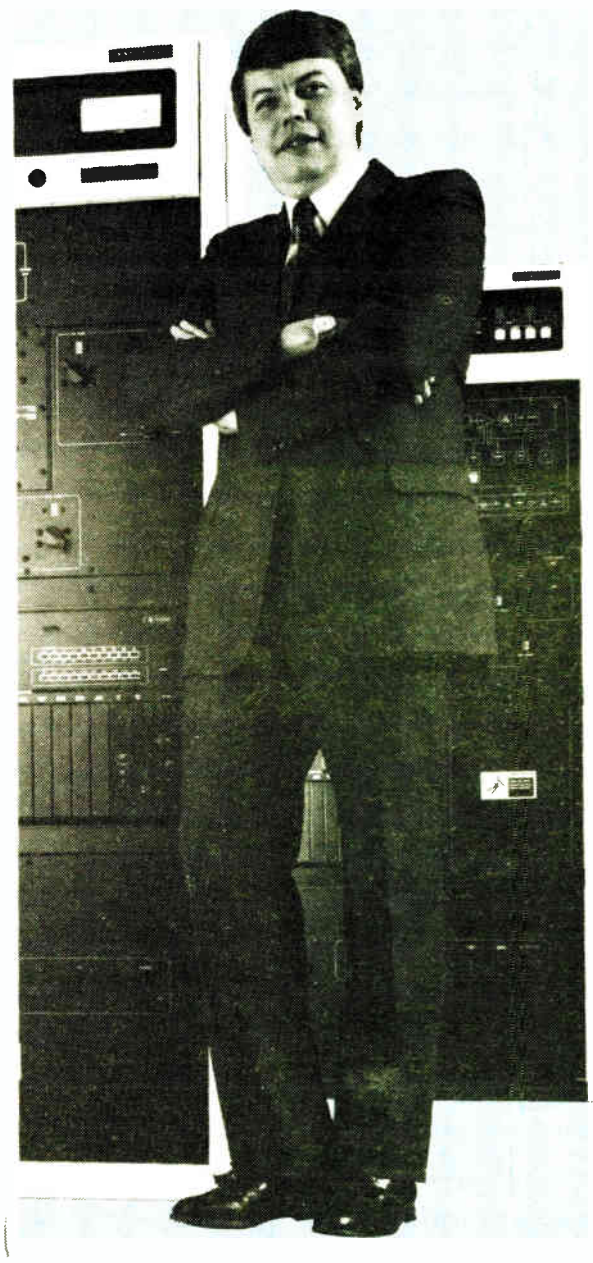
A. ONLY HARRIS. We know station engineers retire . . . that new engineers come on board . . . that engineers move from studio to RF systems maintenance. And we know that those who keep your equipment on the air need to be in the know.

That's why we offer more than 50 regularly-scheduled technical training programs every year at the industry's *only* Broadcast Technology Training Center. While some of our courses focus on major Harris products, we also offer comprehensive, general courses on complex RF systems for *all* broadcasters.

Q. ***Which manufacturer has more high power FM transmitters on the air nationwide than both the second and third-rated manufacturers combined?***

A. ONLY HARRIS.

For complete information about our high power transmitters or to arrange a visit from one of our radio district sales managers, write to me at Harris Broadcast Division, P.O. Box 4290, Quincy, IL 62305-4290, or phone Harris TOLL FREE: 1-800-4-HARRIS, Extension 3012.



Ronald C. Frillman
Manager — Domestic Radio Sales
Harris Corporation, Broadcast Division

HARRIS

Circle Reader Service 21 on Page 34

The Traits Of A Good Leader

by John M. Cummuta

Downers Grove IL ... "Attack ... repeat ... attack!"

With those three words, Admiral William "Bull" Halsey sent a few cruisers and support vessels up the "slot" north of Guadalcanal against a vastly superior Japanese force.

The resulting battle, while a virtual stalemate, was one of the most brutal naval engagements of World War II, costing the fledgling American forces in that area a number of important ships and the lives of the two admirals in tactical command of the operation.

However, they had gone off to this certainly lopsided fight with great spirit. Why? Because they were inspired by their leader, the aggressive Halsey.

Boss vs. leader

These men were not simply submitting to Halsey's superior rank. They weren't just following the "boss's" instructions. They were charging into an uphill struggle not wanting to let their leader down. There's a big difference.

Engineering-Manager

A true leader can always accomplish far more with an organization of people than can those who just see themselves as the "authority" in the situation feeling only that the people must obey their directives.

The latter is a description of a "boss," and boss can best be defined as a "double S.O.B. spelled backwards." That kind of management is a doomed effort.

In order to be a leader you must first of all recognize that your people more attention pay to what you do than what you say.

You must lead by example, and that example should evidence a total commitment to excellent work. Do more than the bare minimum to get by in a situation. Use the old measuring stick: "Would you sign your name to that work?"

But more than that, let your people see your honest enthusiasm for the results of an excellent effort, even if that effort took overtime to complete.

The Golden Rule is the next element of true leadership. Be pleasant and cheerful towards your employees. People really relax and respond energetically to a leader who makes them feel good about themselves, the day, the job, the company.

Set a positive tone for your department or station, and you will achieve positively wonderful results. Be the kind of person that you'd like to be around, if you were one of your subordinates.

You're only human

Another important characteristic of a good leader is a willingness to admit his or her humanity. Admit when you've made a mistake. Faking perfection is a losing proposition for two reasons.

First, it intimidates your subordinates who know that they are not capable of never making a mistake. And secondly, no one believes you anyway.

The honest leader wins a subordinate's respect. If you try to pretend that you're perfect you'll only succeed at proving that you're a perfectly lousy leader.

Keep all your talk positive. Never allow yourself to make a negative comment about anyone else at the station, past, present or prospective. Your people will never be able to really be loyal to you if deep down inside they wonder if you're talking about them like that when they're not around.

Contribute genuine enthusiasm and optimism about the future of your department and the station at large, and show a willingness to pitch in to help your people when necessary.

That shouldn't be interpreted as doing their work for them or doing the hard stuff that you feel you can do better, because both of those strategies will backfire with low morale and a diminished capability level in your subordinates.

It is, however, important that they see you as willing to roll up your sleeves and dig in when the situation calls for it.

Prime characteristic

The "Big I"—integrity—is the most important virtue a leader can exhibit. This means being honest in all your dealings with your people, keeping promises made to them and never betraying confidences.

Integrity breeds respect, and respect is the real power of any leader. Without integrity it is impossible to lead and barely possible to boss.

People who are newly-promoted to a management position often mistakenly feel that their only direction of loyalty and integrity should be upward toward their boss.

They subconciously believe that their job is to represent the interests of the boss—if necessary—at the expense of their subordinates. Nothing could be further from the truth.

It is in maintaining a balance, slightly favoring the people who sign your paycheck, that true leadership operates.

Integrity mandates that this balance be openly and honestly communicated both upward and downward along the chain of command. Both your superiors and subordinates will respect your principles.

Be humble

Humility is a good characteristic for a leader to cultivate. It simply means that you don't lord it over your people and you treat them as you would want to be treated if the roles were reversed.

This should not, however, be confused with timidness or a lack of self-confidence. A strong and obvious belief in yourself is also a necessary ingredient for leadership.

Unselfishness is another key to being a real leader. According to a Biblical quote, "Everything reproduces after its own kind."

In this application it means that a selfish boss reproduces selfish subordinates and any station or department staffed by people who are only in it for their own self-interests is doomed to failure, or at best mediocrity.

Motivational speaker Zig Ziglar's most famous axiom is "You can get anything in life you want if you just help enough other people get what they want." It works.

Using your feelings

Compassion and concern are two more components of a leader. You cannot be an effective leader, in fact you'd have a hard time being a decent human being, without compassion for others.

In terms of leadership, it is critically important to feel for the real needs of your people. However, a leader must also balance compassion and concern with a clearheaded vision of the department's plans and goals.

Integrity breeds respect, and respect is the real power of any leader.

If you're too hard your people will not care about helping you meet your goals. If you're too soft your people are only human—they'll take advantage of that too.

Be an enabler. True leaders don't "make" people do things, they "enable" them to accomplish their tasks. Consider yourself to be a facilitator. You're the person who makes sure that they have all the tools, time, and resources necessary to get the job done right.

Presuming that you've hired the right people in the first place, they'll respond to your support and do a great job.

Trust your people with the tasks and goals that will make or break your job performance. That's a hard pill to swallow I know, but it's the only way to really get the job done—as a leader.

Trusting others

What I'm saying here is that you can't really do all the tasks your department is responsible for anyway, so you must get things done through others. That's the definition of management.

So, since you have no choice but to delegate tasks and responsibilities to your subordinates, let them know that you trust them to complete the jobs successfully.

You'll accomplish two important things: you will reap mutual respect from your employees and you will be building more competent subordinates.

Growing your people this way continually increases their abilities to take on more and more important tasks and responsibilities, freeing you to lead more and do less of the actual nittygritty work of your department.

The "Bossy" type has to constantly be on his people just to make sure that the bare minimum gets done.

But if you develop the skills and characteristics of a true leader, you'll be able to just share your department's goals and responsibilities with your people and then say, "Attack ... repeat ... attack!"

John Cummuta is president of Marketline, a broadcast management and marketing consulting firm, and a regular **RW** *columnist. He can be reached at 312-960-5999.*

Auditronics "because they work well and they're so easy to use"

"That's what I tell colleagues from other stations when they ask why I prefer Auditronics consoles," says Jon Book, Engineering Manager, Studio Systems for WOC-KIIK in Davenport, Iowa.

"We have about 15 people working the boards between our AM and FM operations so ease of use is very important to us. Our five Auditronics consoles in on-air and production let our people air a highly professional product on both our programming and the commercials we produce."

Call us now to find out more about why Jon Book buys Auditronics consoles for on-air and production, **toll free 800-638-0977.**

auditronics, inc.
3750 Old Getwell Road, Memphis, TN 38118 • 901-362-1350

Circle Reader Service 60 on Page 34

Verifying Test Gear Accuracy

by Thomas L. Vernon

Harrisburg PA ... It's happened to all of us at one time or another. Hours are spent trying to troubleshoot a seemingly simple problem, only to discover that readings obtained from the DVM or scope were way off base.

When repairing equipment we have to make some basic assumptions. One of those assumptions is that the test equipment we use is working properly and meeting published specs.

We can only make this assumption safely if there are means to occasionally verify the accuracy of our test equipment.

The newer generation of audio and control equipment make this need all the more pressing. Consider the fact that older transistorized equipment usually worked well when voltage readings were within ±10% of those on the schematic.

Newer opamp technology, on the other hand, is very sensitive to voltage fluctuations. Power supply variations of more than 1 mV usually mean trouble.

Station Sketches

This month we'll look at some easy ways to verify equipment accuracy in-house and discuss when to return test equipment to the factory for recalibration.

Reference standards

The easiest way to do a quick check of instrument calibration is with a set of reference standards. These standards should be mounted in a mini-box with appropriate connectors to mate with your test leads.

Doing this insures that you'll have the standards all in one place when you need them and also that the components won't be accidentally scavanged for your next construction project.

Resistance standards are the easiest to come by. Precision 0.1% resistors are readily available and affordable in many parts catalogs.

Try to get several that are multiples of each other like 1, 10, 100, 1000, etc. This will enable you to verify that all ranges of your VTVM are within specs.

A precision voltage reference can be constructed with a mercury cell and current limiting resistors of about 150 ohms. Mercury cells have the property of maintaning a constant voltage over most of their useful life.

Typical cell voltages are 1.35 or 1.40 V. It is important that your voltage reference never be used to power anything and that it be kept in the refrigerator to prolong its life.

Capacitors

Locating precision capacitors takes some effort, but 1% mica and polypropylene types can usually be found with a little effort.

Precision inductors are beyond most people's budgets. The best way around this is to create your own "standard" by measuring an inductor with a precise capacitance and frequency, or with a lab-grade impedance bridge.

There are several ways to check the accuracy of a frequency counter. Probably the easiest method is with WWV.

Since most counters have a 1 MHz square wave time base, this is simply a matter of placing the counter atop a communications receiver tuned to WWV and listening for the zero beat as the counter's time base is adjusted.

If you don't have a receiver the 60 Hz power line frequency is accurate to one part per thousand, or better if averaged over longer time periods.

If you have engineering friends in the local TV station you may be able to get access to the network 3.579545 MHz color-burst signal, which is locked to an atomic clock.

Buying used

One alternative to building your own boxes with resistance and capacitance standards is to purchase used commercial units through test equipment rental outfits or surplus catalogs. Even pre-owned units tend to be a bit expensive, though.

Bear in mind that when test equipment is calibrated at the factory it is done under closely controlled temperature and humidity conditions. Therefore, it's not a good idea to recalibrate equipment under adverse environmental conditions.

A question that often arises is how often to return equipment to the factory for recalibration. Most manufacturers have a flat fee for performing equipment upgrades and recalibration.

Calibration is typically guaranteed for one year although it frequently holds up longer than that. Some types of contract engineering and warranty repair work require that all equipment used be factory recalibrated.

If you're not under these kinds of constraints, two years between factory recalibrations would not be unreasonable.

In-house equipment checks with your own standards should not be used as a substitute for regular factory recalibration. Such checks, however, insure that your equipment accuracy is well within the ball park.

Knowing this, you can tackle troubleshooting problems with confidence that your test equipment is operating correctly.

Tom Vernon, a regular **RW** *columnist, divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-249-1230.*

Circle Reader Service 34 on Page 34

BROADCAST COMPUTING

Sift Through Transmitter Data

by Peter Burk

Pepperell MA ... Do you still keep a transmitter operating log? While the FCC has eased up on its restrictions, a transmitter log can save the station money and air-time and for most of us, that's reason enough to keep one.

The greatest benefit the log provides is evidence of the long term trend concerning final stage performance and antenna matching. Knowing when to retune or when to replace the finals is much easier with accurate historical data.

Since our minds aren't very good at spotting these trends by inspection, a personal computer becomes a useful tool.

We've mentioned before some of the methods that can be used to process transmitter information. Programs such as dBase and Lotus 1-2-3 can reduce this pile of data to meaningful answers.

If you've tried this, you've undoubtedly noticed that some of the data bounces around too much to be really useful.

Whether the cause is RF corrupting the samples from the transmitter or modulation affecting the antenna current, the result is data that is hard to analyze.

Before you run off looking for a large 'lytic to slug the sample, consider filtering the data with your PC.

We'll talk about techniques that are useful for real-time data collection, but many of these methods are useful in post analysis, even if you keep a manual log.

Transmitter samples

First, let's look at real-time samples that are taken directly from the transmitter or remote control system.

Typically we only want to print a set of readings every few minutes or even hours, yet new samples are available by the second.

Instead of taking snapshots once in a while use those multiple readings to provide a more accurate answer. The simplest technique is an average taken over some period of time prior to the time of the reading.

Listing 1 is a rather trivial example that illustrates this method in BASIC. The sum of the X's is accumulated until time to print the log. A division by the number of X's produces the average value for the log.

A better approach is a moving average, which is the digital equivalent of a low-pass filter.

Mathematically the result is defined by the process shown in Equation 1, where y(n) is the filtered result at sample n, x(n)

(continued on next page)

Listing 1.

A simple average in BASIC.

```
10 N = 10
20 FOR I = 1 TO N
30    INPUT X
40    A = A + X
50 NEXT
60 PRINT A/N
70 A = 0
80 GOTO 20
```

Listing 2.

A moving average.

```
10 N = 10
20 FOR I = 1 TO N
30     INPUT X(I)
40     FOR J = 1 TO N
50         A = A + X(J)
60     NEXT
70     PRINT A/N
80     A = 0
90 NEXT
100 GOTO 20
```

Listing 3.

An alpha-beta tracker.

```
10 INPUT "A,B";A,B
20 Y=0:P=0:V=0
30 INPUT X
40 P = Y + V
50 XP = X - P
60 Y = P + A * XP
70 V = V + B * XP
80 PRINT Y,P,V
90 GOTO 30
```

BROADCAST COMPUTING

With Computer-Based Listings

(continued from previous page)
is the input value at that sample and N is the order of the filter or number of memory locations used.

The performance of such a filter is dependent on the number of elements. If N is too small little smoothing takes place. Make N too large and the output is slow to respond to change, much like an oversized capacitor on the sample.

The best length depends on the type of data we're looking at and what kind of noise we expect to encounter.

Better filter

The improvement over a fixed average is that the output responds more smoothly and quickly to changes in the input.

One important advantage of this filter is that it is easily implemented on a computer. Listing 2 is an example.

These simple filters improve the way our data looks, but do they really tell the whole story? Like weather forecasting, current conditions are essential but what we really want to know is what's going to happen next.

The first step toward predicting the future is to quantify the direction and speed of the change in each parameter.

One way is to determine the first derivative of the signal, perhaps by calculating the slope over the interval between readings. This tells us how fast and in which direction, but is subject to the same noise that bothered us at the start.

An additional problem is how to handle abrupt changes in readings in a timely manner. If we have our samples so slugged with low-pass filters that they won't budge, we'll have very accurate readings, but only if the input never changes!

Quick changes

What happens when the plates are suddenly shut off? We need something that will respond quickly so that we know what happened.

The solution is a tracking filter. With a properly written filter, we can have good accuracy, quick response to change, and as bonuses, an estimate of the rate of change and a prediction of the next reading.

Here's how it works. Assume for a moment that we have an estimate of the parameter of interest and also an estimate of the rate of change of that parameter.

The prediction is determined as shown in Equation 2, where p(n) is the predicted value, y(n − 1) is the previously processed value, v(n − 1) is the velocity estimate and T is the period between readings.

Value corrections

Now when it comes time to read the sample again, we calculate the difference between our new sample and the prediction.

If the difference is positive, the prediction was too low. A negative result means that the prediction was too high.

The new processed value y(n) is corrected in Equation 3, where x(n) is the raw input sample and A is a constant (alpha).

Equation 1.	$y(n) = [x(n) + x(n-1) + \ldots + x(n-N+1)]/N$
Equation 2.	$p(n) = y(n-1) + Tv(n-1)$
Equation 3.	$y(n) = p(n) + A[x(n) - p(n)]$
Equation 4.	$v(n) = v(n-1) + \{B[x(n) - p(n)]\}/T$

To correct the velocity estimate, we use a similar approach in Equation 4, using another constant, beta.

Both alpha and beta must be positive and are determined by experimentation or by highly developed mathematical methods beyond the scope of this article. They, like the filter order before, depend on the nature of the data and noise.

These equations together are known as the alpha-beta tracking equations and are used in many systems where accuracy, response and predictions are required.

They also are easily run on a computer. The program in Listing 3 allows experimenting with different alpha and beta constants. Note that the period T is assumed to be equal to one and is dropped from the equations.

Try these methods on your transmitter data and see just how useful your operating log can be.

RW *welcomes your contributions to Broadcast Computing. Peter Burk is president of Advanced Micro-Dynamics. He can be reached at 617-433-8877.*

Sessions Tackle AM Noise in FM

by Alex Zavistovich

Las Vegas NV ... The focus of the radio new technology session at the NAB seemed to be AM noise in the FM signal, its problems and means of correcting the condition.

Although papers were presented that addressed audio switching and FM boosters for improved signal coverage, the majority of papers addressed the importance of accurate AM synchronous measurements.

The subject even strayed into other technological areas when Emil Torick, in a presentation on FMX, stressed careful monitoring of incidental AM in the FM signal when making the transition to FMX.

Lloyd Berg, engineer at WUSA-FM, Tampa FL, described practical means to measure and minimize so-called source-induced FM multipath problems.

Berg measured multipath at WUSA, which uses parallel transmitters for broadcasting, with a Tektronix 100 MHz oscilloscope, a technique he carried over from his television engineering days. Using the scope, Berg said he could watch the sine wave out from the carrier, and watch amplitude modulation by reducing the unit's sweep speed. WUSA's case, synchronous AM in the signal was traced to interaction between the station's transmitters, in which, as Berg put it, the left side was "fighting" the right. The transmitters had isolation problems, complicated by an "impedance bump" between the exciter and input stages of the power amps.

Replacing a "bud box," which had been used to phase the transmitters together, Berg installed a line stretcher that he could feed with delay without affecting impedance. A power splitter also reduced interaction between the transmitters, he said.

Berg recommended using a scope for measurement, rather than a diode detector. FCC rules allow multipath measurements after standard 6 dB/octave deemphasis, which Berg said would produce an "attractive reading that's totally wrong" on a diode detector.

He also suggested that measurements be made directly at the transmitter, noting "it's hard to get a non-clipped RF sample off the air."
The RF sample has to be terminated, Berg added, otherwise, reflections in the sample line may cause inaccurate readings, leading to transmitter misadjustment.

Later in the session, Geoffrey Mendenhall of Broadcast Electronics gave an overview of techniques for measuring synchronous AM noise in FM transmitters.

Proper measurement of synchronous AM—the amount of incidental AM in the carrier due to FM modulation—gives a station engineer an "idea of the overall system bandwidth and whether the passband is positioned correctly," Mendenhall said.

To observe accurate synchronous waveforms while tuning the FM transmitter, a precision envelope detector with high return loss must be used, he commented. A composite baseband can be routed into the test to fine tune using normal broadcast programming.

Mendenhall said most FM demodulators cannot make reliable AM synchronous measurements. He suggested that if calculating AM noise from the demodulated AM waveform, the demodulator reading should be checked against the demodulated output of the envelope detector.

Also, care should be taken that the test setup does not introduce its own synchronous AM, causing false measurements.

As an alternative to a precision envelope detector, a through-line directional coupler can be used. An envelope detector is built into the sampling element and provides a DC component and demodulated AM noise component; special connectors join its output to the oscilloscope.

Emil Torick of Broadcast Technology Partners described technical considerations for implementing FMX broadcasting. A co-developer of the FMX system, Torick commented that "certain procedures" must be followed to ensure "smooth and trouble-free implementation at the broadcast station level."

FMX occupies the same spectrum space as the regular stereo signal, Torick said, which makes for minimal stereo-SCA cross-talk.

In some cases, such as radio data SCA services, sideband energy can cause data to intermodulate with the stereo channel. Although the presence of FMX can increase the intermodulation, Torick held that the system operates within international specifications for data service.

Still, Torick stressed appropriate calibration and maintenance of composite processors for minimum interference with data transfer.

Another factor underscored by Torick for assuring a smooth switch to FMX was accurate transmitter tuning, especially to limit incidental or synchronous AM levels in the signal.

"Low incidental AM ... is vital for clean stereo," he said. "The new quality FMX service is deserving of similar distortion-free transmission."

In quadrature SCA programs on some receivers, crosstalk of the FMX stereo difference channel with the regular stereo difference channel could reduce separation, depending on how the encoders are aligned.

However, he maintained, tests on a variety of receivers showed that 97% of those measured fell within acceptable limits for detection of separation.

Arizona FM Goes to Solar Power

by Alan Carter

Las Vegas NV ... The saying goes, "Necessity is the mother of invention."

But for KIHX-FM in Prescott Valley AZ, station president Sanford Cohen said it was more desperation than necessity.

In a convention paper, Cohen detailed how KIHX became a solar-powered commerical FM radio station.

KIHX-FM signed on 1 September 1985 with its primary signal emanating from a 60' telephone pole next to the studio. At a HAAT of –73 meters and in a mountainous region, the signal was heard in Prescott Valley, where the population was 6,500. However, in nearby Prescott, with a population of 25,000, there was no clear signal.

The station began making plans before sign-on to elevate the primary transmitter site as soon as possible. The best available location was on an elevation of 6,160'.

But that was easier said than done.

Arizona Public Service, the local electric utility, informed KIHX that it would cost more than $100,000 to provide power to the proposed transmitter site. It was within the boundary of the State of Arizona Land Trust, and state statute required the power lines be underground.

Cohen said the best alternative was solar power. In October 1985, the station contacted Photocomm Inc., Chino Valley AZ, with a proposal to design and implement a solar power array sufficient to power a broadcast site. The state of Arizona approved the project.

Cohen said he considered several alternative power sources before selecting solar.

He looked at wind power and a generator. But in his discussions, solar came up when it was noted that Prescott has about 310 days of partially to fully sunny days every year.

Cohen said CE Chuck Smith believed the only way to make the idea work was to use a combination of a low power, solid state transmitter, with a multi-bay antenna for power gain.

Despite the concerns about multipath distortion in mountainous situations, Cohen noted the only other option would have been a bigger solar plant and that would have been too expensive.

Among the broadcast equipment used are a CSI 500 W solid state amplifier and a Broadcast Electronics FX-30 exciter. The station combined a Gentner VRC-1000 remote control with a low consumption transmitter site package.

Cohen said he and Smith selected a Shively 5-bay circularly polarized FM antenna. With a gain factor of 2.55, Cohen said all they had to do was drive the CSI amplifier to 411 W to achieve the licensed output of 1.05 kW. With the antenna mounted at the top of a 60' tower, KIHX's signal stood at 471 feet above average terrain.

The solar equipment consists of 96 solar panels affixed to a moveable set of light aluminum frames. He said this allows the angle of the panels to be adjusted to correspond to the height of the sun as it varies through the seasons. The panels are rated at 47 W output each.

The system includes a so-called "battery bank" capable of some 3,000 ampere hours of storage. The lead-acid, deep cycle storage batteries are wired for 24 V DC.

The broadcast equipment draws some 1,300 W or 50 A through a DC/AC inverter system. Photocomm uses the Vanner 3,000 W inverter unit that converts the 24 V DC to 120 V AC.

To control minor current fluctuations, Cohen added a Balance of Systems Specialists—a 24 V DC, 200 A voltage regulator.

To accommodate solar shortages, the system is backed up with a propane storage tank to allow its operation for up to 21 days without direct sunlight.

So far, the longest period without direct sun was 21-30 October 1987. Cohen said the system worked "flawlessly."

The number to contact station KIHX-FM is 602-775-5277.

Filing Date

(continued from page 8)

elimination of the "IF Separation Taboo." The station, which stated that it is short-spaced to WRBS-FM, Baltimore, has had no complaints. The broadcaster added that the two stations were granted increases in antenna height above average terrain.

"These newly established facilities have been placed on the air; yet, no interference complaints have ever been received," WQSR wrote.

"This leads to the conclusion that the IF Separation Taboo serves no useful purpose. It is a mere vestige, surviving from a time when the engineering design of FM receivers was not yet fully developed."

WQRS continued that if the FCC is unwilling to eliminate the IF separation, the station would support the proposal to relax the distance separation requirements, but not as stringently as the proposed 36 mV/m overlap test. It recommended a 40 mV/m standard instead.

Peter & John Radio Fellowship, licensee of WRBS-FM, also supported the Commission's proposal.

WRBS recommended setting the signal level no less than the 36 mV/m level, allowing tangency of 36 mV/m contours.

The issue is in Docket MM 86-144. The contact at the FCC is Jay Jackson, 202-632-9660.

ALLIED

The *FULL SERVICE* Broadcast People

Preliminary

Technics

NEW PRODUCT ANNOUNCEMENT

The legend started with the SL-P1200, followed professionally by the SL-P1200X. Now, the latest in a proud series . . . THE

SL-P1300

TECHNICS LATEST
& CERTAINLY
THEIR
GREATEST!

- 8 times oversampling
- 4 digital-to-analog converters
- +8dBm professional XLR connectors
- 3″ & 5″ CD formats with no requirement for adaptors
- No-compromise, totally professional player
- ±8% speed control
- Autocues to first audio
- Optical & coaxial digital outputs
- Joy wheel for precise 0.1 sec. cue

ALLIED *will have the first units available this fall—get yours on order today!*

ATLANTA, GEORGIA 404-964-1464
LOS ANGELES, CALIFORNIA 818-843-5052
CHICAGO, ILLINOIS 312-470-0303
RICHMOND, INDIANA 317-962-8596
DALLAS, TEXAS 214-423-8667
SEATTLE, WASHINGTON 206-838-2705
RICHMOND HILL, ONTARIO, CANADA 416-731-3697

USED EQUIPMENT DIVISION 317-962-1471
BROADCAST SYSTEMS DIVISION 714-752-6664
SATELLITE EQUIPMENT DIVISION 317-962-8596
NIGHTS/WEEKENDS EMERGENCY 317-935-0455

ALLIED
Broadcast Equipment
P.O. BOX 1487 • RICHMOND, IN 47375
Join Our FAX Network • Prompt Response on Your RFQs
FAX 317-962-8961
Log In . . . Bulletin Board Modem . . . 317-935-0531

AM Improvement Spotlighted

by Alex Zavistovich

Las Vegas NV ... The work of the National Radio Systems Committee (NRSC) and the FCC inquiry into AM technical criteria shared the spotlight at an NAB session on AM improvement.

During that session, which kicked off the radio engineering program for the 1988 NAB convention, a study of the effectiveness of NRSC preemphasis and a description of the committee's newly adopted RF mask voluntary standard were presented. An NAB-sponsored review of the FCC's AM technical standards was also presented.

AM stereo was touched on briefly when Electronic Industries Association (EIA) spokesperson Eb Tingley implied that higher quality AM receivers might be made if stereo was promoted.

Other papers presented during the improvement session included an appraisal of Canada's implementation of the NRSC guides and a description of a splatter monitor for NRSC RF mask-related measurements.

"The NRSC is changing the ground rules to give manufacturers the incentive to build decent AM radios."

AM technical review

Harrison Klein, of the San Francisco-based firm of Hammett and Edison, presented a status report on a study he had undertaken for the NAB on the FCC's AM technical review.

The NAB study focused on atmospheric and man-made noise, minimum usable field strength, adjacent channel protection ratios, and root-sum-square (RSS) calculations.

Man-made noise is a more serious allocation issue than it was when the FCC first instituted its AM regulations, Klein said.

Noise was tied by Klein to another factor in the study—minimum usable field strength. He defined minimum usable field strength as the factor which produced the desired S/N for a specific percentage of time in the presence of man-made noise.

However, Klein noted that noise is not a constant and a single report cannot calculate minimum usable field strength in all cases.


Richard Mertz adresses NAB.

Protection ratios

Turning to protection ratios, Klein pointed out that the current ratios are responsible for the state of AM. He enumerated some factors to consider in protection ratios, including channel spacing, spectral characteristics of modulation, modulation depth and processing, pre- and deemphasis, band limiting, out of band radiation, and the frequency response of the ear.

As for RSS calculations, Klein noted that the 50% exclusion rule understates actual interference in some cases by up to 40 dB. He commented that reducing the exclusion percentage to 25% would include more stations in the interference calculations.

Following Klein's remarks, a member of the audience took receiver manufacturers to task for not producing AM equipment of quality, commenting that in some cases specs are no longer supplied for the gear.

This prompted the EIA's Tingley to respond that although "the NRSC is changing the ground rules to give manufacturers the incentive to build decent AM radios," it may take some time to reverse the situation.

Tingley commented that "TV sound languished for a long time" until stereo was introduced. He suggested that if the approach worked for television, it could work in AM, but stressed that "you are not going to solve the problem by bashing manufacturers."

NRSC field study

The session returned to the technical aspects of AM improvement with a study on the effect of the NRSC standard, conducted by two AM stations serving the Washington DC area.

The study was prepared by Richard Mertz, an engineer for WINX-AM, Rockville MD, and Tom McGinley of WPGC-AM, Morningside MD. WINX broadcasts at 1600 kHz with 1 kW; WPGC broadcasts at 1580 kHz with 50 kW.

The stations had been experiencing what Mertz called "spit" or "monkey chatter" interference in certain parts of their coverage areas, particularly in the northern suburbs. An informal agreement to control HF boost did not adequately address the problem.

With some equipment supplied by the NAB, the groups measured the interference between the stations when NRSC preemphasis and filtering was alternately switched in and out. A tunable antenna helped null out an undesired signal from a broadcaster at 1590 kHz in Northern Maryland.

With the filter in, McGinley said a "brick wall" separated the stations. A tape recording of the stations was used to demonstrate the difference between interference levels when the NRSC standard was engaged.

New NRSC standard

John Marino, chairman of the NRSC AM Technical Subgroup, then briefly presented the committee's latest effort—an interim voluntary national standard to limit spurious emissions from AM transmitters.

The so-called "RF mask" was adopted at a meeting of the NRSC on 7 April, the day before the convention sessions opened. (For the complete story, see the 1 May issue of **RW**.)

Marino explained that the RF mask was to be used as a "guide or goal, to address situations where RF exceeds limits," due to overmodulation or internal switching byproducts.

Transmitter manufacturers say much of their equipment easily complies with the mask guide. However, to measure compliance, Marino commented that in addition to a spectrum analyzer, a splatter monitor available from Delta Electronics can measure several channels out from the carrier.

Circle Reader Service 28 on Page 34

A Look At CD Music Libraries

by Tyree Ford

Baltimore MD ... With this article *Producer's File* begins a peripatetic journey through the CD production music marketplace.

Logistics and a sensitivity to monotony will keep these articles from being consecutive. If you are now (or soon expect to be) in the market for a production library, feel free to contact me with your suggestions or questions.

Because many **RW** suscribers work at production houses as well as stations, the scope of these articles will include spot bed libraries as well as longer theme libraries. Some of these themes make good commercial beds.

Producer's File

Library acquisition presents many challenges. Most companies will not send complete libraries on spec.

Then, too, there are music companies who put their best stuff on the demo leaving the buyer disappointed when the whole package arrives. Some companies claim their packages contain some huge number of selections. What they don't tell you is they count the main theme, its rhythm track, the 60, 30 and stinger as five cuts!

Part I of this ongoing review focuses on the DeWolfe CD library of 24 CDs, half of which hold about 55 to 60 minutes. All the discs are AAD recorded in analog, mixed to master in analog and transferred to CD.

Realizing that music is highly subjective, the descriptions in the accompanying chart are designed to give you maximum information with minimun words.

The DeWolfe library has five new CDs which should be ready for shipment by the time this article is published.

Annual license for radio or TV is $1,950 for 24 CDs with new CDs at $20 each. A 500 page cross-referenced catalog of over 1,000 LPs and CDs is included.

DeWolfe will send libraries on spec to production houses with appropriate references. The library is sold on a non-exclusive basis, and you don't have to buy the whole library. Annual license holders pay $20 for additional CDs.

For good reporter production houses, someone who's active, needle drops can be sent. Needle drop fees for spots are $55 per local use and $110 for regional and national.

Donuts are considered separate spots and are subject to the theme rate of $425, renewable on an annual basis. No price breaks currently exist for smaller markets.

Non-broadcast or A/V rates are $50 per needle drop or $200 for any number of cuts for a program up to 10 minutes long. The rate for 10 to 15 minute shows is $235.

For more info call Fred or Andy Jacobs at (212) 382-0220. The next library review will be Century 21's ... keep your heads clean.

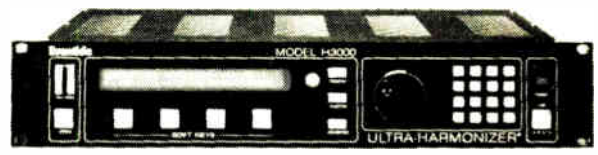
Ty Ford, audio production consultant and voice talent, can be reached at (301) 889-6201 or by MCI mail #347-6635.

CD#	Title	Total Minutes	Selections	Instrumentation	Suggested Use	Comments
DWCD0001	"Mirage"	46	13+1	Fairlight CMI	*Industrial/ documentary	Up-to-date "techy" sounds one additional remix
DWCD0002	"Renoir"	32	12+1	Orchestra w/piano	Industrial/ documentary	Beautiful music programming
DWCD0003	"Night Cruisin' "	38	12+3	Small group/sax/brass guitar/synth	*Industrial/ documentary	Sounds like Mike Post and Peter Carpenter Detective strut
DWCD0004	"Constellation"	32	12	Large orchestra	Indus/doc/white collar/action drama TV series	White collar action drama TV series
DWCD0005	"New Images"	39	14	Sequencer/synthesizer	Indus/doc/TV	A Dr. Who for the 80's
DWCD0006	"Cuts for Comml's Vol.3"	50	80	Synth and piano	*Indust/TV	A TV spot producer's dream, all 30 sec.
DWCD0007	"Slave Driver"	38	12	Contemporary rock	General	Great B movie soundtracks
DWCD0008	"The New World"	33	11	Large orchestra	Indus/doc/movie	Tired of ripping off John Williams themes? Stop here
DWCD0009	"Interstate"	42	6#	Large orchestra w/synth	*Indus/doc/TV	Themes have full, 60, 30, 10 and rythym tracks
DWCD0010	"Touch of a Button"	42	13	Fairlight CMI	Indust/doc/TV/film	Nice collection of techy themes
DWCD0011	"Within Range"	48	8#	Orchestra/synth	*Indus/doc/TV	Each set has at least a 60, 30, 13 and more
DWCD0012	"Over The Moon"	28	14	Orch/synth/Horns	Indus/doc/TV	Good TV promo beds for features
DWCD0013	"Spirit of America"	56	11#	Large orchestra	Indust/doc/TV	Plenty of 60, 30, remix and fanfares
DWCD0014	"Facets"	60	18#	Orchestra/synth	Indust/doc/TV	Includes 7 variations
DWCD0015	"Meet the Future"	57	18#	Large group/brass/ guitar	*Indus/doc/TV	Includes 7 extra intros, outros and variations
DWCD0016	"Topsy Turvy"	57	21	Small group	General	Sesame Street feel, great for comedic scenes
DWCD0017	"Videotronics"	56	15#	Fairlight CMI	*Indust/doc/TV	Orchestral arrangements on synth, includes 12 30's
DWCD0018	"Classics One"	58	17	Orchestra/organ	Indust/doc/TV	Great for that Masterpiece Theatre feel
DWCD0019	"Videotronics Two"	56	15+1	Orchestra/synth	Indust/doc/TV/film	Alan Parsons meets the Boston Pops
DWCD0020	"Life By Night"	57	12#	Orchestra/synth Acoustic Guitar	Indust/doc/TV/film	13 extra tracks of 30's, tempo changes and mixes
DWCD0021	"Challenge the World"	50	18#	Orchestra/synth sampled sounds	Indust/doc/TV film	Five of the themes have alternate mixes and fanfares
DWCD0022	"Switchcraft"	58	20	Synth/sequencer sampler	Indust/doc/film	More "Moderne" than "New Wave," Art School film themes
DWCD0023	"Silicon Valley"	58	20	synth/sequencer sampler	Indust/doc	Classically flavored contemporary themes, to the Beautiful Music side of classical
DWCD0024	"Classics Two"	56	19	Orchestral	Indust/doc	Tech music sounds for tech productions

Note: +1, +2, +3 etc. indicate additional versions of themes; # indicates multiple outtakes and shorter versions. See comments; * indicates 30 and 60 beds

Kidd COMMUNICATIONS

EVENTIDE H3000



Now, with the H3000 Ultra-Harmonizer Pitch Change and Effects Processor, Eventide has created a third category, with a different set of design goals: No-compromise, high-end performance on an impressive variety of effects–including some you've never heard of before–at a very moderate price. The H3000 includes fifty factory programs, plus on-board memory storage for scores of user presets. The Ultra-Harmonizer delivers superb effects quality plus audio specs that meet the challenge of CD and R-DAT. It's the "price/performance breakthrough" box that puts the emphasis on ***performance!***

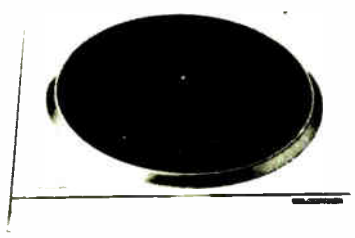
Be the first station in your market to utilize the new Eventide H3000 Ultra-Harmonizer. The price is only $2,995.00! Units are currently on back order. Place your order today for mid-summer delivery.

TECHNICS TURNTABLES AND COMPACT DISC PLAYERS NOW IN STOCK!

We doubled our volume with TECHNICS in 1987.
Now we are receiving larger allocations
to serve you better.

DISCO DRIVE DIRECT TURNTABLE
SL-1200MK II

QUARTZ SYNTHEISZER CONTROLLED DIRECT DRIVE TURNTABLE
SP-25

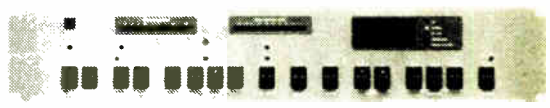


SP-10MK III

CALL NOW! . . . *for immediate delivery and competitive prices on SP-25's, SP-15's, SP-10MK11A's, SL-1200MK11's and SLP-1200's.*

Call KIDD COMMUICATIONS *for* ORBAN OPTIMOD's *and your auxiliary audio processing needs.*

The new programmable mic processor
. . . 787A $1995



The Two Channel Co-Operator
. . . Model 464A $1195

A Stereo Spatial Enhancer that doesn't create multi-path distortion
. . . Model 222A $995

Call Today!
Ask for Chris Kidd

916-961-6411

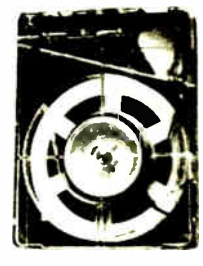
8:30 a.m. to 5:30 p.m. Pacific Standard Time

AUDIOPAK

BROADCASTERS FAVORITE CARTRIDGE

A-2

All Factory Wound

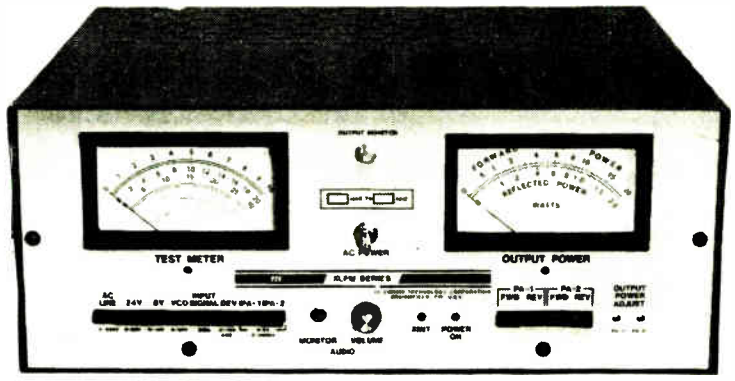


AA-4

	A-2	AA-4
20 Second 40 Second 70 Second 100 Second	3.40	4.85
2.5 Minute 3.5 Minute 4.5 Minute	3.75	5.35
5.5 Minute 7.5 Minute 10.5 Minute	4.25	6.45

Television Technology

FM Translators and Scala Antennas



XL-20 Series

4096 Bridge Street, Suite 4
Fair Oaks, California 95628

Circle Reader Service 95 on Page 34

Radio World Marketplace

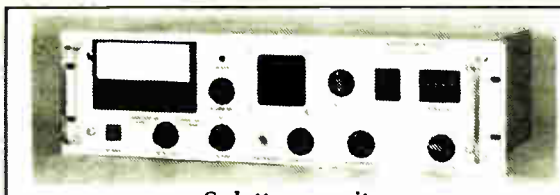
If your company has a new product you wish us to consider in *Radio World Marketplace*, please send a press release and black and white photograph to Radio World Marketplace, P.O. Box 1214, Falls Church, VA 22041

Field strength meter

BTC's Model 3000 field strength meter includes rotary switch attenuation setting, phantom antenna power and a peak flasher for total modulation and SCA deviation monitoring.

The Model 3000 lists for $595.

For more information, contact **Bob German at 303-641-5503,** or circle **Reader Service 76.**



Splatter monitor

Delta Electronics' SM-1 AM splatter monitor allows spectral occupancy measurements at one-tenth the cost of spectrum analyzers.

The Delta SM-1 is frequency agile, and capable of measuring both in-phase and incidental-phase modulation.

A portable active antenna and DC power input for the SM-1 allows the splatter monitor to be used for field testing. The unit can be operated from an automobile cigarette lighter.

The list price of the Delta SM-1 AM splatter monitor is $2,150, as compared with some spectrum analyzers, which can cost up to $20,000.

For more information, contact **John Bisset at 703-354-3350,** or circle **Reader Service 78.**

Audio level master

FM Systems' new ALM672 stereo audio level master stabilizes audio levels within 0.5 dB, even though the audio source may vary up to 30 dB.

The ALM672 is gated to prevent noise pumping and dual-banded to prevent program pumping by low frequency program content.

FM Systems' audio level master also includes a program dependent control system to prevent "ducking" of audio volume after sudden high levels.

Each ALM672 card contains one full stereo audio service and three stereo cards fit in one PMS610 mainframe.

An LED display monitors the compression being applied to the signal and keeps track of output volume and signal level.

For more information, contact **Frank McClatchie at 714-979-3355,** or circle **Reader Service 71.**

Tower lighting transformers

The Peter W. Dahl Co.'s tower lighting transformers are designed to provide RF isolation of the tower lighting system on an AM radio tower from the incoming AC power line. These transformers are wound on high quality low loss "Hipersil"steel toriod cores.

For more information, contact **Peter Dahl at 915-751-2300,** or circle **Reader Service 74.**

Digital editing software

CompuSonics Corporation has introduced the MacSonics™ and MacDJ™ software packages for its computer-based digital recording, editing and playback equipment.

The MacSonics program provides full-screen access to the CompuSonics DSP 1500's editing features. Audio segments are represented as pieces of tape on the screen.

The MacDJ program enables DJs to control one or more DSP 1200 playback units.

For more information contact **Debra Higdon at 415-494-1184,** or circle **Reader Service 79.**

Digital reverb and effects

AKG Acoustics has introduced the ADR 68K, a high end rack mountable digital reverb and effects system.

The unit utilizes a 15 kHz bandwidth and 32 kHz sampling rate, as well as MIDI technology.

The ADR 68K features a two-input four-output design; the inputs can be split into different programs, with the outputs acting as two stereo program pairs.

Voltage is selectable, via an internal switch, for 100, 120, 220 or 240 VAC; the ADR 68K operates with 50 or 60 Hz power line frequency. Its power consumption is approximately 90 W.

For more information contact **Christopher Moore at 617-924-7697,** or circle **Reader Service 73.**

Subscription/Reader Service Forms

Radio World

June 15, 1988 Issue Use until September 15, 1988

FREE Subscription/Renewal Form

I would like to receive or continue receiving **Radio World** FREE each month. ☐ YES ☐ NO

Signature _____ Date _____

Please print and include all information:

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ ZIP _____

Business Telephone ( ) _____

Please circle only one entry for each category:

I. Type of Firm

A. Commercial AM station
B. Commercial FM station
C. Educational FM station
D. Combination AM/FM station
E. Network/group owner
F. Recording studio
G. TV station/teleprod facility
H. Consultant/ind engineer
I. Mfg, distributor or dealer
J. Other _____

II. Job Function

A. Ownership
B. General management
C. Engineering
D. Programming/production
E. News operations
F. Other (specify) _____

III. Purchasing Authority

1. Recommend 2. Specify 3. Approve

Reader Service

Please first fill out contact information at left. Then check each advertisement for corresponding number and circle below. NOTE: Circle no more than 10 numbers, otherwise card will not be processed.

001	021	041	061	081
002	022	042	062	082
003	023	043	063	083
004	024	044	064	084
005	025	045	065	085
006	026	046	066	086
007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
016	036	056	076	096
017	037	057	077	097
018	038	058	078	098
019	039	059	079	099
020	040	060	080	100

Sales Call Service

Please have a salesperson contact me about these items (list numbers):

_____

Clip & Mail to: Radio World, PO Box 1214, Falls Church VA 22041

Circle Reader Service 50 on Page 34

BUYERS GUIDE

Program Audio Processing

Aphex Gates Without Drift

by Barry Victor, Consulting Eng
The Victor Group

Los Angeles CA ... A gate is not normally a device used in a broadcast facility with much regularity. On-air use is difficult due to audio degradation and unwanted side effects of a gate's operation (clicks, pops, lost words).

It usually is found in the production room for special effects or utilized to help reduce track noise in a production tape.

User Report

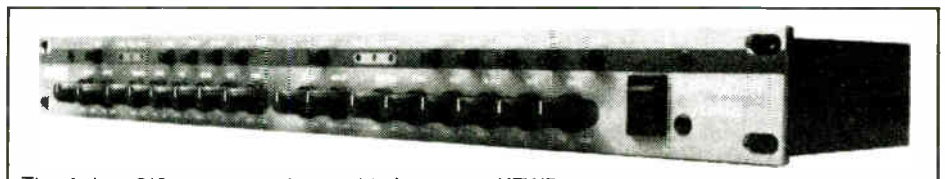
I specifically tried to see where the new 612 gate/ducker/expander from Aphex could be used in a radio station. One of my clients is KFWB radio in Los Angeles. It is an all-news format, owned by Group W Broadcasting. The station was willing to let me try the gate in a number of different situations.

Each use of the device dictated subtle changes in the setting of the gate. I would recommend an hour or two of playing with all the controls to get a feel for what the gate can do.

Reacts fast

Unlike other gates I have tested, the Aphex gate can react very fast with little or no notice that it is in the circuit. However, like all gates, if you have the settings misadjusted you can destroy your audio. The Aphex gate was different in several areas.

First, it had no noticeable pops or clicks when the gate was engaged several gates have a noticeable click when the gate cuts in. The other is the remarkable performance specs of the unit in circuit.



The Aphex 612 gate worked smoothly in tests at KFWB.

I would have to attribute this to the new Aphex VCA. It sounds so clean that it can fool you into thinking that it is out of the circuit.

We tried the unit in three different areas. Remote broadcast lines, satellite feed in conjunction with a compressor and raw voice work.

KFWB has lots of telco program circuits. Some of these are rather noisy due to the grade of service and the audio channel units that the phone company has in its system.

One of these has a noise floor of around 35 dB. It consists mainly of carrier noise in the system. We placed the gate in the circuit and, with a bit of patience and trial and error, we managed to get a setting that reduced the noise to around 65 or 70 dB.

The gate's operation was not noticeable. The unit was set and no drift was noticed during several hours of testing.

With a satellite feed

Next we wanted to see how the device would perform following a compressor. KFWB has several satellite feeds from its networks. One of the feeds from the NBC network utilizes an Aphex Compellor to control dynamic range for in-house use.

We connected the gate after the output of the Compellor and adjusted the gate to see what we could get. During fill time on the NBC feed, NBC sends the output of WNBC, New York, over the satellite.

Once again, careful adjustment of the gate was needed to achieve a sound with no audible effects. During commercials and music the gate was able to follow the effects of the Compellor with no noticeable audio degradation.

By experimenting with the device as an expander, by adjusting the attack time, the ratio, the release time and the range, we found we could increase the dynamic range of the music.

(continued on page 44)

Competing For the Stereo Image

by Marlene Lane

Falls Church VA ... In recent years, audio processing has taken a new turn. Stations appear ready to declare a cease fire on the loudness wars.

"It's pretty clear, not only with our technology at the moment, but with our competitors', that the battle has reached a temporary stopping point in terms of what technology will allow and what stations can do with it," says Sid Goldstein, marketing and sales manager of Pro Audio Products for Orban Associates.

Of course radio, being the fiercely competitive medium it is, has already opened fire with a new set of guns—the so-called stereo image enhancers.

Industry Roundup

Thus far, three companies are vying for the market share on stereo spatial enhancement: Orban, Modulation Sciences and 7 Seas.

However, 7 Seas, which showed a prototype enhancement unit at last year's AES show, did not surface at this year's NAB show and company spokespersons have been unavailable for comment.

The two remaining contenders have had products in the marketplace for several months, and claim to be doing well.

Quality demands

A quality-driven listenership explains the growing popularity of spatial enhancement devices, says Goldstein.

"I think CDs have provided a source of program material that allows for a lot of dynamic range," he says. "Having a CD source shows you how good stereo separation can be," he adds.

Modulation Sciences' VP of Engineering, Eric Small, says his company's development of the StereoMaxx spatial enhancer was in response to broadcasters' use—often unsuccessfully—of hi-fi ambience devices for higher quality sound.

"Some of (the devices) worked very well," admits Small, "but nobody in the hi-fi industry, and correctly so, is ever concerned about mono compatibility, so most of them trash the mono."

Despite the similarity of function between the StereoMaxx and the Orban Model 222A, the design philosophy behind each is radically different.

Different approaches

Orban has opted for what it calls the "subtle approach."

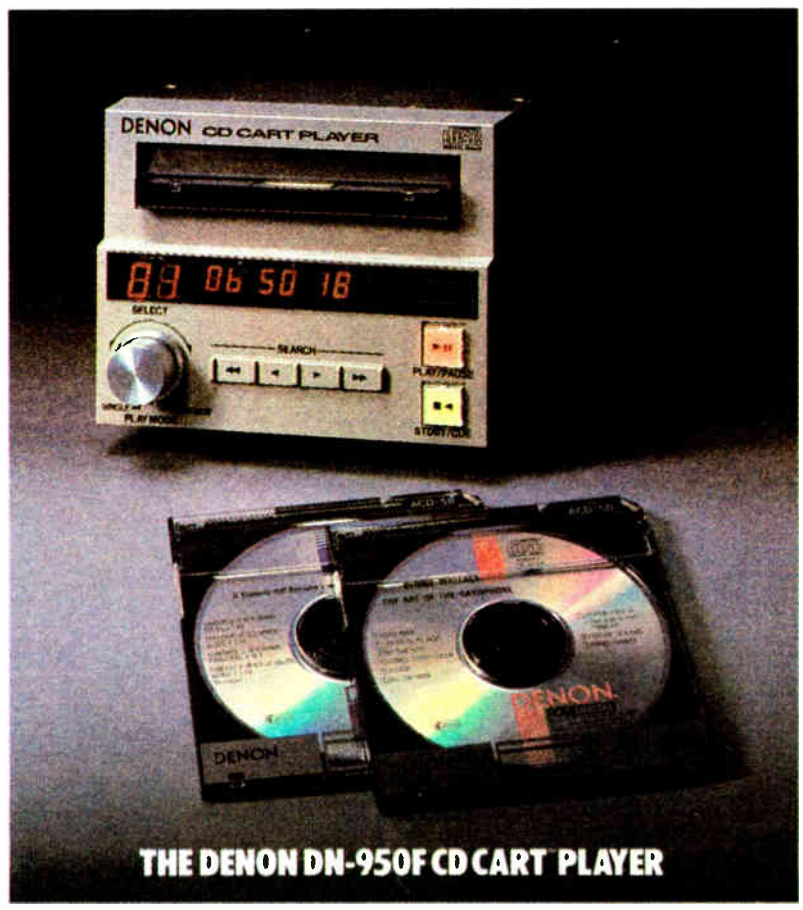
"We feel spatial enhancement should be a subtle but audible enhancement of the stereo sound stage," says Goldstein. "If you go beyond that you start to get unrealistic and unnatural effects," he added.

The Orban unit does not use delay lines, instead relying on manipulation of the attack transient to create the stereo enhancement.

(continued on page 40)

BUYERS GUIDE INDEX

BUILDING THE BEST BROADCAST AUDIO IS EASY. IT ONLY TAKES 49 YEARS OF PRACTICE.



Broadcasters who use the DN-950F CD Cart Player marvel at how Denon designed a CD player that actually functions like a tape cartridge machine. The control layout makes immediate sense to any broadcast professional. And the transport mechanism has more in common with heavy-duty computer transports than with any consumer CD player.

While the DN-950F may be the first Denon broadcast product you buy, it's anything but Denon's first broadcast product. Long before they became a major player in compact discs, cassette tape and home high fidelity, Denon built some of the world's most advanced broadcast equipment. In fact, Denon's been supplying direct-drive transcription turntables to NHK, Japan's national broadcast network, since 1939.

With NHK, they did the trail-blazing research into digital recording. And in 1972, they built the world's first digital recorder good enough for commercial record production. Today, the influence of the original Denon PCM digital recorder is reflected in nearly every compact disc player, regardless of brand. But most of all, in the Denon CD Cart Player—the one that took only 49 years to build.

DENON

The first name in digital audio.

ALLIED

ATLANTA, GA	CHICAGO, IL	DALLAS, TX	LOS ANGELES, CA	RICHMOND, IN	SEATTLE, WA
(404) 964-1464	(312) 470-0303	(214) 423-8667	(818) 843-5052	(317) 962-8596	(206) 838-2705

BUYERS GUIDE

Inovonics 222 Is "NRSC-Smart"

by James C. Parkinson, CE
KAMO-AM

Rogers AK ... Last fall KAMO decided to implement the NRSC standard on its AM transmitter, a McMartin BA-1K. I had to come up with something cost effective, and quickly.

Checking the ads in **RW**, I found a few NRSC processors, all priced at about $500.

Furthur investigation, however, revealed that one of these was a "wrap-around" unit: a preemphasis network to be installed ahead of an existing limiter such as our Gates Solid Statesman, and a 10 kHz rolloff filter on the output side.

User Report

The problem with this single band limiter being fed with preemphasized audio is familiar to anyone who has worked in FM radio engineering.

The enhanced high frequency peaks would cause deep limiting, which would tend to "punch holes" in the bass and midrange audio.

(The Model 222) can be used as a stand-alone processor or in conjunction with additional processing.

Placing the preemphasis at the output of the limiter would be even worse; in order to keep the highs from overmodulating the transmitter, the limiter output would have to be turned down to the point where the audio spectrum below 500 Hz would only be able to modulate 10% or less.

What we needed was a smart limiter which would allow independent additional limiting for the high frequencies only, based on the NRSC preemphasis curve.

Smart limiter

The Inovonics Model 222 NRSC AM Audio Processor was chosen because it does just that. It can be used as a standalone processor or in conjunction with additional processing as desired.

Front panel LEDs indicate gain reduction of 0, 2, 6 and 12 dB for both wideband limiting and preemphasis protection. There are switches to defeat the limiting, preemphasis and a 10 kHz low pass filter for test purposes.

A red LED reminds you to switch these functions back on when you're done with the proof.

Input and output levels are screwdriver adjustable from the front panel, which is 1¾" rack mountable. There is also an independent adjustment to allow for up to 130% positive modulation peaks. (Of course, to comply with current FCC rules, it must be set at 125% or below).

All limiting is controlled by pulse width modulation. The sharp 10 kHz rolloff is accomplished with active components.

Overshoot protection is a must for any post-limiter filter; a green LED lets you know this part of the circuit is functioning. Feedforward techniques are utilized for very tight control of transmitter modulation.

For stereo operation, two units can be operated in tandem, one for L+R, and one for L–R.

The well written manual is exceptionally detailed in theory of operation, setup and maintenance.

No RFI problems

I was at first dismayed to read the admonition against using the 222 near abnormally high RF fields. I had planned on installing it in a rack close to the transmitter, which is only 10' from the base of of our half-wave tower, and which supports six bays of FM at the top.

A glance at the schematic shows no RF bypassing at either the balanced input or output, both of which are DC coupled ICs (no transformers).

To be on the safe side, I installed out-

(continued on page 43)

BUYERS GUIDE

Orban Enhances Spatial Image

by Frank Foti, Field Spvsr
Malrite Communications

Cleveland OH ... *Audio processing: the mystical manipulation of audio signals in an electronic manner in order to enhance or reenforce the creative programming of a broadcast station.*

Many methods can be employed by a broadcast station in its efforts to create or control a dominant, distinctive and hopefully a quality sound over the air.

User Report

Until recently, almost all audio processing concepts have revolved around the use of compression, limiting and controlled clipping within the individual stereo channels. Through the use of amplitude level control of the audio waveform for the discrete left and right channels, audio processing is achieved.

Another method of processing that can augment an audio processing system is the concept of "stereo" processing, or stereo enhancement.

This concept can be used to create a larger stereo image, an illusion that the "sound" is bigger than it actually is. Increased brightness, impact and definition of music can also be realized through this process.

Stereo processing is achieved through altering the difference signals that exist between the left and right channels.

As can be done with discrete audio signals, stereo information can be processed with compression, equalization, delay and reverb to create the enhanced stereo effect.

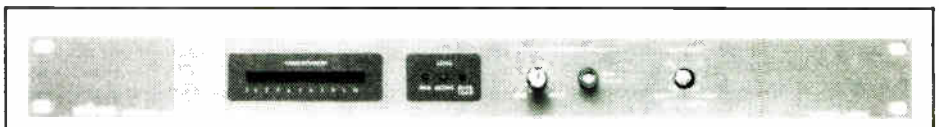
But it should be noted that when processing the stereo information of a signal, undesired results can occur. Within the realm of broadcasting these undesired effects can result in unnatural sounding program material and increased multipath distortion within a coverage area.

Natural sound

The Stereo Spatial Enhancer Model 222A from Orban can and does achieve stereo processing without creating any unnatural sounding program and also without affecting multipath possibilities.

It measures one rack unit high, 1¾", and is very easy to install and operate. Orban recommends that it be installed before any processing within a system.

The stereo enhancement method operates on transient information. For this reason, it should be installed at the output of the audio console.



Orban's Stereo Spatial Enhancer Model 222A.

The unit is configured with electronically balanced input and output stages. The output stage of each channel is an electrically balanced circuit that simulates a true transformer output.

This means that in installations where unbalanced equipment is used, one of the active balanced "sides" of the enhancer could be "tied" to ground with no adverse effect to operation. Connections are by means of a terminal strip, but the metal work has been done if XLR connectors are to be used.

The front panel features an LED enhancement level indicator, an enhancement control and a bypass switch. (There is a stereo ratio control that is located behind a capped recess in the front panel.)

The unit operates at unity gain, so there are no level matching problems to be dealt with.

Once installed, switching the bypass control in and out will activate the processing. Setting of the enhancement control should be done subjectively through listening over periods of time.

(continued on page 44)

MLW-1 Provides Full Switching

by Rob Meuser, Pres
International Broadcast
Support Services

Hamilton Ontario ... Most day-to-day broadcasting functions are taken care of by devices designed to fill each specific need. One of the few, but very critical functions that has been left to the imagination of the broadcaster is the mundane task of switching in a standby program circuit.

Line switching is one of those unglamorous things you take for granted until you lose your program feed and wish you had an automatic back up.

The MLW-1 is probably one of the most complete back-up switching devices ever marketed.

The usual approach to back-up switching is a silence sensor coupled to some kind of line changing switch or relay. Titus Technological Labs has gone beyond this point to produce a very simple to use, but complete switching system.

User Report

The MLW-1 consists of three possible stereo inputs switched, via VCA, to the main output. This switching is done under microprocessor control according to user-set preferences.

Some of the options available include: line two on if line one fails; line one or two switched to mono if one channel is lost; phase reversal of a line if the incoming signal is out of phase; external alarms; manual operation and forced switching via external command.

One of the most important features of the MLW-1 is the built-in bypass function. If the MLW-1 fails, it bypasses line one to the output.

Another important—and unique—feature is the MLW-1's ability to discern the difference between dead air and a failed line.

Microprocessor controlled

The MLW-1 is able to perform its many magic tricks because of its highly logical and straightforward design. Specifically, the MLW-1 functions via a bank of solid state switches under microprocessor control. This means that all routing and sensing is based on the programming of the micro.

One set of VCAs are fed the two signals to be switched, phase flipped, or mono-ed, as the case may be.

The MLW-1's remarkable ability to tell the difference between a bad line and dead air, for instance, is a quite simple function in the mind of the resident micro.

If a line fails, the MLW-1 looks at line two to see if it, too, is dead. If so, then the MLW-1 assumes the problem is either dead air or some other problem which cannot be solved by changing lines.

This feature is very important when the back-up line is not of the same characteristics as the main line. In such cases dead air at the studio causes a line switch and possible alarm, followed by a re-switch (hopefully) when the announcer wakes up or finishes talking on the phone.

It also allows a real failure to switch much faster as operator error need not be considered.

Virtually anything the MLW-1 does or can do is strictly user selectable via DIP switches. Timing and thresholds are set via other DIP switches. The input sensitivity other than for unity gain is set by yet other switches.

Aids in testing

The MLW-1 can also function as a test aid. Many internal features of the MLW-1 are available from the front panel.

Mono only, L–R only, or mono from one channel are available for those who like to dynamically balance either audio processing or stereo generation equipment.

Additionally, any of the three input sources can be selected from the front panel.

My experience with the design and construction of various solid state switching devices makes me tend to be fairly critical of the techniques used in such devices.

The MLW-1 design and construction is strictly first class and sensible. No special circuits requiring odd parts are used.

(continued on page 42)

BUYERS GUIDE

StereoMaxx Widens Stereo Stage

by Harry Simons, CE
WAEB-AM

User Report

Lehigh Valley PA ... Let's get right to the point. I have a very high regard for the StereoMaxx.

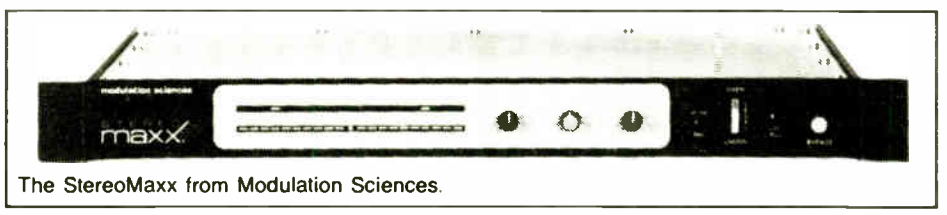
Having a unique situation in that I'm given numerous opportunities to try, buy or pass on most any audio processing gear, I've been able to evaluate several stereo enhancement devices.

As a result, I have formed this very pointed opinion: the StereoMaxx is the only box with enough operator adjustment to produce sufficient stereo enhancement and allow for the control necessary to accommodate various program requirements.

As with any other piece of equipment, the StereoMaxx is not for everyone. But it is a device that the vast majority of stations will find a justifiable addition to their audio processing chain if they plan on keeping up with aggressive technical competition.

Some time ago I read an opinion of another engineer who commented on the fact that it was too bad that stereo enhancement was even necessary, and that the problem of lack of stereo was the fault of the recording industry. He made a plea to that industry to get its act together.

In general the fault may be placed there. But to be fair, the recording industry is attempting to produce a product that is all things to all people.



The StereoMaxx from Modulation Sciences.

A legitimate place

The recording industry's product, be it vinyl or CD, is certainly not just optimized for broadcast use alone. It appears, therefore, that stereo enhancement does have a legitimate place in radio. The problem of lack of stereo in recordings is ours to solve, not to criticize.

So, how do you choose the right unit for your station and how do you answer questions about the side effects of stereo enhancement?

I have used some form of stereo enhancement for a number of years, all with varying degrees of success and effects.

When I put the StereoMaxx on line I heard a substantial improvement over what I previously thought was great. I was very surprised.

I tried the StereoMaxx at three trade shows and was not motivated enough to try one on the air until practically force fed a unit to my door. I had heard stories about unwanted side effects, multipath problems and mic audio that sounded like the inside of a barrel.

None of these stories was true.

No susceptibility to multipath

I made an effort to hear and confirm increased multipath in the field—a process, I might add, that takes some time and cooperation with the weather.

Our station suffers from textbook worst case multipath. We have done everything within reason to determine all of the station's multipath characteristics, from making unscientific chart recordings of multipath from an airplane to flying radials outbound and inbound to the antenna in increments of 10°, to renting a helicopter for access to areas where man is not meant to go.

With this and much more data on my multipath problem, the installation and aggressive use of the StereoMaxx did not have any effect on the severity of my multipath.

However, let me clarify an issue. This station is a high energy CHR all CD-to-air facility. The stereo content is high already.

My level of susceptibility to increased multipath through an increase in peak L–R is small. With the addition of the StereoMaxx, little change in multipath was perceived as none.

Nothing changed except the station's stereo image. It was greatly improved, the low end had more punch, and the mic sounded more solid and pleasing.

Adjustable enhancement

These results were obtained right out of the box. Some turning of the front panel adjustments quickly gave me an understanding of what the StereoMaxx would do.

I was able to make it sound just about any way I wanted. Giving the Stereo-

(continued on page 46)

BUYERS GUIDE

Stereo Enhancement Enters the Audio War

(continued from page 35)

"We're getting in and manipulating that attack transient and getting out before anything nasty happens," says Goldstein. Because there is virtually no increase in the average L–R, he explains, the unit does not create potential problems with multipath distortion.

Modulation Sciences' unit was designed so that the effect could be adjusted to satisfy the needs of the station.

"We're getting in and manipulating that attack transient and getting out before anything nasty happens."

"The StereoMaxx can be as subtle or as dramatic as the station desires," says Small.

The StereoMaxx is based on the patented designs of Joel Cohen, the basic principle of which is to decorrelate the enhanced signal so as not to degrade mono compatibility or increase multipath.

Recent engineering changes, including heightened monaural protection and an increased range of enhancement in the basic StereoMaxx have further increased its adaptability, according to Small.

Small says Modulation Sciences will supply retrofit kits to stations with the earlier models free of charge.

A sense of stage

In the midst of these new "spatial enhancement wars," there are manufacturers who have chosen not to pursue the market, such as Aphex, which prefers a more conservative, even an "audiophile" approach to processing.

"I think you've got to take a look at the beginning of what stereo is all about," says Aphex president Marvin Caesar. "The idea of stereo is to create a stage—these (stereo spatial enhancement) devices are pushing out the scrambled image and making that scrambled image wider," he adds.

Aphex prefers to maintain what is in the recording, says Caesar, rather than change its character.

"With all the processing, (stations) have destroyed the stereo image; with all that multiband processing, it's completely mashed up any semblance of stage," says Caesar. 'To get that back, they have to put in these devices."

Small, however, disagrees that processing has affected the stereo image.

"By and large, the audio processing of Orban, Texar, CRL and Mod Sci has had little or no effect on the spatial information," says Small. "The only way processing can affect the apparent stereo-ability or spatialness of the audio is simply by rolling off the high end, which removes the stereo cues," he says.

"For once, we (the manufacturers) are putting in a product that actually upgrades the quality of the sound, rather than detracts from it," he says.

As the latest in "processing wars" heats up, concentrating on the spatial image for a change may have a positive effect on what many have come to see as a processing overload.

Goldstein notes that "we've actually had some stations back off on their processing a little to take more advantage of the spatial enhancer."

Tuned In

New Directions ... The parent company of JBL Professional, **Harman International,** signed a definitive agreement for the acquisition of **Soundcraft Electronics. Soundcraft, as you may have seen, showed its new SAC200 on-air broadcast console** at NAB.

People ... Guy Numann, VP and GM for **Harris'** broadcast division, announced the appointment of **Bob Weirather** to the position of **director of strategic marketing** for the division.

Weirather joined Harris in 1972 as a designer, project engineer, section manager and consultant. He left for a brief stint as VP of engineering for Broadcast Electronics during 1980-1981 before returning to Harris ...

Meanwhile, **Otari Corporation** has appointed **David Ruttenberg** its new central regional sales manager.

Ruttenberg was formerly a sales specialist for the company. He will be based in the Chicago Otari sales office.

New Locations ... Speaking of **Otari,** on May 6 the company moved to its new headquarters in Foster City, CA. The new facility is double the size of its former offices and boasts a professionally designed studio listening room.

Of Special Note ... During the **NAB show** in Las Vegas, radio broadcasters were given the opportunity to tell the **difference between digital audio and audio cassette** during Systemation's "Nakamichi Challenge."

A Nakamichi cassette deck was pitted against a CD player and an R-DAT deck. Listeners donned headphones to take the blind listening test.

According to Systemation, only a surprisingly miniscule 7% correctly identified all three sources; 11% identified the Nakamichi cassette but switched CD and R-DAT, and a whopping 60% incorrectly identified the cassette source. Twenty-two percent found "no discernible difference."

According to Jett Logan, VP of sales for Nakamichi America, the results of Systemation's challenge are a major vindication for the audio cassette medium.

If you have industry/equipment news to report, send it to **Radio World Buyers Guide,** *PO Box 1214, Falls Church, VA 22041.*

ART's IEQ Impressive, Versatile

by Douglas W. Fearn, CE
WKSZ-FM

Media PA ... A one-third octave graphic equalizer typically has about 30 controls on the front panel. The Applied Research and Technology IEQ takes a different approach.

The IEQ doesn't even look like an equalizer. There is an LCD display and a scattering of pushbuttons on the single rack unit panel, but no sliding pots. Instead, the IEQ is adjusted through digital control.

The operator steps through the various parameters, which are identified on the LCD, and makes changes with "up" and "down" pushbuttons.

The first advantage of this approach is a reduction in size for the front panel. A less obvious benefit is the ability to control several slave equalizers from one master unit.

These slaves can either track one another, for stereo EQ, or be separately adjusted.

The secret to this versatility is MIDI (Musical Instrument Digital Interface), a standardized protocol for communication between various digitally controlled musical instruments that is gradually finding its way into the broadcast world.

The IEQ can be controlled through MIDI commands from a computer, although it would be hard to imagine a practical application for this feature in the real world of radio.

User Report

Up to 16 slave equalizers can be controlled from one master controller. The slaves are the same size but lack any controls—there are just a couple of LEDs to let you know a little about what is going on.

Setting up the controller and slaves requires MIDI cables, which are easily obtained at a music store. (ART does not supply them with the units.)

Up to 99 presets

Hooking up the units requires instruction manual study and some planning. Each slave equalizer is assigned a unique number through DIP switch settings.

The IEQ permits saving 99 preset equalization curves which can be readily recalled. A battery backup holds the memory when power is removed and a large capacitor across the battery gives you a couple of minutes to change the battery before all is lost.

We found the preset feature to be useful for saving standard EQ curves for various voices.

Using the IEQ is a little different. It does not have the intuitive "feel" of a conventional graphic equalizer where you can see, and even "mold" the response curve as you listen to the results.

With the IEQ, you step through each of the bands and adjust the amount of boost or cut. It is easy to lose track of what you are doing.

But ART has a solution for that: a video output that gives a graphic display of the control settings on a video monitor.

High quality sound

How does it sound? Like most modern audio equipment, the specifications are impressive. It sounds like most modern equalizers.

I have to qualify my remarks on the sound by first admitting that my favorite equalizer is an old British unit that uses inductors and capacitors and doesn't have great specs, but I think it sounds terrific.

I'm not convinced that symmetrical curves and reciprocal EQ is all that important. After all, the object is to modify the sound to specifications your ears tell you are necessary. Equalizer quality is very subjective and no two operators are likely to agree on what is best.

The sound of the IEQ is certainly competitive with other high quality equalizers.

The ART IEQ seems targeted for the sound reinforcement and performance users but offers many features the broadcaster can use.

The presets are the most useful feature. Small size and the ability to control slave units are also handy.

The units are very reasonably priced (around $800 for one controller and one slave) and are fully compatible with professional broadcast equipment.

Although its operation is different from most equalizers, I think the IEQ will find a place in radio station production rooms.

Editor's note: Doug Fearn is a frequent contributor to **RW.**

For more information on the IEQ, contact Peter Beverage at ART: 716-437-2720. The author may be reached at 215-565-8900.

BUYERS GUIDE

Valley Digital Processor a First

by Rick McCollister, Dir of
Digital Audio Dev
Valley International

Nashville TN ... Valley International has just introduced the first digital audio processing system aimed at the broadcast market.

Technology Update

The Digital Dynamics Processor, or DDP, provides multiband dynamic processing of stereo audio. The result is increased loudness and better spectral uniformity with fewer processing "artifacts" than are present in current analog processors.

Signal processing in the DDP occurs entirely in the digital domain. A network of DSP chips allows the system to operate at a processing speed of 300 million instructions per second—supercomputer performance dedicated to audio.

Valley's top of the line

Valley's top of the line unit, the DDP-8, splits the audio signal into eight frequency bands. Finite Impulse Response filtering in the unit allows linear phase response which would be unattainable with analog techniques.

This, combined with precisely overlapping magnitude responses, results in a recombined signal identical with the input.

Each band's dynamic structure is analyzed, then processed using proprietary algorithms. Here again, digital processing allows compression and expansion characteristics to be achieved that would be difficult or impossible in the analog world.

Arbitrary gain transfer curves can be programmed, so the dynamic processing can be matched to the type of program material being processed.

One area where the DDP can improve a station's sound is in the car. Ambient noise levels in a car can be fairly high, obscuring quiet musical passages such as ballads or classical material.

The DDP can provide as much as a 15 dB increase in low level material, while preserving the sense of dynamics; soft passages still "feel" soft, but are much more easily heard over background noise.

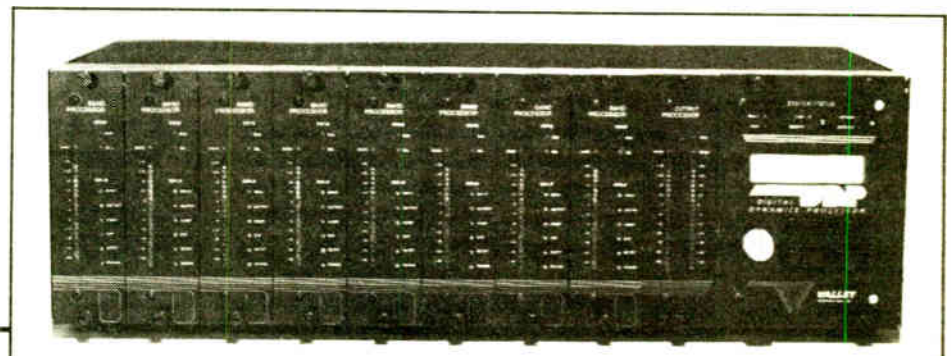
Compact discs present another area where the DDP can help. CDs are capable of storing and reproducing a wider dynamic range than vinyl discs.

Often, record producers and mastering engineers must use broadband or high frequency limiters in order to "fit" their program onto a disc. However, CDs do not usually receive as much processing, because it isn't required.

At the radio station, the much greater peak content can result in the CD sounding softer. The DDP's multiband digital processing results in more uniform loudness and peak content from different program sources.

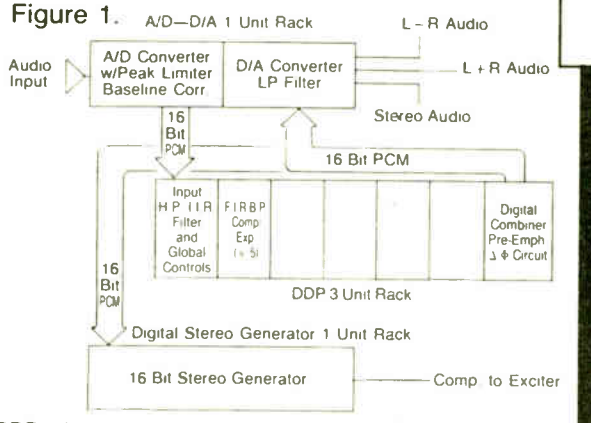
An important design goal was to make the system easy to operate. A liquid crystal display and simple keypad allow the DDP to be quickly set up using a menu-

(continued on page 42)



Valley introduced the DDP at this year's NAB show.

Figure 1.



DDP-5 interconnected with options A/D—D/A and generator.

BUYERS GUIDE

Phoenix Reaps NRSC Benefits

by Glenn Clark, Pres.
Texar, Inc.

Monroesville PA ... With today's powerful engineering work stations, engineering design can be done more and more in front of a keyboard and a mouse, and less with a scope probe in the lab.

Technology — Update

With a properly detailed computer model of the circuit, real world performance duplicates that predicted within the measuring accuracy of the instruments.

But once in awhile real world use uncovers benefits that no one anticipated. Such is the case with the NRSC AM standard.

Most broadcasters who have implemented the NRSC standard have noticed that on the average AM radio their station is now louder than before.

Many are puzzled because the modulation monitor meter appears to indicate slightly less (by maybe 3% or 4%) than it did before. The explanation of this apparent contradiction becomes obvious when one considers the path to the listener's ear as a complete system, including the receiver.

Integral calculus proves that the maximum power through the antenna ammeter will be realized when the transmitter is modulated at 100% with a square wave.

And pre-NRSC AM processors were pretty good at creating square waves with nice sharp corners. But the correlation we all make mentally—that more power into the antenna correlates exactly with more music power on the speaker leads—is only an approximate relationship.

The AM receiver, unlike the modulation monitor, is not a wideband device and therefore much of the power into the antenna never reaches the listener. Only that power within the receiver's bandpass actually reaches the listener's ear.

While the NRSC filter removes some of the higher frequency components which allowed the modulation monitor meter to rest at a higher level, it funnels the remaining power into a narrower spectrum. The net result is a louder perceived signal.

Texar's all-in-one NRSC processor is the Phoenix™, which consists of the basic Texar Audio Prism, the PR-1 Phase Rotator and the AMC-2 AM Modulation Controller.

In addition to digital control, the Phoenix has another unique feature: an internal 80 Hz square wave generator.

Many AM processors included a low frequency tilt corrector to tune out inaccuracies in modulation transformers. Its adjustment required disconnecting the program input and substituting an 80 Hz oscillator. The user then rotated the tilt corrector control for the optimum waveform shape on an oscilloscope.

This was cumbersome, time-consuming and required remembering to take an oscillator to the transmitter site.

With the internal oscillator, one simply depresses a momentary-contact switch, makes the adjustment and releases. It takes seconds.

A close relative to the Phoenix is the Texar Phoenix-EBU, which many refer to colloquially as the "short-wave box." Europe has had a band limiting standard for some time, promulgated by the European Broadcast Union (EBU). The Phoenix-EBU's band pass is slightly less than 5 kHz.

Most broadcasters who have implemented the NRSC standard have noticed . . . their station is now louder than before.

Some US stations have also elected to install the 5 kHz EBU version in lieu of the standard Phoenix, usually in conjunction with nighttime considerations.

As the bandpass is narrower than the standard Phoenix, it is in full compliance with the NRSC standard.

For justification, consider the following allocation example: WLW transmits on 700 kHz, non-directionally, with 50 kW from Cincinnati. WOR transmits on 710 kHz, slightly directionally, with 50 kW from New York.

Their entitled nighttime skywave service areas overlap significantly in between.

Keeping in mind that the NRSC standard alleviated not first adjacent, but second adjacent channel interference—the most common daytime allocation limitation—transmitting the full 10 kHz bandwidth at night on either of these two stations will produce sidebands extending to the other's carrier.

Similar nighttime skywave overlaps occur due to the way the clear channels were allocated. New York and Chicago have three pairs: WNBC on 660 kHz overlaps WMAQ on 670 kHz, WABC on 770 kHz overlaps WBBM on 780 kHz, and WCBS on 880 kHz overlaps WLS on 890 kHz.

When one remembers that most receivers today are narrower than 5 kHz and that the AM stereo receivers will be "adaptive" to narrow the bandpass in the presence of interference and weak desired signal, running 5 kHz bandwidth at night makes logical sense for some pairs of stations who can reach a mutual agreement.

Studio monitoring should also be given consideration when upgrading the AM processing system. A complementary deemphasis function is needed to neutralize the NRSC preemphasis. For daytime-only stations, this can usually be done by installing a simple RC network inside the modulation monitor.

(continued on next page)

DDP Processes Digitally

(continued from page 41)

driven approach.

A group of factory presets are provided for a quick start, and further presets may be programmed with the user's preferred settings.

Internal testing

Comprehensive metering is provided with the DDP for band and output processing and status indicators warn of any malfunction.

Reliability is further enhanced through the use of continuous internal self-testing. If any band processor should fail, the DDP will instantly reconfigure itself to bypass the problem and keep the system on the air.

Modules may be plugged in while the system is operating, and a diagnostic port for the processor is available if needed.

The DDP's digital inputs and outputs accept 16-bit 44.1 kHz or 48 kHz data. For interfacing to analog signals and various digital formats, Valley is introducing a companion unit, the Multi-Format Interface.

Analog-to-digital and digital-to-analog conversion is included, along with the interfaces for two industry standard digital formats: SDIF-2 and AES/EBU. The DDP can also be connected directly to a digital program source and/or digital stereo generator.

The eight-band Digital Dynamics Processor sells for $18,000. A five-band model of the processor is also available for $13,000.

Editor's note: For more information on the DDP and the Multi-Format Interface, contact Norman Baker at Valley: 615-383-4737, or your local Allied Broadcast Equipment representative.

TTL Makes the Switch

(continued from page 38)

As I said at the beginning, one normally never thinks about such equipment until after disaster strikes. I had the pleasure of placing one of these units into operation before disaster struck.

The unit got a real workout: a device that fed both program lines dropped one channel due to chip failure. The MLW-1 first switched to line two and then made line two feed mono off the remaining channel.

This went on for quite awhile before anyone actually noticed that there even was a problem. I guess it was a good thing that we had tied the external alarms to a remote status panel.

I now recommend the MLW-1 to stations around the world.

Editor's note: Rob Meuser is a frequent contributor to **RW.**

For more information on the MLW-1, contact Larry Titus at Titus Technological Labs: 203-633-5472. The author may be reached at 416-692-3330, or via MCI Mail: #3253672.

BUYERS GUIDE

Inovonics Defines KAMO Sound

(continued from page 37)

board .0039 mfd mica capacitors on all input and output terminals. The 10 dB input pad we use supplies additional filtering there, and a couple of 100 μH chokes were added to the output port. I am happy to say no RFI problems were experienced whatsoever.

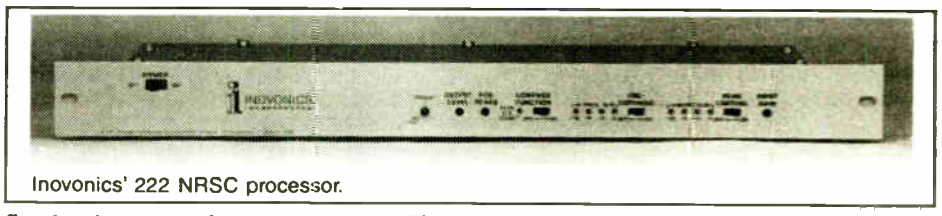
Inovonics recommends a maximum peak limiting of 12 dB on occasional peaks, with average gain reduction running at about 6 dB. For the more aggressive processing demanded by most stations they suggest a compressor (AGC) unit ahead of the 222.

So I modified our Gates limiter to obtain a slower recovery to make it act more like an AGC than a limiter, to smooth out the inevitable variations in level from the control room board.

Although the 222 has a separate control for positive modulation peaks, it will not do anything to accentuate those peaks if they are not already higher coming in.

But our good old Solid Statesman takes advantage of any asymmetry present in the audio waveform and automatically selects the correct polarity for greater positive peaks. The 222 passes this onto the transmitter, but limits it below the preset level—125% in our case.

The front panel LEDs make setup a breeze, and the unit has been operating



Inovonics' 222 NRSC processor.

flawlessly since last November. The sound on a typical AM radio has become brighter and more defined, even to the point where I can actually understand the lyrics of songs.

The GM noticed the improvement too, which made it all worthwhile. I know the filter is operating properly, since at four miles from the antenna I can tune in the second adjacent stations on either side without being bothered by splatter.

Recently, when our Solid Statesman limiter developed a problem and had to be removed for servicing, we had a chance to test the 222 as a standalone processor.

Although we didn't have as high an average level of modulation as with the two units together, the Inovonics gave a good performance by itself as long as the input level was reasonably controlled.

Considering the component count and sophistication of this processor, I consider it a "steal" at $500. Surely the manufacturer must be sacrificing higher profits in order to encourage more AM stations to convert to the NRSC standard.

Even stations using older vintage transmitters (with class AB transformer plate modulation) such as our McMartin, would do well to add this excellent NRSC processor to their audio chains.

I would advise any station wishing to upgrade to the NRSC standard to buy this unit now, before Inovonics wises up and raises the price.

Editor's note: James Parkinson received his FCC First Class Commercial Radiotelephone license in 1957 and has been in radio engineering since 1961. He currently maintains several AM and FM stations in the northwest Arkansas area.

For more information on the Model 222 NRSC AM Audio Processor, contact Jim Wood at Inovonics: 408-458-0552. The author may be reached at 501-248-1108.

Texar Aids NRSC Cause

(continued from previous page)

Belar supplies a schematic for implementing the deemphasis on the AMM-3.

For full time stations, some type of 10 kHz notch will often be desirable to eliminate adjacent channel "whistle." This can be accomplished with the Texar AM Reception Filter (ARF-1).

The ARF-1 contains a truncated 75 μs deemphasis function and separate 5 kHz and 10 kHz outputs.

If there is a sufficient number of external monitor inputs on the air console, both the 5 kHz and 10 kHz outputs can be put up on the monitor selector, allowing the air staff to select either wideband or narrowband mode, depending on the time of day.

The ARF-1 is a 3"×5" printed circuit card with solder-post type input, output and power connections. It is intended to mount inside the station's modulation monitor or monitor receiver.

The ARF-1 requires an external supply of +15 and −15 VDC. Because the current demand is low, this power can frequently be safely obtained from the modulation monitor's power supply.

Editor's note: For more information on the Phoenix and ARF-1, contact the author at Texar: 412-856-4276.

BUYERS GUIDE

Aphex 612 Uses New Technology

(continued from page 35)

There was, however, a fine line in adjusting the settings. At one point there was a noticeable increase of levels, making the audio sound like someone was violently cranking a pot up and down.

The purpose we had in mind was to see if we could reduce the noise of the feed, thereby allowing cleaner voice cuts to be made. The gate in conjunction with the Compellor enabled a cleaner feed with no noticeable audio degradation.

Background noise reduced

Next we tried the gate after a microphone preamplifier to see the effect of reducing background noise and headphone feedback for the news anchors.

After adjusting the 612 for the dynamic difference in several news anchors, the gate was able to reduce unwanted background hiss and noise to an acceptable level while still retaining the complete dynamics of the different anchors.

The device was able to react fast enough so that there was no apparent cutting off of first words or sounds. It was able to clean up the mic sound so well on one anchor that what I at first thought were gate noises turned out to be tongue clicks.

Using the gate in front of a Compellor, we had a very clean sounding mic processor. In other environments I would recommend utilizing the Compellor first and the gate second.

The Aphex gate definitely lived up to the manufacturer's claims of performance. Aphex is claiming it is the "world's best gate." I don't know if that is true or not, but I haven't tested or used a better one.

Innovative uses

All in all, the Aphex 612 Gate could be a very useful instrument in a number of areas in the broadcast environment not previously thought of.

However, one shortcoming should be pointed out. Unlike most of Aphex's products, there is no input reference switch. At a +4 input level there is only 17 dB of headroom before clipping.

However, the gate has a dynamic range of around 108 dB and, using an external pad, the ratio of headroom to S/N could be adjusted for each intended usage.

After all, most broadcast facilities are hard pressed to achieve more than 80 dB SNR in their audio path.

The Aphex Systems 612 Gate is packaged in the tradition of Aphex in a standard 19" wide, one rack unit high chassis. The audio connections are via XLR male and female connectors on the back panel.

The AC connection is with a high quality Corcom AC fuse and filter unit, utilizing an IEC power plug.

The unit is a two-channel device with switching available to "slave" the two channels together for stereo operation. It is also able to "duck" and to expand.

I didn't test these functions other than to the extent that I was able to confirm that the unit is capable of performing them.

I tested the performance of the unit with an Audio Precision System One test set. The results are shown in Figure 1.

The unit met or exceeded its published specs in most cases. As this was a preproduction unit, several discrepancies were discussed with the manufacturer and were fixed or will be, according to Aphex, by the time this article is published.

The most bothersome is the CMRR. All previous Aphex products I have tested were around 90 dB. This unit tested at 42 dB.

The other discrepancy was that Channel One was 0.40 dB higher in level from input to output and slightly higher in distortion products than channel two. But even the higher distortion would beat other processors I have tested.

All tests were performed at a reference level of +4 dBm balanced input (unless otherwise mentioned). Audio bandwidth was 10 Hz to 50 kHz, with an 80 kHz low pass filter used in all tests (unless otherwise mentioned). Both channels were "in," filters "out," threshold control full counter-clockwise. All other controls were at the 12 o'clock position.

Graph 1. Aphex 612 Gate frequency response 1000 point sample; +4 dBm.

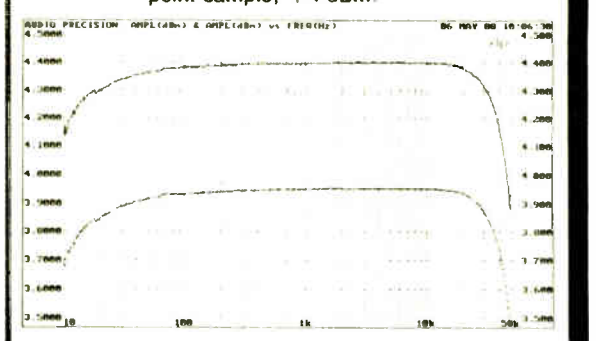


Figure 1.

Input Clip Level:	
Channel One	+21.0 dBm
Channel Two	+21.2 dBm
Published Specs:	+21.0 dBm
Output Clip Level:	
Exceeded input clip level. I could not accurately measure this as there is no provision for output level control.	
Published Specs:	+25 dBm
THD + Noise @1 kHz:	
Channel One	0.0081%
Channel Two	0.0057%
Published Specs:	less than 0.006%
THD + Noise @1 kHz @+20 dBm Input:	
Channel One	0.0101 %
Channel Two	0.0040%
SMPTE Distortion, Standard 4:1:	
Channel One	0.0068%
Channel Two	0.0042%
Published Specs:	less than 0.006%
CCIF Distortion (European intermodulation standard):	
Channel One	0.0090%
Channel Two	0.0015%
TIM Distortion:	
Channel One	0.0130 %
Channel Two	0.0057%
CMRR @1 kHz:	
Channel One	42 dB
Channel Two	42 dB
Published Specs:	"Excellent rejection"
SNR @1 kHz:	
Channel One	−91.03 dB
Channel Two	−91.03 dB
Published Specs:	−87.0 dB
Frequency Response 20 Hz to 30 kHz:	
Channel One	+0.00 to 0.10 dB
Channel Two	+0.00 to 0.10 dB
Note: A production unit I saw was flat to 90 kHz	
Phase Response 20 Hz to 50 kHz:	
Channel One	+0.00 to 0.58°
Channel Two	+0.00 to 0.58°

Editor's note: Barry Victor graduated from California State University at Northridge and began his broadcasting career in 1972. Some of his contract engineering firm clients include KIIS, NBC and Fox Television, LA Network and the Weedeck Radio Group

For more information about the Model 612, contact Marvin Caesar at Aphex: 818-765-2212. The author may be reached at 213-871-4690.

Orban Augments Stereo

(continued from page 38)

The theory used with this unit is that it will not create an exaggerated "echo-ey" sound which may be created when other forms of stereo enhancement are used.

What can be heard is a fuller, warmer sound with greater detail and depth to the overall mix. The stereo separation appears as if there is more "space" present.

On some musical material, certain instruments will actually stand out in the mix. You may even hear other instruments or sounds not heard before within the mix.

Acts on transient information

The technical theory behind the Stereo Spatial Enhancer is an interesting concept. Processing of the stereo information is achieved through the detection of "transient" information within the L+R signal.

This creates a control signal that operates a compressor that controls the level of the L−R or stereo information. Since only transient information is used to "trigger" the stereo enhancement, the added RMS level of L−R energy is kept to a minimum.

For this reason the effects on multipath distortion are either nonexistent or minimal in worst cases.

Actually the L−R level is only momentarily increased to achieve the effect, so multipath distortion is avoided.

It should be noted here that when added RMS levels of signals are present within the L−R channel, the chances or opportunities for multipath are greater.

Some forms of stereo processing utilize equalization or delay to achieve the enhancement process. This can create an unnatural sound due to the exaggeration of existing echo or reverb that exists already on the audio material.

Since the Spatial Enhancer is operating on transient information, existing echo or reverb is not enhanced because of the low transient content of echo and reverb signals.

In general, what has been created is an audio processing device that operates within another "realm" of processing technologies.

The Spatial Enhancer could be the needed edge to help complement an audio processing system. Here is a device that can "keep them guessing," along with an affordable price tag.

Through stereo processing, any audio chain can be augmented to further lock down or dominate your dial position. Now if we were to try and further define a detailed explanation of audio processing, we would all be mystified!

Editor's note: Frank Foti has been employed by Malrite Communications for almost ten years, and has been CE of WHTZ (Z-100) in New York, KSAN in San Francisco, and the Home of the Buzzard, WMMS in Cleveland. He has twisted the knobs of a few audio processors in other major markets as well.

For more information on the Spatial Enhancer, contact Sid Goldstein at Orban: 415-957-1063. The author may be reached at 216-781-3010.

BUYERS GUIDE

AM-4 Gives KTZR Wall of Sound

by Barry Mishkind, CE
KTZR-AM

Tucson AZ ... In the beginning, audio processing was an engineer with a quick hand.

The technology has come a long way. We now have the tools to make our stations loud, and to keep them clean.

In fact, whether our station wants to be the loudest on the dial, the cleanest or somewhere in between, there are four major things we ask from our processors.

A processor should protect the transmitter from excessive peaks, be relatively easy to set up, provide stable levels of modulation and maintain the EQ balance desired. Our choice at KTZR was the CRL AM-4 stereo processor.

The first requirement is not hard. It takes little more than a couple of diodes to clip audio.

The other requirements go to the heart of the processor manufacturer's design. Several units on the market have more knobs and pots than necessary to confuse the average contract engineer.

Others rely on fewer external adjustments, using internal control for many parameters.

And, despite the obvious benefits of stability, certain units are well known for their "EQ of the day" tendencies, as well as "floating" modulation levels.

The CRL units have never caused me any difficulties on these counts. Instead, once set up, they perform flawlessly.

Of course, I can say the same about the audio chain on my FM station. So why pick the CRL AM-4?

User Report

While we wanted to have a good, clean stereo signal, the reality of life was that we had to make sure the mono listeners, who make up the vast majority of the audience, were not slighted in the least.

Therefore, one reason that the CRL unit appealed to me was the strong mono support provided by the SMP-900 stereo matrix processor.

CRL has always been known for its strong limiters, and this was no exception. Both stereo and mono listeners receive a solid wall of sound.

Buyers of the newer SMP-900A will find that the NRSC curves are built into the unit, as well as other refinements.

Speaking of the limiter section, one of the raps on CRL over the years was that, yes, the units got your station very loud, but the distortion was often audible, especially on the high end. Many engineers used CRL processing on AM stations, but turned elsewhere for their FM.

CRL has really put a lot of effort in the last several years into improving its units and making them much cleaner. The differences are dramatic. And, with the addition of its "Dynafex" noise reduction circuitry, CRL has a very competitive box.

Another reason for my choice was that, after a quick and easy setup, the SEP-800 four-band dynamic equalizer made it a snap to tailor the sound to our exact desires. And it stays just as set.

My preference for this four-band unit is driven by the differences between real world AM and FM receivers. I find it easier to make the station both loud and bright with a four-band system.

One of the problems that sneaks up on many engineers is distortion caused by level mismatches between the parts of a processing system.

CRL largely avoids that by using LEDs that make it easy to set levels with great accuracy—even with STLs. From the AGC at the studio to the transmitter, the chain operates as a smooth system.

Are there any complaints with the CRL AM-4 system? Well, there are two things that do bother me a bit.

It sometimes seems that every six months or so CRL comes out with an updated unit, with a few more features.

This creates a problem: do you upgrade each time, at a fairly stiff price, or do you hope that the competition hasn't yet bought the latest version?

Neither is a particularly appealing prospect if you are in a very competitive situation in your market. The PD will scream at any loss of parity with the other stations. The GM wants to know why he has to buy more processing so soon. Either way, you lose.

The other problem is one of communication. CRL is no longer as easy to communicate with as in years past. Information requested often is met with delays, requiring several calls, or sometimes just never arrives.

This is not to say that the folks at CRL aren't top notch, friendly sorts. They've been very nice to me over the years.

Would I recommend CRL's AM-4 to you for a new installation? The answer is a qualified yes. You will not go wrong even if you are in the most competitive of situations. But you had better have a good budget or not be unnerved when the station across the street gets the next incremental version.

Editor's note: Barry Mishkind is **RW**'s *Eclectic Engineer.*

For more information on the AM-4, contact Dee McVicker at CRL: 602-438-0888.

BUYERS GUIDE

StereoMaxx Offers Flexibility

(continued from page 39)

Maxx the benefit of the doubt, it took about 20 minutes or so for me to fine tune to the sound I was most happy with.

The StereoMaxx is a well thought out device that employs a great degree of high technology and does not forget common sense engineering. It avoids sum and difference, it does not increase the peak level of L–R and it will not allow too much stereo enhancement, through automatic width limiting.

Also, a unique stereo threshold detector will prevent mono signals that are considered marginal stereo signals (due in some cases to phase shift) from being enhanced as though they were stereo.

The StereoMaxx is also a device that works well with all types of audio processing equipment, simply because it works in the time domain rather than amplitude domain.

After having been so happy with StereoMaxx, what more could I ask for? Now Eric Small has chosen to offer even greater operating flexibility to users of StereoMaxx through several modifications.

Enhanced enhancer

First, it is now able to make its mono correlation window variable, which allows the user to more accurately compensate for imperfections in phase and amplitude balance in the audio chain prior to the StereoMaxx.

The StereoMaxx . . . employs a great deal of high technology and does not forget common sense engineering.

Another modification permits control of the width limit threshold. This allows the user to move the point that the unit will start reducing stereo enhancement.

Both of these modifications are available to current StereoMaxx users by contacting Modulation Sciences. They'll send a free field modification kit, which simply consists of two trimmers, one resistor, instructions and a template for drilling two holes in the top cover.

Units shipped after 1 June will have these modifications included, and will also have a new manufacturer's price of $2,889—$306 less than earlier models due to the company's savings realized in the new version.

A few other details worth mentioning about StereoMaxx are that it is capable of 115/220 V operation without removing the top cover. Container construction is a full steel chassis, which gives effective RF and magnetic protection.

Components used inside are considered to be extremely expensive, such as a $40 analog to digital converter chip (price as purchased in quantity) and Jensen Transformers on the signal output.

Most of you will get around to StereoMaxx sooner or later. And if you're like I once was, Modulation Sciences' trial purchase program will probably change your mind. My guess is that you will quietly become the next user of radio's new secret weapon.

Editor's note: Harry Simons is also a member of the NRSC Committee.

For more information on StereoMaxx, contact Eric Small at Modulation Sciences: 718-625-7333. The author may be reached at 215-434-4424.

Express Tower Bolsters KQID

by Lennie Dupree, CE
KQID-FM

Editor's note: RW was unable to include the following article in last month's BG review of antennas and towers.

Alexandria LA . . . In 1984, Docket 80-90 was initiated by the FCC. To conform to the new docket our existing FM transmitting tower height had to be extended for us to retain our Class C license.

I work for Cenia Broadcasting, Inc., which owns and operates KQID-FM. Our transmitter site is located approximately 30 miles northeast of Alexandria, Louisiana.

We decided to take down our old tower and erect in its place a new 1,480' tower. The process of requesting preliminary tower quotes, filing applications with the FAA and FCC and selecting new transmitting equipment began.

User Report

With the help of James Kimman of Silliman and Silliman, preliminary assessments were made of the new tower project.

Since KQID's existing tower incorporated a Continental/ERI antenna and Continental transmitter, and both have performed quite well in the past, the decision was made to remain with these companies in obtaining new transmitting equipment.

Taking bids

Next we went out for bids on the 1,480' tower. We had numerous tower companies submit bids to us, but we finally settled on one that could provide us with an unusual top section: a rotating, self-supporting, 24" face, top section that was 90' in length.

The company was Express Tower Company of Locust Grove, Oklahoma.

We purchased our eight-bay G5CPS-8AC FM antenna through Continental Electronics, working directly with Electronic Research Industries (ERI) on the FM antenna pattern.

They submitted several patterns in conjunction with the mounting of the FM antenna to the 24" face top section.

After we discussed these patterns with Silliman and Silliman and picked the one best suited for our needs, it could be moved, with the aid of the rotating top section, to the exact position needed.

With Express Tower supplying all exact dimensions of the top section to ERI for antenna mounting, and Continental supplying the finished FM antenna and the Model 816R-5 35 kW transmitter, we were ready to proceed with the project.

On the air

In March of 1987, our president and GM Taylor Thompson was able to announce that we were officially transmitting from our new tower.

The tower provided by Express Tower Company has proved to be a high quality structure. The rotating top does exactly what we want it to do.

As a result of the taller tower, the pinpoint accuracy of the FM antenna, and the 35 kW transmitter, our city grade signal has increased approximately six to eight miles.

Editor's note: Lennie Dupree is a veteran technician with more than 32 years of broadcasting experience.

For more information on Express Towers, contact Dyke Dean at 918-479-6484. The author may be reached at 318-445-1234.

Circle Reader Service 35 on Page 34

ALLIED

The *FULL SERVICE* Broadcast People

WHEN MANAGEMENT & ENGINEERING CIRCLES THINK ABOUT UPGRADING...

NEW ANDREW

2 1/4" HELIAX®

IS THE TOPIC THAT ALWAYS ROLLS AROUND

ANDREW ALLIED

CLASS A to CLASS B . . . CLASS B to CLASS C . . . 1⅝" is the economical way, but perhaps too small for the job. 3" has great capacity and efficiency, but it's not inexpensive! 2¼" may be the answer. Compare for yourself. How much can you save?

SIZE	HELIAX® TYPE	ATTENUATION in dB per 100 ft. @100 MHz	AVERAGE POWER @100 MHz	MANUFACTURER'S LIST PRICE
3"	HJ8-50B	0.013	37 kW	$22.30/ft.
2¼"	HJ12-50	0.169	20.1 kW	$17/ft.
1⅝"	HJ7-50A	0.207	14.4 kW	$12/ft.

A complete selection of accessories assures compatibility with all 1⅝" and 3" EIA standards.

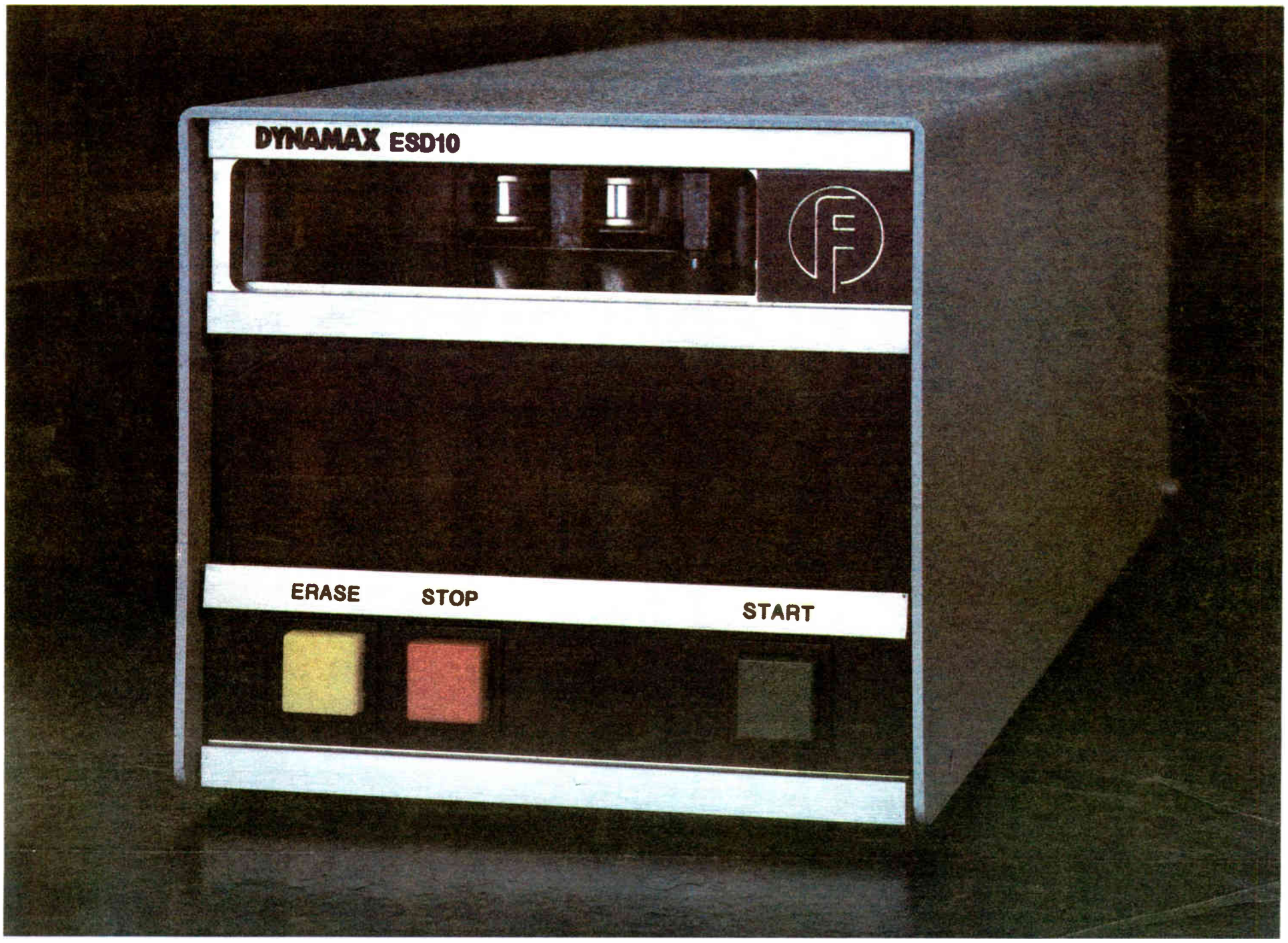
TEST DRIVE THE MIDSIZE

Prices subject to change without notice.

ATLANTA, GEORGIA 404-964-1464
LOS ANGELES, CALIFORNIA 818-843-5052
CHICAGO, ILLINOIS 312-470-0303
RICHMOND, INDIANA 317-962-8596
DALLAS, TEXAS 214-423-8667
SEATTLE, WASHINGTON 206-838-2705
RICHMOND HILL, ONTARIO, CANADA 416-731-3697

USED EQUIPMENT DIVISION 317-962-1471
BROADCAST SYSTEMS DIVISION 714-752-6664
SATELLITE EQUIPMENT DIVISION 317-962-8596
NIGHTS/WEEKENDS EMERGENCY 317-935-0455

ALLIED Broadcast Equipment
P.O. BOX 1487 • RICHMOND, IN 47375
Join Our FAX Network • Prompt Response on Your RFQs
FAX 317-962-8961
Log In . . . Bulletin Board Modem . . . 317-935-0531



Dynamax® ESD10 Eraser/Splice Detector Cleanest Erasure Ever!

Now there's a better way to erase your carts. Without degaussing coils. Without heat. Without damaging your tapes.

The DYNAMAX® ESD10 Eraser/Splice Detector improves on reel-to-reel technology by using two precision full-track erase heads. The result is a significant improvement in cartridge signal-to-noise ratio, and on-air sound beyond anything you might have thought possible.

In addition, a patented system guarantees reliable, automatic splice detection with no sensitivity adjustments. Operating at 27.5 ips, the *continuous duty* ESD10 will erase and splice-locate a 40-second cartridge in less than 22 seconds.

Get the full story on the fastest growing cartridge machine family. Contact Fidelipac or your authorized DYNAMAX Distributor.

DYNAMAX®
BROADCAST PRODUCTS BY FIDELIPAC®

Fidelipac Corporation ☐ P.O. Box 808 ☐ Moorestown, NJ 08057 U.S.A. ☐ 609-235-3900 ☐ TELEX: 710-897-0245 ☐ Toll Free 800-HOT TAPE

Circle Reader Service 61 on Page 34